Bleams Road – Fischer-Hallman Road to Trussler Road

Schedule ‘C’ Class Environmental Assessment (Class EA)

ENVIRONMENTAL STUDY REPORT (ESR)

Project Location:
Bleams Road, Kitchener

Prepared for:
Regional Municipality of Waterloo
Frederick Street, Kitchener, ON

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April 2023

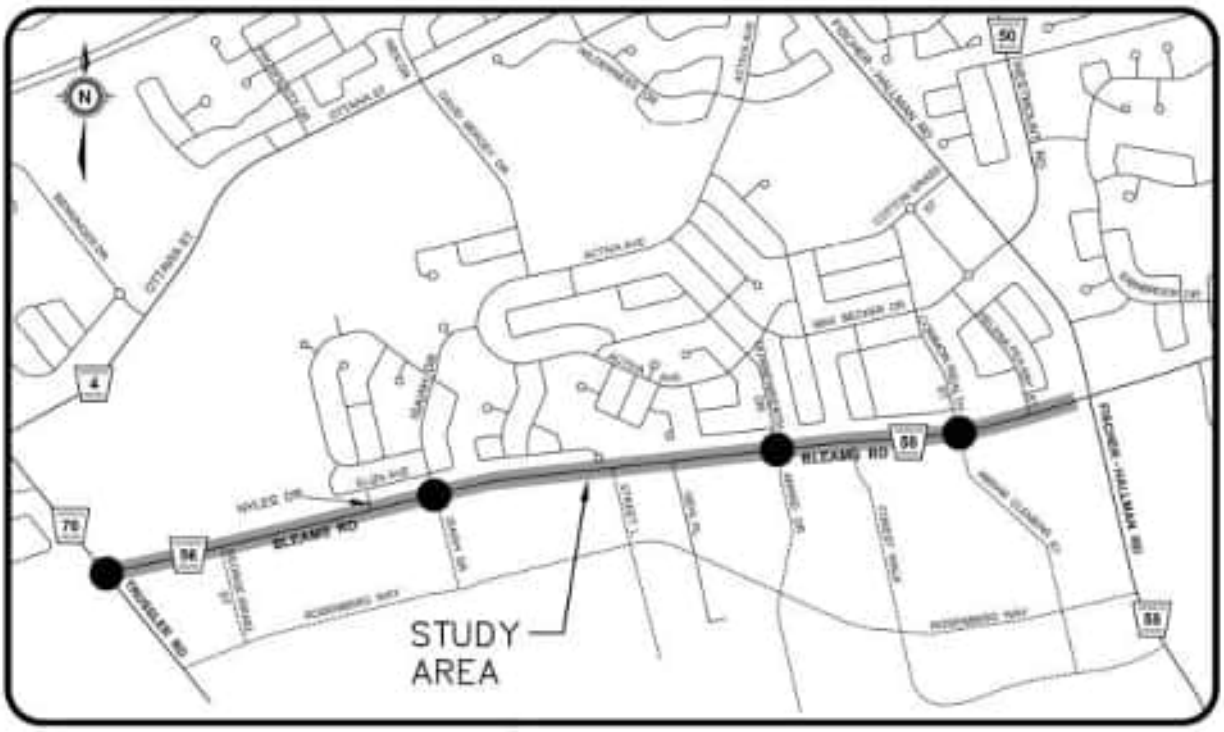
MTE File No.: 47727-100

Engineers, Scientists, Surveyors.

Executive Summary

The Region of Waterloo has undertaken a Schedule 'C' Class Environmental Assessment (Class EA) study in the City of Kitchener for Bleams Road from Fischer-Hallman Road to Trussler Road. The study area for the Bleams Road Class EA is illustrated below in Figure ES1.

Figure ES1 – Study Area



The following Problem Statement outlines the purpose of this Bleams Road Improvements Class EA Study:

> *"The section of Bleams Road from Trussler Road to just east of Fischer-Hallman Road is at the end of its useful life. At the natural point of reconstruction consideration will be given to the traffic demands on the overall corridor with the current development as well as future developments to the south. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians, cyclists, and transit along the corridor."*

The Bleams Road Improvements Class EA was initiated in 2021, and included notification and contact with various agencies, utility companies, first nations communities, and public and private property owners. Two Public Consultation Centres (PCC) were held, using the Region of Waterloo's Engage platform. A number of background studies were also undertaken, including:

- ✓ Natural Environment Report
- ✓ Stage 1 and 2 Archaeological Assessment
- ✓ Built Heritage and Cultural Assessment
- ✓ Transportation Study
- ✓ Noise Assessment

Alternative solutions to address the problem statement explored and screened during the completion of this Class EA:

- ✓ Do Nothing
- ✓ Full Roundabout Solution
- ✓ Full Signalized Solution
- ✓ Hybrid Solution

At the beginning of this process a Traffic Study was initiated, and the traffic volumes were used to determine the warrant for intersection improvements, as well as widening the Bleams Road Corridor. From this work, the study found that four (4) key intersections along this section warranted an increase level of service. These are the intersections of Bleams Road and;

- ✓ Commonwealth Street / Abram Clemens Street;
- ✓ Donnenwerth Drive / Amand Drive;
- ✓ Isaiah Drive;
- ✓ Trussler Road.

From the current, as well as the future demands from the planned development on the south side of Bleams, it was determined that a four-lane section was needed from Fischer-Hallman Road through to Commonwealth Street / Abram Clemens Street. This will taper back to a two-lane corridor to Trussler Road, this was common amongst all the alternative solutions that were considered through the EA process. The final consideration of this corridor was urbanizing the cross-section of the road to include travel solutions for all road users, this came in the form of either a multi-use trail or a single direction cycle track with a sidewalk to accommodate multimodal users.

Since implementing most of these alternative solutions will fully address the problem statement for Bleams Road, all but the Do Nothing alternative solutions was carried forward. The Alternative Design Concepts for Bleams Road included two main components:

- ✓ Intersection Improvements:
  - o Unsignalized Intersections (with turn lanes as required);
  - o Signalized Intersections (with turn lanes as required);

- Roundabouts (i.e. 0, 4, or 2 - signals at Bleams and Commonwealth, Donnenwerth, Isaiah, and Trussler, or roundabouts at Bleams and Commonwealth, Donnenwerth, Isaiah, and Trussler, or 2 roundabouts at Commonweath and Trussler with signalized intersections at Donnenwerth and Isaiah).

✓ Bleams Road Cross Section:
- Four Lanes (two lanes in each direction);
- Two Lanes (one lane in each direction);
- Multi-use Trail, or Single Direction Cycle Track with Sidewalk.

Copies of the intersection alternatives are illustrated in Figures ES2, ES3, and ES4.

These alternatives and their evaluations were presented to the public and stakeholders at the Public Consultation Centre (PCC) #1, which was held on the Region of Waterloo's Engage Platform with a narrative presentation, a comment period from February 14, 2022 until March 7, 2022. In addition, several meetings were held with property developers who are developing along the Bleams corridor to discuss the construction of the roundabout(s) would result in impacts to their property. The comments received from the public and agencies and technical studies was reviewed and evaluated, and a subsequent presentation to present a preferred alternative to the public for PCC #2 was posted on August 15, 2022, with a comment period open until September 12, 2022.

Figure ES2 – Full Signal



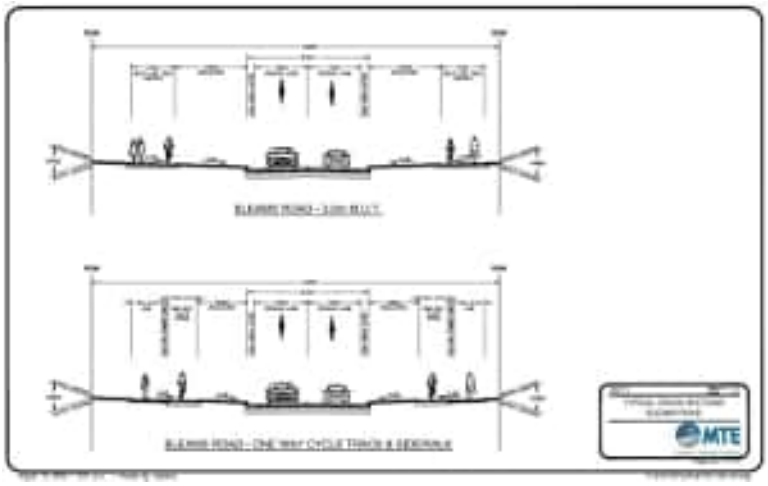
Figure ES3 – Full Roundabout



Figure ES4 – Hybrid



Figure ES5 – Typical Cross-sections



Taking the comments from PCC #1, the project team met several times to agree on a preferred alternative. The preferred design accommodates the needs of Bleams Road, while taking into account comments from the public and stakeholders, along with consideration of other technical studies, best practices, and the experience of those on the project team.

The Preferred Alternative Design Concept for Bleams Road included two main components:

- ✓ Intersection Improvements:
  - o Roundabouts (i.e. 4 roundabout at Bleams and Commonwealth, Donnenwerth, Isaiah, and Trussler)
  - o Multi-lane roundabouts at Bleam and Commonweath, and at Bleams and Trussler
  - o Single lane roundabouts at Bleams and Donnenwerth, and at Bleams and Isaiah.

- ✓ Bleams Road Cross Section:
  - o Four Lanes (two lanes in each direction) for the section from Fischer-Hallman Road to Commonwealth Street / Abrams Clemens Street;
  - o Two Lanes (one lane in each direction) for the remainder of the corridor;
  - o Raised Centre median from Fischer-Hallman Road to Amand / Donnerwerth Street (
  - o Multi-use Trail, or Single Direction Cycle Trak with Sidewalk.

The purpose of Public Consultation Centre #2 (PCC#2) was to:

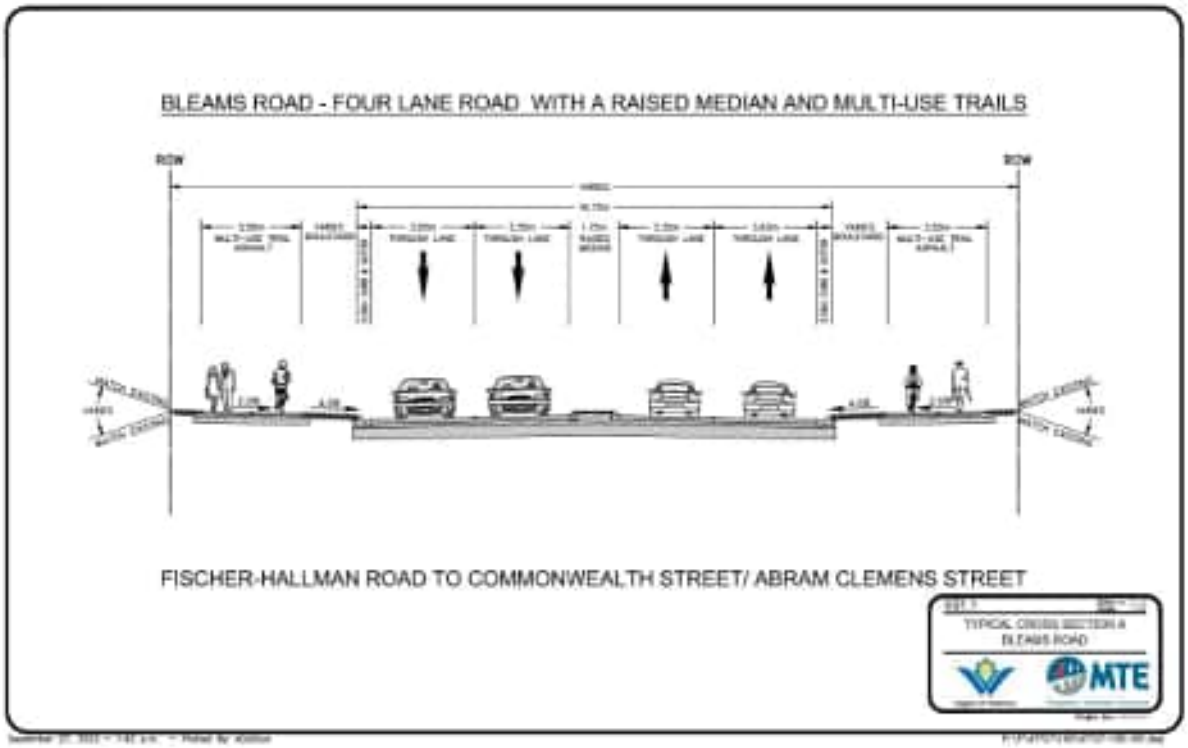
- ✓ present the project team's preferred alternative design that meets the improvement needs of Bleams Road.
- ✓ Receive comments on the preferred solution.

During PCC #2, which ran from August 15 to September 12, 2022, there were 93 visitors, of which, 10 people responded to the survey questions and one visitor offered insights and suggestions relating to vehicle speeds at roundabouts. All of the responses received were in favour of the all roundabout solution. However, some listed active transportation and crossings of the corridor as a concern. The project team was made aware of the above concerns and will take them into account during the detailed design of the Bleams Road improvements.

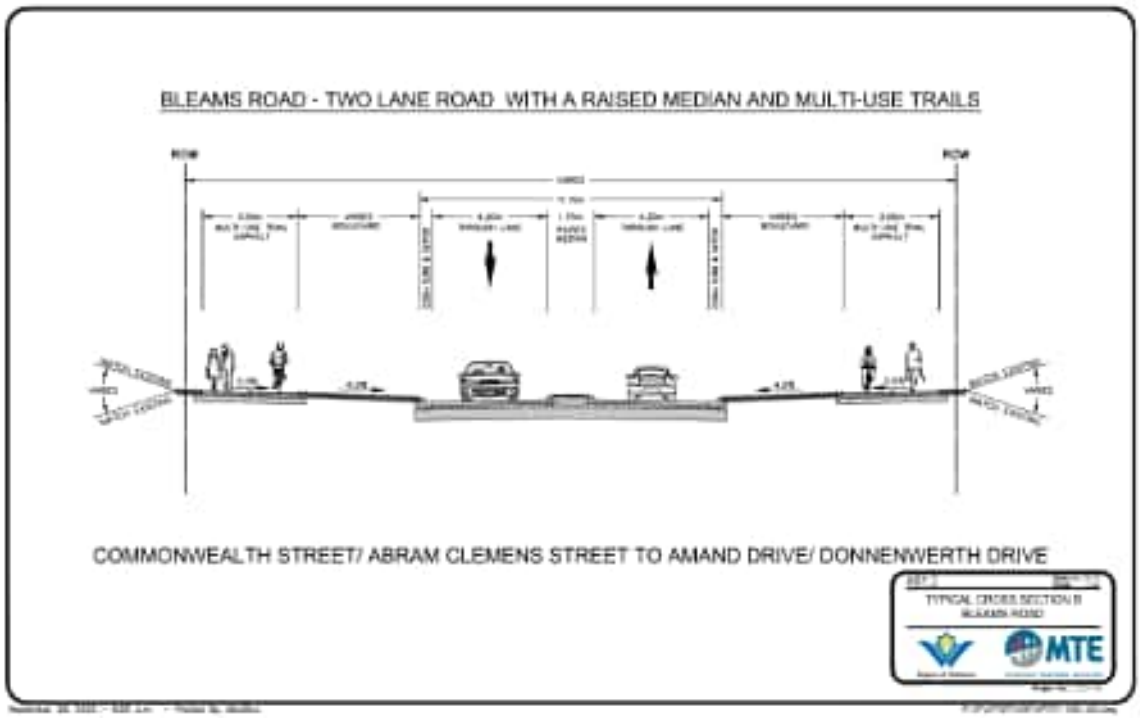
ES6 – Preferred Alternative



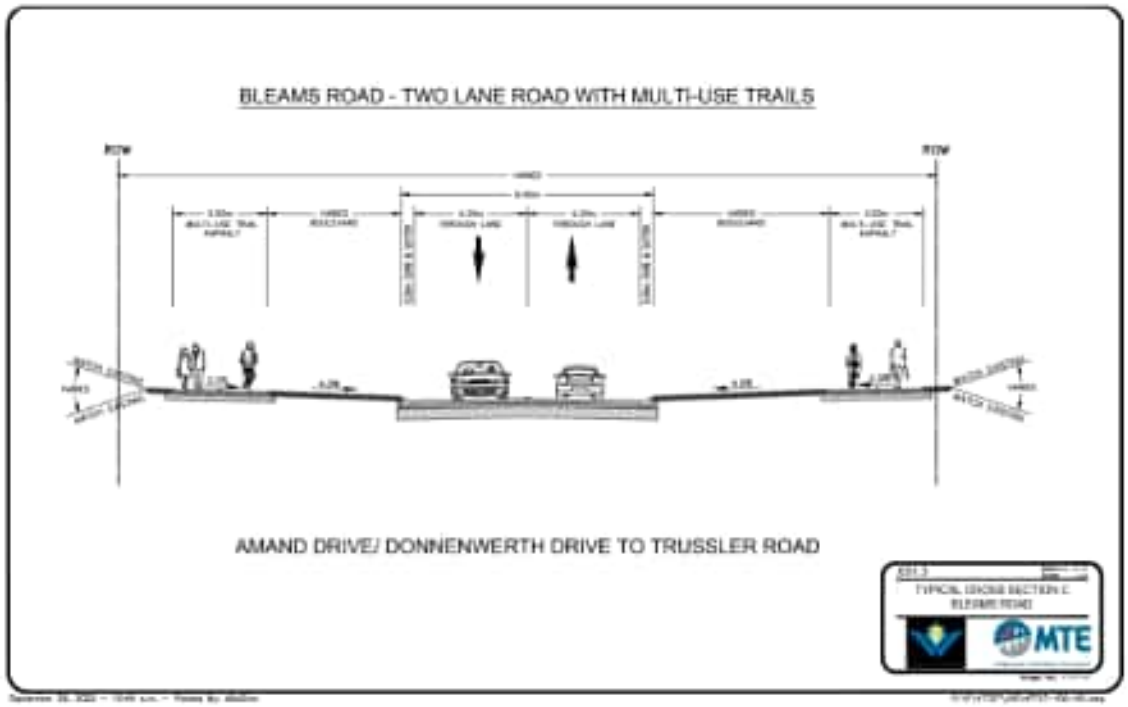
ES7 – Preferred Cross-section – 4 lanes with raised median



ES8 – Preferred Cross-section 2 lane with raised median



ES9 – Preferred Cross-section 2 lane



A preliminary cost estimate to complete the Recommended Alternative Design is approximately $16.6 million and will be included in the 2023-2032 Transportation Capital Budget. The estimated construction cost for the new raw watermain is $3.75 million and will be included in the preliminary 2023-2032 Water Services Capital Program. The timing of the construction is subject to receipt of all technical and financial approvals, completion of detailed design, relocation of utilities and land acquisition, and will be revised as necessary during the preparation of future Transportation Capital Programs.

A Notice of Study Completion for this Class EA is anticipated to be filed on or about May 1, 2023 with the Ministry of Environment, Conservation and Parks (MECP, formerly MOECC), as well as provided to the public, agencies, and stakeholders by means of advertisements in local newspapers and mailings to adjacent property owners, tenants, and review agencies, with the Environmental Study Report (ESR) placed on public record for a thirty (30) day review period. Copies of the ESR will be made available at the Clerks' office in Region of Waterloo, and City of Kitchener for the review period, as noted in the Notice of Study Completion.

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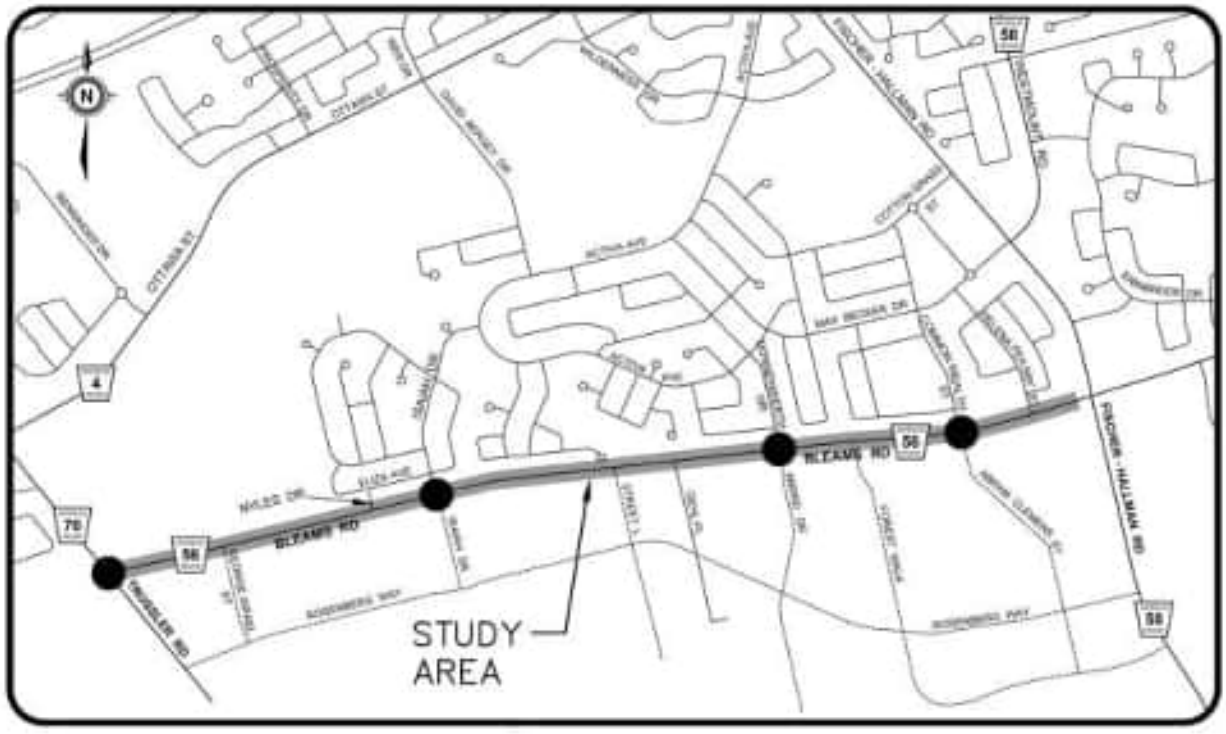
1.0 Introduction and Background

This Environmental Study Report (ESR) documents the Class Environmental Assessment (EA) process undertaken for the Improvements on Bleams Road between Fischer-Hallman and Trussler Road in the City of Kitchener. The study area is illustrated in Figure 1.1. The study followed the Schedule "C" Class EA process as outlined in the Municipal Class Environmental Assessment, June 2000 document, and October 2000 as amended in 2007.

Figure 1.1 - Study Area



Bleams Road is one of the Region's oldest roads, dating back to the early 1800s, even before the City of Kitchener was established. There are a series of developments along the south side of this section of Bleams Road, which are in various levels of approvals and construction. The demand on this corridor is increasing and driving the need to improve Bleams for all modes of transportation. Over the coming years it will become home to some of the Region's newest residents. Because of this growth, the Region is beginning the process of upgrading the roadway to provide a corridor that is more easily travelled by all types of traffic. The project is also an opportunity to improve storm drainage and create better traffic flow through re-envisioned intersections throughout the project limits.

Bleams Road especially at the west limits is within a Wellhead Protection Area (WHPA) and as such little or no infiltration of storm water is permitted through LIDs.

Today, Bleams Road is classified by the Context Sensitive Regional Transportation Corridor Design Guidelines (CSRTCDG) as a Neighbourhood Connector – Avenue. As part of this project the corridor is intended to be upgraded with an ideal right-of-way to support the

extensive residential developments that are known in a planning context as part of the Rosenberg Secondary Plan.

The Region of Waterloo has decided to proceed with the Schedule C Class EA Study for the Improvements to Bleams Road along the existing route, widening the east section of the study area from its current two-lane cross-section to a possible four lane cross-section. One of the questions to be answered in this study is how long the widened section of this corridor needs to be to properly serve the traffic demands. Given the increased population what type of intersections are necessary and preferred to attain an adequate level of service accounting for the expected growth in the area in all modes of transportation. Building on the Region's commitment to active transportation, the corridor will be urbanized from the existing rural cross-section with gravel shoulders, and this study will determine the type and placement of Active transportation facilities to serve the demand on the corridor.

1.1 The Class Environmental Assessment (EA) Process

All municipalities in Ontario are subject to the provisions of the Environmental Assessment Act (EAA) and its requirements to follow the Environmental Assessment Process for most public works projects. The Ontario Municipal Engineers Association (MEA) Municipal Class Environmental Assessment document (June 2000, as amended in 2007), provides municipalities with a five-phase planning procedure approved under the EAA to plan and undertake all municipal road, sewage, stormwater management, water, and transit projects. The Class EA document also serves as a public statement of the decision-making process followed by municipalities in the planning and implementation of needed infrastructure.

Based on the MEA Class EA document, projects are classified as either Schedule "A", "A+", "B", or "C" projects according to their environmental significance and the effects they may impose on the environment, as well as their relative financial costs. The main difference between the classifications/schedule types is the degree to which each project may adversely affect the existing environment. Schedule "A" and "A+" projects have minimal adverse effects, while Schedule "C" projects have the potential for significant environmental effects. Accordingly, each of these classifications requires a different level of review to complete the requirements of the Class EA, and thus comply with the Environmental Assessment Act. Figure 1.2 illustrates the process followed in the planning and design of projects covered by a Class EA. The Class EA process incorporates Phases considered essential for compliance with the requirements of the EA, including public consultation, which is summarized below:

Phase 1

- Identify the problem or opportunity.

Phase 2

- Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, select the project Schedule, and establish the preferred solution.
- Mandatory public and agency contact, normally in the form of a Notice of Commencement for Schedule B and C projects and as a Public Consultation Centre (PCC) for Schedule C projects. Notice is the first mandatory point of contact.

Phase 3

- Examine alternative methods of implementing the preferred solution based on the environment, public and government agency input, anticipated environmental effects, and methods of mitigating negative effects.
- Mandatory public and agency contact, normally in the form of a PCC for Schedule C projects or as a Notice of Completion for Schedule B projects. This is the second mandatory point of contact.

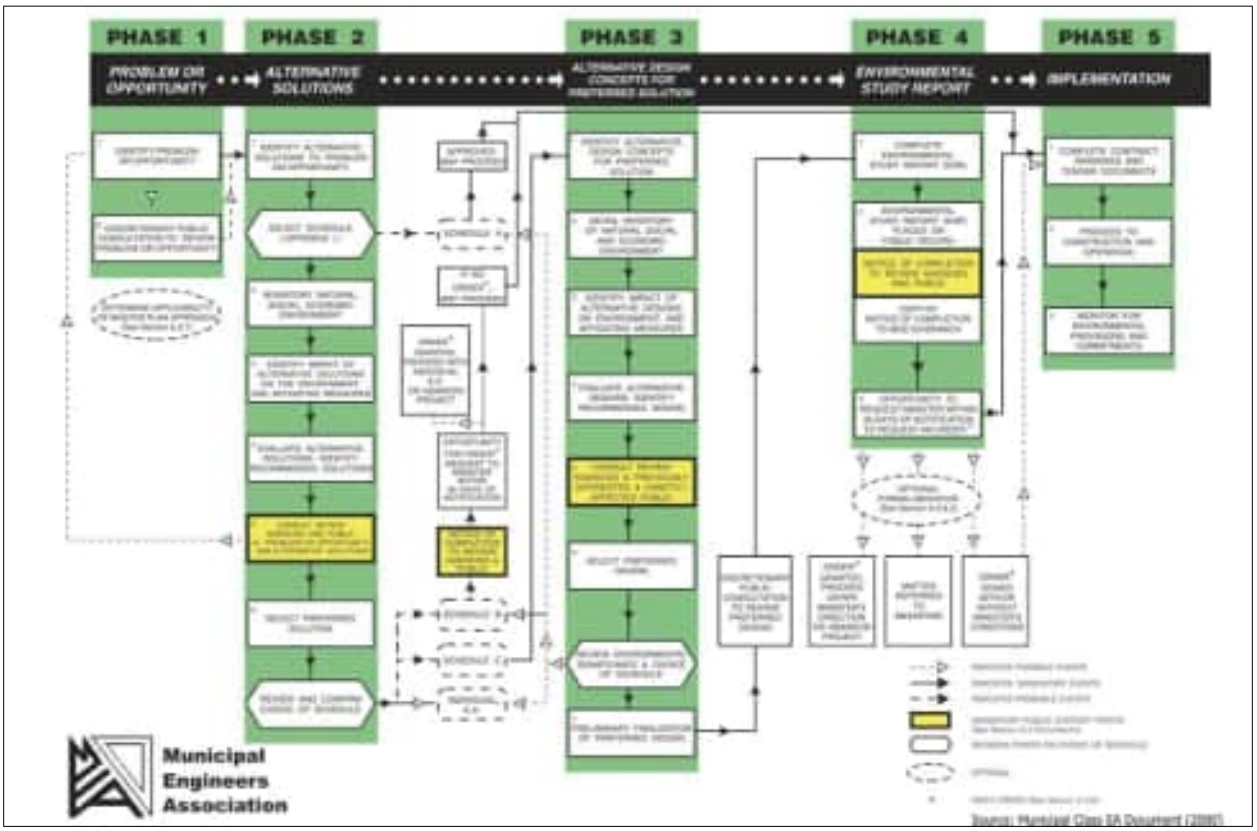
Phase 4

- Mandatory Notice of Completion of ESR (Schedule C projects only). This is the third mandatory contact point for Schedule C projects and also carries a mandatory requirement to include notification of the provision on how to submit an Order under Section 16 of the Environmental Assessment Act.
- Document, in an Environmental Study Report (ESR), a summary of the rationale and the planning, design, and consultation process followed in the project and make such documentation available for scrutiny by review agencies and the public.

Phase 5

- Complete contract drawings and documents; proceed to construction and operation and monitor construction and operation (as required) for adherence to environmental provisions/commitments. This phase is optional and typically completed closer to construction.

Figure 2.1 - Class Environmental Assessment (EA) Process



Public and agency consultation is an important part of the planning process. The proponent is encouraged to resolve all concerns with the public prior to issuing a Notice of Completion and commencing the public review period. This applies to addendums and full projects. However, if members of the public or review agencies feel that significant outstanding issues have not been addressed during the Class EA process they may request the Minister of the Environment, Conservation and Parks (MECP) to require a proponent to comply with a Section 16 Order of the EA Act (which addresses individual EAs), before proceeding with a proposed undertaking – this is what is known as a "Section 16 Order".

Additional details on the Section 16 Order process, where to send requests, timelines, and factors for the Minister making a decision can be found in Section 7.4 of this Environmental Study Report.

The Problem/Opportunity Statement

For this Class EA the problem/opportunity statement is: "The section of Bleams Road from Trussler Road to just east of Fischer-Hallman Road is at the end of its useful life. At the natural point of reconstruction consideration will be given to the traffic demands on the overall corridor with the current development as well as future developments to the south. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians, cyclists, and transit along the corridor."

1.2 Project Team Organization

The Region of Waterloo retained MTE Consultants Inc. (MTE) as their Prime Consultant to assist in completion of this Class EA Study. The “Project Team” consisted of members from the Region of Waterloo, City of Kitchener, MTE, and specialized subconsultants needed to address specific requirements of the project. The following is the Project Team members involved in the project:

Region of Waterloo

Greg Proctor	Project Manager, Design & Construction
Skylar Van Kruistum, P.Eng	Head, Engineering Rehabilitation
Darryl Spencer, P.Eng.	Manager, Transportation Engineering
Kornel Mucsi, P.Eng.	Manager, Transportation Planning
Jason Wigglesworth	Transportation Planner

City of Kitchener

Kelly Galloway-Sealock	Councilor (Former)
Faranak Hosseini, P. Eng,	Project Manager
Trevor Jacobs	Project Manager

Salvini Consulting

Julia Salvini, P.Eng FITE

NRSI

Jennifer McCarter	Terrestrial and Wetland Biologist
Jessica Linton	Senior Manager, Terrestrial and Wetland Biologist

MTE Consultants Inc.

Dot Roga	Project Manager
Jim Redman	Project Coordinator
Nathan Duimering	Project Designer

1.3 Data Collection

A large part of the study involved the collection and review of existing information to determine the need for potential improvements within the identified Study Area in order to develop and evaluate alternative solutions and design concepts.

As part of the data collection phases, stakeholder consultation was undertaken throughout the study process. Target participants included property owners within the Study Area, the general public, technical agencies and stakeholder/interest groups. Information related to land use, traffic operations, the natural and social environment, existing utilities, and other engineering related components was gathered. For ease of reference, the details pertaining to the public and agency consultation undertaken throughout the study is found in Section 4.0 – Public and Agency Consultation.

1.3.1 Utility Coordination

Enbridge Gas

There is a high-pressure Enbridge line within the study limits. It initially appeared that there would be conflicts with the existing elevation of this line identified as the Own Sound Transmission Line at the intersection of Bleams and Abram Clemens Street. The line has an alignment running north along Abram Clemens Street and turns towards Trussler Road at Bleams on the south side of the road. Grading of the new corridor has been confirmed here, and there will not be a conflict in this location.

Part of this project is to improve the safety of this corridor, and the design is to cut the hill on Bleams Road approaching Trussler Road. This is on the west end of the project, with Enbridge as constructed drawings, the existing Transmission line will not conflict with this grade change. The designs have taken into consideration the existing Gas infrastructure and at large transmission line will not conflict with the Bleams Improvement project.

Kitchener Utilities

There is a service gas line that may need to be lowered.

Region of Waterloo

There is a new 600mm raw watermain scheduled for construction, this has been added to the corridor improvements on this project and will run through the corridor and connect to an adjacent project at the Bleams and Fischer-Hallman Roundabout. There is alignment and coordination between the design/construction teams for the different sections of this new raw watermain.

Enova Power

There are existing hydro poles along the north side of Bleams Road, which will likely need to be relocated due to these corridor improvements. The proposed location of various cross section elements such as multi-use trails, curb and gutter and areas of roadway widening will be defined by working with the Region's Corridor Management group. That group will assist in defining the running lines of the hydro poles as well as the gas service and communication service needed for the expanding development in the area. There is also a possibility that the roadway grading may be adjusted during final design. In general, if the grade at the existing hydro pole has to be raised 0.45m or lowered greater than 0.15 m then the pole will need to be replaced. Discussion with Enova Power have begun and will continue through the design process.

Streetlighting
As part of the corridor design, we will have a photometric analysis completed to determine the lighting levels needed for both vehicle, cyclists and pedestrians based on the Region's standard. Lighting will be added to existing and proposed hydro poles with stand alone street light poles added where necessary to provide safe travel along the corridor.

1.3.2 Clean Water Act

This study must consider the impact to drinking water sources, in accordance with section A.2.10.6 of the EAA, as well as Regional policy RW-CW/NB-40 of the Grand River Source Protection Plan. In this context the application of road salts would create a Significant drinking water threat within the study area. In accordance with the Clean Water Act, mitigation is required to prevent Significant threats to drinking water sources. All the alternatives, including the preferred design, will increase the surface area that will require application of road salts for winter maintenance. The western 2/3 of the project overlies the highly vulnerable drinking water protection areas for the Mannheim water supply wells and the project will need to include measures to protect the water quality from the application of road salts. The identified area of concern is outlined in **Appendix I.**

Detailed design of this project includes the installation of a closed storm sewer to convey surface drainage out of the area of high vulnerability. At this point in the design there have been potential design concepts, such as clay lined boulevards and winter by-pass features in the adjacent storm water ponds. During the upcoming detailed design phase, Regional Water Services staff will be consulted for alternate construction practices as well as their involvement with discussions regarding reduction of rock salt use for winter deicing practices in this area.

1.3.3 Drainage

Stormwater
The current stormwater is managed through existing deep ditches along the corridor with various informal outlets and infiltration. With the geometric improvements to Bleams Road and the urbanizing of the cross-section, the existing open ditches will be removed, and active transportation facilities will be constructed. At this point the Region will improve the current condition over the sensitive area noted in Section 1.3.2 of this report, by limiting the salt laden water that infiltrates into the sensitive area in the western 2/3 of the corridor.

A new stormwater management (SWM) system will be designed to manage the Region's right of way drainage. The new stormwater system will utilize the quality and quantity control of the proposed SWM ponds owned by new developments on the south side of Bleams Road. These ponds won't likely be available for use before the construction of Bleams Road commences so an interim solution has been devised directing roadway drainage directly to the existing SWM pond as part of Strasburg Creek near Fischer Hallman Boulevard. The "Upper Strasburg Creek Erosion Analysis for Bleams Road Reconstruction" was completed, and it confirmed that no adverse effects to Strasburg Creek are expected during the interim condition. An Oil/Grit Separator will be installed in the interim as well to provide quality control. These Ultimate ponds are also equipped with winter bypasses to divert any road salts away from sensitive recharge areas, and through to the Strasburg Creek as the legal outlet.

The details on the mitigation measure are still in development in cooperation with Regional staff and will continue into detailed design. The potential design concepts currently in consideration are clay lined boulevards, an additional concrete strip to catch salt laden snow, or winter

closures for one of the multiuse trails to limit the need for salt. See Catchment Area plan in **Appendix H.**

1.3.4 Planned Developments

There are substantial developments planned along the Bleams Road corridor. Most of the south side of the corridor has been approved for new residential developments with some neighborhood commercial. The following sites were specifically accounted for in this EA.

- Big Springs/Williamsburg South located between Fischer-Hallman Road and including new connection to Bleams Road at Abram Clemens Street.
- South Estates/Cook/Mattamy west of Big Spring with a new connection to Bleams Road at Forestwalk Street.
- Stamm located west of Cook/Mattamy with a new connection to Bleams Road at Amand Drive
- Mattamy west of Stamm to Trussler Road with multiple new connections to Bleams Road at Street L, Isaiah Drive and George Israel Street.

In addition, there is a development proposed for vacant lands at the northeast corner of the Trussler/Bleams intersection.

1.3.5 Transit

GRT bus services are planned to be provided on Rosenberg Way south of Bleams Road. However, the design of the intersections on Bleams Road should accommodate transit buses to provide flexibility for future services and also to provide options for the buses to turn around and return to the east as they reach the west end of Rosenberg Way.

1.3.6 Winter Maintenance

In addition to the design considerations indicated in this report, the road authority that will undertake winter maintenance of the bike lanes are encouraged to identify management practices that would mitigate the impact of their salt application to the nearby drinking water supply wells as required by the Clean Water Act. This could include consideration of options to reduce salt use by identifying practical levels of service (e.g. only maintaining one side of the bike lanes in the winter, publishing mandated response times), using advanced equipment (e.g. salt spreaders that can be calibrated, use of liquid brines), establishing standards for review of individual storm responses, and detailed salt use tracking.

2.0 Background Studies

2.1 Natural Environment

On behalf of the Regional Municipality of Waterloo, Natural Resource Solutions Inc. (NRSI) completed an Environmental Impact Study (EIS), which has been completed as part of this Class C EA for the potential reconstruction and improvement of Bleams Road (Regional Road 56) between Fischer-Hallman Road and Trussler Road in the City of Kitchener.

2.1.1 Introduction

The steps required to complete the EIS for the proposed undertaking in accordance with the GRCA Environmental Impact Study Guidelines and Submission Standards for Wetlands (2005), the Region of Waterloo Greenlands Network Implementation Guideline (2016), the Region of Waterloo Official Plan (2015), the City of Kitchener Official Plan (2014), and the Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan (CH2MHill and North-South Environmental Inc. 2008). For the purposes of the EIS, Natural features expand beyond the boundaries of the Subject Lands; therefore, a larger area was considered to inform this EIS. The term "Study Area" refers to the Subject Lands plus the surrounding lands within 120m for which additional information was collected and reviewed.

The Study Area falls within Ecoregion 6E, the Grand River Watershed, and the Alder Creek Watershed and Upper Strasburg Creek Subwatershed. Natural features identified within the Study Area include the headwaters of Strasburg Creek and its associated floodplain, south of Bleams Road just west of Fischer-Hallman Road. This area is also mapped as a Core Natural Heritage Feature by the City of Kitchener (2014). The watercourse, floodplain, and wetland are regulated by the Grand River Conservation Authority (GRCA) and subject to Ontario Regulation 150/06 (GRCA 2015c). Portions of a woodland not considered significant by the City or the Region, is also present just east of Trussler Road. The Study Area also falls within a Regional Recharge Area (Region of Waterloo 2015).

The EIS was completed in three phases 1) background information review; 2) natural resource characterization, and; 3) impact analysis and EIS Conclusions and reporting. Each of these study components is described in the full report, which is included in **Appendix A.**

<u>Species at Risk and Species of Conservation Concern Screening</u>
A preliminary screening exercise was conducted on these species to identify which species have suitable habitat within the Study Area. This involved cross-referencing the preferred habitat for reported Species at Risk (SAR) (MNR 2000) against habitats known to occur in the Subject Lands or Study Area. This was completed to ensure that the potential presence of all SAR and Species of Conservation Concern (SCC) within the Study Area was adequately assessed in this EIS. Through this exercise, SAR and SCC were identified as having potentially suitable habitat in the Subject Lands.

2.1.2 Findings

All the vegetation communities and wildlife species known from within the study area are typical of an urban community, and no significant species (SAR or SCC) or SWH were documented.

The characterization of existing natural features was used to inform an analysis of the significance and sensitivity of natural features within the study area. This information was intended to inform the selection of a preferred alternative design that seeks to avoid or minimize impact to existing natural features and species. Design Alternatives #2 to #4 were equivalent in terms of the types and extent of impacts.

Direct impacts to natural features resulting from the preferred alternative design will be limited to vegetation and roadside tree removals. The proposed development does not include replacing the existing culvert with the Strasburg Creek floodplain, therefore no direct or indirect impacts to fish or fish habitat are anticipated based on design.

This report provides recommendations to minimize impacts and ensure that mitigation measures are installed and functioning properly. These include recommendations to mitigate direct and indirect impacts that may arise during the proposed undertaking. Based on the preliminary design, and provided that these recommendations are implemented, negative impacts arising from this undertaking are not anticipated. It is anticipated that the impact assessment completed for this report, as well as recommendations for impact mitigation, will be updated as necessary based on detailed design of the proposed undertaking.

A full copy of this report has been included as **Appendix A.**

2.2 Archaeological Assessment

2.2.1 Introduction

On behalf of the Regional Municipality of Waterloo, Archaeological Research Associates Ltd. (ARA) completed an Archaeological Assessment in support of the Class EA study. As with all the supportive studies, its focus is the area to be reconstructed and improved along Bleams Road (Regional Road 56) between Fischer-Hallman Road and Trussler Road in the City of Kitchener. From an archeological standpoint this translates into approximately 15.00 ha (37.07 ac) in size, located on part of Lots 129, 132, 133, 139 and 140, German Company Tract and Heist & S Tract in the Geographic Township of Waterloo, Former Waterloo County.

The preliminary analysis of the project lands indicated that, in its pristine state, the area would have potential for archaeological resources. ARA has completed studies in the past in this area and built this study to incorporate a number of previous archaeological assessments. These have included assessments for the redevelopment of lands abutting Bleams Road, the proposed widening of Fischer-Hallman Road, Bleams Road improvements from Strasburg Road to Fischer-Hallman Road and in the 1980's, to document an identified portion of a corduroy road along Bleams Road, east of Fischer- Hallman Road, that was found during construction. Three of the past assessments for the redevelopment of lands abutting Bleams Road were completed by ARA.

Building upon the reports completed, a gap analysis of the previous archaeological assessment reports and the current project lands has identified areas of archaeological potential that have outstanding recommendations for Stage 2 assessment. These recommendations were included in a Stage 2 program which was subsequently completed following the Stage 1 work.

ARA has undertaken an archaeological investigation in accordance with the MHSTCI's current Standards and Guidelines for Consultant Archaeologists (2011). The methods used for archaeological assessments in Ontario are laid out in a series of increasingly involved stages, including background study (Stage 1), property assessment (Stage 2), site-specific assessment (Stage 3) and mitigation of development impacts (Stage 4). For the proposed project, the archaeological investigation comprised a Stage 1 and Stage 2 archaeological assessment.

2.2.2 Findings

The completed Stage 1 assessment consists of comprehensive background research into the study area. This was accomplished through an examination of the archaeology, cultural heritage, history, geography and current land conditions in the vicinity of the project lands. This stage also generates an inventory of known archaeological sites within 1km, previous archaeological fieldwork results within 50m of the study area and designated cultural heritage

resources within the study area, which are used to assist in predicting zones of archaeological potential. Sources utilized during a background study include archival sources (e.g., historical publications and records), current academic and archaeological publications (e.g., archaeological studies, reports and management plans), modern topographic maps, recent satellite imagery, historical maps/atlases and the MHSTCI's Ontario Archaeological Sites Database.

A property inspection (site visit) was conducted by an MHSTCI-licenced Field Director to gain first-hand knowledge of geography, topography and current land conditions. This inspection identified areas of archaeological potential for Pre-Contact and Euro-Canadian sites and conclusively map areas of no archaeological potential (i.e., lands disturbed by deep land alterations, etc.) within the study area.

In 2021 and 2022, ARA conducted a Stage 1 Archaeological Assessment for the proposed improvements to Bleams Road from just west of Fischer-Hallman Road to Trussler Road. The Stage 1 assessment determined that the study area was comprised of a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. ARA recommended that all areas of archaeological potential that could be impacted be subject to a Stage 2 assessment.

ARA completed a Stage 2 assessment on the areas that were identified in the Stage 1 work, this additional work was completed in the fall of 2022. Since the study area consists of lands where ploughing is not possible or viable, it was necessary to use the test pit survey method to complete the Stage 2 assessment. Using the test pit survey method, ARA crew members hand-excavated small regular test pits with a minimum diameter of 30 cm at a 5 m interval within all areas of clear archaeological potential. Areas that appeared to be disturbed were subjected to a combination of test pit survey and visual inspection (i.e., combination survey) to confirm the absence of archaeological potential. Test pits in combination survey areas were placed using professional judgement. If intact soils were encountered, then a test pit survey at interval of ≤ 5 m was conducted. The resultant pits were examined for stratigraphy, cultural features and/or evidence of fill, and the soils were screened for archaeological materials. If archaeological materials were encountered over the course of the test pit survey, each positive test pit (PTP) was documented, and all artifacts were collected according to their associated test pit. If there were any test pits they were backfilled upon completion. The field methods breakdown for the study area are:

- 0.02 ha (0.05 ac) Test Pit Survey at an Interval of ≤ 5 m
- 0.06 ha (0.15 ac) Combination Survey to Confirm Disturbance
- 10.96 ha (27.08 ac) Previously Assessed – No Further Work

ARA completed this field work with 1 day with a field crew of three people (1 Field Director and 2 Field Technicians). Field work for this project was completed on November 3, 2022. The Stage 2 assessment did not result in the identification of nay archaeological materials, and it was recommended by ARA that no further assessment be required within the study areas, a full copy of this report has been included as **Appendix B**.

2.3 Record of Indigenous Engagement

Engaging Indigenous communities in archaeology is an increasingly important way of acknowledging Indigenous interests in the stewardship of their own heritage. Currently, in the archaeological assessment process, it is considered best practice to engage with local Indigenous communities as early as possible.

Following the recommendations of the final report of the Truth and Reconciliation Commission of Canada (TRC) and a number of Supreme Court decisions regarding the Duty to Consult, the MHSTCI has started providing information on all archaeological projects and proponent contact information to local First Nations communities.

As noted above, ARA on behalf of the Region of Waterloo and MTE Consultants Inc. contacted the following groups to see if they were interested in participating in this study:

- The Department of Consultation & Accommodation (DOCA) on behalf of the Mississaugas of the Credit First Nation (MCFN);
- The Haudenosaunee Development Institute (HDI) on behalf of the Confederacy Chiefs Council (HCCC); and
- The Six Nations Lands & Resources Office (SNLR) on behalf of the Six Nations of the Grand River Elected Council (SNGREC).

ARA engaged with each of these groups over the course of the study work, this is noted in the chart below:

Table 1 - Summary of Engagement Events

RoIE Table 1: Summary of Engagement Events

Group	Date	Engagement Event	Nature
DOCA on behalf of the MCFN *Contact: A. LaForme*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	27-Oct-21	MCFN indicated that they do not require a monitor in field for the Stage 1 site visit but that they would need to review the report.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week.	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email
	13-Feb-22	Circulation of the report for review and comment.	Email
	24-Feb-23	Follow up on the status of the report review. A. LaForme replied that following his review of the draft report, he agrees with the recommendations.	Email
HDI on behalf of the HCCC *Contacts: O. Greene, W. Hill, S. Martin, T. Williams*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	31-Oct-21	W. Hill confirmed interest in participating in the Stage 1 assessment.	Email
	01-Nov-21	V. Cafik responded to request that HDI forward their standard agreement to the contact at the City of Kitchener.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week.	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email
	13-Feb-22	Circulation of the report for review and comment.	Email
	24-Feb-23	Follow up on the status of the report review.	Email
	28-Feb-23	No comments received.	-
SNLR on behalf of the SNGREC *Contacts: T. Hill-Montour, D. LaForme*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	12-Nov-21	V. Cafik followed up to determine whether the community had an interest in being engaged for the Stage 1 assessment. T. Hill-Montour indicated that they were interested, and D. LaForme provided a standard agreement for signature.	Email
	23-Nov-21	V. Cafik indicated that a clause needed to be added to the agreement at the request of the Region. If the SNEC was agreeable to the clause, then V. Cafik would facilitate signatures at the Region and the project would be put into the schedule the following week.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week.	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email
	13-Feb-22	Circulation of the report for review and comment.	Email
	21-Feb-23	T. Hill-Montour replied that the area is of significant interest to SNGREC and that following a review of the draft report, SNGREC have no comments or concerns.	Email

A full copy of this report has been included as **Appendix C**.

2.4 Built Cultural Heritage

2.4.1 Introduction

On behalf of the Regional Municipality of Waterloo, Archaeological Research Associates Ltd. (ARA) completed a Cultural Heritage Assessment Report (CHAR) in support of the Class EA study. As with all the supportive studies, its focus is the area to be reconstructed and improved along Bleams Road (Regional Road 56) between Fischer-Hallman Road and Trussler Road in the City of Kitchener.

The Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) provides a screening checklist of Criteria for Evaluating Potential for Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) to assist with determining if a project may impact cultural heritage resources. Preliminary analysis indicates that one question in the self-assessment will likely result in a "yes" determination. The study area contains multiple buildings which may be 40 years of age or older (Question 4d). As such, a CHAR was completed for this project.

The cultural heritage component has been completed in accordance with current best practices and requirements set out in the following legislation and guidelines: the Ontario Heritage Act (R.S.O. 1990); Provincial Policy Statement (2020); Parks Canada's Standards and Guidelines for the Conservation of Historic Places in Canada (2010); Standards & Guidelines for Conservation of Provincial Heritage Properties (2010); the former Ministry of Culture's Ontario Heritage Tool Kit Series (2006); and the local Official Plan.

2.4.2 Findings

As a result of consultation and field survey the following Built Heritage Resource (BHRs) and Cultural Heritage Landscape (CHLs) were identified within and adjacent to the study area: 1385 Bleams Road (BHR-1), 1643 Bleams Road (BHR-2), 2219 Ottawa Street South (BHR-3), Trussler Road (CHL-1), and 2091 Bleams Road (CHL-2).

Detailed designs or plans for the reconstruction of the Bleams Road roadway were not available at the time this report was written, however there is potential that the identified BHRs and CHLs may be directly or indirectly impacted by the proposed project. All identified BHRs and CHLs fall within the heritage assessed area along the roadway study area. Depending on the nature and extent of the proposed project and study area, the BHRs and CHLs have potential for direct and indirect impacts. The following mitigation measures were recommended.

- That any construction and staging areas should avoid the use of land which are part of BHR-1 at 1385 Bleams Road, BHR-2 at 1643 Bleams Road and BHR-3 at 2219 Ottawa Street South as well as, CHL-1 along Trussler Road and CHL-2 at 2091 Bleams Road;
- That should project-related activities be expected to impact the property associated with BHR-1 BHR-2, BHR-3 CHL-1, or CHL-2, a qualified heritage consultant should be contracted to complete property specific or Cultural Heritage Landscape specific Cultural Heritage Impact Assessments and provide detailed mitigation options to address the proposed design on the resources;
- As BHR-1 was identified by the Region of Waterloo's heritage planner to likely meet the criteria for Regional Significance, should any project-related activities be expected to impact this BHR, a qualified heritage consultant should be contracted to complete property specific Cultural Heritage Evaluation or Cultural Heritage Impact Assessment according to the Region's Guidelines for Conserving Regionally Significant Cultural Heritage Resources (Region of Waterloo 2018);
- To protect the BHRs and CHL located along the study area roadway, specifically, BHR-1, BHR-2 and CHL-2 during the construction period, vibrations should be identified through a vibration impact study and/or vibration monitoring implementation strategy. It is recommended that City of Kitchener staff provide

guidance on the scope required and at what stage of the planning process the study should be undertaken;

- That design alternatives should consider the heritage attributes of CHL-1. Specifically, the narrow two-lane alignment without shoulders, the scenic views to surrounding agricultural fields, the diverse roadside vegetation that abuts the road and provides a defined edge as well as the corresponding and undulating topography which is part of the original historic alignment; this may be achieved through appropriate setbacks;
- That public consultation may result in additional potential cultural heritage resources being identified. These potential cultural heritage resources should be reviewed by a qualified heritage consultant to: 1) determine their cultural heritage value or interest, 2) evaluate potential project impacts, and 3) suggest strategies for future conservation of any identified cultural heritage resources;
- That should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That should the proposed project create publicly accessible areas, this may provide an opportunity to interpret some of the identified cultural heritage resources associated with the Cultural Heritage Landscapes (i.e., with plaques, public art);
- That this CHAR should be provided to staff/planners at the City of Kitchener and Region of Waterloo; and
- That a Stage 1/Stage 2 archaeological assessment is completed, which has been completed to address the identified archaeological potential associated with the study area and no soil disturbing activities should take place until all archaeological concerns are mitigated and all reports are accepted by the MTCS.

A full copy of this report has been included as **Appendix D**.

2.5 Traffic Study

2.5.1 Introduction

On behalf of the Regional Municipality of Waterloo, Salvini Consulting completed a Transportation Report, which is being completed as part of this Class C EA for the potential reconstruction and improvement of Bleams Road (Regional Road 56) between Fischer-Hallman Road and Trussler Road in the City of Kitchener.

The Region of Waterloo has a Roundabout policy that states that an Initial Roundabout Screening be conducted when design work is being considered for:

- a new intersection on a Regional Road
- an existing intersection where traffic signals are warranted
- an existing Regional road intersection that is programmed for improvements to address an identified safety or capacity problem
- any other location as determined by Regional staff or Regional Councillors.

Any recommended improvements as part of this study to address capacity deficiencies will be subject to an Initial Roundabout Screening which is detailed in the full report.

Future 2031 traffic volumes were forecast by including a background growth rate of 0.5 percent per year over the study horizon and by specifically accounting for the planned development traffic in the corridor. Assumptions included in the forecast include the following:

- 0.5% per year growth on Bleams Road over 13 years since base data was collected in 2018;
- 1% per year growth on Trussler Road over 13 years;
- Horizon year of 2031;
- Trip generation rates based on average rates in the ITE Trip Generation Manual (10th edition) plus a 10% reduction to account for planned transit mode split;
- 80% of school trips internal to the subdivisions;
- 5% of the general traffic internal to the subdivisions;
- 5% of the traffic destined to Trussler Road south;
- A shifting distribution to the east and west along Bleams Road depending on the location of the site;

The table below provides a summary of the land use assumptions for each of the planned developments described in Section 1.3.4 of this report.

2.5.2 Findings

Recommendations for future infrastructure needs were made in the context of the Region's Transportation Master Plan along with current guidelines and policies related to transportation. The area around the Bleams Road corridor has been the subject of multiple transportation studies and significant planned growth in recent years. The traffic forecasts developed for this Transportation Study reflect the ongoing and planned development in the area and the broader Region.

It is the recommendation of this study that the following considerations be included in the preferred alternative for the corridor:

- Multi-use paths on both sides of Bleams Road to accommodate both pedestrians and cyclists in accordance with the Region's Transportation Master Plan.
- The design of the road should accommodate GRT buses so that they may use the intersections for routing as needed.
- The major intersections in the corridor – Trussler Road, Isaiah Drive, Donnenwerth/Amand, and Commonwealth/Abram Clemens – can proceed as either signalized intersections or as roundabouts.
- The minor intersections in the corridor – George Israel Street, Nyles Drive, Street L, Forestwalk Street, and Helena Feasby Street – should proceed as side street stop controlled intersections.

- The intersections at Forestwalk Street and Helena Feasby have been assessed as right turns only. Left turn capacity at these two intersections is limited and adjacent major intersections are provided that allow for traffic to access Bleams Road appropriately.
- The George Israel Street intersection warrants the inclusion of an eastbound right turn lane and a westbound left turn lane.
- The Nyles Drive intersection warrants the inclusion of an eastbound left turn lane.
- The Street L intersection warrants the inclusion of a westbound left turn lane.

The full version of this report has been included in **Appendix E.**

2.6 Noise Assessment

The Region has a Noise Policy which is used to determine when noise barriers, such as noise berms or walls, would be recommended as part of an upcoming project. Part B of the Region's Noise Policy applies when a road widening is being considered. For this project, Part B of the Region's Noise Policy would apply if Bleams Road is widened from two to four lanes, which was considered and incorporated into the preferred alternative design from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive.

The Region's Noise Policy is made up of three Parts:

- Part A: New development impacted by existing roads and railways.
- Part B: Existing development impacted by proposed Regional road widenings.
- Part C: Existing development impacted by noise from existing Regional roads.

Since there is no new development proposed, only Parts B or C may apply to this project. The Bleams Road Class Environmental Assessment from just west of Fischer-Hallman Road to Trussler Road is proposing to:

- Widen Bleams Road from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive – therefore Part B applies to this section of Bleams Road; and
- Reconstruct Bleams Road only and maintain existing 2 lane "vehicle lane" configuration in all other areas.
    - Noise is calculated at a residence outdoor living area – typically defined as the backyard or patio within 3 metres of the rear wall of a residential unit.
    - Noise is calculated using a Ministry of the Environment, Conservation and Parks (MECP) model that calculates a 16-hour average noise level for the outdoor living area based on several factors, such as traffic volumes, distance from the outdoor living area to the centre of the road, and elevation differences between the outdoor living area to the centre of the road. The noise level used in the policy is not based on peak levels that may be recorded at a given location/time.

Part B of Region Noise Policy – Road Widening

The Region will consider designing and constructing a noise barrier if:

- ✓ The projected noise level in 10 years is calculated to exceed 65 dBa; or
- ✓ The projected noise level in 10 years is calculated to exceed 60 dBa and increase the existing noise level by 5dBa or more.

By constructing a noise barrier, projected noise is required to be calculated to be reduced to 60 dBa or less and reduced by 5dBa or more.

Part C of Region Noise Policy – No Road Widening – Complaint Driven

The Region will consider cost-sharing (50-50) noise barrier design and construction if:

- ✓ A resident raises a noise concern; and
- ✓ Existing noise levels are calculated to exceed 60dBa; and
- ✓ Two thirds (2/3) of affected property owners are in agreement to build noise barrier (based on rear yard property length) in accordance with Local Improvement Act; and
- ✓ All property owners pay 50% of cost of noise barrier based on length of wall installed at their property with payments charged over a period of ten (10) years (in accordance with Local Improvement Act).
- ✓ Residents may also decide to take other measures such as installing a privacy fence, air conditioning or window improvements at their own expense.

The Region of Waterloo retained MTE consultants to complete a Noise Assessment within the criteria of Part B of the Regions Noise policy noted above. The area of study was the section of the corridor that is shown as widened in the preferred alternative design; Bleams Road from Fischer-Hallman Road to Commonwealth Street/ Abrams Clemens Street. The specific methodology and results can be found in **Appendix F.**

Table 2 - Noise Level Results

OLA	Municipal Address	Existing Bleams Road Alignment (2022)		Future Bleams Road Alignment (2032)		Increase in Noise Level (dBA)
		Distance from Road Centreline (m)	OLA Noise Level Limit (dBA)	Distance from Road Centreline (m)	OLA Noise Level Limit (dBA)	
From Study Limit to Commonwealth Street						
1	539 Commonwealth Crescent	36.6	56.6[1]	36.6	61.2[2]	**4.6**
2	507 Commonwealth Crescent	41.1	55.7[1]	44.2	59.8[2]	**4.1**
From Commonwealth Street to Helena Feasby Street						
3	2 Commonwealth Street	30.3	55.0[2]	42.5	58.0[2]	**3.0**
4	3 Helena Feasby Street	26.7	54.3[1]	23.8	59.1[1]	**4.8**
From Helena Feasby Street to Fischer-Hallman Road						
5	2 Harding Street	31.8	52.8[1]	29.1	57.4[1]	**4.6**
6	26 Harding Street	35.2	52.6[1]	32.9	57.2[1]	**4.6**
7	1385 Bleams Road	38.7	55.9[2]	41.4	59.8[2]	**3.9**
8	1375 Bleams Road	43.1	53.2[2]	45.5	57.1[2]	**3.9**

Note: 1 – Modelled as an absorptive intermediate surface
2 – Modelled as a reflective intermediate surface

The conclusion of the assessment for this length of the study area was:

- ✓ All OLAs analysed experience a projected noise level increase of less than 5dBA as a result of the proposed road widening of Bleams Road from Fischer-Hallman Road to Commonwealth Street.
- ✓ Per Part B of the Region's Noise Policy, it can be concluded that the proposed widening of Bleams Road between Fischer-Hallman Road and Commonwealth Street do not require any additional noise mitigation measures than what is already present on the existing lots.

3.0 EA Phase 2: Development and evaluation of Alternative Solutions

Under Phase 2 of the Class EA process, all reasonable solutions to the problem (i.e. planning alternatives) are identified and described, including the “Do Nothing” alternative. Planning alternatives are alternative solutions to the problem or opportunity in the transportation network. Planning alternatives are identified by taking into consideration factors such as the existing environment, as well as public and agency input and establishing a preferred solution. The Environmental Assessment Act (EAA) requires that all reasonable planning alternatives to the undertaking be considered during the decision making process.

Solutions to address the Problem Statement that have been considered in the planning and various background studies include:

3.1 Do Nothing

The Class EA process explicitly requires consideration of a “Do Nothing” alternative, which represents the effect on the transportation network of choosing to not complete any network improvements. In practical terms, 2031 and 2041 projected traffic conditions represented by “doing nothing” would, at minimum, result in delays to commuters, goods movement, emergency vehicles, etc. In this case, the “Do Nothing” solution would involve reconstructing Bleams Road in its current two-lane rural cross-section with shoulders and roadside ditches. This solution was screened out because it does not satisfy the Region’s primary objectives for the corridor.

3.2 Roundabout Alternative

The roundabout alternative includes implementing roundabouts at all significant intersections within the study area (Bleams and Abram Clemens/Commonwealth Street, Bleams and Amand / Donnenwerth Drive, Bleams and Isaiah Drive, and Bleams and Trussler Road) The roundabout option was developed based on forecasted volumes, and results from the ARCADY modelling software (specialized software for modelling traffic flows in roundabouts). All of the roundabouts were designed utilizing a dual lane Inscribed Circle Diameter (“ICD”) of 52m and circulatory road width of 9.4m and a single lane ICD of 46m and circulatory road width of 6.5m. This means that the design can accommodate a bus turning without rolling over the central island curb and a WB-20 transport truck with the aid of the truck apron for trailer tracking. Full size functional design drawings for the entire corridor can be found in **Appendix G.**

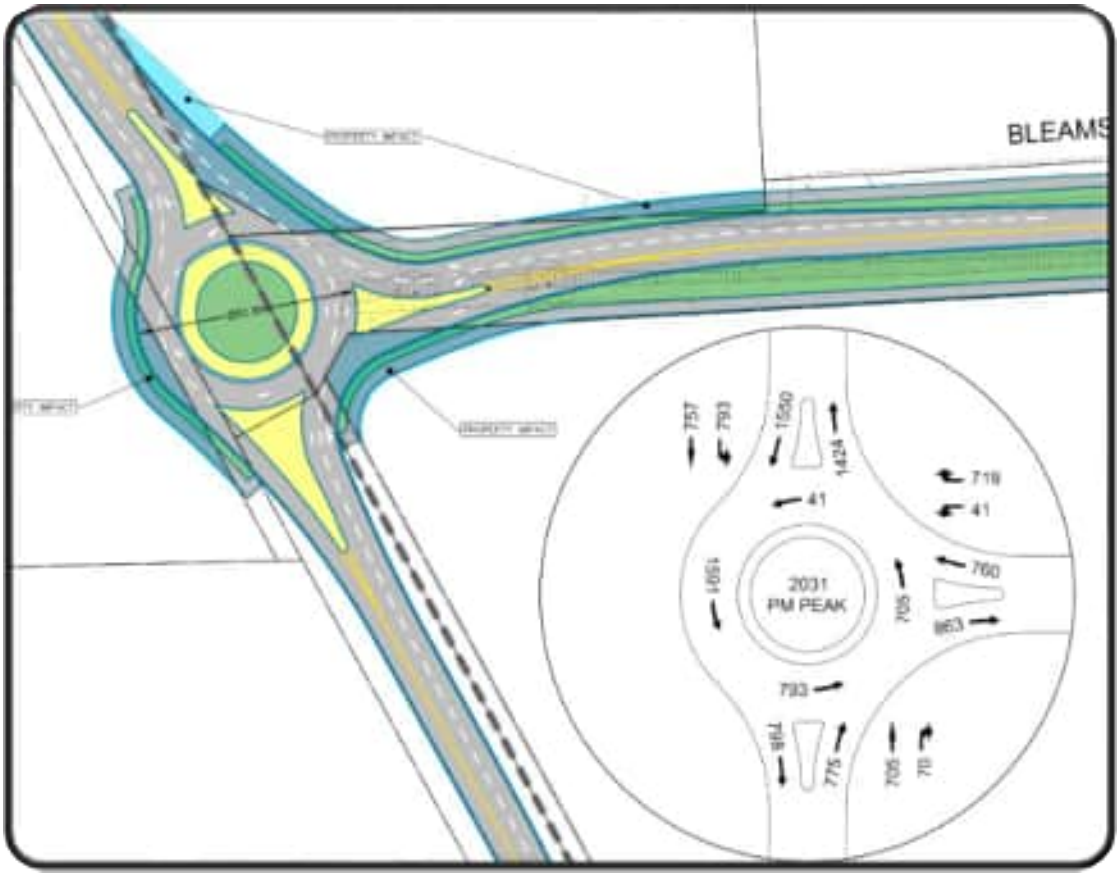
Figure 3:1 – Roundabout Concept



3.2.1 Trussler Road

The roundabout is a three-leg design with dual lane entries for all legs, dual circulatory lanes north/south on Trussler Road with an ICD of 52m and circulatory road width of 9.4m and a single circulating lane for the left turning traffic with an ICD of 46m and circulatory road width of 6.5m. The southbound Trussler entry volumes are virtually 50/50 between the through and left turn movements, so to accommodate the high volumes of left turns the lane designations consist of a dedicated left turn and dedicated through lane. In contrast the majority of the northbound Trussler volumes are through movements so a traditional dual lane through movement is proposed.

Figure 4:1 – Roundabout Concept – Trussler Road

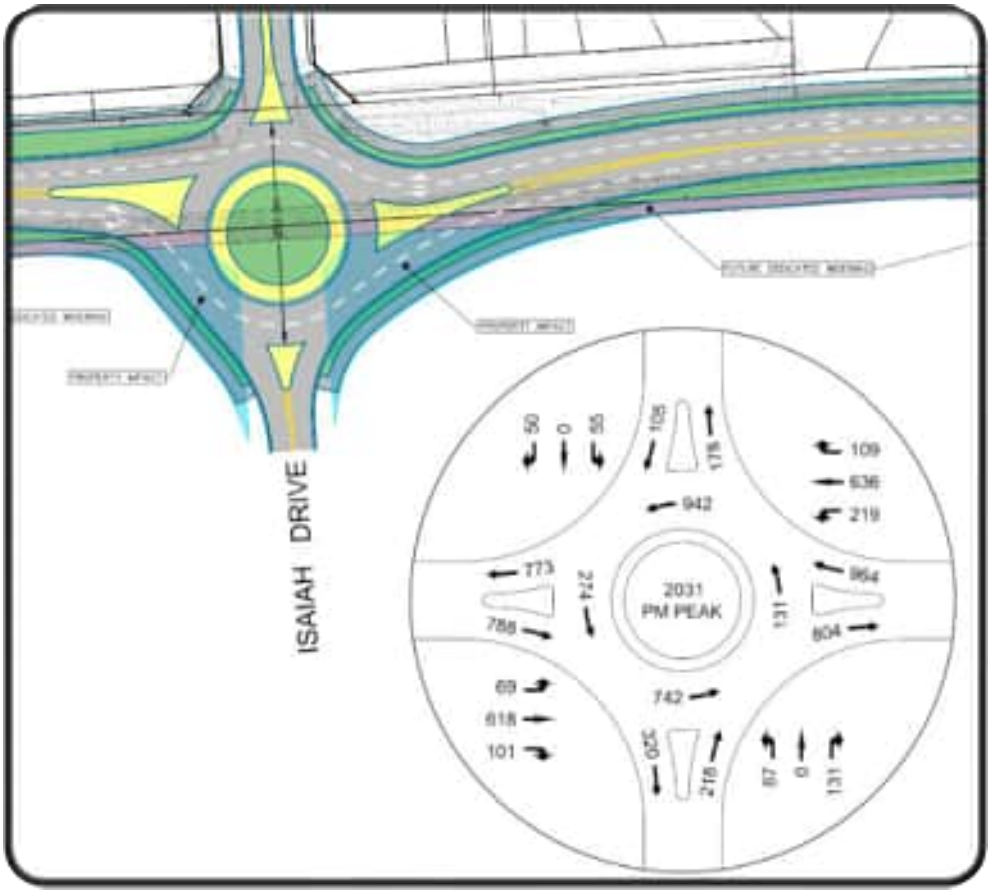


From Trussler Road to Isaiah Drive Bleams Road is brought to a two-lane section, one lane in each direction, with dedicated right and left turn lanes onto George Israel Street and onto Nyles Drive. Both mid-block accesses at George Israel Street and Nyles Drive would permit full turning movements onto/off of Bleams Road.

3.2.2 Isaiah Drive

The roundabout is a four-leg design with dual lanes east/west on Bleams Road and single lane north/south on Isaiah Drive. The dual lane entries/exits are maintained for 100m with a 100m taper back to a single lane in each direction.

Figure 5.1- Roundabout Concept – Isaiah Drive

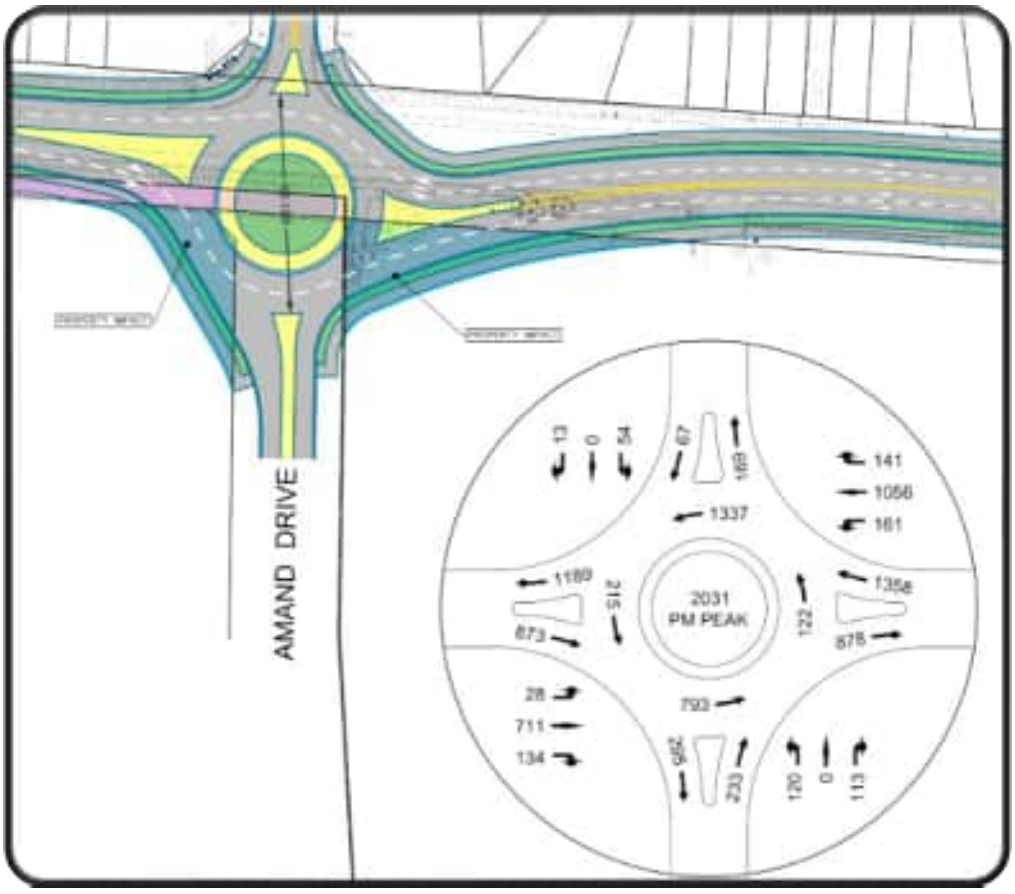


From Isaiah Drive to Donnenwerth Drive/Amand Drive Bleams Road is tapered to a two lane section, one lane in each direction, with dedicated westbound left turn lane onto Street L, the only mid-block access between the two major intersections. Street L will permit full turning movements onto/off of Bleams Road.

3.2.3 Donnenwerth Drive / Amand Drive

The roundabout is a four-leg design with dual lanes east/west on Bleams Road and single lane north/south on Isaiah.

Figure 6.1 - Roundabout Concept – Donnenwerth Drive / Amand Drive

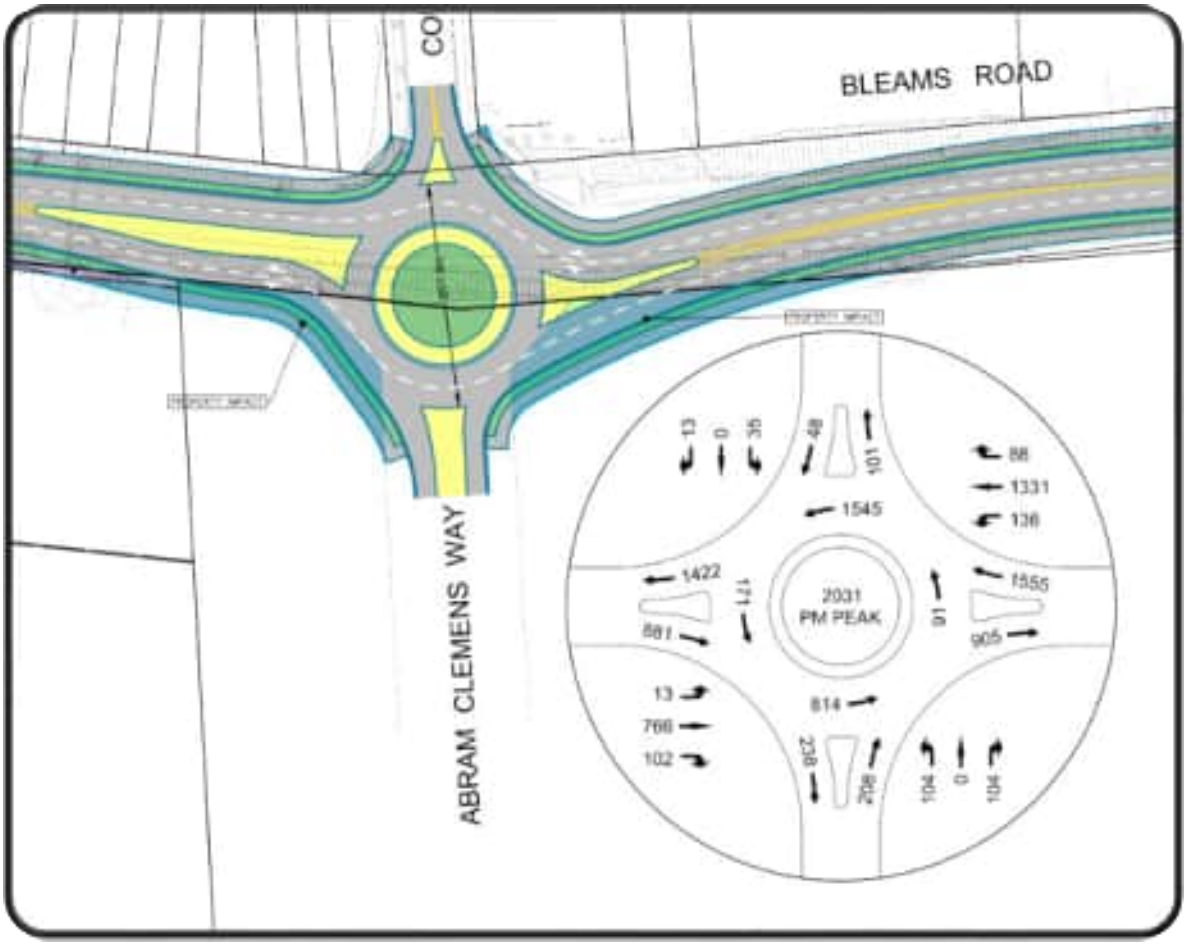


From Donnenwerth Drive/Amand Drive to Commonwealth Street/Abram Clemens Way Bleams road is maintained as a four lane cross section. This was presented in the initial design of the roundabout option, but the length of the widening section was not needed, which was corrected after this design was presented at the PCC#1 and in the ICS report. Due to the close proximity of the two intersections, 580m, and the requirement for a westbound left turn lane onto Forest Walk Trail, the only mid-block access between the two intersections, it was felt best to maintain a four lane section for better lane continuity and roundabout lane utilization. Due to high traffic volumes it may be warranted to restrict left out movements on Forest Walk Trail during peak hour volumes.

3.2.4 Commonwealth Street / Abram Clemens Way

The roundabout is a four-leg design with dual lanes east/west on Bleams Road and single lane north/south on Isaiah Drive.

Figure 7:1 - Roundabout Concept – Commonwealth / Abram Clemens

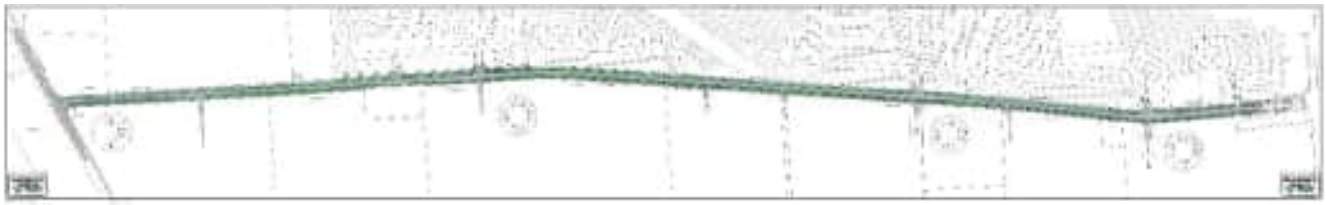


From Commonwealth Street/Abram Clemens Way to Fischer-Hallman Road Bleams Road is maintained as a four-lane section due to high traffic volumes, the proximity of the two major intersections (430m), and the mid-block accesses to Helena Feasby Street and the Williamsburg Plaza.

3.3 Signalized Intersection Alternative

The signalized design concept was derived using the forecasted volumes along with consultations with the project team. The concept drawing of the signalized intersection is shown below in Figure 7, and is designed to accommodate the traffic projections for 2031. Full size functional design drawings for the entire corridor can be found in **Appendix G.**

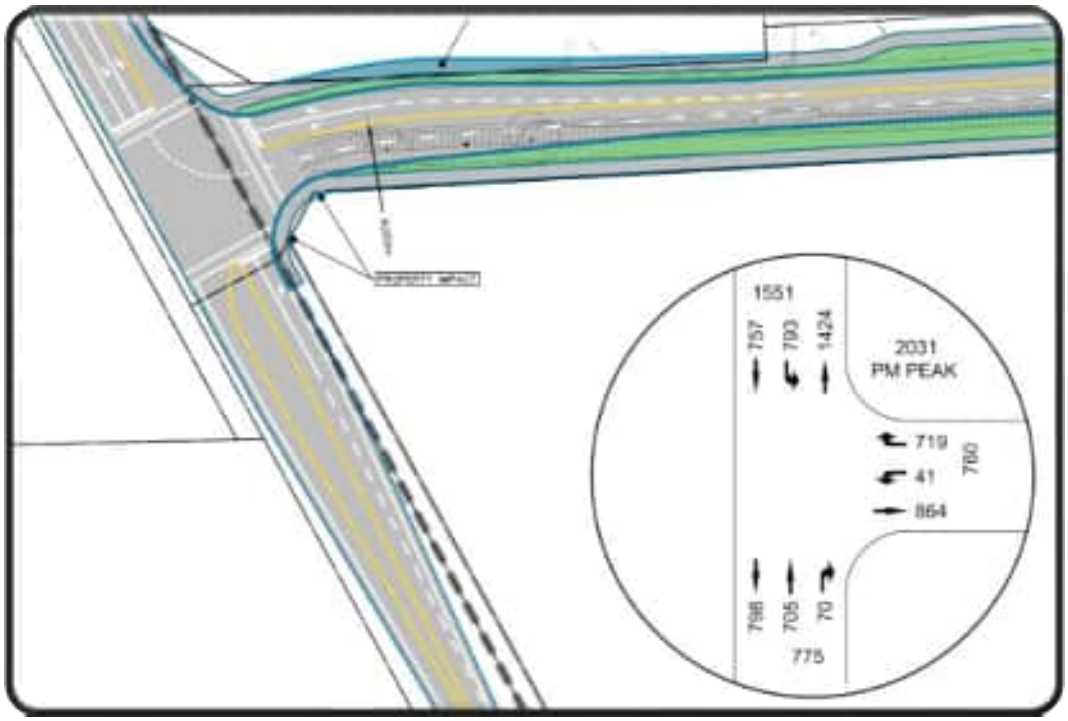
Figure 8.1 - Signalized Concept



3.3.1 Trussler Road

The design consists of one through lane in each direction on Trussler Road, with dual southbound left turn lanes required to accommodate the large left turn volumes along with a northbound right turn lane with storage lengths of 95m and 30m, respectively. Bleams Road ends at Trussler Road, with the westbound lane transitioning into a right turn lane and the development of a left turn lane with 30m of storage. Additional property to the north side of the intersection is anticipated to accommodate this design.

Figure 9.1 – Signalized Intersection Concept – Trussler Road

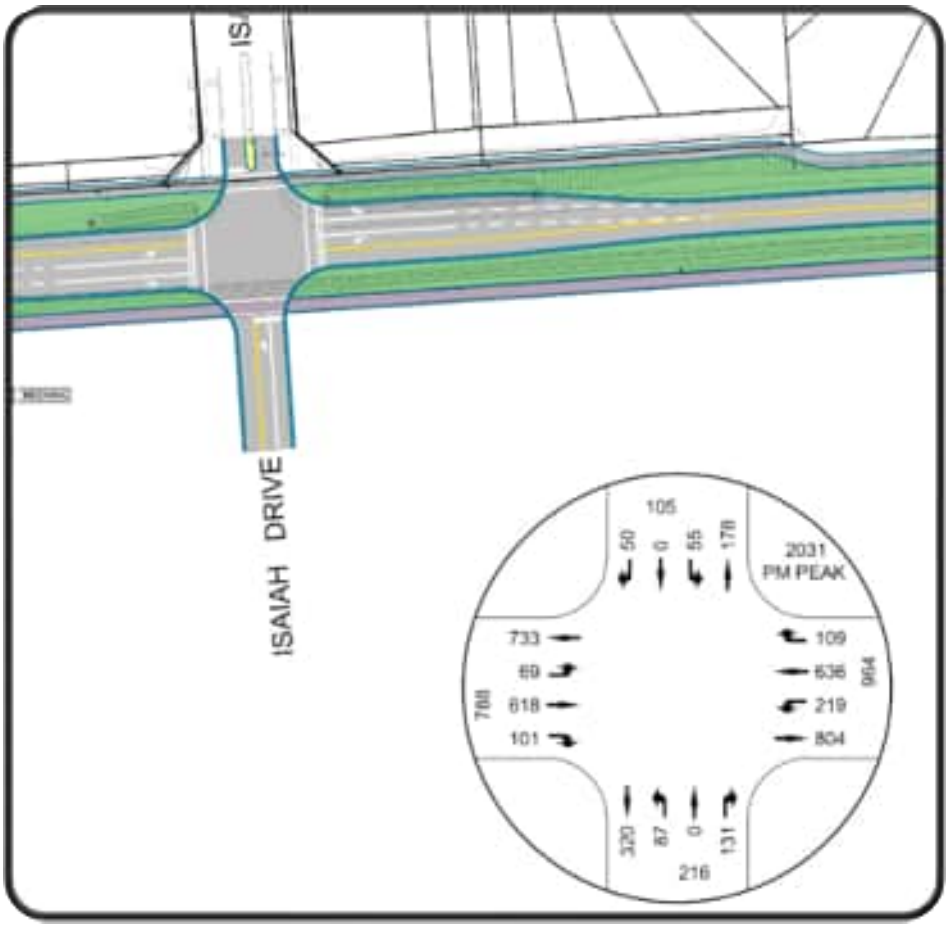


From Trussler Road to Isaiah Drive Bleams Road is a two-lane section, one lane in each direction, with dedicated eastbound right and westbound left turn lanes onto George Israel Street and an eastbound left onto Nyles Drive. Both mid-block accesses at George Israel Street and Nyles Drive would permit full turning movements onto/off of Bleams Road.

3.3.2 Isaiah Drive

The design consists of one through lane in each direction on Isaiah Drive, with a northbound left turn lane onto Bleams Road. Bleams Road consists of one through lane in each direction, with right and left turn lanes in both directions, utilizing 30m storage in each turn lane. It is not anticipated that additional property would be required to accommodate this design.

Figure 10.1 - Signalized Intersection Concept – Isaiah Drive

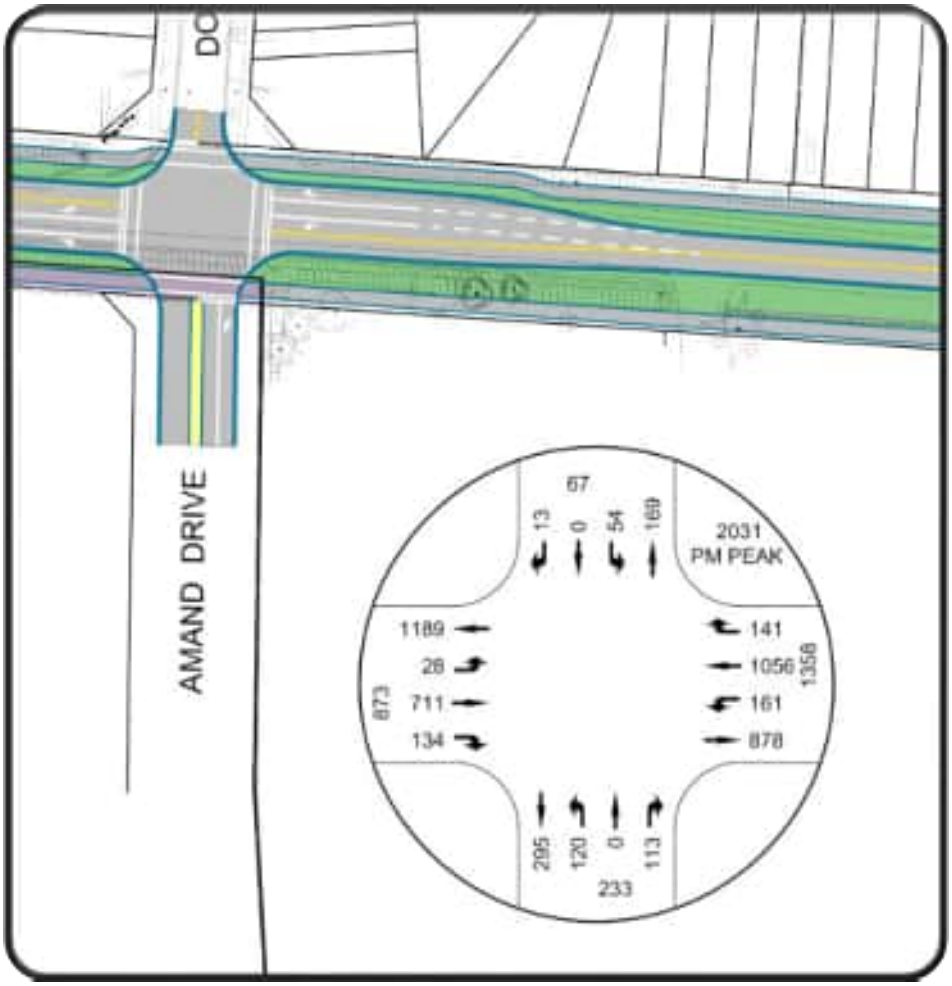


From Isaiah Drive to Donnenwerth Drive/Amand Drive Bleams Road is a two lane section, one lane in each direction, with a dedicated westbound left turn lane onto Street L, the only mid-block access between the two major intersections. Street L will permit full turning movements onto/off of Bleams Road.

3.3.3 Donnenwerth Drive / Amand Drive

The design consists of one through lane in each direction on Donnenwerth/Amand Drive, with a northbound right turn lane onto Bleams Road. Bleams Road consists of one through lane in each direction, with right and left turn lanes in both directions, utilizing 30m storage in each turn lane. It is not anticipated that additional property would be required to accommodate this design.

Figure 11.1 – Signalized Intersection Concept – Donnenwerth Drive / Amand Drive

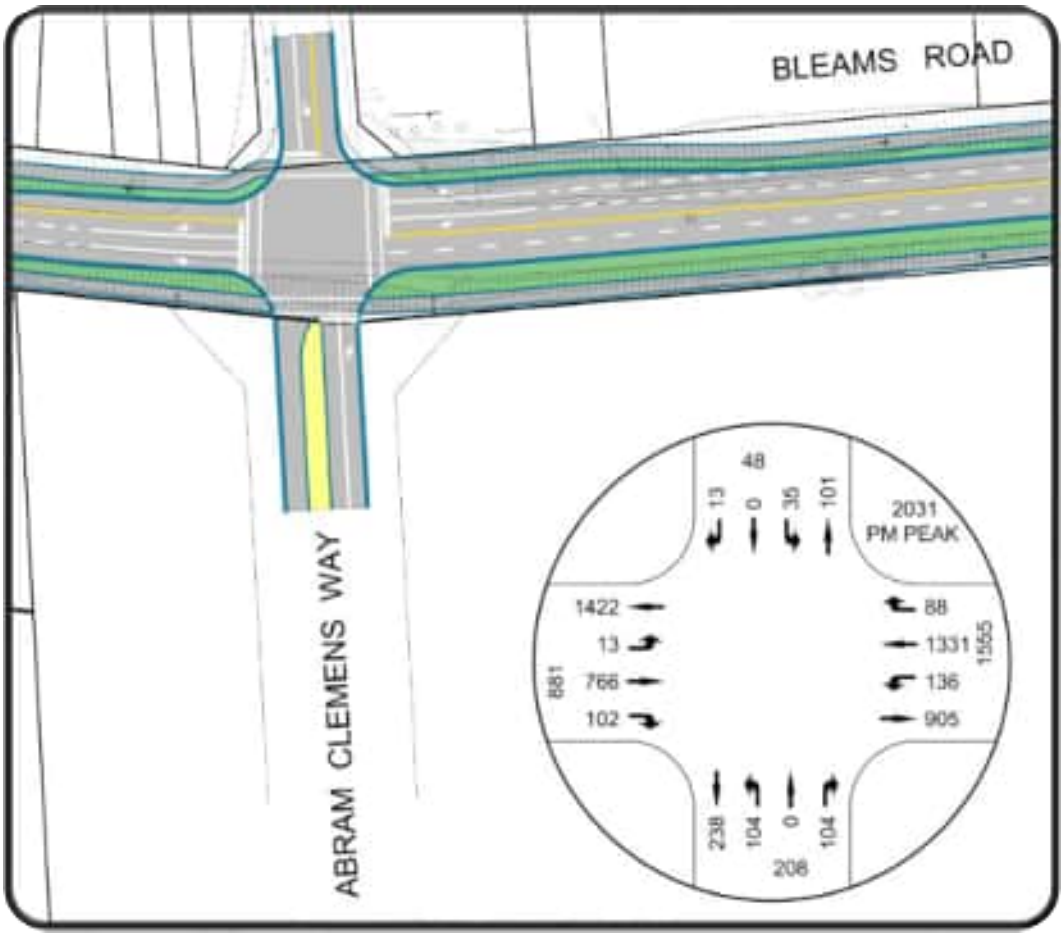


From Donnenwerth Drive/Amand Drive to Commonwealth Street/Abram Clemens Way, Bleams Road is a two lane section, one lane in each direction, with a westbound left turn lane onto Forest Walk Trail. West Forest Trail is the only mid-block access between the two intersections, and while it would provide full turning movements onto/off of Bleams Road, due to high traffic volumes it may be warranted to restrict left out movements on Forest Walk Trail during peak hour volumes.

3.3.4 Commonwealth Street / Abram Clemens Sreet

The design consists of one through lane in each direction on Commonwealth Street/Abram Clemens Way, with a southbound left turn lane, and a northbound right turn lane onto Bleams Road. Bleams Road consists of a single through lane eastbound with both right and left turn lanes, both having 30m of storage. The westbound leg approaches with two lanes coming out of the Fischer Hallman roundabout with the left lane becoming a dedicated left turn lane and a single through lane. An eastbound right turn lane is also required with a 30m storage. It is not anticipated that additional property would be required to accommodate this design.

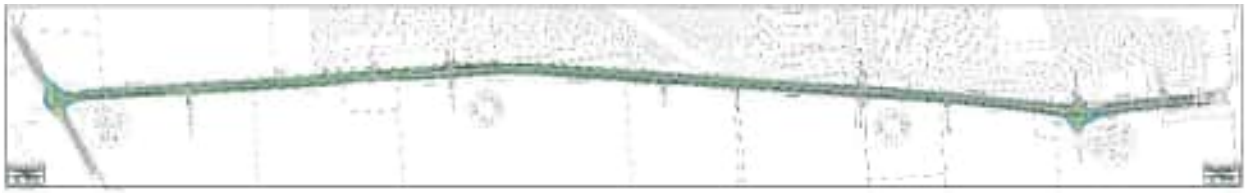
Figure 12.1 - Signalized Intersection Concept – Commonwealth / Abram Clemens



3.4 Hybrid Alternative

The Hybrid alternative utilizes roundabout intersection control at the furthest west and east intersections of Bleams Road & Trussler Road as well as at Bleams Road and Commonwealth St./Abram Clemens Way. The central two intersections of Bleams Road & Isaiah Drive and Bleams Road and Donnenwerth/Amand Drive would be signal controlled. Refer to the previous sections for detailed intersection configurations. Bleams road would utilize a two lane section for the bulk of the corridor, with four lane sections required at the roundabouts and between Commonwealth Street/Abram Clemens Way and Fischer-Hallman Road. Full size functional design drawings for the entire corridor can be found in **Appendix G.**

Figure 13.1 – Hybrid Concept



MTE Consultants Inc. completed an Intersection Control Study (ICS) to give equal consideration to three of the four options described in the previous section. The “Do Nothing” alternative was not recommended for consideration after an initial review by the Project Team. The three corridor design options are: roundabouts at all four major intersections, signalized control at all four intersections, and a hybrid alternative with a roundabout at either end of the corridor and signalized control at the two center intersections. These options are analyzed using various criteria including construction costs, societal costs, traffic operations, property impacts, pedestrian and cyclist effects, speed control, fuel consumption and emissions, area land uses, construction staging, maintenance and aesthetics.

Peak hour and Average Annual Daily Traffic (“AADT”) forecasts for 2031 were prepared by Salvini Consulting in consultation with Region of Waterloo staff to develop an agreed upon forecast for the corridor. The forecasts were used to develop signalized and roundabout concept designs to accommodate anticipated volumes, projected volumes and roundabout flow sheets can be found in the included ICS Full Report, which is included in **Appendix G2.**

The design concepts provided are considered adequate for the evaluation of the intersection functionality, as well as estimating construction costs and property impacts. The designs are considered part of the preliminary design process, and therefore require further refinement as the design process continues.

The analysis which was conducted does not consider the cost of acquiring property, here it should be noted that the roundabouts, for both the full roundabout option and the hybrid option, do require the acquisition of additional land from future developments. Gaining use of this land may come at a cost to the Region.

Given the preliminary designs at the time of the completion of the of this report, which was prior to the first interaction with the Public, it was concluded that:

- The quantitative analysis, which takes into account cost estimates for construction costs, life cycle costs and collision costs, favours the Hybrid option over all others.
- The most expensive option over the 20-year study period is the Signalized option, which is higher than the Hybrid option by $899,644 or 3%. The construction costs for the Hybrid option are estimated to be approximately $18,751,150 (97%) of the estimated more costly full Roundabout option. The Hybrid option has the lowest total cost.
- The qualitative analysis favours the roundabout option over the signalized option with a LOS of A, compared to a LOS C. At the intersection at the extremes of the project there are some slight overall qualitative preferences towards the roundabout option. The intersections at Bleams/Trussler, and Bleams/Commonwealth/Abram Clemens, are more suitable to a roundabout.

At the time of this ICS report it was recommended that:

- The Hybrid option is the preferred intersection configuration for the proposed Bleams Road corridor. While there are some qualitative advantages towards the full roundabout option, the Hybrid option is estimated to have the lowest construction and overall cost of the three considered.
- The intersection analysis showed an improvement in wait times for the roundabout rather than a signalized intersection at Bleams/Trussler, and Bleams/Commonwealth/Abram Clemens. For the central two intersections of Bleams/Isaiah and Bleams/Donnenwerth/Amand while roundabouts would provide a slightly better LOS, the quantitative analysis favored the hybrid alternative.
- The hybrid alternative presents some advantages with respect to active transportation, specifically cyclists who, through the use of cross-rides at signalized intersections, would enjoy a more continuous multi-use trail network within the central portion of the study area. Therefore, the signalized option is preferred for those locations.
- A detailed roundabout design checks package be prepared for the roundabout designs prior to proceeding with property acquisitions.

In November 2021, this ICS report was circulated to the Project Team. This is an important summary of the design alternatives and was preparatory work for the second point of contact with the public, Public Consultation Centre #2 (PCC). The first being the Notice of Commencement that was circulated to all stakeholders by mail on November 3, 2021. A copy of this Notice is included in **Appendix G.1.**

4.0 Preferred Alternative

Prior to PCC#2, the Project Team held several meetings to review the current designs, the completed traffic studies, the ICS report and the compiled public comments from PCC#1. It was at this time that the publics preference for an all-roundabout corridor caused the team to revisit the ICS recommendations. The Hybrid alternative was the recommended; however, the comparison of the life cycle costs and the construction costs shown a slight advantage was taken in comparison to the 80% support for an all Roundabout Alternative.

On May 31, 2022, the RCC met to discuss the work completed, as well as the comments received from the public during the PCC#1 comment period. After a lengthy discussion without a consensus within the committee; however, a vote was held and the direction that was given from the RCC voted in favour of all roundabouts version, instead of the hybrid version. The results of the RCC meetings are presented below:

- All four intersections are to be designed as multi-lane roundabouts, but the centre two (Isaiah and Donnenwerth) are to be constructed as single-lane roundabouts on opening day. Moving forward, Regional staff will monitor the need for future expansion of the Isaiah and Donnenwerth intersections to multi-lane roundabouts.
- To enhance the active transportation environment, these single-lane roundabouts are to have the function, look and feel of true single-lane roundabouts even when designed for future expansion to multi-lane roundabouts. To that end, we will need to discuss design options to achieve this goal.
- We would like to acquire sufficient land for the “Dutch style” roundabout design under the ultimate (and interim) roundabout condition at all 4 locations. Again, to heighten the experience for active transportation users (mainly, cyclists), we would like to develop roundabout designs that can be converted to “Dutch style” if possible. There is a sense that, within a 5 – 10 year timeframe, cross rides will be allowed at roundabouts.
- At all four roundabout intersections, we may prefer roundabout designs with raised pedestrian crossings. We understand there are grading/drainage implications of this design style, but we would like for MTE to investigate the feasibility of this option at this stage.

The roundabout at Donnenwerth/Amand is planned to be constructed initially as a single lane roundabout. In the fullness of time the project team expects that auto traffic demands associated with the substantial planned growth in the area will require the single lane roundabout be converted to a two-lane roundabout. Single lane roundabouts are more comfortable and safer for pedestrians and cyclists along with auto traffic. Additionally, the growth planned to the south of Bleams Road will take many years to build out. A single lane roundabout in this location better meets the needs of all the users in the short term and supports the prioritization of walking and cycling through the intersection during the time when new residents are establishing travel patterns in the area. Before converting the single lane roundabout to a two-lane roundabout, some congestion can be expected during the typical weekday morning and afternoon peak hours.

Following the completion of PCC#1, the Project Team reached out to the Transportation Engineering staff at the Region to discuss the addition of a raised median along the entire corridor. This would be in an effort to improve the safety/collision prediction analysis for each of the stop control intersections at: George, Israel, Nyles, Street L Forest Walk, and Helena Feasby. The Regional staff presented the continuous raised centre median to include on the preferred Alternative Design for PCC#2.

A full meeting with the Project team highlighted several concerns with a fully divided median, July 15, 2022. Although the raised centre median will have an increase in safety with a right-in-right-out; however, the corridor is acceptable without a closed corridor. Regional staff had put forward a fully closed corridor with a raised median through the entire study area. The idea of this meeting was to get consensus within this smaller group to go to the larger Project Team and then to the public with a preferred solution at PCC# 2.

- We will proceed with four (4) Roundabouts (RAB).
- Close a portion of the corridor where there is a short distance to proposed RABS and we can move additional pressure from the left movements onto the RABs.
- There is a worry about the impact on the in-place development draft plans. There may be push back from the development community if their traffic studies relied on full movements on the minor streets.
- Revisions are needed to the traffic studies because of the change to a closed corridor, this has been considered in the Traffic Report in Section 2.5 of this report.
- Geometry will need to be reconsidered because of the potential pedestrian crossing points.
- Two intersections were the focus of our discussion with different concerns.
- Forest Walk Trail which favoured closing access and putting the traffic onto the relatively close RABs (to reduce collisions).
- Street L which favoured open access because of the highest left-turn-in volumes and the relatively long distances associated with the right-in-right-out closed access.

The compromise is that we move to two different sections of the corridor; closed from Fischer-Hallman to Donnenwerth/Amand Drive, which means right-in-right-out connections to Helena Feasby Street and Forest Walk Trail; and the remainder of the corridor will be open with free movements for the remainder of the corridor. Full drawings of the preferred alternative have been included in **Appendix J.**



4.1 Notice letter

A letter notifying that the Regional staff will take the recommended design to the planning and works committee for review, this letter was posted on the engage website notifying the public of the meeting. A full copy of this document is included in **Appendix G.4.9.**

4.2 Planning and Works Committee

Regional staff prepared a report to the planning and works Committee for review. This report is a discussion of the recommended design for improvements to Bleams Road. A full copy of this document is included in **Appendix G.4.10.**

4.3 Council

On December 14, 2022 the project was approved by the Region of Waterloo Council.

5.0 Public Consultation

5.1 Notice of Project Commencement

The contact with the public was completed with the circulation of the Notice of Project Commencement. A notice of Project Commencement was circulated both digitally through the engage website, as well as through the mail to residence immediately surrounding the study area. This notice was given to the general public and was published in the Kitchener Waterloo Record in the November 9, 2021.

5.2 Public Consultation Centre #1

5.2.1 Notice of Public Consultation

Due to the COVID-19 pandemic, the public consultation centre was completed using the Region of Waterloo's engage platform. A notice of Public Consultation was circulated both digitally through the engage website, as well as through the mail to residence immediately surrounding the study area. This notice directed the public to the engage website and highlighted the comment period for this PCC as February 14, 2022 to March 7, 2022.

The Notice of PCC #1 was published in The Waterloo Region Record on February 10, 2022, Kitchener Citizen February 2022 edition and New Hamburg Independent on February 16, 2022. Notices were also mailed to over 900 residents within and bordering the Study Area, and mailed to identified agency, stakeholder groups, and Indigenous community representatives on February 14, 2022. This notice is included in this report as **Appendix G.3.1.**

5.2.2 PCC#1 Information Package

Using the Engage platform an information package was posted with 22 common questions that are asked about projects of this type. The information package included full answers to all the questions in the document, and a copy of this document has been included as **Appendix G.3.2.**

5.2.3 PCC#1 Presentation and Script

A video presentation, as well as a copy of the slides were posted on the Region's Engage website. This information went live on February 14, 2022. The presentation acknowledges the traditional territory that this project is located on and recognizes our responsibilities to serve as stewards to the land and honour the original caretakers that came before us. The video presentation requested comments and directed these to the project managers from the Region and the consulting engineer MTE. The project was introduced, showing a key plan of the study area, the project team was introduced, and a timeline of the EA process was presented illustrating the current stage of the study.

The existing condition of Bleams Road, as a two-lane rural collector with the established Laurentian West neighbourhood to the north and the new Rosenberg neighbourhood to the south.

5.2.3.1 Do nothing

The first option that all studies consider is the Do Nothing option. In this case, we do not feel this is a viable alternative. The current asphalt surface is in poor condition, the capacity of the two-lane road at the east end is limited and with the current developments coming on-line, the east end is forecasted to require a four-lane cross section from Fischer Hallman Road to Commonwealth/Abram Clemens to handle the projected traffic load. The current road does not provide suitable facilities for active transportation—meaning walking, rolling, or cycling.

5.2.3.2 Roundabouts (Alternative 1)



We start with a four-lane cross section between Fischer Hallman and Commonwealth Street/Abram Clemens Way. That roundabout would consist of four-lanes on Bleams and two lanes on the side streets.

The four-lane section would be reduced to a two-lane section as we approach the Donnenwerth Drive/Amand Drive intersection. This roundabout, as well as Isaiah Drive roundabout, would be designed for four lanes on Bleams and two lanes on side streets but in the interim, the roundabout would be painted to be a single lane in all directions until volumes are such that four lanes on Bleams Road are required.

A left turn lane is proposed into one of the subdivision accesses currently controlled by a stop sign and labeled as Street L.

Right and left turn lanes are proposed to access Nyles Drive and George Israel Street.

Approaching the Trussler Road roundabout, Bleams would widen to two lanes, one for right turning and one for left turning vehicles.

The Trussler road roundabout is proposed to have two lanes running south; one as a dedicated left and the other a through. Northbound will also have two lanes with a through and through/right lane.

5.2.3.3 Signals (Alternative 2)



The signalized version, similar to the roundabout version, will have four lanes from the roundabout at Fischer Hallman to the intersection with Commonwealth/Abram Clemens where two lanes will merge into dedicated right and left turn lanes and a single through lane. West of the intersection, the road transitions into a two-lane urban cross section with a single lane in each direction. A left turn lane will accommodate access to Forest Walk Trail. The Donnenwerth/ Amand intersection would include dedicated turn lanes and a single through lane. A left turn lane for Street L and a signalized intersection at Isaiah Drive with dedicated turn lanes. To the west, turn lanes are planned for Nyles and George Israel Drive. Approaching Trussler Road there would be a right turn lane and left turn lane. Trussler road will have single through lanes in the north/south direction with a dedicated right turn lane for northbound traffic. And due to the projected peak hour volumes, a dual left turn lane onto Bleams Road is required.

5.2.3.4 Hybrid (Alternative 3)



In Alternative 3, we combine portions of the two previous alternatives with roundabouts proposed at the furthest east and west intersections, and signals at the two central intersections. As with the roundabout option, we have four lanes west from Fischer-Hallman to a roundabout at Commonwealth Street/Abram Clemens Way. The road is then narrowed down to a two-lane cross section with a left turn lane onto Forest Walk Trail. A signalized intersection with full turn lanes is proposed at Donnenwerth/Amand Drive. Bleams continues to the west with a two-lane cross section with a left turn lane to access Street L and then another signalized intersection with full turn lanes at the Isaiah Drive intersection. We continue with the two-lane section with turn lanes to Nyles Drive and George Israel Street and then into a roundabout at the Trussler Intersection.

The pros and cons of the options that were presented were discussed:

- There are benefits to traffic signals in that the intersections can be designed to include cycling crossrides and dedicated bicycle signals to allow cyclists to access all cycling routes.

- On the contrary, large and multi-lane roundabouts are shown to inhibit the desirability of using that intersection for walkers and cyclists with one example being that the Ontario Highway Traffic Act does not permit us to implement crossrides that allow cyclists to continue through that intersection without dismounting.
- In terms of operation, the roundabouts and the concept of continuous traffic flow are shown to perform better than traffic signals in terms of reducing vehicle delay. Roundabouts would also be expected to produce lower traffic speeds along the corridor, and better performance in terms of long-term expectation for vehicle collisions and their associated costs.

Given the pros and cons of the individual roundabout and traffic signal intersection control options, it could be said that the hybrid corridor (or, Alternative 3) would provide the alternative that is somewhere in the middle between all the pros and cons of an exclusive roundabout corridor (Alternative 1) or an exclusive traffic signals corridor (Alternative 2).

Again, at the end of the presentation a call for public participation was made with the details on how to engage with the project team. The survey was open from February 14 to March 7, 2023. The full presentation slides with the script are included in the report as **Appendix G.3.3**, as well the three alternative designs presented at PCC#1 are also included in this report as **Appendix G.3.5, Appendix G.3.6, Appendix G.3.7**.

5.2.4 PCC#1 Comments

The PCC #1 survey and submitted comments were conducted online through the EngageWR webpage to collect information on:

- where respondents reside,
- the frequency of their travel along the corridor,
- their concerns with the proposed alternatives,
- preferences for intersection controls.

In addition to approximately 1,200 page visits to the Study's EngageWR webpage PCC #1, 181 PCC #1 online surveys were submitted.

An analysis was completed by taking the general support for the questions, this is less direct and has some logical inferences in the method used and meant to create a narrative through all of the responses received. The response in support of all-roundabouts was strong, 80% of the respondents were in favour of using Roundabouts ("RAB") on Bleams.

From the responses received, based on the four intersections within the study area, the ranking of public support would appear as follows:

- 50% support for all RAB
- 20% support for all Signals
- 30% for the Hybrid Option (2 RAB bordering 2 Signalized intersections)

There was no consensus within the Project Team at this time, there was split support for agreeing with the Public and the full RAB option and the balanced Hybrid option. The Project Team agreed to summarize our discussion and the results from the PCC#1 to Roundabout Control Committee (RCC).

5.2.5 PCC#1 FAQ

Using the Engage platform an information package was posted with 9 common questions that are asked about projects of this type. The information package included full answers to all the questions above, and a copy of this document has been included as **Appendix G.3.4**.

5.3 Public Consultation Centre #2

5.3.1 Notice of Public Consultation

Due to the COVID-19 pandemic, the public consultation centre was completed using the Region of Waterloo's engage platform. A notice of Public Consultation was circulated both digitally through the engage website, as well as through the mail to residence immediately surrounding the study area. This notice directed the public to the engage website and highlighted the comment period for this PCC as August 15, 2022 to September 12, 2022.

The Notice of PCC #2 was published in August 2022 in The Waterloo Region Record, Kitchener Citizen edition and New Hamburg Independent. Notices were also mailed to over 900 residents within and bordering the Study Area, and mailed to identified agency, stakeholder groups, and Indigenous community representatives. This notice is included in this report as **Appendix G.4.1.**

5.3.2 PCC#2 Information Package

Using the Engage platform an information package was posted with 15 common questions that are asked about projects of this type.

The information package included full answers to all these questions, and a copy of this document has been included as **Appendix G.4.2.**

5.3.3 PCC#1 Summary

In preparation for the second PCC, a summary of the first PCC was posted to the engage website. This document the work that was completed for PCC#1, the summarized the information presented, and the comments received.

The conclusion of this document is the public support for the three alternatives presented during PCC #1 to improve four intersections on Bleams Road (Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive) is:

- 50% support for roundabouts at all 4 intersections
- 20% support for all traffic signals at all 4 intersections
- 30% for the hybrid combination of signals and roundabouts

The Project Team met to discuss the results and the analysis presented above, and the results were included in the selection of the preferred alternative. The PCC#1 Summary in its entirety has been included as **Appendix G.4.3.**

5.3.4 PCC#2 Presentation and Script

A video presentation, as well as a copy of the slides were posted on the Region's Engage website. This information went live on August 15, 2022. The presentation acknowledges the traditional territory that this project is located on and recognizes our responsibilities to serve as stewards to the land and honour the original caretakers that came before us. The project was introduced with a key plan of the study area. There was an update on the current status of the project and a recap of the PCC#1 engagement and comments.

The three alternatives that were consider for this project were presented: Full Roundabout, Full Signalized Corridor, and the Hybrid alternative designs. A recap of the public support from the PCC#1 comments for each option was presented. The two most common priorities were discussed, those being Traffic flow and Active Transportation.

An update on the supportive studies was given with the current status of the Archaeological Assessment, Natural Environmental Site Assessment, Noise Study and Intersection Control studies were given. Noting that there was no species at risk found in the study area, and there were areas that would require a Stage 2 Archaeological Assessment for several pockets of the study area.

5.3.4.1 All Roundabouts (Preferred Alternative)



The preferred design as shown in the above figure, which a larger version is included in **Appendix G.4.5**. the Preferred alternative that we intend on carrying forward to council and ultimately constructing consists of four roundabouts: a multi-lane roundabout at the east limit and single lane roundabouts for the other locations. This also comes with an active transportation solution, which is included in **Appendix G.4.6.**

The most common concern from the public with respect to active transportation was pedestrian and cyclist crossing of multilane roundabouts, the use of single lane roundabouts was used, when possible, to help alleviate those concerns.

There is a section of the corridor that will be widened to four lanes, this is from the east limit of the study area to Commonwealth Street / Abram Clemens Street when it will taper back down to a two-lane cross-section (one lane in each direction) for the balance of the corridor.

Another feature of note is the proposed raised center median, which is proposed from Fischer-Hallman Road to the Donnenwerth / Amand Drive intersection. This is for the safety and traffic flow of the corridor. The addition of the raised median will create a right-in-right-out condition for the side streets of Helena Feasby, and Forest walk Trail.

The timeline of the EA process was presented illustrating the current stage of the study with the expected timeline for the completion of the Study. This environmental study report was discussed, and the 30 days public review period was presented. The presentation was

completed with a request for comments through the engage website or directly to one of the project managers for the study.

5.3.5 PCC#2 FAQ

Using the Engage platform an information package was posted with 8 common questions that are asked about projects of this type. The information package included full answers to all the questions above, and a copy of this document has been included as **Appendix G.4.7**.

5.3.6 PCC#2 Comments

During the PCC #2 comment period, which was open from August 15 to September 12, 2022 there were 93 visitors, of which 10 people commented in response to the survey questions. All responses were in favour of the all-roundabout alternative. With one visitor offered specific insight into slowing vehicle speeds along the corridor. The project team was made aware of the responses and have taken them into account during the detailed design process. A full copy of this document is included in **Appendix G.4.8**.

5.4 Notice of Completion

The notice of completion for this study, dated May 2, 2023, was posted on the engage website, as well as published in the KW Record. A full copy of this document has been included in **Appendix G.6**.

6.0 Impacts and Mitigation Measures

6.1 Key Impacts and Mitigation

The following table is a summary of the key impacts and mitigation measures that must be considered as part of the detailed design phase and throughout construction.

Issue/Concern	Project Team Response
Need for efficient Traffic Flow	Analysis of the existing and future traffic volumes and turning movements have determined that roundabouts and raised medians through this corridor will provide an efficient traffic flow.
Preference of Signals over Roundabouts	Signals and roundabouts were given equal consideration in this study and were included in the three alternatives presented to the public during the first public consultation. The Project Team determined that these four intersections are better served with roundabouts rather than signals.
Concern with interaction of Active Transportation at multi-lane roundabouts	In order to alleviate this concern, the Project Team's Recommended Alternative includes the installation of single lane roundabouts on Bleams Road at Donnenwerth Drive/Abram Clemens Drive and at Isaiah Drive. It is hoped, that in the next few years, provincial legislation will change to improve active transportation crossings at

Issue/Concern	Project Team Response
	roundabouts. Current Ontario legislation does not allow cross-rides at roundabouts.
Preference for a four-lane cross-section rather than two lane cross-section	Traffic forecasts have been completed to establish the number of lanes that are warranted for the corridor. It was determined that a four-lane section between Fischer-Hallman and Commonwealth Street/Abram Clemens Street is required. The remained of the corridor can remain a two lanes section for many years to come. Construction of the Roundabouts will be completed allowing for an easy transition from single lane to multilane roundabouts to support a potential future four-lane configuration.
Traffic Speed	Detailed design of the roundabout intersections will consider the fastest path and the geometry of the intersections will be constructed to reduce speed with the correct approach angles. The maximum speed through a typical roundabout is 30 km/h.
Too many Pedestrian Crossing locations	Pedestrian crossing locations under consideration are located where there is an existing tendency to cross such as a trail on either side of Bleams, a church, or a cross street without a full intersection. Crossings will occur in these locations naturally, and we would like to make these crossings as safe as possible. Final locations of all crossings will be reviewed during detailed design of the roadway.
On street Parking on side streets	On street parking on intersecting streets will be adjusted as required with City of Kitchener Staff to accommodate vehicle movement.
There is a need for Streetscaping along Bleams Road	As the design progresses, the green spaces will be designed, and the appropriate landscaping will be placed in locations that allow for adequate sightlines.
Transit Routes	Currently, this section of Bleams Road does not include a transit route and is not being considered as a future transit corridor. However, the intersections will be designed to handle buses in the case GRT plans change. Rosenburg Way is the route currently planned for a GRT route, and it runs parallel for the full length of the Bleams Corridor.
Concern for the safety of corridor users	Safety is paramount in corridor designs. We will complete this design to maintain the highest level of safety for all forms of transportation who will use this corridor.

Issue/Concern	Project Team Response
	The Region strives to build safe roads and roundabouts designed to eliminate fatalities associated with right angle collisions and high-speed rear end collisions. Roundabouts have been shown to reduce these accidents; however, there are many 'failure to yield' minor accidents which generally involve front or rear quarter panel damage and little or no injuries.
Access for EMS due to raised median at Helena Feasby Street	Access for EMS vehicles will be tested for all Roundabouts and any streets with limited access will be communicated to all EMS services. It is felt that suitable access to Helena Feasby can be achieved from either Bleams Road or the adjacent roundabouts, which are in close proximity. Consultation with EMS services will be continued through detailed design.
Lighting	Appropriate lighting will be designed to accommodate the roadway and the trails along the Bleams Corridor.
Sightlines	Ensuring proper sightlines for the safety of all forms of transportation is a key consideration in this design. This will be considered from the beginning to the end of the design of all roundabouts and side streets along this corridor.
Sound Barriers/Noise Barriers	In accordance with the Region's Noise Policy - Part B, a noise assessment was completed for the properties on Bleams Road in the section from Fischer-Hallman to Commonwealth Street/Abram Clemens Street, which is being widened from two to four lanes. That study determined that no additional noise attenuation measures are required. Per Part B, the 10-year projections for traffic volumes are used to determine if noise levels exceed either 65 dBa or increase the existing levels by 5 dBa and are greater than 60 dBa. This widened section does not meet those thresholds for noise attenuation.
Additional left turn lane at Romanian Orthodox Church	A turning lane at the Romanian Orthodox Church will be explored.
Speeding	Use of Roundabouts along the corridor will tend to reduce vehicle speed simply through the geometry of the intersections.

Issue/Concern	Project Team Response
Student Crossing of Bleams to Proposed School	Consideration was given to the need for students to cross Bleams at Isiah Drive, the Project Team has determined that a single lane Roundabout best suits this location.

6.2 Climate Change

A key focus of this Study has been the impact of climate change and consideration of how the Alternative Solutions and Design Concepts are influenced by – and can influence – climate change. The Region of Waterloo published their Climate Action WR study, which identifies ways for emission reduction within the community. Consideration of the alternatives in this study give consideration to the implementation of the actions identified in the Region's Study. The Region's study was published in spring of 2021, and was prepared in conjunction with it's 8 municipal partners. The study endorsed a community greenhouse gas emission reduction target of 80% of the 2010 levels by 2050 (80by50). In the shorter term they also adopted an interim goal of GHG reduction of 50% by 2030 (50by30).

Through the Class EA, Design Concepts have been developed to support the Region's plans for addressing climate change.

- **Reduced Emissions** - Improvements to traffic flow, limiting the idle time at traffic signals by using an all-roundabout preferred alternative. Reduced idling time will have direct impacts on reducing emissions throughout the corridor.
- **Corridor Capacity** – The design of the roadway corridor limits the number of lanes to accommodate the mid-term growth scenario, and does not allow for this corridor to exceed capacity in future conditions. The limitations will limit traffic flow in the area, and ensure that not further environmental impacts will occur in the future within the right of way in the future.
- **Street Trees** – The corridor design includes the introduction of street trees wherever possible. The enhanced landscaping associated with the street trees will improve the air quality, and boulevard erosion. During detailed design, the species and location of street trees will be confirmed with the objective of maximizing the survival rate of the trees, and allowing them to reach their full canopy.
- **Active Transportation** - The introduction of multiuse trails on both sides of the corridor provides dedicated cycle lanes, which will provide a safe environment for cyclists to make their way along the corridor, as well as improved pedestrian facilities. Increased safety for cyclists will directly translate to a greater number of cyclists and reduced number of drivers within the corridor. Increased active transportation will assist in reducing emissions through the corridor.
- **Groundwater Protection** – The project area lies within a protected groundwater recharge area. Rather than looking at ways to improve infiltration, this project is looking to protect the drinking water source by reducing infiltration. Protecting the groundwater in the area by reducing or eliminating the impact of anti-icing/de-icing agents on the local water supply wells which are in an area of high vulnerability. Clay capping of boulevards and using a winter bypass (dedicated storm sewer) instead of infiltrating winter drainage

in the proposed SWM ponds between November and April are some of the measures that will be implemented as part of the detailed design.

- **Air Quality** – the project area currently has a rural cross-section surrounded by farmland, and quarry pits at the end of their useful life. The area is in a transition period into new residential developments. The Project Team deemed that an Air Quality Impact Assessment was not required.
    - The existing local air quality does of course have a baseline level of air pollution along the existing corridor, the baseline traffic data is in Section 2.5 (Traffic Study) of this report, and this level is anticipated to grow.
    - There are some sensitive receptors along the corridor in the form of existing houses on the south side of Bleams Road, as well as the back lotted subdivisions along the north side of the road. There are also two places of worship along the corridor and a potential future school located in the STAMM subdivision. At the time of this report, the location for this new school has not been confirmed.
    - During construction there will be an impact to the local air quality due to the number of vehicles that are operating in the area, this will be mitigated as discussed below.
    - The preferred alternative employs roundabouts at all major intersections, which as mentioned above, is known to reduce the idling time for cars at the intersections. There is an emphasis on active transportation that will allow for alternative sustainable modes of transportation along the corridor. These will be mitigation measures to the impacts on the local air quality.

- **Construction** – industry best practices will be employed during construction. Construction documents will use the Region's Construction Standards, which includes the Region's Clean Air Initiative (Item 29) as a baseline to ensure they are minimized. Some examples of this are:
    - Ensuring all motorized equipment is in good condition, properly and regularly maintained, and compliant with applicable federal and provincial regulations;
    - Ensuring all equipment is maintained and operated in accordance with the manufacturer's specifications;
    - Locating stationary equipment as far away from sensitive receptors as practical;
    - No refueling of equipment within the hours of 8:00 am to 6:00 pm;
    - Shutting down any equipment idling for more than 10 minutes;
    - Implementing a Dust Management Plan for the full duration of construction activities – with the use of non-chloride dust suppressants.

7.0 Permits, Approvals and Next Steps

7.1 Approvals

During the detailed design phase of the project, there will be a number of submissions that will need to be made regarding various elements of the project:

Feature	Approval Details	Timing
Storm Sewers	Storm sewer design, including OGS units that will require Environmental Compliance Approval (ECA) submission to the MECP.	90% Detailed Design
Watermain	Watermain design will require a Form 1 submission to the MECP.	100% Detailed Design
Grand River Conservation Authority (GRCA)	The Study Area lies just outside the GRCA's regulation limit, floodplain, and floodplain special policy area. Given the proximity to the regulation limit and floodplain, the GRCA should be circulated on all design submissions, and treated as a key stakeholder in the detailed design phase.	60% & 90% Detailed Design

7.2 Future Phases

A 30-day public and agency review period will follow the submission of this report. At the conclusion of this period, the detailed design phase of the project may continue. Design elements highlighted in this report will be incorporated and combined with outside design elements into the detailed design.

The drawings and documents must incorporate all of the environmental and mitigation measures identified in this report to avoid and mitigate adverse impacts. These mitigation measures will be expanded upon where necessary during detailed design. The Region will maintain ongoing coordination with stakeholders, the public, utilities and emergency services throughout the design and construction phases.

7.3 Construction Staging

As the project transitions from the Class EA phase to the detailed design phase, there will be much more focus on the construction staging and timing of construction. Currently, it is anticipated that the detailed design phase will take place in 2023, this will be completed at the same time as the necessary utility relocations. With construction expected to start in 2024 and continue through to the end of 2025.

7.4 Submission of Environmental Study Report and Section 16 Order Requests

Hard copies of this Environmental Study Report (ESR) have been made available for the 30-day review period in the Clerk's office at 150 Fredrick Street, as well as the nearest Kitchener Public Library location to the study area, Forest Heights location. The ESR is also available for review on the Region of Waterloo's website at https://www.engagewr.ca/bleams-rd.

Under Section 16 of the EAA, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty

rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name.

Requests should specify what kind of order is being requested (request for conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy potential adverse impacts on Aboriginal and treaty rights, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

Unless otherwise stated in a request, any personal information provided will become part of the public record and will be released, if requested, to any person.

Where to send request – A completed Section 16 Order Request Form must be sent to the Minister of Environment, Conservation and Parks or delegate. You should also send a copy of the form to the Director of Environmental Assessment and Permissions Branch as well as the Proponent:

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
Floor 11
77 Wellesley Street West
Toronto ON M7A 2T5
minister.mecp@ontario.ca

Director, Environmental Assessment and Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto ON M4V 1P5
enviropermissions@ontario.ca

The Section 16 Order Request Form must also be sent to the Region of Waterloo (Proponent) and their Consultant Project Manager:

Greg Proctor, C.E.T.
Project Manager
Transportation and Environmental Services - Design & Construction
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4400

519 575-4729
GProctor@regionofwaterloo.ca

Dot Roga, C.E.T.
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520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

519 743-6500
droga@mte85.com

8.0 Summary and Recommendations

As part of the Class EA process, several Alternative Designs for the improvements to the Bleams Road corridor were evaluated. Following a Schedule C Class EA process, a Preferred Alternative was selected.

The Preferred Alternative is a roundabout corridor with:

- Two multi-lane roundabouts located at the intersection of Bleams and Abram Clemens/Commonwealth Street, and one at the intersection of Bleams and Trussler Road;
- Two single-lane roundabouts at the intersection of Bleams Road and Amand Drive / Donnwenwerth Drive, and one at the intersection of Bleams Road and Isaiah Drive. These will be constructed to allow for future expansion to multi-lane roundabouts, if required;
- Widened the section of Bleams Road from Fischer-Hallman Road to Amand Drive / Donnenwerth Drive to a four lane cross-section (two lanes in each direction), with the remainder of the corridor remaining a two-lane cross-section (one lane in each direction);
- A raised centre median is recommended from Fisher-Hallman Road to Amand / Donnenwerth Drive, with the remainder of the corridor open, with a painted center line;
- Bi-directional Multi-use Trails (MUT) are planned for both sides of Bleams, these will be 3.50m asphalt trails.
- There is no parking included in the preferred alternative for improvements to Bleams Road.
- There is no planned transit route in the preferred alternative for Bleams Road, which is in line with the GRT's long term plans for the area. The new Rosenberg Way is the planned transit corridor for this area, which runs parallel to Bleams to the south. The sizing of all the roundabouts will accommodate buses turning, or detours if it is required.

The detailed design of the Preferred Alternative will continue in 2023, at the same time all utilities will be relocated. The timeline for the construction is expected to take place in the years 2024 and 2025. Construction will commence in stages starting at the east end to tie into the current Fischer-Hallman roundabout project, underground work will commence followed by grading and surface works (widening the road). The work is anticipated to continue through the winter progressing the underground work. The estimated construction cost of the preferred design is expected to cost approximately $20.0 million dollars based on the preliminary design.

A full drawing of this design is included in **Appendix J.**

Appendix A

Natural Environment



Bleams Road (Fischer-Hallman Road to Trussler Road) Class C Environmental Assessment - Environmental Impact Study

Prepared for:

The Regional Municipality of Waterloo
150 Frederick St.,
Kitchener, Ontario
N2G 4J3

Project No. 2455 | February 2023

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Bleams Road (Fischer-Hallman Road to Trussler Road) Class C Environmental Assessment - Environmental Impact Study
Environmental Impact Study

Project Team

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Gina MacVeigh	Aquatic Biologist
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Report submitted on February 23, 2023



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Senior Manager
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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by The Regional Municipality of Waterloo c/o MTE Consultants to complete the Natural Environment component of the Bleams Road (Fischer-Hallman Road to Trussler Road) Class C Environmental Assessment (EA) and Preliminary Design, Detailed Design, and Construction Inspection.

The Bleams Road Class A+ EA Study Area extends from Fischer-Hallman Road west to Trussler Road and includes lands within 120m on either side of Bleams Road (Map 1). The Study Area falls within Ecoregion 6E, the Grand River Watershed, and the Alder Creek Watershed and Upper Strasburg Creek Subwatersheds. Natural features identified within the Study Area include the headwaters of Strasburg Creek and its associated floodplain, south of Bleams road just west of Fischer-Hallman Road. This area is also mapped as a Core Natural Heritage Feature by the City of Kitchener (2014). A portion of an unevaluated wetland is within the Study Area, just north of Bleams Road in the western portion of the Study Area. The watercourse, floodplain, and wetland are regulated by the Grand River Conservation Authority (GRCA) and subject to Ontario Regulation 150/06 (GRCA 2015b). Portions of a woodland, not considered significant by the City or the Region, is also present just east of Trussler Road. The Study Area also falls within a Regional Recharge Area (Region of Waterloo 2015).

This study has been developed in accordance with local municipal and conservation authority guidelines for Environmental Impact Study (EIS) reports (City of Kitchener 2002, GRCA 2005, Region of Waterloo 2010). This report summarizes background information on natural heritage features, as well as results of original field surveys. Due to the urbanized nature of the Study Area and the availability of existing survey data for the area, the ecological field program was scoped in consultation with GRCA and the City of Kitchener. The detailed characterization of existing natural features was used to inform an analysis of the significance and sensitivity of natural features within the study area with consideration for applicable municipal and provincial policies and legislation. This information is then used to evaluate several alternatives for road improvements from a natural heritage perspective. This EIS is one component of the EA which informed the selection of the preferred alternative. Examples of other components which needed to be considered are technical feasibility, potential impacts to the local community, archeological resources, cost, and input from a variety of stakeholders. This report also includes an assessment of environmental impacts associated with preferred alternative.

1.1 Proposed Undertaking

Due to recent and future developments along Bleams Road, the Region has identified the need to reconstruct and improve Bleams Road from just west of Fischer-Hallman Road to Trussler Road to accommodate projected traffic volumes and patterns. Although this section of Bleams Road is identified as a neighborhood connector, it currently has a rural cross-section with gravel shoulders and ditches along the majority of its length.

The Region of Waterloo has decided to proceed with improvements to Bleams Road which include urbanizing the existing rural cross-section. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians, cyclists, and transit along the corridor. The current stormwater runoff from Bleams Road is managed through existing deep ditches along the corridor with various informal outlets and infiltration (MTE 2023). As part of the road improvements, existing open ditches will be removed and a new stormwater management (SWM) system will be designed to manage the Region's right of way drainage using the quality and quantity control of SWM ponds proposed by the developments on the south side of Bleams Road.

1.2 Project Scoping

In order to determine a study approach for this EIS, existing natural heritage information was first gathered and reviewed to identify key natural heritage features and species that are known or have potential to occur within the study area. This included background information on the natural environment features within the study area vicinity from the MNRF Natural Heritage Information Centre (NHIC) significant species database (MNRF 2020), the MNRF's Land Information Ontario (LIO) (MNRF 2020), the Region of Waterloo Official Plan mapping (Region of Waterloo 2010), the City of Kitchener Official Plan mapping (City of Kitchener 2014), the Grand River Conservation Network: Interactive Mapping Tool (GRCA 2015a).

Initial wildlife species lists were compiled to provide information on species reported from the vicinity of the Study Area (10km radius) using various atlases including the Ontario Breeding Bird Atlas (BSC et al. 2008), Ontario Reptile and Amphibian Atlas (Ontario Nature 2022), Ontario Mammal Atlas (Dobbyn 1994), Ontario Butterfly Atlas (McNaughton et al. 2022), and the Ontario Odonata Atlas Database (2018). Background information on fish species in the Study Area was compiled from the Department of Fisheries and Oceans (DFO) Aquatic Species at Risk Maps (2020) as well as Stormwater Management Audit Reports for the City of Kitchener

(Aquafor Beech Ltd 2012, 2014; AECOM 2015). Since several of the atlases provide data based on 10x10km survey squares, information from the square that overlaps the study area (17NJ40) was compiled. These initial species lists were used to guide the scope and type of field surveys required as outlined in the following sections.

1.2.1 Species at Risk and Species of Conservation Concern Screening

SAR are those listed on the Species at Risk in Ontario List (MNRF 2023). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially Endangered, Threatened, or Special Concern. For the purposes of this report, SAR refers to Endangered or Threatened species which receive habitat protection under the *Endangered Species Act*, 2007 (Government of Ontario 2007).

Species of Conservation Concern (SCC) are species that are significant but do not receive habitat protection under the *Endangered Species Act*, 2007 (Government of Ontario 2007). SCC include the following:

- species designated provincially as Special Concern,
- species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the Natural Heritage Information Centre, and
- species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) but not provincially by the COSSARO. These species and their habitats may be protected by the federal Species at Risk Act (Government of Canada 2002) but not provincially by the Endangered Species Act (Government of Ontario 2007).

Habitats of SCC are considered a form of Significant Wildlife Habitat (SWH) (MNR 2000) which is afforded protection under the Provincial Policy Statement (OMMAH 2020) and various municipal natural heritage protection policies.

Based on the results of background information review, SAR with occurrence records within 10km of the Study Area were identified. A preliminary screening exercise was conducted to identify which of these species have potentially suitable habitat within the study area. This involved cross-referencing the preferred habitat for reported SAR (MNR 2000) against habitats known to occur within the Study Area or adjacent lands (based on satellite imagery or existing studies). This was completed to ensure that the potential presence of all SAR and SCC within the study area was adequately assessed in this EIS.

The following SAR were identified as potentially having suitable habitat within the Study Area:

- Butternut (*Juglans cinerea*) - provincially and federally listed as Endangered
- Blanding's Turtle (*Emydoidea blandingii*) - provincially and federally listed as Threatened
- Bank Swallow (*Riparia riparia*)- provincially and federally listed as Threatened
- Barn Swallow (*Hirundo rustica*)- provincially and federally listed as Threatened at the time the screening was done, but has since been downlisted to Special Concern.
- Chimney Swift (*Chaetura pelagica*)- provincially and federally listed as Threatened

The following SCC were identified as potentially having suitable habitat within the Study Area:

- Eastern Wood Pewee (*Contopus virens*)- provincially and federally listed as Special Concern

These species are discussed in Section 4.3 of this report under their respective biota subsections (e.g., Birds). Full results of the SAR/SCC screening exercise are provided in the TOR in APPENDIX I.

1.2.2 Significant Wildlife Habitat Screening

A preliminary screening for the presence of SWH was also completed for the study area. The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline document that outlines the types of habitats that the MNRF considers significant in Ontario as well as criteria to identify these habitats (MNR 2000, MNRF 2015). The SWHTG groups SWH into 4 broad categories: 1) seasonal concentration areas, 2) rare vegetation communities and specialized wildlife habitat, 3) habitats of SCC, and 4) animal movement corridors. Based on the results of this preliminary screening exercise, the following 7 candidate SWH types were identified for the study area:

- Seasonal Concentration Areas:
    - Bat Maternity Colonies
    - Snake Hibernacula
- Rare Vegetation Communities
    - None
- Specialized Wildlife Habitat
    - None

- Habitats of SCC
    - Terrestrial Crayfish
    - Special Concern and Rare Wildlife Species
- Animal Movement Corridors
    - None

These candidate SWH types are discussed further in Section 5.3 of this report. Full results of the SWH screening are provided in the TOR in APPENDIX I.

1.2.3 Terms of Reference

Based on the findings of the background review, including SAR and Species of Conservation Concern (SCC) screening, and Significant Wildlife Habitat (SWH) screening exercises, a TOR for the EIS was prepared by NRSI and submitted on September 1, 2020 to the GRCA, City of Kitchener, the Regional Municipality of Waterloo, the Ministry of Environment Conservation and Parks (MECP), and the MNRF Guelph District. Comments on the TOR and the study approach were received from the GRCA, City of Kitchener and MECP. Subject to minor comments, the study approach as laid out in the TOR was accepted by the reviewing agencies.

The project TOR and associated agency staff comments are appended to this report (APPENDIX I). The TOR includes the results of a comprehensive SAR, SCC and SWH screening.

2.0 Relevant Policies, Legislation and Planning Studies

For the purposes of this report, information on the natural heritage features within the Study Area was collected and assessed for significance. To help inform suitable land-use concepts, guide the layout of development, and identify areas to be protected, these features were evaluated against relevant policies, legislation, and planning studies (Table 1). The specific implications of these policies to the study are discussed in further detail later on in the report. Table 1 provides an overview of policies that were considered and which informed the field program and analysis.

Table 1. Relevant Policies, Legislation and Planning Studies

Policy/Legislation	Description	Project Relevance
Provincial Policy Statement (PPS) (OMMAH 2020)	• Issued under the authority of Section 3 of the *Planning Act* and came into effect on May 1, 2020, replacing the 2014 PPS (OMMAH 2014). • Section 2.1 of the PPS – Natural Heritage establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'. • The Natural Heritage Reference Manual (OMNR 2010) and the Significant Wildlife Habitat Technical Guide (OMNR 2000) were prepared by the MNDMNRF to provide guidance on identifying natural features and in interpreting the Natural Heritage sections of the PPS.	• Based on the initial background review, including SAR and SWH screenings, several natural features afforded consideration within the PPS were identified within the Study Area, which include: o Candidate habitat for Endangered and Threatened species o Candidate SWH o Fish habitat
Endangered Species Act (ESA) (Government of Ontario 2007)	• The original ESA, written in 1971, underwent a year-long review which resulted in a number of changes which came into force in 2007. • The ESA prohibits killing, harming, harassing, or capturing SAR and protects their habitats from damage and destruction.	• Based on the initial background review and SAR screening, several SAR were identified as having suitable habitat within the Study Area.
Migratory Birds Convention Act (MBCA) (CWS 2013)	• The MBCA protects migratory game birds, insectivorous birds, and several other migratory non-game birds from persecution in the form of harassment. • The schedule of on-site work must consider MBCA windows, with timing of breeding bird season typically occurring between May 1 and July 31; however, this is a guideline, since the MBCA applies to nesting bird species. • "Incidental take" is considered illegal, with the exception of a permit obtained by the Canadian Wildlife Service (CWS).	• Species protected by the *Migratory Birds Convention Act* were identified in background screening for the Study Area. • The timing of construction activities, especially vegetation clearing must have consideration for the MBCA.
Fish and Wildlife Conservation Act (FWCA) (Government of Ontario 1997)	• The FWCA provides protection for certain bird species, not protected under the MBCA (i.e. raptors), as well as furbearing mammals and their dens or habitual dwellings, aside from the Red Fox (*Vulpes vulpes*) and Striped Skunk (*Mephitis mephitis*).	• The timing of construction activities, especially vegetation clearing and site grading must have consideration for bird nesting and den sites for furbearing mammals.

Policy/Legislation	Description	Project Relevance
Grand River Conservation Authority Ontario Regulation 150/06 (GRCA 2015b)	• Regulation issued under *Conservation Authorities Act,* R.S.O. 1990. • Through this regulation, the GRCA has the responsibility to regulate activities in natural and hazardous areas (i.e. areas in and near rivers, streams, floodplains, wetlands, and slopes). • GRCA requires that an EIS be undertaken in accordance with their *EIS Guidelines and Submission Standards for Wetlands* where development is proposed within 120m of PSW or 30m of non-PSW (GRCA 2005).	• Strasburg Creek and its associated floodplain are regulated by the GRCA. • In accordance with this policy, the proposed development must demonstrate no negative impacts to the regulated natural features or their ecological functions.
Canadian Fisheries Act	• Manages threats to the sustainability and productivity of Canada's commercial, recreational and Aboriginal fisheries. • The Act prohibits "serious harm to fish" including destruction of habitat • DFO has developed an online, self-assessment tool, where proponents can determine whether their projects require DFO review based on the type of water body the work is occurring in and the nature of the proposed activity.	• The approach to stormwater management may have implications for fish habitat within Strasburg Creek.
Region of Waterloo Official Plan (ROP) (Region of Waterloo 2015)	• The recently approved ROP includes policies related to the natural environment through the conservation and enhancement of the Region's sensitive natural areas and native biodiversity, and the promotion of informed stewardship. • Core Environmental Features are identified within the ROP (2015) as environmental features which are considered provincially or regional significant.	• There are no Core Environmental Features according to the ROP (2015) in the Study Area. • The potential for habitat for Endangered or Threatened species to occur was also identified which, if confirmed, is considered Core Environmental Feature.
City of Kitchener Official Plan (City of Kitchener 2014)	• The City of Kitchener Official Plan (2014) outlines current policies for the protection of the City's natural heritage resources. • Policies speak to the protection natural features within the City's Natural Heritage System.	• The Official Plan includes policies for the protection of the following natural features within the study area: o Significant Wetlands, o Significant habitat for Endangered and Threatened species, o SWH and other areas of Local Significance.

Policy/Legislation	Description	Project Relevance
City of Kitchener Tree Management Policy (City of Kitchener 2002)	• A policy framework to ensure that areas containing trees worth retaining are identified, to inform and guide the design of the proposed development.	• Isolated and landscape trees may be impacted by the proposed undertaking. • A tree inventory and Tree Protection Plan, following the City of Kitchener's Tree Management Policy (2002) will be required if any trees need to be removed for the proposed development.
Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan (CH2MHill and North-South Environmental Inc. 2008)	• The subwatershed study describes, maps and qualifies Core Natural Areas based on the criteria for designation as an Environmentally Sensitive Policy Area (ESPA). It also identifies Satellite Areas which do not meet the criteria to be considered Core Natural Areas, but were still considered to play an important ecological function. • According to the subwatershed study, the goal of the Natural Heritage System is to promote persistence, restoration, and enhancement of the environmental features and functions and the native biodiversity now present within the watershed in the face of ecosystem stressors that can be predicted over the long term. • In the case of isolated wetlands, the plan recommends restoring and/or enhancing upland adjacent upland areas to ensure a physical linkage for the promotion of breeding, foraging, and/or development. • Recommends 30m buffers around Core Natural Areas.	• There are no significant natural features identified in the study area within the plan.
Rosenberg Secondary Plan (City of Kitchener 2013)	• Building on the subwatershed plan, the Rosenberg Secondary Plan established a Natural Heritage System of Core Areas and Non-Core Areas comprised of Provincially Significant Wetlands, Regionally Significant Core Environmental Features, Significant Habitat of Endangered or Threatened Species, Locally Significant Woodlands, Wetlands and Valleylands (City of Kitchener 2013).	• The lands south of Bleams Road falls within the Rosenberg Secondary Plan. • There are no significant natural features identified in the study area within the plan. • The southwest corner of the Bleams and Fischer-Hallman Road intersection are identified as Open Space in association with a stormwater management area. • Immediately downstream of Fischer-Hallman Road the

Policy/Legislation	Description	Project Relevance
		Strasburg Creek Corridor is identified as part of the City's Natural Heritage System. Stormwater management within the Study Area must have consideration for these important downstream areas.

3.0 Field Methods

Terrestrial field surveys were undertaken within the study area to characterize natural features and identify significant and sensitive natural heritage features, and species that have potential to be adversely affected by the proposed development. Field visits were completed on the property on a total of 6 dates between October 2020 and January 2022 (Table 2). Survey methods, undertaken in accordance with provincial and local guidance documents, are described in detail in the TOR appended to this report (APPENDIX I).

During the field work program, all observations of birds, reptiles, amphibians, mammals, butterflies, dragonflies, and damselflies were documented on all field visits. This included actual direct observations of individuals, as well as signs of wildlife presence (i.e. tracks, scats, dens, nests etc.)

Table 2. Field Survey Summary

Survey Type	Protocol	Date
Aquatic Habitat Characterization	MNRF 2017b	Oct 29, 2020
Bat Cavity Tree Inventory (leaf off)	OMNR 2011 OMNRF 2016a	January 25, 2022
Bat Cavity Tree Inventory (leaf on)	OMNR 2011 OMNRF 2016a	September 24, 2021
Tree Inventory	City of Kitchener 2002	March 18, 2022
Tree Inventory	City of Kitchener 2002	January 10, 2022
Tree Inventory	City of Kitchener 2002	January 25, 2022
Headwater Drainage Feature Assessment	CVC and TRCA 2014	April 11, 2021

4.0 Existing Conditions

4.1 Soil, Terrain and Drainage

The study area is located within a physiographic region of southern Ontario known as the Waterloo Hills (Ontario Ministry of Northern Development and Mines 2017). This region has an area of approximately 777 km^2 and occupies much of the Regional Municipality of Waterloo. The land is dominated by sandy hills, including ridges of sandy till, and kames or kame moraines. Outwash sands lie in the hollows between the hills (Chapman and Putnam 1984). The soils of the Waterloo Hills are well-drained and are described as Grey Brown Luvisolic soils (Chapman and Putnam 1984). The study area is also located on the Waterloo Interlobate Moraine, which spans most of the Township of Wilmot and parts of Kitchener-Waterloo. Extensive ice-contact and glaciofluvial stratified deposits are found within this moraine, either at the surface or beneath till units (Ontario Geological Survey and Planning and Engineering Initiatives Limited 1998). The study area is dominated by the Fox and Waterloo soil series. The Fox series is comprised of well-drained medium or coarse sands on gently-sloping ground (Presant and Wicklund 1971). The Waterloo soil series developed on the fine sandy loam found within the Waterloo Interlobate Moraine. These well-drained soils formed on gently-sloping lacustrine deposits (Presant and Wicklund 1971).

4.2 Vegetation

The majority northern portion of the Study Area is developed as existing residential areas with manicured lawn and garden characterizing the proposed road right-of-way (ROW). On the south side of the road right-of-way, the eastern third is comprised of a residential neighbourhood under construction (Williamsburg South). The western two thirds are characterized by resource (sand and gravel) extraction areas which also planned for residential development.

Naturalized vegetation communities are limited to a culturally influenced areas including a wooded area near the intersection of Beams Road and Trussler road which is characterized by a cultural Red Pine (*Pinus resinosa*) plantation (CUP) and a small wetland community characterized by meadow marsh (MAM). The floodplain area associated with Strasburg Creek has been modified significantly by residential development and has been landscaped. A stormwater management pond is located north of Bleams Road which outlets via a culvert to a newly constructed stormwater management property for the Williamsburg South Neighbourhood.

No significant vegetation communities or vascular flora were observed during field investigations along the road right-of-way.

4.2.1 Trees

A total of 517 trees, belonging to 35 different species, were inventoried within the Study Area by a Certified Arborist. In total, 190 of the tree species documented are non-native in Ontario. Trees condition within the study area is largely in Good to Fair condition with an Improbable potential for structural failure. APPENDIX II provides the complete list of trees inventoried within theSstudy Area, their overall condition, and comments relating to the individual specimen.

A total of 244 trees were recommended for removal due to their location within the proposed development area, or due to impacts from proposed grading activities. This includes planted Red Pine (*Pinus resinosa*), American Basswood (*Tilia americana*), and Eastern White Cedar (*Thuja canadensis*), Russian Olive (*Eleagnus angustifolia*) among others.

Once the detailed design is completed, the impacts to individual trees will need to be assessed through a Tree Preservation Plan. Inventoried tree locations within the Study Area are included in the maps included in APPENDIX II.

4.3 Wildlife

4.3.1 Birds

A total of 118 bird species are reported from the study area based on the OBBA for Squares 17NJ30 and 17NJ40 (BSC et al. 2008) (Appendix III). The data found in the OBBA includes those species that have been observed in the area (10 x 10km range), are known to nest in the area, and/or have exhibited some evidence of breeding in the area. Based on the initial project screening exercise, three species at risk were identified as having the potential to occur with the Study Area: Bank Swallow, Barn Swallow, and Chimney Swift.

During subsequent field investigations NRSI determined that no suitable habitat for these species was present within the road right-of-way or within the lands within 120m. Bank Swallow are known to nest in the south end of the active extraction area south of the Bleams Road (NRSI 2021). Barn Swallow are known to generally nest in barns and possibly establish nests on nearby houses within the Study Area, however any potential nesting areas are well removed

from the road of right-of-way. No suitable structures or natural features are present within the Study Area for Chimney Swift.

Potential habitat for Eastern Wood Pewee, a species of conservation concern, was also identified at the screening stage in the wooded area in the west end of the Study Area. Field investigations determined that this area is comprised of a cultural plantation and is not suitable for this species which prefers the mid-canopy layer of intermediate-age mature forest clearings and edges of deciduous and mixed forests.

Based on the lack of naturalized habitat within the Study Area and absence of suitable habitat to support species at risk and species of conservation concern identified, no targeted bird surveys were carried out.

4.3.2 Herpetofauna

According to the background information, 25 species of herpetofauna, including 3 SAR and 3 SCC, are known from within the City of Kitchener (MNRF 2018c) or within 10km of the study area (Ontario Nature 2022) (Appendix III). The SAR screening and NRSI's experience in this area of southwest Kitchener assisted in flagging one SAR (Blanding's Turtle) which is known to have regulated General Habitat within Strasburg Creek and natural areas associated with the Huron Natural Area, southeast of the Study Area.

Up until the development of the Williamsburg South Subdivision and Fischer-Hallman Road (Bleams to Huron Road) widening project, General Habitat regulated by the *Endangered Species Act* overlapped with the eastern extent of the Study Area, encompassing the stormwater management pond north of Bleams Road and Strasburg Creek south of the road. Based on extensive modifications to this area over the last three years, NRSI updated the General Habitat mapping to limit habitat to the east side of Fischer-Hallman Road (Map 1). This was based on the fact that:

1) typically stormwater management ponds would not be considered Category 2 habitat,

2) the entire floodplain area was recently converted into a large stormwater management facility as part of the Williamsburg South Subdivision (ESA permit No. GU-C-002-14), and

3) as part of the Fischer-Hallman Road widening project (ESA permit No. GU-C-010-17) the Region of Waterloo installed turtle exclusion measures on the east side of the Strasburg Creek culvert to exclude turtles from moving across Fischer-Hallman into these developed area. This includes both a physical barrier on the culvert and wildlife fencing.

This mapping has been provided to the MECP Species at Risk Branch for review.

Although not initially flagged as potentially occurring the Study Area when the Terms of Reference was scoped, Midland Painted Turtles, a species of conservation concern, were observed in the stormwater management pond north of Bleams road. During construction monitoring surveys for the Williamsburg South Subdivision, NRSI has also identified low numbers of Midland Painted Turtle mortalities along Bleams road near the stormwater pond.

Field review by NRSI biologists confirmed there are no suitable features for snake hibernation within or adjacent to the proposed road right-of-way.

4.3.3 Mammals

According to the Mammal Atlas of Ontario (Dobbyn 1994), 46 mammal species are reported from within 10km of the study area (Appendix III). This includes four species at risk bats which may use suitable cavity trees within the Study Area for roosting.

A bat habitat assessment was conducted during the leaf-off period, corresponding to MNRF guidelines (MNRF 2016). Potentially suitable bat cavity trees were identified within the Study Area (Map 2).

No SAR, SCC or regionally significant mammal species were observed.

4.3.4 Insects

The Ontario Butterfly Atlas had 76 species recorded for the study area and surrounding area, including one SAR (Mottled Duskywing (*Erynnis martialis*)) and one SCC (Monarch (*Danaus plexippus*)), and 16 regionally significant species (MacNaughton et al. 2017) (Appendix III). Of the SAR and SCC, the screening exercise determined that there was no suitable habitat for these species within the study area.

Background reviews revealed that 13 species of common Odonata (dragonflies and damselflies), all common species in the region, have been recorded in the Ontario Odonata Atlas (2018) in the vicinity of the study area (Appendix III).

4.3.5 Crayfish

Some crayfish live in waterbodies such as streams and lakes all the time, while others burrow in soil, living for most of the year in terrestrial areas in deep burrows topped with chimneys of mud balls. These chimneys are conspicuous and are most commonly found near wetlands or aquatic habitats. During field surveys within the road right-of-way no evidence of terrestrial crayfish were observed by NRSI, nor has any evidence of them been observed by NRSI biologists conducting work in this area of southwest Kitchener over the last 15 years.

4.4 Aquatic Resources

4.4.1 Aquatic Habitats

Background information (GRCA 2015, CH2MHill & NSE 2008) indicates that Upper Strasburg Creek is a coldwater feature and the Subwatershed Plan notes that Upper Strasburg Creek below (east) of the Fischer-Hallman Road culvert is managed as coldwater fisheries habitat (CHM2Hill and NSE 2008). The portion of the creek west of Fischer-Hallman Road was characterized in detail by NRSI previously (NRSI 2013). The creek has been heavily modified south of Bleams Road and west of Ficher-Hallman Road (mapped as floodplain on Map 1) due to changes in drainage from development north of Bleams Road and the creation of a large stormwater management pond for the Williamsburg South Subdivision. The floodplain is now characterized by a large stormwater management facility and low-flow channel. North of Bleams road, there is an existing stormwater management pond which replaced what was once mapped as the headwaters of Strasburg Creek.

East of Fischer-Hallman the creek flows east to west with three shallow ponds (Sunfish Pond, Board of Education Pond and Battler Pond) occurring downstream (east) of Fischer-Hallman Road. The fish community within the creek has been documented through previous studies (CH2M-Hill and NSE 2008, Stantec Consulting Ltd. 2014). These background sources indicate that the fish community within the creek, downstream of Fischer-Hallman Road, is characterized by common cool and coldwater species including Brook Trout.

As part of ongoing construction monitoring for the Williamsburg South Subdivision, staff of NRSI have observed fish in the floodplain area of Strasburg Creek and this area is considered fish habitat.

A complete list of fish documented in Strasburg Creek downstream of the Study Area is provided in Appendix III.

5.0 Significance and Sensitivity of Natural Features

This section analyzes the significance and sensitivity of natural features to determine opportunities and constraints for development. Natural features that are sensitive to disturbance are identified based on the rarity or significance of the feature or the functions/processes and/or policies inhibiting development within them. These areas are identified as “constraints”, and are discussed in the context of natural heritage policies governing their protection. Areas that are not subject to any of these constraints are thus considered “opportunities” for development.

This analysis is intended to guide the evaluation of alternatives so as to avoid or minimize impacts to significant and sensitive natural features and their ecological functions.

5.1 Wetlands and Woodlands

There is one locally significant wetland within the west side of the Study Area, regulated by the GRCA. This wetland, and its associated regulation limit, are outside of the proposed road right-of-way and the limit of this feature is estimated to be 80m from the proposed construction area.

There is one small wooded area comprised of Red Pine Plantation area at the west end of the Study Area. This feature is culturally influenced and is not considered significant by the Region of Waterloo or City of Kitchener. The limit of this feature overlaps in several areas with the proposed construction area. To address potential impacts to these trees, individual trees were inventoried.

5.2 Floodplain

The Strasburg Creek floodplain which extends across Bleams Road in the east side of the Study Area is regulated by the GRCA. In accordance with GRCA Ontario Regulation 150/06, Section 8.1.15, public infrastructure including roads, pipelines and utilities may be permitted in a regulated floodplain as determined through an EA process (GRCA 2015a). Briefly, the EA must demonstrate that adverse hydraulic or fluvial impacts are limited, risk of flood damage to upstream and downstream properties is not increased, there is no loss of flood storage wherever possible, and intrusions on significant natural features or hydrologic or ecological functions are minimized (GRCA 2015a). Development within the regulated area will also require prior permission from GRCA in the form of a permit pursuant to Ontario Regulation 150/06 (GRCA 2015b).

5.3 Significant Wildlife Habitat

Based on the results of a comprehensive SHW screening exercise and subsequent field surveys, no SWH is present within the Study Area.

5.4 Habitat of Endangered and Threatened Species

Based on background information collected from the various wildlife atlases indicated that 13 Endangered and Threatened species are known to occur in the vicinity of the study area. Potential habitat for several of these species (Butternut, Blanding's Turtle, and species at risk bats) were identified within the study area by comparing the results of vegetation community mapping to the habitat requirements for each of these species outlined in the SWHTG (MNR 2000)(APPENDIX I).

Field surveys confirmed there are no Butternut present within the road right-of-way or visible areas of the Study Area from the road.

NRSI have provided MECP with updated information regarding the widening of Bleams Road and the updated regulated Blanding's turtle habitat and specific information on potential bat habitats. At the time this report was completed no response had been received, however no permitting under the ESA is anticipated subject to proper mitigation (discussed in Section 7).

5.4.1 Fish Habitat

The floodplain area upstream of Strasburg Creek proper adjacent to the road provides habitat for fish. Downstream, Srasburg Creek also provides direct fish habitat for a small number of tolerant and moderately -tolerant cool- and warmwater fish species. Direct fish habitat is defined as spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly in order to carry out their life processes.

The proposed development does not include replacing the existing culvert between the stormwater management ponds north and south of Bleams Road, therefore no review by DFO is required. Given there may be alteration of the floodplain associated with the road widening, a permit may be required from the GRCA.

5.4.2 Headwater Drainage Features

There are no features that are considered headwater drainage features within the Study Area at present day due to heavy modifications and repurposing of what was the northern extent of

Strasburg Creek for stormwater management. Any headwater features present in the past no longer have hydrological or ecological functions which warrant protection and/or management and as a result, the CVC/TRCA headwater guideline evaluation and management recommendations do not apply any longer.

5.5 Summary of Natural Feature Constraints

A summary of significant or sensitive natural features identified as constraints to the proposed road improvements is provided in Table 3. The design of the preferred alternative should seek to minimize impacts to these features wherever possible.

Table 3. Summary of the Study Area Natural Feature Constraints

Natural Feature Constraint	Regulatory and Permitting Considerations	Project Considerations
Floodplain and Headwaters (Strasburg Creek)	• Ontario Regulation 150/06 (GRCA 2015b)	• Development within the regulated area will require prior permission from GRCA in the form of a permit pursuant to Ontario Regulation 150/06 (GRCA 2015b).
Trees	• City of Kitchener Tree Management Policy By-Law No. I-1160 (2002)	• A tree preservation plan will be required as development proceeds within the study area that should identify trees to be retained and/or protected and mitigation or compensation measures for trees that are removed. • The map in APPENDIX II indicates the arborist's recommendations in terms of hazard trees for removal and trees for retention, if possible.
Wildlife	• Endangered Species Act (2007) • Provincial Policy Statement (MMAH 2014) • Region of Waterloo Official Plan (2015) • City of Kitchener Official Plan (2014) • Migratory Birds Convention Act (2013)	• Candidate bat habitat (5 trees) have been identified within or adjacent to the project area. Removal of these features outside the bat active period (April 1 to September 30) should be sufficient mitigation but MECP should be contacted for confirmation. • Midland Painted Turtles are known to inhabit the stormwater management pond north of Bleams Road, east of Commonwealth St. and Blanding's Turtle is known to occur downstream of Fischer-Hallman Road in the Strasburg Creek corridor. Construction mitigation measures should include consideration for turtles as a precautionary approach. No impacts to regulated turtle habitat is anticipated but MECP should be contacted to confirm. • Removal of trees should have considerations for breeding birds and be outside the peak breeding window (May 1 to August 31) to the greatest extent possible.
Fish Habitat	• Provincial Policy Statement (MMAH 2014) • Federal Fisheries Act (Government of Canada 1985) • Region of Waterloo Official Plan (2015) • City of Kitchener Official Plan (2014)	• Direct and indirect fish habitat is present in Strasburg Creek. • Watercourse thermal regime is warm water • The proposed development does not include replacing the existing culvert under Bleams Road within the Strasburg Creek Floodplain • Development and site alteration within floodplain areas are prohibited unless permitted by GRCA • Should in-water work be required at the storm culvert crossing, a permit will be required from the GRCA. • Any proposed works for the preferred alternative to be completed in the vicinity of Strasburg Creek, will require a proponent-led DFO self-assessment to ensure that no serious harm is caused to fish.

6.0 Evaluation of Alternatives

Consistent with the Class EA process, a number of alternatives were considered as part of the EA in order to accommodate the required road upgrades. The process included an evaluation of impacts on the natural and social environment, which takes into consideration natural heritage features as well as, traffic patterns, and potential impacts to residents and businesses in the community. The process also must have consideration for the technical feasibility and cost of different alternatives put forward.

Based on all identified needs and objectives for Bleams Road, including the recommendations in the Transportation Study, the Region's Transportation Master Plan, the Region's Active Transportation Master Plan, and the City of Kitchener's Trails Master Plan, the Project Team developed a series of preliminary design alternatives for improvements to Bleams Road. Cross section drawings of all Design Alternatives developed by the Project Team in advance of the Public Consultation Centre are presented in **Error! Reference source not found.**. These 4 Design Alternatives are described as follows:

1. **Do Nothing.** This scenario involves leaving Bleams Road in its current two-lane rural cross-section with shoulders and roadside ditches. This solution was ultimately screened out because it does not satisfy the Region's primary objectives for the corridor and based on predicted traffic volumes would result in delays to commuters, goods movement, emergency vehicles, etc.

2. **Roundabout Alternative.** The roundabout alternative includes implementing roundabouts at all (4) significant intersections within the study area (Bleams and Abram Clemens/Commonwealth Street, Bleams and Amand / Donnenwerth Drive, Bleams and Isaiah Drive, and Bleams and Trussler Road). This alternative requires impacts to isolated trees and trees within the cultural plantation area mapped as woodland at the northeast corner of the Trussler Road and Bleams Road intersection. Five of these trees have been identified as candidate habitat for bat roosting. There is also encroachment into the GRCA's regulation limit associated with the Strasburg Creek floodplain at the roundabout at Commonwealth Street and Abram Clemens Way. The other two proposed roundabouts have no implications for natural features identified by NRSI.

3. **Signalized Intersection Alternative.** The signalized design concept involves traffic lights at each of the four major intersections along the road corridor. Similar to the roundabout option, this alternative requires impacts to trees within the cultural plantation area mapped as woodland at the northeast corner of the Trussler Road and Bleams Road intersection associated with required turn lanes, as well as scattered isolated trees along the corridor. Five cavity trees have been identified as candidate habitat for roosting bats and multiple trees suitable for Tri-coloured Bat roosting were also identified (Map 2). There is also minor encroachments into the GRCA's regulation limit associated with the Strasburg Creek floodplain at the roundabout at Commonwealth Street and Abram Clemens Way. The other two proposed signalized intersections have no implications for natural features identified by NRSI.

4. **Hybrid Alternative.** This alternative includes a roundabout intersection at Bleams Road and Trussler Road as well as at Bleams Road and Commonwealth St./Abram Clemens Way. The central two intersections of Bleams Road and Isaiah Drive and Bleams Road and Donnenwerth/Amand Drive would be signalized. From a natural heritage perspective, this alternative is the same as the roundabout alternative.

From a natural heritage perspective, the same types and extent of impacts are anticipated with Design Alternatives #2 to #4. Each of these alternatives will result in some tree removal along the road corridor and within the cultural plantation area and encroachment into the regulated floodplain. None of the alternatives identified involve replacement or modification of the existing culvert between the two stormwater management areas east of Commonwealth Street.

Impact considerations and mitigation strategies for each of these alternatives is presented in Table 4.

Ultimately, the project team identified the Design Alternative #2 (Roundabout Option) as the preferred alternative based on:

- Outcome of public stakeholder consultation,
- construction and overall cost of the three considered (more than Hybrid Option but less than Signalized Option), and
- projected traffic volumes and traffic flow.

Table 4. Summary of Natural Environment Considerations for the Selection of the Preferred Design Alternative

Design Alternative	Natural Feature	Potential Impacts	Potential Mitigation Measures
Design Alternative #1 – Do Nothing	Watercourse and Fish Habitat	• None identified	N/A
Design Alternatives #2 to #4	Floodplain, Headwaters, and downstream Fish Habitat	• Erosion and sedimentation • Contaminant spills • Soil compaction • Construction debris • Risk of impacts to aquatic wildlife • Quality and quantity impacts to Strasburg Creek	• Development of an Erosion and Sediment Control Plan. • Spill Response Plan. • Machine operation and maintenance in designated areas. • Stabilization of construction debris. • Stockpiling of any removed topsoil for replacement upon completion. • Consultation with GRCA to determine requirements for work within the regulated floodplain of Strasburg Creek
	Individual Trees, bat habitat and breeding birds	• Removal of isolated trees within road ROW and trees within the wooded cultural plantation area	• Development of Tree Preservation Plan at detailed design stage. • Timing of vegetation removal activities so that they occur outside the core bird breeding season (May 1 – July 31) • If vegetation removal must occur during the bird breeding season, retain an avian biologist to survey for active nests just prior to vegetation removal activities. • Timing of tree removal activities so that they occur outside the bat roosting period (April 1 to September 30) • Consultation with MECP to confirm there are no further considerations under the *Endangered Species Act* with regards to bats.
	Turtles	• Potential for turtle encounters within the road ROW near SWM ponds east of Commonwealth Street	• Erosion and Sediment Control fencing will act as a barrier for turtles around the work area. • Workers should be aware of turtles and be provided a site-specific response protocol. • Consultation with MECP to confirm there are no further considerations under the *Endangered Species Act* with regards to turtles.

7.0 Impact Analysis of the Preferred Alternative

Design Alternative #2 was selected as the preferred alternative for the Bleams Road improvements. The road will remain as a two lane road but all four intersections will involve roundabout construction, widening the road right-of-way in some areas beyond the existing road footprint. The roundabouts at Trussler Road and Commonwealth Street will be multi-lane. The centre two intersections (at Isaiah and Donnenwerth) will be constructed as single-lane roundabouts initially, however Regional staff will monitor the need for future expansion of the Isaiah and Donnenwerth intersections to multi-lane roundabouts (MTE 2023).

A new SWM system will be designed to manage the right of way drainage via a curb and gutter system and will utilize the quality and quantity control of the proposed SWM ponds owned by new developments on the south side of Bleams Road. These ponds will also be equipped with winter bypasses to divert any road salts away from sensitive recharge areas, and through to the Strasburg Creek as the legal outlet (MTE 2023). However, these ponds may not be constructed before the construction of Bleams Road commences, therefore an interim solution has been devised directing roadway drainage directly to the existing SWM pond at the southwest corner of Bleams Road and Fischer-Hallman Road (MTE 2023). An Oil/Git Separator will be installed in the interim condition as well to provide quality control. These Ultimate ponds are also equipped with winter bypasses to divert any road salts away from sensitive recharge areas, and through to the Strasburg Creek as the legal outlet. The corridor is within a Well Head Protection Zone so infiltration is not recommended and enhanced measures will be put in place to limit the infiltration of road salts such as clay capping boulevards, etc. (MTE 2023).

The following assessment of impacts is based on the preliminary design of the proposed undertaking.

7.1 Approach to Impact Analysis

Potential impacts arising from the proposed undertaking are determined by comparing the details of the proposed undertaking with the characteristics of the existing natural features and their functions. Where the development proposal overlaps with the natural features or their buffers, impacts may arise. The following is a description of the types of impacts which will be discussed.

- Direct impacts to the natural features within the study area associated with disruption or displacement caused by the actual proposed ‘footprint’ of the undertaking.

- Indirect impacts associated with changes in site conditions such as drainage and water quantity/quality.

7.2 Direct Impacts and Mitigations

Direct impacts are expected to be minimal given the nature of the existing road right-of way but will include tree and vegetation removal and associated potential impacts to bird nests and candidate bat roosting trees. The floodplain and headwaters associated with Strasburg Creek are within the limits of disturbance associated with the proposed undertaking, and therefore may be directly impacted.

7.2.1 Vegetation Removal

The majority of the road right-of-way will remain the same in the improved conditions, but widening the road in some areas is required to accommodate new roundabout intersections. Naturalized vegetation is limited in the Study Area to isolated trees and a cultural pine plantation.

Any vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults. Vegetation clearing is therefore recommended to occur outside the core bird nesting season (May 1-July 31) so as to limit disturbances to nesting activities of birds within treed areas. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*, 1994 (CWS 2013). If vegetation clearing cannot be avoided during the core bird nesting season, a qualified avian biologist must be retained to carry out a nest search ahead of clearing activities within “simple” (i.e., non-forested) habitats.

Similarly, for this project the vegetation clearing window is recommended to increase from (April 1 to September 30) to avoid the bat roosting period for the five isolated trees within the road right-of-way which have a high potential to be impacted by construction activities.

7.2.2 Impacts to Aquatic Features and Fish Habitat

The proposed development does not include replacing the existing culvert between the two stormwater management areas just east of Commonwealth Street. Therefore, there will be no changes to the fish habitat associated with this area of the Strasburg Creek floodplain. A sediment and erosion control plan will be required to protect downstream aquatic features during construction.

7.3 Indirect Impacts and Mitigations

The following outlines potential sources of indirect impacts associated with the proposed development:

- Disturbance to Protected Natural Features and Wildlife Habitat
- Changes to groundwater and surface water flow patterns
- Changes to water quality
- Sedimentation and erosion

7.3.1 Surface Flow and Groundwater Water Balance

Given the paucity of natural features immediately adjacent to the Bleams Road ROW, and the relatively small amount of increased impervious surface that is expected relative to existing conditions, indirect impacts associated with alterations to surface flow and groundwater balance are expected to be minimal or negligible.

As described above, the proposed undertaking will include the installation of curb and gutter to collect stormwater discharge along Bleams Road which will direct stormwater to existing (interim) or planned stormwater facilities (ultimate). These facilities have been designed for an enhanced level of quality and quantity control and have been designed to accommodate stormwater from the Study Area and road ROW. An erosion analysis was also completed for Upper Strasburg Creek by MTE (2022).

7.3.2 Sediment and Erosion

Provided that standard erosion and sediment control measures are in place and work is maintained no sedimentation and erosion impacts are expected. Any runoff will be directed to an existing stormwater facility which will mitigate potential impacts to downstream areas of Strasburg Creek.

Prior to the commencement of construction and during the construction period monitoring and maintenance should occur regularly to ensure that the sediment and erosion control measures are functioning within approved limits. Where erosion and sediment control measures are found to be in an unacceptable condition they are to be repaired or replaced.

7.4 Impact Assessment Summary

A summary of potential impacts associated with the proposed development, and associated recommended mitigations and significance of impacts once mitigated, are presented in Table 5.

Table 5. Summary of Potential Development Impacts and Mitigation

Potential Impact	Recommended Mitigation Measure(s)	Resulting Impact Significance
Direct Impacts		
Vegetation/ breeding bird & bat habitat removal	• The amount of required vegetation removal is considered negligible and is not associated with any significant or sensitive natural features. • Limit unnecessary vegetation removal and degradation by clearly demarcating the boundaries of construction zones • Once the detailed design is completed, the impacts to individual trees will need to be assessed through a Tree Preservation Plan. • Time vegetation removal activities to occur outside the core bird breeding season (May 1 – July 31) and for the five trees identified as potential bat roosting habitat, between April 1 and September 30. • If vegetation removal must occur during the bird breeding season, retain an avian biologist to survey for active nests just prior to vegetation removal activities	• Not Significant
Impacts to Floodplain and Fish Habitat	• The proposed development does not include replacing the existing culvert. • Development of an Erosion and Sediment Control Plan. • Spill Response Plan. • Machine operation and maintenance in designated areas. • Stabilization of construction debris. • Stockpiling of any removed topsoil for replacement upon completion. • Consultation with GRCA with regards to floodplain impacts and required permitting.	• Not Significant
Turtles	• Erosion and Sediment Control fencing will act as a barrier for turtles around the work area. • Workers should be aware of turtles and be provided a site-specific response protocol. (Consultation with MECP to confirm there are no further considerations under the *Endangered Species Act* with regards to turtles.	• Not Significant
Indirect Impacts		
Surface flow and groundwater balance	• Stormwater to be directed to existing (interim) or planned (ultimate) stormwater management facilities designed to achieve enhanced levels of quality and quantity control.	• Not Significant
Erosion and sedimentation	• A Sediment and Erosion Control Plan should be developed during the detailed design stage and implemented during construction. • Install silt fencing along the boundaries of the construction zone, inspect on a regular basis, remove accumulated sediment as needed and immediately replace any damaged fencing	• Not significant

8.0 Summary

Natural Resource Solutions Inc. (NRSI) was retained by the Region of Waterloo as part of a team led by MTE Consulting to complete the natural heritage component of the Bleams Road (Trussler Road to Fischer-Hallman Road) Class C Environmental Assessment. This report summarizes background information on natural heritage features, as well as the methods and results of a scoped field program within the study area.

All the vegetation communities and wildlife species known from within the study area are typical of an urban community, and no significant species (SAR or SCC) or SWH were documented.

The characterization of existing natural features was used to inform an analysis of the significance and sensitivity of natural features within the study area. This information was intended to inform the selection of a preferred alternative design that seeks to avoid or minimize impact to existing natural features and species. Design Alternatives #2 to #4 were equivalent in terms of the types and extent of impacts.

Design Alternative #2, which includes installing a curb and gutter system and roundabouts at four intersections, was selected as the preferred alternative due its economically feasibility, compatibility with the Region's Active Transportation Master Plan (2014), and consultation with local stakeholders.

Direct impacts to natural features resulting from the preferred alternative design will be limited to vegetation and roadside tree removals. The proposed development does not include replacing the existing culvert with the Strasburg Creek floodplain, therefore no direct or indirect impacts to fish or fish habitat are anticipated based on design.

This report provides recommendations to minimize impacts and ensure that mitigation measures are installed and functioning properly. These include recommendations to mitigate direct and indirect impacts that may arise during the proposed undertaking. Based on the preliminary design, and provided that these recommendations are implemented, negative impacts arising from this undertaking are not anticipated. It is anticipated that the impact assessment completed for this report, as well as recommendations for impact mitigation, will be updated as necessary based on detailed design of the proposed undertaking.

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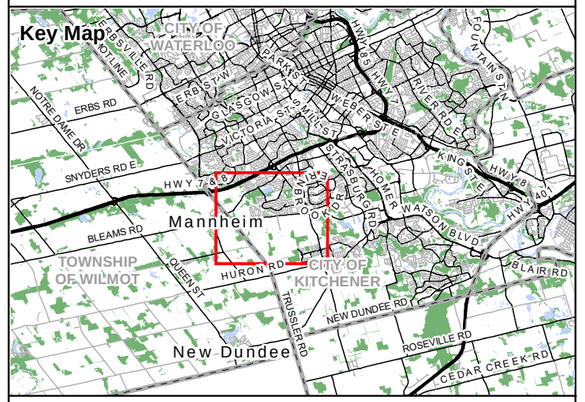
MAPS

Map 1

Bleams Road Class EA

Study Area and Designated Significant Natural Features



Legend

- Subject Lands
- Study Area
- Municipal Boundary
- Utility Line
- Highway
- Primary Road
- Secondary Road
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Provincially Significant Wetland (PSW)
- Other Wetland (Non-PSW)
- Wooded Area
- NHS Area
- Regulation Limit (GRCA)
- Wetland (GRCA)
- Blanding's Turtle Category 2 Habitat
- Blanding's Turtle Category 3 Habitat

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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Project: P3719
Date: February 17, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:15,000

0 200 400 600 800 1,000 Metres

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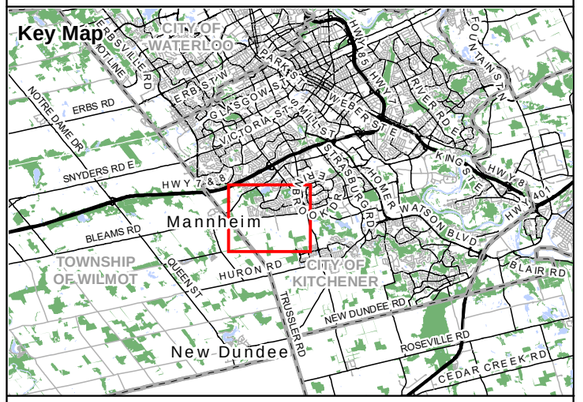
Map 2

Bleams Road EA

Candidate Bat Habitat



Legend

- Project Area
- Municipal Boundary
- Candidate Bat Habitat Tree
- Candidate Habitat for Tri-colored Bat
- Utility Line
- Highway
- Primary Road
- Secondary Road
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Wooded Area

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Project: P3719
Date: February 17, 2023

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APPENDIX I Terms of Reference

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

September 1, 2020 Project No. 2455

To: Chris Foster-Pengelly, Grand River Conservation Authority
Peter Ellis, Region of Waterloo
Shilling Yip, Region of Waterloo
Barbara Steiner, City of Kitchener
Ministry of Environment, Conservation, and Parks (MECP)
Ministry of Natural Resources and Forestry (MNRF)

Re: Bleams Road Reconstruction (Fischer-Hallman Road to Trussler Road) - Class A+ Environmental Assessment:
Environmental Impact Study - Terms of Reference

On behalf of the Regional Municipality of Waterloo, Natural Resource Solutions Inc. (NRSI), and MTE Consultants Inc., I am pleased to provide the following Terms of Reference (TOR) for an Environmental Impact Study (EIS), which is being completed as part of the Class A+ Environmental Assessment (EA) for the potential reconstruction and improvement of Bleams Road (Regional Road 56) between Fischer-Hallman Road and Trussler Road in the City of Kitchener (Map 1).

Introduction

Due to recent and future developments along Bleams Road, the Region has identified the need to reconstruct and improve Bleams Road from just west of Fischer-Hallman Road to Trussler Road (referred to in this TOR as the "Subject Lands") to accommodate projected traffic volumes and patterns. Although this section of Bleams Road is identified as a Neighborhood Connector: Avenue (Brook McIlroy Planning + Urban Design Inc. et al. 2013), which should meet certain minimum criteria for boulevard elements, it currently has a rural cross-section with gravel shoulders and ditches along the majority of its length. Pending the results of a comprehensive Traffic Impact Study and other assessments, the rural cross-sections within the Subject Lands are to be urbanized with the addition of curb and gutter, catch-basins, storm sewer, and illumination. Intersection improvements and multi-use trails adjacent to the road may also be included.

This TOR outlines the steps required to complete the EIS for the proposed undertaking in accordance with the GRCA Environmental Impact Study Guidelines and Submission Standards for Wetlands (2005), the Region of Waterloo Greenlands Network Implementation Guideline (2016), the Region of Waterloo Official Plan (2015), the City of Kitchener Official Plan (2014), and the Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan (CH2MHill and North-South Environmental Inc. 2008).

For the purposes of this TOR, Natural features expand beyond the boundaries of the Subject Lands; therefore, a larger area was considered to inform this EIS. The term "Study Area" refers to the Subject Lands plus the surrounding lands within 120m for which additional information was collected and reviewed (Map 1).

The Study Area falls within Ecoregion 6E, the Grand River Watershed, and the Alder Creek Watershed and Upper Strasburg Creek Subwatershed. Natural features identified within the Study Area include the headwaters of Strasburg Creek and its associated floodplain, south of Bleams road just west of Fischer-Hallman Road. This area is also mapped as a Core Natural Heritage Feature by the City of Kitchener (2014). A portion of an unevaluated wetland is within the Study Area, just north of Bleams Road in the western portion of the Study Area. A wetland shown previously located northeast of the Bleams Rd and Fischer-Hallman Road intersection has been removed as part of a roundabout construction for the Fischer-Hallman Road project as per an approved GRCA fill permit. The watercourse, floodplain, and wetland are regulated by the Grand River Conservation Authority (GRCA) and subject to Ontario Regulation 150/06 (GRCA 2015c). Portions of a woodland, not considered significant by the City or the Region, is also present just east of Trussler Road. The Study Area also falls within a Regional Recharge Area (Region of Waterloo 2015).

The following work plan consists of three phases: 1) background information review; 2) natural resource characterization, and; 3) impact analysis and EIS report. Each of these study components is described in separate sections below.

1. Background Information Review

Collection and Review of Background Information

In order to determine a study approach for the EIS, existing natural heritage information was first gathered and reviewed to identify key natural heritage features and species that are known or have potential to occur within the Study Area. Background information on the natural heritage features within the Study Area was gathered from the:

- Land Information Ontario (LIO) (Government of Ontario 2015),
- Grand River Conservation Network: Interactive Mapping Tool (GRCA 2015b),
- Region of Waterloo Official Plan mapping (Region of Waterloo 2015),
- City of Kitchener Official Plan mapping (City of Kitchener 2014),
- City of Kitchener Natural Heritage Study Report (2011),
- Natural Heritage Information Center (NHIC) (MNRF 2014),
- Species at Risk List for the Region of Waterloo (MNRF 2018b),
- Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan Update (CH2MHill and North-South Environmental Inc. 2008),
- Ontario Breeding Bird Atlas (BSC et al. 2008),
- Ontario Reptile and Amphibian Atlas (ORAA) (Ontario Nature 2019),
- Atlas of the Mammals of Ontario (Dobbyn 1994),
- Ontario Butterfly Atlas (MacNaughton et al. 2020),
- Ontario Odonata Atlas Database (2020), and
- Department of Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Mapping (2018).

The wildlife and insect atlases listed above provide data based on 10x10km survey squares. Information was compiled from the atlas squares that overlap the Study Area (square 17NJ30, 17NJ40).

Species at Risk and Species of Conservation Concern Screening

A preliminary screening exercise was conducted on these species to identify which species have suitable habitat within the Study Area. This involved cross-referencing the preferred habitat for reported Species at Risk (SAR) (MNR 2000) against habitats known to occur in the Subject Lands or Study Area. This was completed to ensure that the potential presence of all SAR and Species of Conservation Concern (SCC) within the Study Area was adequately assessed in this EIS. Through this exercise, SAR and SCC were identified as having potentially suitable habitat in the Subject Lands.

It should be noted that one SAR with the potential to occur within the Study Area is the Blanding's Turtle (*Emydoidea blandingii*), which is listed as Threatened in Ontario and is protected under the *Endangered Species Act* (Government of Ontario 2007). Due to the documented occurrence of this species in the Huron Natural Area, to the southeast, general habitat Blanding's Turtle is mapped as extending into the east end of the Study Area.

Full results of the SAR screening exercise are provided in Appendix I.

Significant Wildlife Habitat Screening

A preliminary screening for the presence of SWH was also completed for the Study Area. The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline document that outlines the types of habitats that the MNRF considers significant in Ontario as well as criteria to identify these habitats (MNR 2000, MNRF 2015). The SWHTG groups SWH into four broad categories: 1) seasonal concentration areas, 2) rare vegetation communities and specialized wildlife habitat, 3) habitats of SCC, and 4) animal movement corridors. Based on the results of this preliminary screening exercise, several candidate and confirmed SWH types were identified for the Study Area. Full results of the SWH screening are provided in Appendix II

2. Natural Resource Characterization

A scoped field inventory program was developed to include an assessment of the species and habitats present within the Subject Lands and Study Area. Inventories of wildlife and vegetation will include the following specific surveys:

Tree Inventory

A tree inventory consistent with the with the City of Kitchener's Tree Management Policy I-1160 (2002) and Tree Conservation By-Law (2010) will be completed. NRSI's Certified Arborists will inventory and assess trees ≥10cm Diameter at Breast Height (DBH) within the Subject Lands, focusing on trees along and immediately adjacent to the Bleams Road ROW, any proposed lay-down areas, and anywhere disturbance is anticipated. The following information will be recorded for inventoried trees in order to complete a Tree Preservation Plan:

- tag number,
- species (common and scientific name),
- DBH (cm),
- crown radius (metres),
- general health (excellent, good, fair, poor, very poor, dead),

- potential for structural failure (improbable, possible, probable, imminent),
- potential cavities that could be used for SAR bats,
- tree location, and
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

Blanding's Turtle

Due to the presence of general habitat for Blanding's Turtle, which is mapped by the MECP as overlapping with the eastern portion of the Study Area, NRSI will review site conditions in the context of ongoing developments in the area and refine the habitat mapping, as necessary, and in consultation with the MECP.

Bat Habitat Surveys

The SAR screening identified the potential for Eastern Small-footed Myotis (*Myotis leibii*), Northern Myotis (*Myotis septentrionalis*), Little Brown Myotis (*Myotis lucifungus*), and Tri-colored Bat (*Perimyotis subflavus*) to occur in the Study Area. A leaf-off survey for suitable cavity trees for bat maternity roosting will be completed. This survey will follow the MNRF Survey Protocol for Species at Risk Bats within Treed Habitats (2017). Information considered (and recorded, where applicable) for cavity trees included tree species, location, diameter at breast height (DBH), canopy cover, tree height, decay class according to Watt and Caceres (1999), and number of potentially suitable cavities. If there are suitable oak and/or maple trees within the potential areas of development, surveys for suitable roosts for Tri-colored bat will also be conducted during the leaf-on period.

Aquatic Habitat Characterization

An Aquatic Biologist from NRSI will complete a habitat characterization for the headwaters of the Strasburg Creek. This will involve walking upstream through the creek, and recording the following information:

- Substrate type,
- Channel geometry including, depth, wetted width, bankfull width, etc.,
- Water temperature,
- Dissolved oxygen,
- pH, conductivity and total dissolved solids,
- General bank stability,
- Riparian and aquatic vegetation,
- Cover type and quality, and
- Flow conditions.

Detailed sketches of the assessed reaches will also be made and site photos will be taken.

Incidental Wildlife

In addition to the targeted surveys noted above, all wildlife species observations will be recorded during field surveys. This includes direct observations, as well as signs such as dens, tracks, scats, etc.

3. Impact Analysis and EIS Report

Identification of Opportunities and Constraints

Based on the findings of the background review and field investigations, the opportunities and constraints to the project undertaking will be determined. Opportunities for restoration and enhancement of natural habitats including improvements for ecological linkages and wildlife passage will be provided. The characterization of the natural environment will be used to identify a series of criteria for comparison of alternatives. These criteria will include the sensitivity and significance of existing features (e.g. rare species and habitats), as well as potential restoration opportunities (e.g. removal of invasive species). Opportunities and constraints mapping will be prepared and provided to assist in the development of the Bleams Road preferred design.

Evaluation of Alternatives

The characterization of the natural heritage features present within the Study Area will be used to evaluate each of the alternatives against the criteria identified. Potential impacts to the aquatic, wetland and terrestrial resources from the proposed road improvements will be analyzed. The evaluation will take into account recommended mitigation measures. The biological evaluation will be one of several factors used to assess the alternatives.

An analysis of current and potential impacts to the aquatic, wetland and terrestrial resources from the range of sources in the area, such as existing and future developments, road patterns, etc., will be completed. This assessment will assist in the identification of enhancement measures that may be incorporated into the road design, as well as potential limitations to achieving enhancements.

Based on the natural environment criteria, the preferred alternative will be identified. Recommendations for implementation, timing and monitoring will also be provided. Monitoring will focus on aquatic, wetland and terrestrial aspects of the natural environment including connectivity.

Impact Analysis, Mitigation and Enhancement

An impact assessment will be carried out on the selected preferred Bleams Road reconstruction design alternative. This assessment will identify potential impacts based on review of engineering plan details (i.e. road alignment, grading limits, culvert design etc.), fluvial geomorphic engineering requirements (i.e. channel realignments, erosion stabilization etc.), as well as the Stormwater Management (SWM) Report. The details of the proposed undertaking will be reviewed and compared to the existing conditions on the Subject Lands. Conflict between significant habitats and the areas of the proposed undertaking will be discussed with the client and options for minimizing impacts will be recommended. Impacts will be determined based on the direct, indirect, and induced effects of the project:

- Direct impacts associated with disruption or displacement caused by the actual proposed 'footprint' of the undertaking.
- Indirect impacts associated with the construction of the project.
- Induced impacts associated with impacts after the undertaking is completed such as subsequent demand on the resources created by habitation/use of the area and vicinity.

Recommendations for mitigation measures will be proposed to offset negative impacts on the natural environment and species associated with the undertaking. In addition, potential enhancements or compensation measures that can be achieved will also be highlighted. This will include recommendations for monitoring of the identified natural features to ensure effectiveness of the proposed mitigation strategies.

Reporting

The findings of the characterization and impact analysis will be prepared in a written report. The report will be formatted to be consistent with the GRCA EIS guidelines (GRCA 2005) and will include appendices, such as species lists and figures including the location of the Subject Lands and Study Area, existing natural environment conditions and the proposed undertaking. The final EIS report will also include a comprehensive summary of how the following relevant environmental policies apply to the proposed development:

- *Fisheries* Act (Government of Canada 1985);
- Migratory Birds Convention Act (Government of Canada 1994);
- Endangered Species Act (Government of Ontario 2007);
- Fish and Wildlife Conservation Act (Government of Ontario 1997);
- Provincial Policy Statement (MMAH 2014);
- GRCA Wetlands Policy (GRCA 2015);
- Region of Waterloo Official Plan (2015);
- City of Kitchener Official Plan (2014).

The report will be submitted to the agencies for review. At a minimum the report will include:

- A description of the proposal, including the alternatives;
- A detailed characterization of natural environment within the Study Area;
- Mapping that shows the boundary of confirmed natural features and the location of any significant habitats or species;
- Natural features/areas that require protection (e.g. PSW);
- Identification of potential direct, indirect or induced impacts of the preferred alternative;
- Recommendations for mitigation, enhancements, and compensation measures;
- A Tree Preservation Plan.

Fisheries and Oceans Canada Assessment

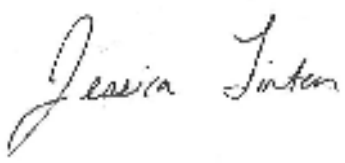
NRSI will complete the DFO self-assessment for projects near water regarding potential works in the Strasburg Creek headwaters area. This will help determine whether the project requires DFO review based on the type of water body present, and the nature of the proposed activity. This tool was designed to assist proponents through the DFO screening and review process. NRSI will engage DFO, if necessary, early in the planning stages of the project in order to ensure that the appropriate steps to avoid or mitigate impacts to fish and fish habitat are being taken. NRSI will use the measures to avoid harm to fish and fish habitat, prepared by DFO to

replace Operational Statements, as part of the recommendations for mitigation and monitoring. This will help to ensure the proposed undertakings comply with the *Act*.

This TOR provides a comprehensive description of the proposed natural environment characterization work and the EIS Report that will be completed for the proposed Bleams Road reconstruction, between Fischer-Hallman Road and Trussler Road in Kitchener, Ontario.

Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,
Natural Resource Solutions Inc.



Jessica Linton, M.E.S.
Senior Manager/Biologist

Cc.: Dot Roga, MTE Consultants Inc.

Greg Proctor, Region of Waterloo

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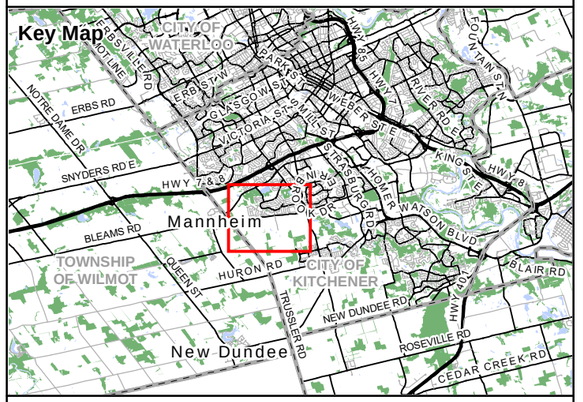
MAP

Map 1

Bleams Road Detailed Design

Study Area and Designated Significant Natural Features



Legend

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- Secondary Road
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Provincially Significant Wetland (PSW)
- Other Wetland (Non-PSW)
- Unevaluated Wetland
- Wooded Area
- Aquatic Resource Area (ARA) Survey Point
- NHS Area
- Regulation Limit (GRCA)

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Aquatic, Terrestrial and Wetland Biologists

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Project: P3719
Date: August 31, 2020

NAD83 - UTM Zone 17
Size: 11x17"
1:11,000

0 100 200 300 400 500 600 700 Metres

N

Path: X:\2455_BleamsRoad\NRSI_2455_Map1_StudyArea_SigNatFeatures_11K_2020_08_31_GCS.mxd

Appendix I. Species at Risk Screening

Species at Risk and Species of Conservation Concern Screening

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Plants									
Castanea dentata	American Chestnut	S1S2	END	E	Schedule 1	MNRF 2018	Moist to well drained forests on sand, occasionally heavy soils.	There are no forests suitable for this species within the Study Area (the woodlot in the west of the Study Area is plantation).	No
Juglans cinerea	Butternut	S2?	END	E	Schedule 1	MNRF 2018	Generally grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldomly, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows.	Forests and hedgrows within the Study Area may provide suitable habitat for this species.	Yes
Panax quinquefolius	Ginseng	S2	END	E	Schdule 1	MNRF 2018	Deep leaf litter in rich, moist deciduous woods, especially on rocky, shaded cool slopes in sweet soil.	There are no rich, moist forests suitable for this species within the Study Area (the woodlot in the west of the Study Area is plantation).	No
Arisaema dracontium	Green Dragon	S3	SC	SC	Schedule 3	MNRF 2018	Somewhat wet to wet deciduous forests along streams, particularly maple forest and forest dominated by Red Ash and White Elm trees.	There are no riparian forests within the Study Area which would provide suitable habitat for this species.	No
Birds									
Empidonax virescens	Acadian Flycatcher	S2S3B	END	E	Schedule 1	MNRF 2018	Mature, shady, deciduous forests; heavily wooded ravines; creek bottoms or river swamps; availability of good quality habitat is limiting factor; needs at least 30 ha of forest.	Forests within the Study Area are not large enough for this species and the amount of interior forest is limited.	No
Haliaeetus leucocephalus	Bald Eagle	S2N, S4B	SC	NAR	-	MNRF 2018	Require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching. Bald Eagles nest in a variety of habitats and forest types, almost always near a major lake or river where they do most of their hunting.They usually nest in large trees such as pine and poplar.	The Study Area is not within proximity to any large rivers.	No
Riparia riparia	Bank Swallow	S4B	THR	T	Schedule 1	Cadman et al. 2007, MNRF 2018	Sand, clay or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are limiting factor for species presence.	Suitable foraging habitat is present within the Study Area and nesting habitat is present in the aggregate pit south of Bleams Road.	Yes
Tyto alba	Barn Owl	S1	END	E	Schedule 1	MNRF 2018	Open areas such as fields, agricultural lands with scattered woodlots, buildings and/or orchards; grasslands, sedge meadows, marshes; snow-cover limits ability to catch prey; species has intolerance to severe cold; nests in hollow trees and live trees >46 cm dbh; also nests in barns, abandoned buildings.	There are no open fields within the Study Area that could provide suitable foraging habitat. Due to the urban developments in the Study Area, there is unlikely to be any suitable nesting habitat.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Hirundo rustica	Barn Swallow	S4B	THR	T	Schedule 1	Cadman et al. 2007, MNRF 2018, MNRF 2019b	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	The open areas within the Study Area could provide suitable foraging habitat. There may also be suitable nesting structures present.	Yes
Chlidonias niger	Black Tern	S3B	SC	NAR	-	MNRF 2018	Black Terns build floating nests in loose colonies in shallow marshes, coastal or inland marshes; large cattail marshes, marshy edges of rivers, lakes or ponds, wet open fens, wet meadows; returns to same area to nest each year in loose colonies; must have shallow (0.5 to 1 m deep) water and areas of open water near nests; requires marshes >20 ha in size; feeds over adjacent grasslands for insects; also feeds on fish, crayfish and frogs.	There are no marshes large enough within the Study Area to provide suitable habitat for this species.	No
Dolichonyx oryzivorus	Bobolink	S4B	THR	T	Schedule 1	Cadman et al. 2007, MNRF 2018, MNRF 2019b	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha.	There are no suitable large, open grasslands within the Study Area.	No
Cardellina canadensis	Canada Warbler	S4B	SC	T	Schedule 1	MNRF 2018	Canada Warblers breed in mixed conifer and deciduous forest with a shrubby and mossy understory often near water. They frequent aspen and popular forests in Canada, and forested wetlands in the central part of their range. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest.	Suitable forest habitat, with a shrubby and mossy understory is not present within the Study Area.	No
Setophaga cerulea	Cerulean Warbler	S3B	THR	E	Schedule 1	MNRF 2018	Mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha)	Forests within the Study Area are not large enough to provide suitable habtiat for this species.	No
Chaetura pelagica	Chimney Swift	S4B,S4N	THR	T	Schedule 1	Cadman et al. 2007, MNRF 2018	Nest on cave walls and in hollow trees or tree cavities in old growth forests. Also likely to be found in and around urban settlements where they nest and roost (rest or sleep) in chimneys and other manmade structures. They also tend to stay close to water as this is where the flying insects they eat congregate.	There may be suitable foraging habitat within the Study Area. There are structures within the Study Area may provide suitable nesting habitat for this species.	Yes
Chordeiles minor	Common Nighthawk	S4B	SC	T	Schedule 1	Cadman et al. 2007, MNRF 2018	Generally prefer open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests. Can also be found in urban areas (nest on flat roof-tops).	There are no vegetation-free habitats or flat roof-tops suitable for nesting by this species within the Study Area.	No
Sturnella magna	Eastern Meadowlark	S4B	THR	T	Schedule 1	Cadman et al. 2007, MNRF 2018, MNRF 2019b	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size.	There are no suitable large, open grasslands within the Study Area.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Caprimulgus vociferus	Eastern Whip-poor-will	S4B	THR	T	Schedule 1	MNRF 2018	Dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaflitter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests; may require 500 to 1000 ha to maintain population.	The forests within the Study Area are not dry, open deciduous woodlands of suitable size (>100ha) for this species.	No
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC	Schedule 1	Cadman et al. 2007, MNRF 2018, MNRF 2019b	Lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in intermediate-age mature forest stands with little understory vegetation.	The woodlot in the west end of the Study Area may provide suitable habitat for this species.	Yes
Vermivora chrysoptera	Golden-winged Warbler	S4B	SC	T	Schedule 1	MNRF 2018	Generally prefer areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways, or recently logged areas.	Although there are field edges, there are no large areas of early sucessional vegetation within the Study Area.	No
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	-	Cadman et al. 2007	Lives in open grassland areas with well-drained, sandy soil. It will also nest in hayfields and pasture, as well as alvars, prairies and occasionally grain crops such as barley. It prefers areas that are sparsely vegetated.	There are no suitable large, open grasslands, pastures, etc. within the Study Area.	No
Ammodramus henslowii	Henslow's Sparrow	SHB	END	E	Schedule 1	MNRF 2018	It has been found in abandoned farm fields, pastures, and wet meadows. It tends to avoid fields that have been grazed or are crowded with trees and shrubs. It prefers extensive, dense, tall grasslands where it can more easily conceal its small ground nest.	There are no suitable large, open abandoned farm fields, pastures, or wet meadows suitable for this species within the Study Area.	No
Ixobrychus exilis	Least Bittern	S4B	THR	T	Schedule 1	MNRF 2018	Generally located near pools of open water in relatively large marshes and swamps that are dominated by cattail and other robust emergent plants.	There are no large marshes or swamps within the Study Area.	No
Parkesia motacilla	Louisiana Waterthrush	S3B	THR	T	Schedule 1	MNRF 2018	Prefers wooded ravines with running streams; also woodlands swamps; large tracts of mature deciduous or mixed forests; canopy cover is essential; has strong affinity to nest sites; nests on ground.	Woodland swamps are not present within the Study Area.	No
Colinus virginianus	Northern Bobwhite	S1	END	E	Schedule 1	Cadman et al. 2007, MNRF 2018	Grassland, prairie or hay fields with woody cover in form of thickets, tangles of vines, shrubs; fence rows or woodland edges; cropland growing corn, soybeans or small grains and clover or grass; well-drained sandy or loamy soil; pond edges.	There is no grassland, prairie, or hay fields with woody cover present within the Study Area.	No
Falco peregrinus anatum/tundrius	Peregrine Falcon	S3B	SC	SC	Schedule 1	MNRF 2018	Breed in open landscapes with cliffs (or skyscrapers) for nest sites, as well as along rivers and coastlines or in cities.	There is no suitable nesting habitat for this species within the Study Area.	No
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	SC	T	Schedule 1	Cadman et al. 2007, MNRF 2018	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory.	Forests within the Study Area are not large enough to provide suitable habitat for this species and there are no fields or pasture lands with scattered large trees, wooded swamps, etc.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Asio flammeus	Short-eared Owl	S2N, S4B	SC	SC	Schedule 1	MNRF 2018	Grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; both diurnal and nocturnal habits; ground nester; destruction of wetlands by drainage for agriculture is an important factor in the decline of this species; home range 25 - 125 ha; requires 75-100 ha of contiguous open habitat.	There are no suitable grasslands, open areas or meadows within the Study Area for this species.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Hylocichla mustelina	Wood Thrush	S4B	SC	T	Schedule 1	Cadman et al. 2007, MNRF 2018	Mature deciduous and mixed forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing perches. These birds prefer large forests, but will also use smaller stands of trees. They build their nests in living saplings, trees or shrubs, usually in sugar maple or American beech.	There are no moist, mature forests within the Study Area suitable for this species.	No
Icteria virens	Yellow-breasted Chat	S2B	END	E	Schedule 1	MNRF 2018	Dense thickets around wood edges, riparian areas, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc. The Ontario population is very dependent on successional habitats of thick shrubbery.	Dense thickets, and shrubbery beside ponds and wetlands are not present in the Study Area.	No
Herpetofauna									
Emydoidea blandingii	Blanding's Turtle	S3	THR	END	Schedule 1	MNRF 2018, Ontario Nature 2019, MNRF 2019b	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed.	There is regulated habitat for Blanding's Turtle in the east end of the Study Area, due to the documented presence of this species to the southeast. There is one small wetland, and one SWM pond within the Study Area.	Yes
Thamnophis sauritus	Northern Ribbonsnake	S4	SC	SC	Schedule 1	MNRF 2018, Ontario Nature 2019, MNRF 2019b	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups.	There are no suitable wetlands within the Study Area that may provide habitat for this species.	No
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	Schedule 1	MNRF 2018, Ontario Nature 2019	Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs.	The forest within the Study Area is likely largely coniferous and does not provide suitable habitat for this species.	No
Graptemys geographica	Northern Map Turtle	S3	SC	SC	Schedule 1	MNRF 2018	Rivers and lakeshores where it basks on emergent rocks and fallen trees throughout the spring and summer. In winter, the turtles hibernate on the bottom of deep, slow-moving sections of river. They require high-quality water that supports the female's mollusc prey. Their habitat must contain suitable basking sites, such as rocks and deadheads, with an unobstructed view from which a turtle can drop immediately into the water if startled.	There are no rivers or lakes within the Study Area.	No
Regina septemvittata	Queensnake	S2	END	E	Schedule 1	MNRF 2018	The Queensnake is an aquatic species that is seldom found more than a few metres from the water. It prefers rivers, streams and lakes with clear water, rocky or gravel bottoms, lots of places to hide, and an abundance of crayfish. Queensnakes will often hibernate in groups with other snakes, amphibians and even crayfish. Suitable hibernation sites (called hibernacula) include abutments of old bridges and crevices in bedrock.	There are no rivers or streams within the Study Area.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Chelydra serpentina serpentina	Snapping Turtle	S3	SC	SC	Schedule 1	MNRF 2018, Ontario Nature 2019	Permanent or semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddybanks or bottoms. The species often uses soft soil or clean dry sand on south-facing slopes for nest sites and may nest at some distance from water.	There are no suitable wetlands within the Study Area that may provide habitat for this species.	No
Ambystoma laterale - (2) *jeffersonianum*	Unisexual *Ambystoma* Jefferson dependent population	S2	END	E	Schedule 1	MNRF 2018	Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs	The forest within the Study Area is likely largely coniferous and does not provide suitable habitat for this species.	No
Pseudacris triseriata pop. 2	Western Chorus Frog *(Great Lakes/St. Lawrence - Canadian Shield Population)*	S3	NAR	T	Schedule 1	Ontario Nature 2019	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools	There are no suitable wetlands within the Study Area that may provide habitat for this species.	No
Mammals									
Taxidea taxus jacksoni	American Badger	S1	END	E	Schedule 1	Dobbyn 1994, MNRF 2018	Open grasslands and oak savannahs; dens in new hole or enlarged existing hole; sometimes makes food caches.	There are no open grasslands, savannahs or open rural lands suitable for this species in the Study Area.	No
Myotis leibii	Eastern Small-footed Myotis	S2S3	END	-	-	Dobbyn 1994, MNRF 2018	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: primarily under loose rocks on exposed rock outcrops, crevices and cliffs, and occasionally in buildings, under bridges and highway overpasses and under tree bark	Trees present within the Study Area may provide suitable roosting habitat. No potential hibernation sites are present.	Yes
Myotis lucifungus	Little Brown Myotis	S4	END	E	Schedule 1	Dobbyn 1994, MNRF 2018	Caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges.	Trees present within the Study Area may provide suitable roosting habitat. No potential hibernation sites are present.	Yes
Myotis septentrionalis	Northern Myotis	S3	END	E	Schedule 1	Dobbyn 1994, MNRF 2018	Northern Myotis roosts within tree crevices, hollows and under the bark of live and dead trees, particularly when trees are located within a forest gap.	Trees present within the Study Area may provide suitable roosting habitat.	Yes
Perimyotis subflavus	Tri-coloured Bat	S3?	END	E	Schedule 1	Dobbyn 1994, MNRF 2018	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices.	Trees present within the Study Area may provide suitable roosting habitat. No potential hibernation sites are present.	Yes
Microtus pinetorum	Woodland Vole	S3?	SC	SC	Schedule 1	Dobbyn 1994	Mature deciduous forest in the Carolinian forest zone, with loose sandy soil and deep humus; grasslands, meadows and orchards with groundcover of duff or grass	The small forest within the Study Area is unlikely to provide suitable habitat for this species.	No
Fish									
Moxostoma duquesnei	Black Redhorse	S2	THR	T	-	MNRF 2018	The Black Redhorse lives in pools and riffle areas of medium-sized rivers and streams that are usually less than two metres deep. These rivers usually have few aquatic plants, a moderate to fast current, and a sandy or gravel bottom. In the spring, it migrates to breeding habitat where eggs are laid on gravel in fast water. The winter is spent in deeper pools.	There are no medium-sized rivers or streams within the Study Area.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Ichthyomyzon fossor	Northern Brook Lamprey (GL-USL Pop.)	S3	SC	SC	Schedule 1	MNRF 2018	The Northern brook lamprey inhabits clear, coolwater streams. The larval stage requires soft substrates such as silt and sand for burrowing which are often found in the slow-moving portions of a stream. Adults are found in areas associated with spawning, including fast flowing riffles comprised of rock or gravel. Spawning occurs in May and June. The males construct small, often inconspicuous, nests by picking up pebbles with their mouths and moving them to form the rims of shallow depressions. The sticky eggs are deposited in the nest and adhere to the substrate.	There are no clear, coolwater streams within the Study Area.	No
Notropis photogenis	Silver Shiner	S2S3	THR	T	Schedule 3	MNRF 2018	Silver shiners prefer moderate to large size streams with swift currents that are free of weeds and have clean gravel or boulder bottoms. They live in schools and feed on crustaceans and adult flies that fall in the water or fly just above the surface. In June or July, they spawn by scattering their eggs over gravel riffles.	There are no large streams within the Study Area.	No
Molluscs									
Lampsilis fasciola	Wavy-rayed Lampmussel	S1	THR	SC	Schedule 1	MNRF 2018	The Wavy-rayed lampmussel is usually found in small to medium rivers with clear water. It lives in shallow riffle areas with clean gravel or sand bottoms. The Wavy-rayed lampmussel's fish hosts are the Largemouth bass and Smallmouth bass.	There are no small to medium-sized rivers or streams within the Study Area.	No
Butterflies									
Euphyes conspicua	Black Dash	S3	-	-	-	Macnaughton et al. 2020	Wet sedge meadows; also, open shrubby or partially-wooded wetlands with red maple	There are no wet sedge meadows, open shrubby or partially-wooded wetlands with red maple within the Study Area.	No
Danaus plexippus	Monarch Butterfly	S2N, S4B	SC	E	Schedule 1	MNRF 2018, Macnaughton et al. 2020	Monarch caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers.	Open areas with milkweed are present within Study Area, although they are likely confined to roadsides.	Yes
Erynnis martialis	Mottled Duskywing	S2	END	E	-	Macnaughton et al. 2020	Oak or pine savannas or open woodlands; also non-co	Oak or pine savannahs and open woodlands are not present within the subject property.	No
Asterocampa clyton	Tawny Emperor	S3	-	-	-	Macnaughton et al. 2020	Most typical in edge or riparian areas where hackberry trees are present. Less tolerant of suburbia compared to *A. celtis*, as hibernating larvae may be destroyed when leaves are raked	Wetland/Riparian areas are not present within the Study Area.	No
Pieris virginiensis	West Virginia White	S3	SC	-	-	MNRF 2018	Generally prefer moist, deciduous woodlands. The larvae feed only on the leaves of the two-leaved toothwort (Cardamine diphylla), which is a small, spring-blooming plant of the forest floor. It avoids edges and open fields in fragmented landscapes.	The forest within the Study Area is likely largely coniferous and does not provide suitable habitat for this species.	No

Scientific Name	Common Name	S-Rank[1]	COSSARO[1]	COSEWIC[2]	SARA[2]	Background Source	Habitat Preference[1,2]	Suitable Habitat Present within Study Area: Rationale	Suitable Habitat Within Study Area
Odonates									
Lestes eurinus	Amber-winged Spreadwing	S3				Ontario Odonata Atlas Database 2019	This species is found throughout southeast Canada and the northern half of eastern United States. It prefers ponds and small lakes.	There are no ponds within the Study Area that may provide suitable habitat for this species.	No
Phanogomphus graslinellus	Pronghorn Clubtail	S3				Ontario Odonata Atlas Database 2019	Occurs at slow-flowing sandy or muddy streams with or without rocks and in or out of woodland, also medium to large lakes in northern part of range. Larvae burrow in bottom substrates.	There are no streams or lakes within the Study Area.	No
Arigomphus villosipes	Unicorn Clubtail	S2S3				Ontario Odonata Atlas Database 2019	Semi-permanent and artificial ponds, lakes and slow-areas of small streams with muddy bottoms.	The wetland in the west end of the Study Area, or the floodplain in the east end of the Study Area may provide suitable habitat for this species.	Yes
Other Insects									
Bombus affinis	Rusty-patched Bumble Bee	S1	END	E	Schedule 1	MNRF 2018	Open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings have been in oak savannah, which contains both woodland and grassland flora and fauna.	Some potentially suitable open habitat exists in the Study Area, however the only recent observations in Ontario were in the Pinery Provincial Park in 2002, so it is highly unlikely.	No

[1]MNRF 2020a, [2]Governnent of Canada 2019

Appendix II. Significant Wildlife Habitat Screening

Significant Wildlife Habitat Assessment Tables

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Waterfowl Stopover and Staging Areas (Terrestrial)					
Rationale: Habitat important to migrating waterfowl.	American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	Fields with sheet water during Spring (mid March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available[cxlviii]. Information Sources • Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. • Reports and other information available from Conservation Authorities (CAs) • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Field Naturalist Clubs • Ducks Unlimited Canada • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Any mixed species aggregations of 100 or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependent on local site conditions and adjacent land use is the significant wildlife habitat[cxlviii]. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • SWHMiST[cxlix] Index #7 provides development effects and mitigation measures.	Fields with sheet water are not present within the study area. **Not SWH**
Wildlife Habitat: Waterfowl Stopover and Staging Areas (Aquatic)					
Rationale: Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked Duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water). Information Sources • Environment Canada • Naturalist clubs often are aware of staging/stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of: • Aggregations of 100[i] or more of listed species for 7 days[i], results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH[cxlix] • The combined area of the ELC ecosites and a 100m radius area is the SWH[cxlviii] • Wetland area and shorelines associated with sites identified within the SWHTG[cxlviii] Appendix K[cxlix] are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWHMiST[cxlix] Index #7 provides development effects and mitigation measures.	Wetland habitat suitable for waterfowl stopover and staging are not present within the Study Area. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Shorebird Migratory Stopover Area					
Rationale: High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH. Information Sources • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • Natural Heritage Information Center (NHIC) Shorebird Migratory Concentration Area	Studies confirming: • Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area[cxlviii] • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #8 provides development effects and mitigation measures.	There are no large bodies of water such as lakes, rivers or large wetlands within the Study Area. **Not SWH**
Wildlife Habitat: Raptor Wintering Area					
Rational: Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl Special Concern: Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class: Forest: FOD, FOM, FOC Upland: CUM, CUT, CUS, CUW	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering sites need to be > 20 ha[cxlviii, cxlix] with a combination of forest and upland.[xvi, xvii, xviii, xix, xx, xxi] Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands[cxlix] Field area of the habitat is to be wind swept with limited snow depth or accumulation. Eagle sites have open water, large trees and snags available for roosting Information Sources • OMNRF Ecologist or Biologist • Field Natural Clubs • Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada • Reports and other information available from Conservation Authorities CAs	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years)[cxlix] for a minimum of 20 days by the above number of birds • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #10 and #11 provides development effects and mitigation measures.	Suitably-sized (>20ha), undisturbed areas with a combination of fields and woodlands are not present within the Study Area. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Bat Hibernacula					
Rationale Bat hibernacula are rare habitats in Ontario landscapes.	Big Brown Bat Tri-coloured Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH • The locations of bat hibernacula are relatively poorly known. Information Sources • OMNRF for possible locations and contact for local experts • Natural Heritage Information Center (NHIC) Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club) • University Biology Departments with bat experts.	• All sites with confirmed hibernating bats are SWH. • The habitat area includes a 200m radius around the entrance of the hibernaculum[cxlviii, ccvii] for most. • Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects"[ccv] • SWHMiST[cxlix] Index #1 provides development effects and mitigation measures.	No suitable hibernacula habitat (e.g. caves, mine shafts, underground foundations) is present within the study area. **Not SWH**
Wildlife Habitat: Bat Maternity Colonies					

Rationale:
Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes.
	Big Brown Bat
	Silver-haired Bat
		Maternity colonies considered SWH are found in forested Ecosites.
		
		All ELC Ecosites in ELC Community Series:
		FOD
		FOM
		SWD
		SWM
			Maternity colonies can be found in tree cavities, vegetation and often in buildings[xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH).
			• Maternity roosts are not found in caves and mines in Ontario[xxii]
			• Maternity colonies located in Mature deciduous or mixed forest stands[ccix, ccx] with >10/ha large diameter (>25cm dbh) wildlife trees[ccvii]
			• Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3[ccxiv] or class 1 or 2[ccxii]
			• Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred[ccx]
			
			Information Sources
			• OMNRF for possible locations and contact for local experts
			• University Biology Departments with bat experts.
				• Maternity Colonies with confirmed use by:
				  • >10 Big Brown Bats
				  • >5 Adult Female Silver-haired Bats
				• The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies.
				• Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for wind Power Projects[ccv]
				• SWHMiS T[cxlix] Index #12 provides development effects and mitigation measures.
					Cavity trees that may provide suitable maternity habitat for bats could be present within the Study Area.
					
					Candidate SWH

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Turtle Wintering Area					
Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	Midland Painted Turtle Special Concern: Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles - ELC Community Classes: SW, MA, OA and SA; ELC Community Series: FEO and BOO Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen[cix, cx, cxi, cxviii]. • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. Information Sources • EIS studies carried out by Conservation Authorities. • Local field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. • OMNRF ecologist or biologist • Natural Heritage Information Center (NHIC)	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May)[cvii] • Congregation of turtles is more common where wintering areas are limited and therefore significant[cix, cx, cxi, cxii]. • SWHMiST[cxlix] Index #28 provides development effects and mitigation measures for turtle	Although there is one wetland in the Study Area, north of Bleams Road in the west side of the Study Area, it is on the property of the Mannheim Water Treatment Plant and based on aerial imagery appears too shallow to provide significant turtle wintering habitat. The other potential location for turtle wintering habitat within the Study Area is a stormwater management pond, which is not considered SWH. **Not SWH**
Wildlife Habitat: Snake Hibernaculum					
Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake Special Concern: Eastern Ribbonsnake Lizard: Special Concern (Southern Shield population): Five-lined Skink	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats. Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator. For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. The existence of features that go below the frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line[xliv, l, li, lii, cxii.] • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. • Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures cciii. Information Sources • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). • Reports and other information from CAs. • Local Field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. clubs • Natural Heritage Information Center (NHIC) • OMNRF ecologist or biologist may be aware of locations of wintering skinks	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct). • Note: If there are Special Concern Species present, then site is SWH • Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30m buffer is the SWH[i] • SWHMiST[cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula. • Presence of any active hibernaculum for skink is significant. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat.	Suitable snake hibernaculum features, such as rock piles that extend below the frost line, may be present within the Study Area. **Candidate SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)					
Rationale: Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow populations are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. Information Sources • Reports and other information available from CAs • Ontario Breeding Bird Atlas [ccv] • Bird Studies Canada; *NatureCounts* http://www.birdscanada.org/birdmon/ • Field Naturalist clubs	Studies confirming: • Presence of 1 or more nesting sites with 8[cxlvix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50m radius habitat area from the peripheral nests[ccvii] • Field surveys to observe and count swallow nests are to be completed during the breeding season Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #4 provides development effects and mitigation measures	There are no natural banks and/or slopes suitable for nesting by these species within the Study Area (licensed aggregate pit lands, such as those south of Bleams Road, are excluded from this SWH type). **Not SWH**
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)					
Rationale: Large Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15m from ground, near the top of the tree. Information Sources • Ontario Breeding Bird Atlas[ccv], colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNR). • NHIC Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries • Reports and other information available from CAs • MNRF District Offices • Local naturalist clubs	Studies confirming: • Presence of 5[i] or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH [cc, ccvii] • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWHMiST[cxlix] Index #5 provides development effects and mitigation measures.	Suitable tree/shrub habitat for colonially-nesting bird breeding is not present within the Study Area. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Ground)					
Rationale: Colonies are important to local bird populations, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1:50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6 MAS1 – 3 CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. Information Sources • Ontario Breeding Bird Atlas[ccv], rare/colonial species records. • Canadian Wildlife Service • Reports and other information available from CAs • Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area • MNRF District Offices • Field naturalist clubs	Studies confirming: • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern[l]. • Presence of 5 or more pairs for Brewer's Blackbird. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150m area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH[cc, ccvii] • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #6 provides development effects and mitigation measures.	Rocky islands and peninsulas are not present within the Study Area. **Not SWH**
Wildlife Habitat: Migratory Butterfly Stopover Areas					
Rationale: Butterfly stopovers areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral Special Concern: Monarch	Combination of ELC Community Series: Need to have present one Community Series from each landclass: Field: CUM CUS CUT Forest: FOC FOM FOD CUP Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario[cxlix]. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south[xxxii, xxxiii, xxxiv, xxxv, xxxvi.] • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat cxlviii, cxlix. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes[xxxvii, xxxviii, xxxix, xl, xli.] Information Sources • OMNRF (NHIC) • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)[xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day[xxxvii], significant variation can occur between years and multiple years of sampling should occur [xl, xlii]. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWHMiST[cxlix] Index #16 provides development effects and mitigation measures.	The Study Area is not within 5km of Lake Ontario. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Landbird Migratory Stopover Areas					
Rationale: Sites with a high diversity of species as well as high number are most significant	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.on.ec.gc.ca/wildlife_e.html All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	Woodlots need to be >10 ha[i] in size and within 5km [iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Ontario. • If multiple woodlands are located along the shoreline, those woodlands <2km from Lake Ontario are more significant[cxlix] • Sites have a variety of habitats; forest, grassland and wetland complexes[cxlix]. • The largest sites are more significant[cxlix] • Woodlots and forest fragments are important habitats to migrating birds[ccxviii], these features located along the shore and located within 5km of Lake Ontario are Candidate SWH[cxlviii]. Information Sources • Bird Studies Canada • Ontario Nature • Local birders and naturalist club • Ontario Important Bird Areas (IBA) Program	Studies confirm: • Use of the woodlot by >200 birds/day and with >35 spp. with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (Apr/May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #9 provides development effects and mitigation measures.	The Study Area is not within 5km of Lake Ontario. **Not SWH**
Wildlife Habitat: Deer Yarding Areas					
Rationale: Winter habitat for deer is considered to be the main factor for northern deer populations. In winter, deer congregate in "yards" to survive severe winter conditions. Deer yards typically have a long history of annual use by deer, yards typically represent 10-15% of an areas summer range.	White-tailed Deer	Note: OMNRF to determine this habitat. ELC Community Series providing a thermal cover component for a deer yard would include: FOM, FOC, SWM and SWC. Or these ELC Ecosites: CUP2 CUP3 FOD3 CUT	• Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter. • The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%[cxciv]. • OMNRF determines deer yards following methods outlined in "Selected Wildlife and Habitat Features: Inventory Manual"[cxcv] • Woodlots with high densities of deer due to artificial feeding are not significant	No Studies Required: • Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH[lvi, lvii, lviii, lix, lx, l]. • Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRF offices or via Land Information Ontario (LIO). • Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNRF will complete these field investigations[cxcv]. • If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #2 provides development effects and mitigation measures.	There are no MNRF-identified deer yarding areas within the Study Area. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Deer Winter Congregation Areas					
Rationale: Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions[exlviii]	White-tailed Deer	All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50ha may also be used.	• Woodlots will typically be >100 ha in size. Woodlots <100ha may be considered as significant based on MNRF studies or assessment. • Deer movement during winter in the southern areas of Eco-region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands[cxlviii]. • If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule. • Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha[ccxxiv]. • Woodlots with high densities of deer due to artificial feeding are not significant. Information Sources • MNRF District Offices • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF[cxlviii]. • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNR[í]. • Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques[ccxxiv] , ground or road surveys, or a pellet count deer density survey[ccxxv]. • If a SWH is determined for Deer Wintering Area of if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #2 provides development effects and mitigation measures.	There is no suitable habitat in Study Area (woodlots are not >100ha in size). **Not SWH**

[1]MNRF 2015b

Significant Wildlife Habitat Assessment Tables

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Cliff and Talus Slopes					
Rationale: Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	Most cliff and talus slopes occur along the Niagara Escarpment. Information Sources • The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF District • Natural Heritage Information Center (NHIC) has location information on their website • Local naturalist clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes[lxxviii] • SWHMiST[cxlix] Index #21 provides development effects and mitigation measures.	No cliff or talus slopes within the study area. **Not SWH**
Sand Barrens					
Rationale: Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry.	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	Any sand barren area, >0.5ha in size. Information Sources • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location information on their website • Field naturalist clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens[lxxviii] • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)[l]. • SWHMiST[cxlix] Index #20 provides development effects and mitigation measures.	No sand barrens within the study area. **Not SWH**
Alvar					
Rationale: Alvars are extremely rare habitats in Ecoregion 6E. Most alvars in Ontario are in Ecoregion 6E and 7E. Alvars in 6E are small and highly localized just north of the Palaeozoic-Precambrian contact.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 Five Alvar Indicator Species: 1) Carex crawei 2) Panicum philadelphicum 3) Eleochairs compressa 4) Scutellaria parvula 5) Trichostema branchiatum These indicator species are very specific to Alvars within Ecoregion	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoo geographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover[lxxviii].	An Alvar site > 0.5 ha in size[lxxv]. Information Sources • Alvars of Ontario (2000), Federation of Ontario Naturalists[lxxvi]. • Ontario Nature – Conserving Great Lakes Alvars[ccviii]. • Natural Heritage Information Center (NHIC) has location information on their website • Field Naturalist clubs • Conservation Authorities	Field studies identify four of the five Alvar indicator species[lxxv, cxlix] at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotics sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses[lxxv]. • SWHMiST[cxlix] Index #17 provides development effects and mitigation measures.	No alvars within the study area. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Old Growth Forest					
Rationale: Due to historic logging practices, extensive old growth forest is rare in the Ecoregion. Interior habitat provided by old growth forests is required by many wildlife species.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	Woodland Stands areas 30ha or greater in size or with at least 10 ha interior habitat assuming 100m buffer at edge of forest Í. Information Sources • OMNRF Forest Resource Inventory mapping • OMNRF Forester, Ecologist or Biologist • Field Local naturalist clubs • Conservation Authorities • Sustainable Forestry License (SFL) companies will possibly know locations through field operations. • Municipal forestry departments	Field Studies will determine: • If dominant trees species of the ecosite are >140 years old, then stand is Significant Wildlife Habitat[cxlviii] • The stand will have experienced no recognizable forestry activities[cxlviii] • The area of Forest Ecosites combined to make up the stand is the SWH. • Determine ELC Vegetation Type for forest stand[lxxviii] • SWHDSS[cxlix] Index #23 provides development effects and mitigation measures.	No large old growth woodlots within the study area. **Not SWH**
Savannah					
Rationale: Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.	• No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • Natural Heritage Information Center (NHIC) has location information on their website • OMNRF Ecologists • Field naturalists clubs • Conservation Authorities	Field studies confirm one or more of the Savannah indicator species listed in[lxxv] Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used[cxlviii]. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics sp.). • SWHMiST[cxlix] Index #18 provides development effects and mitigation measures.	No savannahs within the study area. **Not SWH**
Tallgrass Prairie					
Rationale: Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.	• No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • OMNR Districts • Natural Heritage Information Center (NHIC) has location information available on their website • Field naturalists clubs • Conservation Authorities	Field studies confirm one or more of the Prairie indicator species listed in[lxxv] Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 6E should be used[cxlviii]. • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • SWHMiST[cxlix] Index #19 provides development effects and mitigation measures.	No tallgrass prairie within the study area. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Other Rare Vegetation Communities					
Rationale: Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG[cxlviii]. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M[cxlviii] The OMNR/NHIC will have up to date listing for rare vegetation communities. Information Sources • Natural Heritage Information Center (NHIC) has location information available on their website • OMNRF Districts • Field naturalists clubs • Conservation Authorities	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG[cxlviii]. • Area of the ELC Vegetation Type polygon is the SWH. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures.	Additional rare vegetation communities are not present within the Study Area. **Not SWH**

[1]MNRF 2015b

Significant Wildlife Habitat Assessment Tables

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Waterfowl Nesting Area					
Rationale: Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands	A waterfowl nesting area extends 120m[cxlix] from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120m of each individual wetland where waterfowl nesting is known to occur[cxlix]. • Upland areas should be at least 120m wide so that predators such as raccoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. Information Sources • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from CAs	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120m[cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWHMiST[cxlix] Index #25 provides development effects and mitigation measures.	There is no suitable habitat for waterfowl nesting within the Study Area. **Not SWH**
Wildlife Habitat: Bald Eagle and Osprey Nesting, Foraging and Perching Habitat					
Rationale: Nest sites are fairly uncommon in Eco-region 6E are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey Special Concern: Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). Information Sources • Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. • MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF Districts • Sustainable Forestry License (SFL) companies will identify additional nesting locations through field operations. • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented • Reports and other information available from CAs. • Field naturalists clubs	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area[cxlviii]. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300m radius around the nest or the contiguous woodland stand is the SWHccvii, maintaining undisturbed shorelines with large trees within this area is important[cxlviii]. • For a Bald Eagle the active nest and a 400-800m radius around the nest is the SWH[cvi], ccvii. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat[cvi]. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant[ccvii] • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #26 provides development effects and mitigation measures	There is no suitable habitat for Bald Eagle or Osprey nesting within the Study Area. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Woodland Raptor Nesting Habitat					
Rationale: Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in SWC, SWM, SWD and CUP3.	All natural or conifer plantation woodland/forest stands >30ha with >10ha of interior habitat[lxxxviiii, lxxxix, xc, xci, xciii, xciv, xcv, xcvi, cxxxiii]. Interior habitat determined with a 200m buffer[cxlviii]. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Cooper's hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. Information Sources • OMNRF • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada • Reports and other information available from CAs	Studies confirm: • Presence of 1 or more active nests from species list is considered significant[cxlviii]. • Red-shouldered Hawk and Northern Goshawk – a 400m radius around the nest or 28ha area of habitat is the SWH[ccvii]. • Barred Owl – a 200m radius around the nest is the SWH[ccvii]. • Broad-winged Hawk and Coopers Hawk – a 100m radius around the nest is the SWH[ccvii]. • Sharp-shinned Hawk – a 50m radius around the nest is the SWH[ccvii]. • Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWHMiST[cxlix] Index #27 provides development effects and mitigation measures.	The woodlands within the Study Area are not large enough to provide suitable habitat for nesting woodland raptors. **Not SWH**
Wildlife Habitat: Turtle Nesting Area					
Rationale: These habitats are rare and when identified will often be the only breeding site for local populations of turtles	Midland Painted Turtle Special Concern: Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m)[cxlviii] or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. Information Sources • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Center (NHIC) • Field Naturalist clubs and landowners	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH[i] • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH[cxlviii]. • Travel routes from wetland to nesting area are to be considered within the SWH[cxlix]. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWHMiST[cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat.	There is no suitable nesting habitat for turtles within the Study Area. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Seeps and Springs					
Rationale: Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system[cxvii, cxlix]. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species[cxix, cxx, cxxi, cxxii, cxiii, cxiv] Information Sources • Topographical Map • Thermography • Hydrological surveys conducted by CAs and MOE • Field naturalists clubs and landowners • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.	Field Studies confirm: • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat[cxlviii] • SWHMiST[cxlix] Index #30 provides development effects and mitigation measures	There are no seeps or spring within the Study Area. **Not SWH**
Wildlife Habitat: Amphibian Breeding Habitat (Woodland)					
Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500m^2 (about 25m diameter) [ccvii] within or adjacent (within 120m) to a woodland (no minimum size)[clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx] Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat[cxlviii] Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF District • OMNRF wetland evaluations • Field naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses)[lxxi] or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys[cviii] will be required during the spring March-June when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the woodland area plus a 230m radius of woodland area[lxiii,lxv, lxvi, lxvii, lxviii, lxix, lxx, lxxi] if a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is the be included in the habitat. • SWHMiST[cxlix] Index #14 provides development effects and mitigation measures.	There are no woodland wetlands large enough to provide significant habitat for amphibian breeding. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Amphibian Breeding Habitat (Wetland)					
Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Tree frog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.	• Wetlands >500m2 (about 25m diameter)[ccvii] supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats[cbxxiv]. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation. Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations • Reports and other information available from CAs.	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses)[bxxi, lxxiii], or 2 or more of the listed frog/toad species with Call Level Codes of 3. or; Wetland with confirmed breeding Bullfrogs are significant. • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys[cviii] will be required during spring March to June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #15 provides development effects and mitigation measures.	There is one wetland in the Study Area, north of Bleams Road in the west side of the Study Area, on the property of the Mannheim Water Treatment Plant, which may provide suitable habitat for amphibian breeding; however, it is largely outside the Study Area and well away from the Subject Lands where the undertaking will be occuring. The other wetland within the Study Arae is a stormwater management pond, which is not considered SWH. **Not SWH**
Woodland Area-Sensitive Bird Breeding Habitat					
Rationale: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-Bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Special Concern: Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha.[cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxv, cxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvii, clviii, clix] • Interior forest habitats are at least 200m from forest edge habitat. Information Sources • Local bird clubs • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to greatest value to interior species • Reports and other information available from CAs.	• Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #34 provides development effects and mitigation measures.	There are no woodlands within the Study Area large enough to provide suitable habitat for woodland area-sensitive breeding birds. **Not SWH**

[1]MNRF 2015b

Significant Wildlife Habitat Assessment Tables

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Marsh Bird Breeding Habitat					
Rationale: Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Gallinule American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan Special Concern: Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present[cxxiv]. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. Information Sources • Contact OMNRF, wetland evaluations are a good source of information. • Field naturalist clubs • Natural Heritage Information Center (NHIC) Records • Reports and other information available from CAs. • Ontario Breeding Bird Atlas[ccv]	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species[i]. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH[i]. • Area of the ELC ecosite is the SWH • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]. • SWHMiST[cxlix] Index #35 provides development effects and mitigation	There are no wetlands large enough to provide significant habitat for marsh breeding birds. **Not SWH**
Wildlife Habitat: Open Country Bird Breeding Habitat					
Rationale: This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow Special Concern: Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha [clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix]. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years)[i]. Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. Information Sources • Agricultural land classification maps, Ministry of Agriculture. • Ask local birders • Ontario Breeding Bird Atlas[ccv] • Reports and other information available from CAs.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owl is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]. • SWHMiST[cxlix] Index #32 provides development effects and mitigation measures.	Large fields of suitable size (>30 ha) and composition are not present within the Study Area. **Not SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Shrub/Early Successional Bird Breeding Habitat					
Rationale: This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records cxcix.	Indicator spp.: Brown Thrasher Clay-coloured Sparrow Common spp.: Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher Special Concern: Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species.	Large field areas succeeding to shrub and thicket habitats>10ha[clxiv] in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years)[i]. Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species [clxxiii]. Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. Information Sources • Agricultural land classification maps Ministry of Agriculture Local bird clubs • Ontario Breeding Bird Atlas[ccv] • Reports and other information available from CAs	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species[i]. • A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #33 provides development effects and mitigation measures.	Large early successional fields or large thicket habitats (>10 ha) are not present within the Study Area. **Not SWH**
Wildlife Habitat: Terrestrial Crayfish					
Rationale: Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare. [ccii]	Chimney or Digger Crayfish: (*Fallicambarus fodiens*) Devil Crawfish or Meadow Crayfish: (*Cambarus Diogenes*)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM	Wet meadow and edges of shallow marshes (no minimum size) identified should be surveyed for terrestrial crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites[cci] • Area of ELC Ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH • Surveys should be done April to August during in temporary or permanent water Note the presence of burrows or chemistry are often the only indicator of presence, observance or collection of individuals is very difficult[cci] • SWHMiST[cxlix] Index #36 provides development effects and mitigation measures.	Suitable habitat for terrestrial crayfish may be present around the unevaluated wetland within the Study Area. **Candidate SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Special Concern and Rare Wildlife Species					
Rationale: These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites[lxxviii]. Information Sources • Natural Heritage Information Centre (NHIC) will have the Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website: "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas[ccv] • Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures	Several Species of Conservation Concern (Special Concern or S Ranks S1-S3) have been documented within the vicinity of the study area based on the background review, and may be present within the Study Area. For more details, refer to the Species at Risk screening table. **Candidate SWH**

[1]MNRF 2015b

Significant Wildlife Habitat Assessment Tables

Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Amphibian Movement Corridors					
Rationale: Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all ecosites associated with water. • Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1.	Movement corridors between breeding habitat and summer habitat [clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi]. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat – Wetland) of this Schedule[j]. Information Sources • MNRF District Office • Natural Heritage Information Center NHIC • Reports and other information available from CAs • Field Naturalist Clubs	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. Cooridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant[cxlix]. • Corridors should have at least 15m of vegetation on both sides of waterway [cxlix] or be up to 200m wide[cxlix] of woodland habitat and with gaps <20m [cxlix]. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat[cxlix]. • SWHMiST[cxlix] Index #40 provides development effects and mitigation measures.	Presence of this SWH type is dependent on the confirmation of Amphibian Breeding Habitat (Wetland), which was ruled-out for the Study Area. **Not SWH**
Wildlife Habitat: Deer Movement Corridors					
Rationale: Corridors important for all species to be able to access seasonally important life-cycle habitats or to access new habitat for dispersing individuals by minimizing their vulnerability while travelling.	White-tailed Deer	Corridors may be found in all forested ecosites. A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridors.	Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH from Table 1.1 of this schedule[l]. • A deer wintering habitat identified by the OMNRF as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion [clxxxii, clxxxiii, cxlix, cxciv]. • Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges). Information Sources • MNRF District Office • Natural Heritage Information Center (NHIC) • Reports and other information available from CAs • Field Naturalist Clubs	• Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas. • Corridors that lead to a deer wintering yard should be unbroken by roads and residential areas. • Corridors should be at least 200m wide[cxlix] with gaps <20m[cxlix] and if following riparian area with at least 15m of vegetation on both sides of waterway[cxlix]. Shorter corridors are more significant than longer corridors[cxlix] • SWHMiST[cxlix] Index #39 provides development effects and mitigation measures.	There is no MNRF-identified deer wintering habitat in the Study Area. Therefore, there is no potential for deer movement corridors. **Not SWH**

[1]MNRF 2015b

From: Barbara Steiner <Barbara.Steiner@kitchener.ca>
Sent: September 29, 2021 2:25 PM
To: 'Jennifer McCarter'
Cc: Trevor Jacobs
Subject: Kitchener Environmental Planning RE: Bleams Road EA - Natural Heritage Terms of Reference (Proj2455)

Hello Jennifer.

I have reviewed the TOR, and find them to be complete for the purposes of assessing alternatives for the widening / increased capacity of Bleams Road between Fischer Hallman and Trussler Roads. I do, however offer the following clarifications and comments:

1. All elements of the Kitchener Natural Heritage System (KNHS) are distant from Bleams Road with the exception of the Main Branch of Strasburg Creek, designated as a Locally Significant Valleyland in the Kitchener Official Plan. The study area contains the headwater area of this significant and sensitive coldwater stream which is known to support Brook Trout downstream.

2. Post-development water management is complex in this area owing to both Regional sourcewater protection issues and concerns re: surface and groundwater water quality (e.g. esp. temperature, salt and nutrient loading impacts) and quantity supporting the coldwater fish habitat.

- GRCA provides good advice on this matter in their comments on the TOR regarding coordination of this with past studies and water management objectives.
- In addition to direction from the Alder / Upper Strasburg Watershed Plan noted in NRSI's TOR, I would also point to the water management design objectives outlined for the Main Branch in the Strasburg Creek Watershed Plan (1991 and 1996).
- Water quality and quantity impacts from the proposed road improvements will be of great concern to the City of Kitchener as the undertaking may impact headwater characteristics and change the significant attributes of the sensitive Strasburg Creek system. Therefore, salt loading (to a lesser extent nutrient loading) and temperature impacts should be carefully considered in choosing an alternative and developing mitigation measures to protect the features and functions of Strasburg Creek. The City has invested heavily in this natural feature and its functions over a number of decades, and Strasburg Creek should not be compromised by Bleams Road improvements.

3. Blandings Turtle habitat was mapped by the City and accepted by the Province (MNRF at the time) in this area. BLTU habitat is largely out of the study area with only a very small piece of Category 3 habitat extending west of Fisher Hallman along the Strasburg Creek floodplain.

4. Treed and woodland vegetation is very limited along Bleams Road here, and the woodland on the north side of Bleams Road east of Trussler is a plantation that is not considered either Regionally or locally significant.

I look forward to reviewing the study results and the evaluation of alternative solutions. I assume Trevor will circulate internally at CoK.

Barbara Steiner
Senior Environmental Planner | Planning | City of Kitchener
519-741-2200 X7293 | TTY 1-866-969-9994 | barbara.steiner@kitchener.ca

From: Jennifer McCarter <jmccarter@nrsi.on.ca>
Sent: Wednesday, September 8, 2021 10:31 AM
To: Barbara Steiner <Barbara.Steiner@kitchener.ca>; Trevor Jacobs <Trevor.Jacobs@kitchener.ca>
Subject: [EXTERNAL] Re: Bleams Road EA - Natural Heritage Terms of Reference (Proj2455)

Good Morning,

We just had a kick-off team meeting for the Bleams Road EA project. Trevor asked that I copy him on correspondence regarding the Terms of References (TOR) that was sent out.

Trevor, for your reference, I have attached the TOR as well as the comments that we have received from the GRCA and MECP. To date, we have completed the aquatic habitat assessment and the requested headwater drainage feature assessment as requested by the GRCA.

Please let me know if the City has any additional comments on the planned natural heritage survey program for this project.

Kind regards,

Jen

Jennifer McCarter M.Sc.
Terrestrial and Wetland Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 409 (f) 519-725-2575
(w) www.nrsi.on.ca (e) jmccarter@nrsi.on.ca
@nrsinews Natural Resource Solutions Inc.
Over 20 years of environmental consulting excellence

On 12/2/2020 1:24 PM, Jennifer McCarter wrote:

> Sounds good. Thank you!

Jennifer McCarter M.Sc.
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On 12/2/2020 1:12 PM, Barbara Steiner wrote:

> Thanks Jennifer for SAR comments. My apologies; Chris F-P from the GRCA did copy me on his comments. Would be good to see if RMOW Environmental Planning staff have been consulted internally…. Often in the past, they have not been; and in recent years, those staff have (too) much expected of them since Chris Gosselin retired and Tim Van Hinte went on his leave. When I hear who the City contact for the study is, I will send back my comments, copying my City colleague.

From: Jennifer McCarter <jmccarter@nrsi.on.ca>
Sent: Wednesday, December 02, 2020 11:53 AM/
To: Barbara Steiner <Barbara.Steiner@kitchener.ca>; 'gproctor@regionofwaterloo.ca' <gproctor@regionofwaterloo.ca>
Cc: Jessica Linton <jlinton@nrsi.on.ca>
Subject: [EXTERNAL] Re: Bleams Road EA - Natural Heritage Terms of Reference (Proj2455)

Hi Barbara,

Thank you for your email.

I have attached the comments we received from the GRCA and MECP.

Cheers,

Jen

Jennifer McCarter M.Sc.
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@nrsinews Natural Resource Solutions Inc.
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On 12/2/2020 11:48 AM, Barbara Steiner wrote:

> Hello Jennifer. Hello Greg.
>
> Thank you for circulating the TOR. I am never really sure how to comment on such documents where Kitchener Environmental Planning's role is somewhat peripheral. I can but I would like some clarity from the Region on:
>
> 1. Greg -Who is/are the City contact(s) on this Regional project? I am assuming Greg has involved a City staff person from our

Transportation Planning Division (or other?), and I would like to make sure they are aware / copied if I offer any comments.

2. Jennifer – Could you provide the comments received from any of the other environmental approval agencies listed below? That way, City Environmental Planning will not be repeating comments or speaking on behalf of the agencies with the appropriate jurisdiction. However, seeing their comments will assure us that any bona fide concerns / requests of other orders of government are being addressed in the process.

Thanks for your help so that we can be of help.

Barbara Steiner
Senior Environmental Planner | Planning | City of Kitchener
519-741-2200 X7293 | TTY 1-866-969-9994 |
barbara.steiner@kitchener.ca

From: Jennifer McCarter <jmccarter@nrsi.on.ca>
Sent: Thursday, November 12, 2020 11:37 AM
To: Chris Foster-Pengelly <cfosterpengelly@grandriver.ca>; PEllis@regionofwaterloo.ca; syip@regionofwaterloo.ca; Barbara Steiner <Barbara.Steiner@kitchener.ca>; SAROntario@ontario.ca; al.murray@ontario.ca
Cc: droga@mte85.com; gproctor@regionofwaterloo.ca; Jessica Linton <jlinton@nrsi.on.ca>
Subject: [EXTERNAL] Re: Bleams Road EA - Terms of Reference (Proj2455)

Thank you for your input, Chris!

Jennifer McCarter M.Sc.
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On 11/10/2020 11:18 AM, Chris Foster-Pengelly wrote:

> Hi Jen,
>
> Please find attached GRCAs comments.
>
> Thank you,
> Chris

Chris Foster-Pengelly, M.Sc., CAN-CISEC
P: (519) 621-2763 x2319
F: (519) 621-4844
www.grandriver.ca

From: Jennifer McCarter <jmccarter@nrsi.on.ca>
Sent: Tuesday, September 1, 2020 11:37 AM
To: Chris Foster-Pengelly <cfosterpengelly@grandriver.ca>; PEllis@regionofwaterloo.ca; syip@regionofwaterloo.ca; Barbara.Steiner@kitchener.ca; SAROntario@ontario.ca; al.murray@ontario.ca
Cc: droga@mte85.com; gproctor@regionofwaterloo.ca; Jessica Linton <jlinton@nrsi.on.ca>
Subject: Bleams Road EA - Terms of Reference (Proj2455)

Good Morning,

On behalf of the Regional Municipality of Waterloo, Natural Resource Solutions Inc. (NRSI), and MTE Consultants Inc., I am pleased to provide the attached Terms of Reference (TOR) for an Environmental Impact Study (EIS) which NRSI is completing as part of the Class A+ Environmental Assessment (EA) for the potential reconstruction of Bleams Road between Fischer-Hallman Road and Trussler Road, Kitchener, Ontario.

We would appreciate your review of, and input on, the proposed work plan, which is outlined in this TOR.

Thank you in advance,

Jen
--

Jennifer McCarter M.Sc.
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400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6

Phone: 519.621.2761 **Toll free:** 866.900.4722 **Fax:** 519.621.4844 **Online:** www.grandriver.ca

November 10, 2020
Via email

Jennifer McCarter, M. Sc.
Natural Resource Solutions Inc.
415 Philip Street, Unit C
Waterloo, ON, N2L 3X2

Dear Ms. McCarter,

Re: Bleams Road Reconstruction (Fischer-Hall Road to Trussler Road) – Class A+ Environmental Assessment:
Environmental Impact Study - Terms of Reference

Grand River Conservation Authority (GRCA) staff have now had the opportunity to review the following information submitted for the Class A+ EA for potential road reconstruction and improvement of Bleams Road between Trussler Road and Fisher-Hallman Road in the City of Kitchener:

- Environmental Impact Study - Terms of Reference, prepared by Natural Resource Solutions Inc., dated September 1, 2020. Your file: Project #2455

We offer the following comments and recommendations for your consideration:

Comments:

1. The proposed work site is located within Wellhead Protection Area Mannheim B, C, D with Wellhead Protection Area Vulnerability Scores ranging from 2 (low) to 8 (high). The EIS should identify and assess the impacts of road salt on the sites groundwater related to Source Water Protection as well as impacts to the Strasburg Creek headwater feature.
2. The proposed road construction enhancements should be coordinated with the planned headwater channel improvements south of the roadway on the Schlegel Lands. Channel design and elevations will need to be matched to ensure stable channel and flows.
3. The existing floodplain located between Commonwealth St. and Helena Feasby St. will need to be matched to ensure the new road design and construction does not result in negative impacts above or below Bleams Rd. on the headwater feature.

Recommendations:

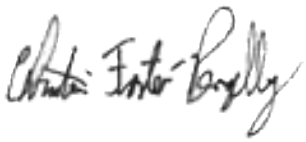
4. Recommend the use of the recently completed EIS reports for the Schlegel and Williamsburg South developments as background reports. Will help provide more recent observations in support of the subwatershed studies.

5. Recommend the use of the CVC/TRCA Evaluation, Classification and Management of Headwater Drainage Features (2013) procedure to help identify and assess the sensitivity of the headwater feature and its response to proposed road enhancements.

6. The Region of Waterloo and the City of Kitchener should look at the cumulative impacts of road salt on the area groundwater and surface water due to development of the Schlegel lands, Fischer-Hallman Rd. improvements and Bleams Rd. improvements.

We trust that this information is of assistance. Should you have any questions, please contact Chris Foster-Pengelly, Resource Planner at 519-621-2763 ext. 2319 or cfosterpengelly@grandriver.ca.

Sincerely,



Chris Foster-Pengelly, M.Sc.
Resource Planner
Grand River Conservation Authority

Subject: RE: Bleams Road EA - Terms of Reference (Proj2455)
From: "Brothers, Brianne (MECP)" <Brianne.Brothers@ontario.ca>
Date: 11/9/2020, 3:49 PM
To: Jennifer McCarter <jmccarter@nrsi.on.ca>

Hi Jennifer,

My apologies for the delay. I have reviewed the document below and am in agreement with the species identified. Maternity roosting surveys should be undertaken for species at risk bats, depending on the amount of trees proposed for removal. Please provide MECP with these details once they have been established. Photos of the treed area that will be removed is also helpful for my assessment.

Further discussions about with MECP regarding Blanding's Turtle should occur once project details have been established. It would be helpful if you could provide me with the Blanding's Turtle habitat mapping referenced in the document.

If you have any questions regarding any of the information above, do not hesitate to contact me.

Thank you,

Brianne

Brianne Brothers
A/Management Biologist, Permissions and Compliance Section
Species at Risk Branch
Ministry of the Environment, Conservation and Parks
(905)-321-5736 | Brianne.brothers@ontario.ca

From: Jennifer McCarter <jmccarter@nrsi.on.ca>
Sent: September 1, 2020 11:37 AM
To: cfosterpengelly@grandriver.ca; PEllis@regionofwaterloo.ca; syip@regionofwaterloo.ca; Barbara.Steiner@kitchener.ca; Species at Risk (MECP) <SAROntario@ontario.ca>; Murray, Al (MNRF) <al.murray@ontario.ca>
Cc: droga@mte85.com; gproctor@regionofwaterloo.ca; Jessica Linton <jlinton@nrsi.on.ca>
Subject: Bleams Road EA - Terms of Reference (Proj2455)

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

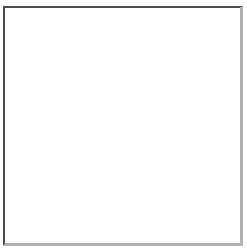
Good Morning,

On behalf of the Regional Municipality of Waterloo, Natural Resource Solutions Inc. (NRSI), and MTE Consultants Inc., I am pleased to provide the attached Terms of Reference (TOR) for an Environmental Impact Study (EIS) which NRSI is completing as part of the Class A+ Environmental Assessment (EA) for the potential reconstruction of Bleams Road between Fischer-Hallman Road and Trussler Road, Kitchener, Ontario.

We would appreciate your review of, and input on, the proposed work plan, which is outlined in this TOR.

Thank you in advance,

Jen
--



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APPENDIX II Tree Inventory Results

Bleams Road Class C EA - Environmental Impact Study
Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
1	Red Pine	*Pinus resinosa*	Native	1	20.5	2.5	Improbable	Fair	Medium	Retain	Some defoliated branches; slight curve in upper trunk; thin canopy; lots of self pruning.
2	Red Pine	*Pinus resinosa*	Native	1	21	2.5	Improbable	Fair	Medium	Remove	Some defoliated and dead upper branches; self pruning; asymmetrical crown toward road.
3	Red Pine	*Pinus resinosa*	Native	1	13	0.5	Improbable	Fair	Medium	Remove	Self-pruning; modest crown.
4	Red Pine	*Pinus resinosa*	Native	1	17	1.5	Improbable	Fair	Medium	Remove	Self-pruning; codominant leaders.
5	White Spruce	*Picea glauca*	Native	1	22	2.5	Improbable	Good	High	Remove	Asymmetrical crown toward road; self pruning; epicormic growth; minor defoliated.
6	Red Pine	*Pinus resinosa*	Native	1	19	1.5	Improbable	Good	High	Remove	Self-pruning; healthy foliage.
7	Red Pine	*Pinus resinosa*	Native	1	15	2.0	Improbable	Good	High	Remove	Thin canopy; some defoliated branches; self pruning.
8	Red Pine	*Pinus resinosa*	Native	1	12	0.5	Possible	Fair	Medium	Retain	Crooked stem, once lost leader.
9	Red Pine	*Pinus resinosa*	Native	1	14	1.0	Improbable	Fair	Medium	Remove	Once lost leader, but well-adapted; codominant leaders.
10	Red Pine	*Pinus resinosa*	Native	1	12	1.0	Improbable	Good	High	Remove	Lost leader but strong replacement; self pruning.
11	Red Pine	*Pinus resinosa*	Native	1	15	1.5	Improbable	Good	High	Remove	Self pruning; minor defoliation.
12	Red Pine	*Pinus resinosa*	Native	1	13	2.0	Improbable	Good	High	Remove	Slightly asymmetrical crown toward road; self pruning; minor defoliation.
13	Red Pine	*Pinus resinosa*	Native	1	14	1.0	Improbable	Fair	Medium	Remove	Suppressed, meagre crown.
14	White Spruce	*Picea glauca*	Native	1	20	1.0	Improbable	Good	High	Remove	Asymmetrical, but healthy crown; sap exuding.
15	Red Pine	*Pinus resinosa*	Native	1	13	1.5	Improbable	Fair	Medium	Remove	Sparse crown, self-pruning.
16	Scots Pine	*Pinus sylvestris*	Non-native	1	11	2.5	Improbable	Fair	Medium	Remove	Bark in upper trunk peeling; full crown; self pruning.
17	Jack Pine	*Pinus banksiana*	Native	1	15	3.0	Improbable	Poor	Low	Remove	Heavily defoliated; asymmetrical crown toward road; self pruning; epicormic growth; vines up trunk.
18	Red Pine	*Pinus resinosa*	Native	1	13	1.0	Possible	Fair	Medium	Remove	Weak leader; asymmetrical crown.
19	White Spruce	*Picea glauca*	Native	1	14	1.5	Improbable	Fair	Medium	Remove	Good form; epicormic growth.
20	Red Pine	*Pinus resinosa*	Native	1	18	3.0	Improbable	Good	High	Remove	Asymmetrical crown toward road; self pruning; some minor defoliation.
21	Red Pine	*Pinus resinosa*	Native	1	11	1.5	Improbable	Good	High	Remove	Asymmetrical crown toward road; self pruning; some minor defoliation.
22	Red Pine	*Pinus resinosa*	Native	1	12	1.0	Improbable	Fair	Medium	Remove	Once lost leader.
23	White Spruce	*Picea glauca*	Native	1	22	2.0	Improbable	Good	High	Remove	Good root flare; self-pruning; healthy crown.
24	Red Pine	*Pinus resinosa*	Native	1	11	1.5	Improbable	Good	High	Remove	Slight crook in trunk; asymmetrical crown toward road; self pruning; some minor defoliation.
25	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.5	Improbable	Good	High	Remove	Vigorous lower scaffold branches.
26	Red Pine	*Pinus resinosa*	Native	1	10	1.0	Improbable	Good	High	Remove	Asymmetrical crown toward road; self pruning; some minor defoliation.
27	White Spruce	*Picea glauca*	Native	1	16	2.5	Improbable	Good	High	Retain	Good crown structure; some self pruning; minor defoliation.
28	Red Pine	*Pinus resinosa*	Native	1	16	1.5	Improbable	Good	High	Retain	Healthy crown.
29	Red Pine	*Pinus resinosa*	Native	1	14	1.5	Improbable	Good	High	Retain	Asymmetrical crown toward road; self pruning; minor defoliation.
30	Red Pine	*Pinus resinosa*	Native	1	14	1.0	Improbable	Good	High	Retain	Healthy foliage; self-pruning..
31	Red Pine	*Pinus resinosa*	Native	1	16	1.0	Improbable	Fair	Medium	Retain	Thin canopy; self pruning; dead branches.
32	Red Pine	*Pinus resinosa*	Native	1	15	1.5	Improbable	Good	High	Retain	Thin canopy; self pruning.
33	Red Pine	*Pinus resinosa*	Native	1	13	1.5	Improbable	Fair	Medium	Retain	Slightly crooked stem; sparse crown.
34	White Spruce	*Picea glauca*	Native	1	19	3.5	Improbable	Good	High	Retain	Slight curve in trunk; asymmetrical crown toward road.
35	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.5	Improbable	Fair	Medium	Remove	Basal wound; healthy crown.
36	Eastern White Cedar	*Thuja occidentalis*	Native	2	10	1.0	Improbable	Fair	Medium	Remove	Strong taper.
37	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.0	Improbable	Fair	Medium	Remove	Strong taper; sparse crown.
38	Red Pine	*Pinus resinosa*	Native	1	15	1.5	Improbable	Dead	Dead	Remove	Zero needles; dead broken branches.
39	Red Pine	*Pinus resinosa*	Native	1	13	1.0	Possible	Dead	Dead	Remove	Shedding bark.
40	Red Pine	*Pinus resinosa*	Native	1	14	1.0	Improbable	Very Poor	Low	Retain	Little to no needles; numerous dead and broken branches.
41	Red Pine	*Pinus resinosa*	Native	1	14	1.5	Improbable	Fair	Medium	Retain	Self-pruning; irregular crown.
42	Red Pine	*Pinus resinosa*	Native	1	15	2.0	Improbable	Good	High	Retain	Slight crook in trunk; thin canopy; self pruning.

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Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
43	Red Pine	*Pinus resinosa*	Native	1	12	0.5	Possible	Dead	Dead	Retain	Broken top.
44	Red Pine	*Pinus resinosa*	Native	1	20	2.5	Improbable	Good	High	Retain	Good crown structure ; self pruning.
45	Red Pine	*Pinus resinosa*	Native	1	13	1.0	Possible	Dead	Dead	Retain	
46	White Spruce	*Picea glauca*	Native	1	12	1.5	Possible	Dead	Dead	Retain	No foliage.
47	White Spruce	*Picea glauca*	Native	1	20	2.5	Improbable	Dead	Dead	Retain	No needles; dead and broken branches; peeling bark showing rotte core.
48	Scots Pine	*Pinus sylvestris*	Non-native	2	19+17	2.0	Possible	Fair	Medium	Retain	Codominant stems; canker at branch base; sparse crown.
49	Slippery Elm	*Ulmus rubra*	Native	1	22	4.0	Possible	Poor	Low	Remove	Numerous knots and cankers up trunk; unable to detect buds.
50	Slippery Elm	*Ulmus rubra*	Native	1	20	5.0	Improbable	Fair	Medium	Retain	Poor branch attatchment; asymmetrical crown toward road.
51	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	2.0	Improbable	Good	High	Remove	Good crown structure; slight defoliation; slight asymmetrical crown.
52	Slippery Elm	*Ulmus rubra*	Native	1	23	4.5	Improbable	Good	High	Remove	Asymmetrical crown toward road; signs of LDD nests; epicormic growth.
53	Black Walnut	*Juglans nigra*	Native	2	25.8+22.2	4.0	Improbable	Fair	Medium	Remove	Codominant stems with included bark; vigorous crown growing around power lines; epicormic growth.
54	White Ash	*Fraxinus americana*	Native	1	12	3.5	Improbable	Poor	Low	Remove	Canopy covered in vines; poor branch attatchment; poor branch attatchment; multiple leaders.
55	Black Locust	*Robinia pseudoacacia*	Non-native	1	18	3.0	Improbable	Good	High	Remove	Double leader just above dbh; epicormic growth; few branch failures.
56	Black Locust	*Robinia pseudoacacia*	Non-native	3	13.5, 13.2, 16.2	4.5	Improbable	Fair	Medium	Remove	Branch growing around one another; epicormic growth; multiple small stems.
57	Black Locust	*Robinia pseudoacacia*	Non-native	1	11	2.0	Improbable	Fair	Medium	Remove	Asymmetrical crown under power lines; open wound from branch rubbing.
58	Black Locust	*Robinia pseudoacacia*	Non-native	1	11	2.0	Improbable	Fair	Medium	Remove	Phototropic growth, arching lean; secondary stem; water sprouts.
59	Black Locust	*Robinia pseudoacacia*	Non-native	4	1.9+30.5+13.2+12	3.5	Possible	Fair	Medium	Remove	Poor structure; bark rubbing; a few dead branches.
60	Black Locust	*Robinia pseudoacacia*	Non-native	2	20.5, 12.7	5.0	Improbable	Fair	Medium	Remove	Leaders have curved and now gowing horizontal;smaller stem twisted up trunk; signs of branch failure.
61	Eastern Cottonwood	*Populus deltoides*	Native	1	22	2.5	Improbable	Good	High	Retain	Strong central stem; decent structure; minor epicormic growth.
62	Eastern Cottonwood	*Populus deltoides*	Native	1	16	2.0	Improbable	Good	High	Retain	Good structure until codominant leaders developing; vines in crown.
63	Eastern Cottonwood	*Populus deltoides*	Native	1	13	2.0	Improbable	Good	High	Retain	Vines all throughout canopy; good crown structure.
64	Sweet Cherry	*Prunus avium*	Non-native	2	17+12.7	2.0	Possible	Fair	Medium	Remove	Large canker over half of circumference of 1 stem; topped, maybe for power lines, but still growing upward.
65	Willow species	*Salix sp.*	Native	2	13.2+12.7	2.5	Improbable	Good	High	Remove	3 other secondary stems; healthy crown.
66	Black Locust	*Robinia pseudoacacia*	Non-native	3	25.4+19.6+17.7	3.5	Improbable	Good	High	Remove	Asymmetrical crown to south; included bark; codominant stems.
67	Black Locust	*Robinia pseudoacacia*	Non-native	2	19.3+12.0	3.5	Improbable	Fair	Medium	Remove	Asymmetrical crown to east; crossing stems; basal shoots; 1 dead branch.
68	Black Locust	*Robinia pseudoacacia*	Non-native	2	23.2+16.5	3.5	Improbable	Good	High	Remove	Asymmetrical crown to north; 2 dead branches.
69	Black Locust	*Robinia pseudoacacia*	Non-native	5	+19.1+15.8+14.2+	4.0	Improbable	Fair	Medium	Remove	Minor branch dieback; crossing branches.
70	Black Locust	*Robinia pseudoacacia*	Non-native	2	16.4, 21.5	4.5	Improbable	Fair	Medium	Remove	Poor branch attatchment; branches from either stems fused/ growing into eachother; dead epicormic growth.
71	Black Locust	*Robinia pseudoacacia*	Non-native	3	24.7, 17.2, 14.3	5.0	Improbable	Fair	Medium	Remove	Double leader; epicormic growth; basal shoots; evidence of branch failure.
72	Norway Maple	*Acer platanoides*	Non-native	1	48	4.0	Possible	Good	High	Remove	Included bark with low scaffold branch; balanced crown; 1 poor branch attachment; poor past pruning cuts.

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73	White Ash	*Fraxinus americana*	Native	4	14+14+13+11	4.0	Possible	Very Poor	Low	Retain	EAB exit holes; loose bark showing insect galleries; live basal shoots.
74	White Ash	*Fraxinus americana*	Native	2	21+16.7	3.5	Possible	Very Poor	Low	Retain	Vertical crack below union of 2 stems; EAB exit holes; insect galleries; live basal shoots.
1001	Red Pine	*Pinus resinosa*	Native	1	21	1.0	Improbable	Good	High	Retain	Light pruning causing branch dieback throughout plantation; straight form
1002	Red Pine	*Pinus resinosa*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown toward road; once lost leader.
1003	Norway Spruce	*Picea abies*	Non-native	1	18	2.0	Improbable	Fair	Medium	Retain	Some needles browning.
1004	Red Pine	*Pinus resinosa*	Native	1	18	1.5	Improbable	Fair	Medium	Retain	asymmetrical crown to south; light pruning
1005	Red Pine	*Pinus resinosa*	Native	1	15	1.0	Improbable	Fair	Medium	Retain	asymmetrical crown to south; light pruning
1006	Red Pine	*Pinus resinosa*	Native	1	21	2.0	Improbable	Good	High	Retain	light pruning causing branch dieback throughout plantation due to phototropic growth; straight form
1007	Red Pine	*Pinus resinosa*	Native	1	13	1.5	Improbable	Fair	Medium	Retain	Sparse crown, somewhat suppressed.
1009	Norway Spruce	*Picea abies*	Non-native	1	12	1.5	Improbable	Fair	Medium	Retain	minor lower branch dieback; adjacent tree branch rub
1009	Red Pine	*Pinus resinosa*	Native	1	14	2.0	Improbable	Good	High	Remove	.
1010	Siberian Elm	*Ulmus pumila*	Non-native	1	14	1.0	Possible	Very Poor	Low	Remove	Previously topped; significant dieback; .
1011	Red Pine	*Pinus resinosa*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	asymmetrical crown to south due to phototropic growth; branch dieback
1012	Red Pine	*Pinus resinosa*	Native	1	19	3.0	Improbable	Fair	Medium	Retain	asymmetrical crown to southeast; branch dieback due to light pruning; tree slight lean to southeast.
1013	Red Pine	*Pinus resinosa*	Native	1	24	2.5	Improbable	Fair	Medium	Remove	Self -pruning; asymmetrical crown towards road;
1014	Red Pine	*Pinus resinosa*	Native	1	11	1.5	Improbable	Fair	Medium	Retain	asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1015	Red Pine	*Pinus resinosa*	Native	1	17	1.5	Improbable	Fair	Medium	Retain	Asymmetrical crown to south due to phototropic growth; grapevine entangled in branches; branch dieback due to light pruning
1016	Red Pine	*Pinus resinosa*	Native	1	17	1.3	Improbable	Fair	Medium	Retain	Asymmetrical crown to southeast; branch dieback due to light pruning
1017	Red Pine	*Pinus resinosa*	Native	1	16	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown to southeast; branch dieback due to light pruning
1018	Red Pine	*Pinus resinosa*	Native	1	18	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown to southeast; branch dieback due to light pruning
1019	Red Pine	*Pinus resinosa*	Native	1	17	2.0	Improbable	Fair	Medium	Retain	Curved stem; asymmetrical crown to southeast; branch dieback due to light pruning
1020	Red Pine	*Pinus resinosa*	Native	1	22	3.3	Improbable	Fair	Medium	Remove	Slight lean south; asymmetrical crown to southeast; branch dieback due to light pruning
1021	Red Pine	*Pinus resinosa*	Native	1	14	0.5	Improbable	Good	High	Retain	Straight form; branch dieback due to light pruning
1022	Red Pine	*Pinus resinosa*	Native	1	19	0.5	Improbable	Fair	Medium	Retain	Straight form; asymmetrical crown to southeast; branch dieback due to light pruning
1023	Red Pine	*Pinus resinosa*	Native	1	13	0.5	Possible	Very Poor	Low	Remove	Tree topped; adjacent dead tree leaning on stem; grapevine throughout
1024	Red Pine	*Pinus resinosa*	Native	1	13	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1025	Red Pine	*Pinus resinosa*	Native	1	11	2.3	Improbable	Fair	Medium	Remove	Asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1025	Red Pine	*Pinus resinosa*	Native	1	21	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1026	Red Pine	*Pinus resinosa*	Native	1	13	1.0	Possible	Dead	Dead	Remove	Broken top ; no live crown.
1027	Red Pine	*Pinus resinosa*	Native	1	12	2.0	Improbable	Fair	Medium	Remove	Leader being superseded; asymmetrical crown towards road.;
1028	Red Pine	*Pinus resinosa*	Native	1	13	0.5	Probable	Dead	Dead	Remove	Broken top; very unstable.
1029	Red Pine	*Pinus resinosa*	Native	1	21	2.5	Improbable	Fair	Medium	Retain	Somewhat sparse crown; self -pruning.
1031	Red Pine	*Pinus resinosa*	Native	1	13	3.0	Improbable	Fair	Medium	Remove	Curved stem; asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1032	Red Pine	*Pinus resinosa*	Native	1	14	1.5	Possible	Fair	Medium	Remove	Spindly leader; vigorous lateral; crown thinning;

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1033	Red Pine	*Pinus resinosa*	Native	1	16	3.0	Improbable	Fair	Medium	Remove	Slight lean to southeast; crown bent south; asymmetrical crown to southeast due to phototropic growth; branch dieback due to light pruning
1034	Red Pine	*Pinus resinosa*	Native	1	21	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to south; branch dieback due to light pruning
1035	Red Pine	*Pinus resinosa*	Native	1	17	2.0	Improbable	Fair	Medium	Remove	Slight bend in trunk; vigorous laterals.
1036	Red Pine	*Pinus resinosa*	Native	1	18	1.0	Improbable	Good	High	Remove	Straight form; branch dieback due to light pruning
1037	Red Pine	*Pinus resinosa*	Native	1	20	2.0	Improbable	Good	High	Remove	Good form; self -pruning.
1038	Red Pine	*Pinus resinosa*	Native	1	15	1.0	Possible	Dead	Dead	Remove	
1039	Red Pine	*Pinus resinosa*	Native	1	11	0.5	Probable	Very Poor	Low	Remove	Brown needles; unstable.
1040	Red Pine	*Pinus resinosa*	Native	1	19	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southwest; branch dieback due to light pruning
1041	Red Pine	*Pinus resinosa*	Native	1	15	1.5	Possible	Poor	Low	Remove	Weak leader; sparse crown.
1042	Black Walnut	*Juglans nigra*	Native	1	14	3.0	Improbable	Good	High	Remove	Healthy crown; 1 tight branch union.
1043	Red Pine	*Pinus resinosa*	Native	1	19	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southwest; branch dieback due to light pruning
1044	Red Pine	*Pinus resinosa*	Native	1	20	1.0	Improbable	Fair	Medium	Remove	History branch failure; branch dieback due to light pruning
1045	Red Pine	*Pinus resinosa*	Native	1	19	2.5	Improbable	Fair	Medium	Remove	Corrected bend in stem.
1046	Red Pine	*Pinus resinosa*	Native	1	13	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to south; branch dieback due to light pruning
1047	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	2.0	Improbable	Fair	Medium	Remove	Originally 2 stems, now fused into 1 with included bark; lower branch dieback due to light pruning
1048	Red Pine	*Pinus resinosa*	Native	1	18	2.0	Improbable	Fair	Medium	Remove	Vigorous laterals, asymmetrical crown towards road; spindly leader; good seed set.
1049	Red Pine	*Pinus resinosa*	Native	1	16	1.5	Improbable	Fair	Medium	Remove	Asymmetrical, healthy crown; once lost leader;
1050	Eastern White Cedar	*Thuja occidentalis*	Native	1	20	2.0	Improbable	Good	High	Remove	Great form; 1 tight branch union.
1051	Red Pine	*Pinus resinosa*	Native	1	17	2.0	Improbable	Good	High	Remove	Straight form; several lower asymmetrical branches due to phototropic growth
1052	Red Pine	*Pinus resinosa*	Native	1	20	3.0	Improbable	Good	High	Remove	Straight form; several lower asymmetrical branches due to phototropic growth
1053	Red Pine	*Pinus resinosa*	Native	1	17	1.5	Possible	Dead	Dead	Remove	
1054	Red Pine	*Pinus resinosa*	Native	1	19	1.5	Probable	Dead	Dead	Remove	Root flare rotting;
1055	Red Pine	*Pinus resinosa*	Native	1	11	1.5	Possible	Dead	Dead	Remove	Broken top.
1056	Eastern White Cedar	*Thuja occidentalis*	Native	2	13.1, 12.8	2.5	Improbable	Fair	Medium	Remove	Codominant stems; asymmetrical crown to south due to phototropic growth; lower branch dieback
1057	Eastern White Cedar	*Thuja occidentalis*	Native	2	15.1+ 14.2	2.0	Improbable	Fair	Medium	Remove	Codominant stems; minor epicormic growth .
1058	Eastern White Cedar	*Thuja occidentalis*	Native	1	17	1.5	Improbable	Fair	Medium	Remove	Branch rub and dieback due adjacent tree; stem splits in 2 halfway up canopy
1059	Eastern White Cedar	*Thuja occidentalis*	Native	1	17	2.0	Improbable	Fair	Medium	Remove	Some loose bark; codominant leaders; epicormic growth .
1060	Red Pine	*Pinus resinosa*	Native	1	14		Probable	Dead	Dead	Remove	
1061	Red Pine	*Pinus resinosa*	Native	1	12		Imminent	Dead	Dead	Remove	
1062	Red Pine	*Pinus resinosa*	Native	1	16	2.0	Improbable	Fair	Medium	Retain	Self -pruning.
1063	Red Pine	*Pinus resinosa*	Native	1	18	2.0	Improbable	Good	High	Retain	Straight form; even balanced crown
1064	Red Pine	*Pinus resinosa*	Native	1	15	2.0	Possible	Fair	Medium	Remove	Irregular, somewhat sparse crown.
1065	Red Pine	*Pinus resinosa*	Native	1	17	1.5	Improbable	Fair	Medium	Remove	Lower to mid branch diedieback due to light pruning
1066	Red Pine	*Pinus resinosa*	Native	1	19	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southeast lower to mid branch diedieback due to light pruning
1067	Red Pine	*Pinus resinosa*	Native	1	16	2.0	Possible	Dead	Dead	Remove	Insect holes
1067	Red Pine	*Pinus resinosa*	Native	1	19	2.0	Probable	Dead	Dead	Remove	Basal decay.
1068	Red Pine	*Pinus resinosa*	Native	1	19	2.0	Improbable	Good	High	Remove	Straight form; balanced crown
1069	Red Pine	*Pinus resinosa*	Native	1	20	2.5	Improbable	Fair	Medium	Remove	Sparse crown; self -pruning.
1070	Red Pine	*Pinus resinosa*	Native	1	13	0.5	Probable	Dead	Dead	Remove	Insect exit holes.
1071	Red Pine	*Pinus resinosa*	Native	1	22	2.0	Improbable	Fair	Medium	Remove	Irregular crown; self -pruning.

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Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
1072	Red Pine	*Pinus resinosa*	Native	1	16	1.5	Improbable	Fair	Medium	Remove	Asymmetrical crown to southwest due to phototropic growth; branch dieback due to light pruning
1073	Red Pine	*Pinus resinosa*	Native	1	21	1.0	Probable	Dead	Dead	Remove	Shedding bark; branch dieback. ;
1073	Black Walnut	*Juglans nigra*	Native	1	28	4.5	Improbable	Fair	Medium	Remove	Decent structure; 3 dead branches; minor epicormic growth .
1074	Black Walnut	*Juglans nigra*	Native	1	34	5.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southeast due to phototropic growth; vine growth on lower stem; history of branch failure; branch dieback
1076	White Spruce	*Picea glauca*	Native	1	19	1.0	Probable	Dead	Dead	Remove	Leaning; root flare rotting;
1077	White Spruce	*Picea glauca*	Native	1	23	2.0	Possible	Dead	Dead	Remove	Missing most bark; mushrooms in root zone.
1078	White Spruce	*Picea glauca*	Native	1	13	2.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to east; lower branch dieback due to light pruning and understory shrub
1079	Black Walnut	*Juglans nigra*	Native	1	20	3.0	Improbable	Fair	Medium	Remove	Several closed cankers; 3 dead branches. ;
1080	Black Pine	*Pinus nigra*	Non-native	1	46	5.0	Improbable	Good	High	Remove	Broad crown , leader may lack vigour; 2 branches poorly pruned for sign installation .
1081	Black Pine	*Pinus nigra*	Non-native	1	37	5.0	Improbable	Fair	Medium	Remove	Codominant leaders just above DBH; grapevine throughout
1082	Black Pine	*Pinus nigra*	Non-native	1	42	5.0	Improbable	Good	High	Remove	A few scaffold branches slightly outsized, reaching toward intersection .
1083	Black Pine	*Pinus nigra*	Non-native	1	35	4.0	Improbable	Good	High	Remove	Straight form; sapsucker holes; grapevine in crown
1084	Black Pine	*Pinus nigra*	Non-native	1	38	5.0	Improbable	Fair	Medium	Remove	Codominant leaders; vine in crown; growing close to power lines.
1085	Sugar Maple	*Acer saccharum*	Native	1	47	6.0	Possible	Poor	Low	Remove	Dead leader, past failure shows decay; decay at old pruning sites; 10% dieback; epicormic growth.;
1086	Sugar Maple	*Acer saccharum*	Native	1	74	10.0	Improbable	Fair	High	Remove	Asymmetrical crown toward road north; history of branch failure with large hollow cavity
1087	Manitoba Maple	*Acer negundo*	Native	2	25.6, 34.8	4.0	Improbable	Fair	Medium	Retain	Codominant stems with included bark; epicormic growth; branch dieback; callous wounds on stem
1088	Common Apple	*Malus pumila*	Non-native	2	32.7, 20.2	6.0	Improbable	Fair	Medium	Remove	Epicormic growth; codominant stems; lower branch dieback
1089	Silver Maple	*Acer saccharinum*	Native	1	35	4.0	Improbable	Good	High	Retain	Some black spotting on leaves; minor branch dieback
1090	Sugar Maple	*Acer saccharum*	Native	1	13	2.5	Improbable	Fair	Medium	Remove	Vigorous growth; minor epicormic growth. ;
1091	Sugar Maple	*Acer saccharum*	Native	1	11		Improbable	Fair	Medium	Remove	Large crack in bark longitudinal along stem; directly under powerlines
1092	American Basswood	*Tilia americana*	Native	1	11	2.0	Possible	Fair	Medium	Remove	Basal wound, dead sapwood; asymmetrical crown due to neighboring trees.
1093	American Basswood	*Tilia americana*	Native	1	14	2.0	Improbable	Fair	Medium	Remove	Large grapevine entangled throughout; callous wound on trunk flare likely due to mechanical damage;
1094	American Basswood	*Tilia americana*	Native	1	11	2.0	Possible	Fair	Medium	Remove	Basal wound, dead sapwood; vine in crown.
1095	American Basswood	*Tilia americana*	Native	1	14	2.5	Possible	Fair	Medium	Remove	Potential canker mid-stem; a few poor branch attachments; vine in lower crown.
1096	American Basswood	*Tilia americana*	Native	1	15	2.0	Improbable	Fair	Medium	Remove	Branch dieback; grapevine entangled throughout; wounds on stem
1097	American Basswood	*Tilia americana*	Native	2	13	2.0	Improbable	Fair	Medium	Remove	Branch dieback; leaf defoliation; wounds on stem
1098	American Basswood	*Tilia americana*	Native	9	12.2+11.0+11.3	4.5	Possible	Good	High	Remove	Multiple stems, some twisting; poor structure; healthy crown.
1099	American Basswood	*Tilia americana*	Native	4	13.9, 12.2, 10.5	2.0	Improbable	Fair	Medium	Remove	Asymmetrical crown to southeast due to phototropic growth;
1100	American Basswood	*Tilia americana*	Native	2	23.8+19.8	4.0	Improbable	Good	High	Remove	Two main stems, 2 basal shoots; healthy crown.
1101	American Basswood	*Tilia americana*	Native	6	19.3, 17.6, 17.2	2.0	Improbable	Fair	Medium	Remove	Asymmetrical crown toward road north; callous wounds in bark; leaf defoliation
1102	American Basswood	*Tilia americana*	Native	6	14.8+12.4+10.2	4.5	Improbable	Good	High	Remove	Multiple stems; healthy crown.
1103	American Basswood	*Tilia americana*	Native	7	15.6, 13.3, 12.9	4.0	Improbable	Fair	Medium	Remove	Asymmetrical crown toward road north; callous wounds in bark; leaf defoliation

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1104	Sweet Cherry	*Prunus avium*	Non-native	2	23.1, 19.4	3.5	Improbable	Fair	Medium	Remove	Smaller stem mostly dead with epicormic growth; gypsy moth cocoon on stem
1105	American Basswood	*Tilia americana*	Native	5	48.9+14.8+17.2	5.0	Possible	Fair	Medium	Remove	Closed cankers in main stem; 2 dying scaffold branches ; crossing branches with secondary stems.
1106	American Basswood	*Tilia americana*	Native	1	12	1.5	Improbable	Fair	Medium	Remove	leaf defoliation; lower branch dieback
1107	American Basswood	*Tilia americana*	Native	1	10	1.0	Improbable	Good	High	Remove	minor lower branch dieback
1108	American Basswood	*Tilia americana*	Native	1	11	2.0	Improbable	Fair	Medium	Remove	Wounds from wire fence; asymmetrical crown due to neighboring trees .
1109	American Basswood	*Tilia americana*	Native	1	16	1.0	Improbable	Fair	Medium	Remove	Codominant leaders; callous closed wound lower stem; minor lower branch dieback
1110	American Basswood	*Tilia americana*	Native	1	16	2.0	Improbable	Fair	Medium	Remove	Leaf browning and defoliation; lower branch dieback
1111	American Basswood	*Tilia americana*	Native	1	17	3.0	Improbable	Fair	Medium	Remove	Gypsy moth egg sac; Leaf browning and defoliation; lower branch dieback
1112	American Basswood	*Tilia americana*	Native	1	10	1.0	Improbable	Fair	Medium	Remove	Compact crown; small bark seam; heavy seed set.
1113	American Basswood	*Tilia americana*	Native	4	14	3.0	Improbable	Fair	Medium	Remove	Gypsy moth egg sac; Leaf browning and defoliation; lower branch dieback
1114	American Basswood	*Tilia americana*	Native	1	12	3.0	Improbable	Fair	Medium	Remove	Gypsy mothmcocoon; Leaf browning and defoliation; lower branch dieback
1115	American Basswood	*Tilia americana*	Native	1	17	3.0	Improbable	Good	High	Remove	Good structure ; basal shoot .
1116	American Basswood	*Tilia americana*	Native	3	17.7+16.0+15.5	4.0	Possible	Fair	Medium	Remove	Codominant stems; a few closed cankers. ;
1117	American Basswood	*Tilia americana*	Native	3	15.9+11.8	3.0	Possible	Fair	Medium	Remove	2 stems with basal shoots; open branch stub wound.
1118	American Basswood	*Tilia americana*	Native	3	18, 21.9	3.5	Improbable	Fair	Medium	Remove	Codominant leaders; leaf browning and defoliation; lower branch dieback
1119	American Basswood	*Tilia americana*	Native	2	13	2.5	Improbable	Good	High	Remove	2 stems growing close to one another, crossing branches.
1120	American Basswood	*Tilia americana*	Native	8	13.6, 10.5, 10.4	2.5	Improbable	Poor	Low	Remove	Leaf defoliation and browning; larger stem heavy dieback; stems ent
1121	Silver Maple	*Acer saccharinum*	Native	5	13.4+12.3	4.5	Improbable	Fair	Medium	Retain	Some tar spot present; minor epicormic growth. ;
1122	Silver Maple	*Acer saccharinum*	Native	6	33.4+23.8+20.7	6.5	Improbable	Good	High	Retain	Some epicormic growth between stems; minor epicormic growth. ;
1123	American Basswood	*Tilia americana*	Native	6	20.6, 16.7, 21.6	3.5	Improbable	Fair	Medium	Remove	Gypsy moth cocoon and egg sacs present on stem; eaf defoliation and browning; larger stem heavy dieback; stems ent
1124	American Basswood	*Tilia americana*	Native	3	16.5+11.8	2.5	Improbable	Fair	Medium	Remove	Crossing branches; epicormic growth.
1125	Common Apple	*Malus pumila*	Non-native	1	30	3.0	Possible	Very Poor	Low	Remove	Extreme epicormic growth; main stem dead; bark mostly peeled; large cavaity in main stem
1126	American Basswood	*Tilia americana*	Native	3	22.5+13.4	4.0	Improbable	Good	High	Remove	Bark seam; crossing branches; healthy crown.
1127	Silver Maple	*Acer saccharinum*	Native	3	19.7+14.4+12.2	3.5	Improbable	Good	High	Retain	1 past branch failure; minor epicormic growth.
1128	American Basswood	*Tilia americana*	Native	5	23.7, 14.2, 14.5	3.0	Possible	Very Poor	Low	Remove	Extreme epicormic growth; main stems mostly dead
1129	American Basswood	*Tilia americana*	Native	3	17.5+12.4+11.2	3.5	Improbable	Fair	Medium	Remove	Crossing branches; a few small dead branches; some poor branch attachments .
1130	Manitoba Maple	*Acer negundo*	Native	5	18.0, 14.4, 10.5	3.0	Possible	Fair	Medium	Remove	Epicormic growth; branch failures; mechanical ornmanual damage; callous wound on stem
1202	Norway Spruce	*Picea abies*	Non-native	1	12	1.0	Improbable	Fair	Medium	Remove	Natural dieback in lower branches.
1229	Norway Spruce	*Picea abies*	Non-native	1	12	1.0	Improbable	Fair	Medium	Remove	Natural dieback in lower branches.
1238	Scots Pine	*Pinus sylvestris*	Non-native	1	17	1.0	Possible	Poor	Low	Retain	One sided crown; light pruning dieback; minimal crown remaining
1601	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	15	1.5	Possible	Very Poor	Low	Remove	Injury at base where previous codominant stem failed; crown touching utility lines.
1602	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	12.3, 9.4	2.5	Improbable	Fair	Medium	Remove	Stem wounds with compartmentalization; some branch tip dieback
1603	Autumn Olive	*Elaeagnus umbellata*	Non-native	1	11	1.5	Possible	Fair	Medium	Remove	Open growth characteristics; minor lower natural branch dieback; crown nearing utility lines.
1604	Autumn Olive	*Elaeagnus umbellata*	Non-native	1	11	2.0	Improbable	Fair	Medium	Remove	Narrow, unbalanced crown due to competition; epicormic growth; in hedgerow area

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1605	Green Ash	*Fraxinus pennsylvanica*	Native	3	13.4+11.0+10.5	1.5	Probable	Very Poor	Low	Retain	Former leader girdled; fencing grown into base; insect damage on former leader; mostly full crown.
1606	Autumn Olive	*Elaeagnus umbellata*	Non-native	1	16	2.0	Improbable	Fair	Medium	Remove	Light pruning dieback; narrow crown due to competition; hedgerow area
1607	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	10	2.0	Possible	Fair	Medium	Remove	Minor lower branch dieback; grape vine in upper crown.
1608	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	19	3.0	Improbable	Fair	Medium	Remove	Lower scaffold draped in riverbank grape; asymmetrical crown; light pruning dieback; hedgerow area
1609	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	10	1.5	Possible	Very Poor	Low	Remove	Congealed sap/goo?; minor lower branch dieback; fungal bodies forming in bark fissures.
1610	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	11	4.0	Improbable	Poor	Low	Remove	Growing on 10 degree angle; epicormic growth; evidence of rot
1611	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	16.2+11.5	3.0	Possible	Poor	Low	Remove	Sparse crown; each stem leaning >10%
1612	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	13.5+11.2	2.5	Probable	Very Poor	Low	Remove	Considerable gummosis; epicormic growth; minor lower branch dieback.
1613	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	13	3.0	Improbable	Fair	Medium	Remove	One sided crown; light pruning dieback; growing in ditch; hedgerow area
1614	Russian Olive	*Elaeagnus angustifolia*	Non-native	4	6.3+14.0+10.6+11	3.0	Probable	Very Poor	Low	Remove	Considerable gummosis; epicormic growth; minor lower branch dieback.
1615	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	17	1.5	Improbable	Poor	Low	Remove	Epicormic growth; crown dieback; gumosis; hedgerow area
1616	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	12	2.0	Improbable	Fair	Medium	Remove	Water sprouts; self-pruning.
1617	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	17	2.5	Probable	Very Poor	Low	Remove	Considerable gummosis; epicormic growth; considerable lean >10%; minor lower branch dieback.
1618	Russian Olive	*Elaeagnus angustifolia*	Non-native	3	16	1.0	Improbable	Fair	Medium	Remove	Epicormic growth; some crown dieback; hedgerow area
1619	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	14	2.5	Improbable	Poor	Low	Remove	Minor lower branch dieback; epicormic growth.
1620	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	10	2.0	Possible	Fair	Medium	Remove	Some dieback; gummosis.
1621	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	20	3.0	Possible	Fair	Medium	Remove	Leaning toward road; some structural roots visible, perhaps lifted at some point; epicormic growth.
1622	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	13	1.5	Improbable	Fair	Medium	Remove	Epicormic growth; gumosis; some crown dieback; hedgerow area
1623	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	16.6+11.2	3.0	Possible	Poor	Low	Remove	Minor lower branch dieback; extensive epicormic growth.
1624	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	11.5, 11.2	3.0	Improbable	Fair	Medium	Remove	Growing on 45 degree angle; epicormic growth; crown dieback
1625	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	13	1.5	Improbable	Fair	Medium	Remove	Minor lower branch dieback.
1626	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	12	2.0	Improbable	Poor	Low	Remove	Lower scaffold draped in riverbank grape; epicormic growth; crown dieback; asymmetrical crown
1627	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	13	2.0	Improbable	Fair	Medium	Remove	Crooked stem, once lost leader; gummosis.
1628	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	16	2.0	Probable	Poor	Low	Remove	Minor lower branch dieback; scaffold branch nearing failure; epicormic growth.
1629	Russian Olive	*Elaeagnus angustifolia*	Non-native	3	15+11+10	3.0	Possible	Fair	Medium	Remove	Stem wound shows dead sapwood; some poor branch attachments; epicormic growth.
1630	Silver Maple	*Acer saccharinum*	Native	2	13.0, 12.5, 10.8	3.0	Possible	Fair	Medium	Retain	Included bark; tree stake wire girdling 1 stem; decay in some lower scaffold; prune out branch overlap
1631	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	13	1.0	Possible	Poor	Low	Remove	Minor lower branch dieback; minor decay on bark; some epicormic growth.
1632	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	11	1.5	Improbable	Fair	Medium	Remove	Vigorous; tight branch unions; gummosis.
1633	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	11	1.0	Possible	Fair	Medium	Remove	Minor lower branch dieback; some epicormic growth.
1634	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	10	3.3	Possible	Poor	Low	Remove	Gumosis; evidence of stem rot; epicormic growth; growing in ditch area
1635	White Spruce	*Picea glauca*	Native	1	13	1.0	Improbable	Good	High	Retain	Vigorous growth; dense crown.
1636	Russian Olive	*Elaeagnus angustifolia*	Non-native	2	16.8, 17.2	4.0	Improbable	Fair	Medium	Remove	Epicormic growth; some crown dieback; gumosis
1637	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	19	2.5	Possible	Poor	Low	Remove	Evidence of pruning cuts along fence line; some gummosis; minor decay on bark.

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1638	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	13	1.5	Possible	Poor	Low	Remove	Some gummosis; minor decay on bark.
1639	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	14	2.0	Possible	Fair	Medium	Remove	Arched lean toward road; covered in grapevine.
1640	Manitoba Maple	*Acer negundo*	Native	3	14.8+12+11	2.5	Improbable	Fair	Medium	Remove	Poor structure; grapevine through crown; minor epicormic growth. Empty bird's nest.
1641	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	16	2.5	Possible	Poor	Low	Remove	Grape vine intertwined with crown; gummosis throughout; minor lower branch dieback; buckthorn succeeding beneath.
1642	Manitoba Maple	*Acer negundo*	Native	3	13.5+15.7+12.1	2.5	Possible	Fair	Medium	Retain	Variety of minor scars to lower trunk and branches; full crown.
1643	Sugar Maple	*Acer saccharum*	Native	1	10	1.5	Possible	Poor	Low	Retain	Loose bark up much of stem; girdling by support wires; tight branch union.
1644	Blue Spruce	*Picea pungens*	Non-native	1	11	1.5	Improbable	Good	High	Retain	Planted tree; wire ties should be removed to avoid girdling; full crown
1645	Blue Spruce	*Picea pungens*	Non-native	1	11	1.0	Improbable	Fair	Medium	Retain	Minor lower branch dieback; boulevard tree.
1646	Blue Spruce	*Picea pungens*	Non-native	1	10	1.0	Improbable	Good	High	Retain	Remove wire ties as starting to girdle; vigorous tree; full crown
1647	Blue Spruce	*Picea pungens*	Non-native	1	11	1.0	Improbable	Good	High	Retain	Boulevard tree.
1648	Blue Spruce	*Picea pungens*	Non-native	1	11	1.5	Improbable	Good	High	Retain	Good form.
1649	Blue Spruce	*Picea pungens*	Non-native	1	14	1.0	Improbable	Fair	Medium	Retain	Some dieback in lower scaffold; soil high on root flare; tree tie should be removed
1650	Blue Spruce	*Picea pungens*	Non-native	1	10	1.0	Improbable	Good	High	Retain	Boulevard tree.
1651	Blue Spruce	*Picea pungens*	Non-native	1	13	1.5	Improbable	Good	High	Retain	Boulevard tree; good vigor;.
1652	Blue Spruce	*Picea pungens*	Non-native	1	11	1.0	Improbable	Good	High	Retain	Stem girdling beginning from support wire.
1653	Blue Spruce	*Picea pungens*	Non-native	1	15	1.5	Improbable	Good	High	Retain	Very full, vigorous crown; remove tree ties
1654	Freeman's Maple	*Acer x freemanii*	Native	1	12	1.5	Improbable	Fair	Medium	Retain	Narrow crown; tar spot; main stem partially girdled from tree tie; could benefit from minor pruning
1655	Freeman's Maple	*Acer x freemanii*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	Low crown; basal shoots; girdling by support wires; minor tar spot.
1656	Black Locust	*Robinia pseudoacacia*	Non-native	4	3.5, 27.4, 25.4, 24.	5.0	Possible	Fair	Medium	Retain	Riverbank grape in scaffold; included bark between stem unions; evidence of decay on root flare; growing against fence
1657	Black Locust	*Robinia pseudoacacia*	Non-native	1	21	4.0	Improbable	Fair	Medium	Remove	Riverbank grape in lower scaffold; slight phototrophic growth toward road; minor leaf defoliation from insects
1658	American Basswood	*Tilia americana*	Native	2	12.4, 12.0	2.5	Possible	Fair	Medium	Retain	Gypsy moth defoliation; included bark; epicormic growth
1659	American Basswood	*Tilia americana*	Native	1	13	1.5	Improbable	Fair	Medium	Retain	Extensive insect defoliation; tight union between leaders.
1660	American Basswood	*Tilia americana*	Native	4	0.3+11.4+11.1+10	2.5	Improbable	Fair	Medium	Retain	Potential coppice growth; minor defoliation in upper crown; smaller stems at base.
1661	White Willow	*Salix alba*	Non-native	1	15	3.5	Improbable	Good	High	Retain	One sided crown due to competition; gypsy moth eggs and cocoons; light pruning dieback
1662	White Willow	*Salix alba*	Non-native	1	19	2.5	Improbable	Good	High	Retain	Good structure; self-pruning.
1663	White Willow	*Salix alba*	Non-native	3	18.7, 14.5, 15.8	3.0	Possible	Fair	Medium	Retain	Staining on main stem along fused branch union; epicormic growth; branch rub; lower scaffold dieback
1664	Eastern Cottonwood	*Populus deltoides*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; some leaves with brown chlorosis; vine in upper crown.
1665	White Willow	*Salix alba*	Non-native	1	22	3.0	Improbable	Good	High	Retain	Strong central leader; crossing branches.
1666	Eastern Cottonwood	*Populus deltoides*	Native	1	18	3.0	Improbable	Fair	Medium	Remove	Minor defoliation in upper crown; open grown characteristics; minor branch dieback.
1667	Eastern Cottonwood	*Populus deltoides*	Native	1	13	2.0	Improbable	Fair	Medium	Remove	Low crown; vigorous basal shoot; minor foliar necrosis.
1668	White Willow	*Salix alba*	Non-native	1	24	4.0	Possible	Fair	Medium	Remove	Full crown; some staining on main stem; epicormic growth; gypsy moth
1669	Black Walnut	*Juglans nigra*	Native	1	11	1.5	Possible	Fair	Medium	Retain	Main stem has fence absorbed into trunk; 2nd stem on opposite side of fence; minor branch dieback.
1670	American Basswood	*Tilia americana*	Native	2	10	2.0	Improbable	Fair	Medium	Retain	Basal shoots; some insect defoliation.

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1671	Balsam Poplar	*Populus balsamifera*	Native	1	10	2.0	Improbable	Fair	Medium	Retain	Strong central leader; sparse crown; gypsy moth egg sacs.
1672	Balsam Poplar	*Populus balsamifera*	Native	1	12	3.0	Possible	Fair	Medium	Retain	Crack on lower main stem; narrow root flare; growing against fence; full crown
1673	Trembling Aspen	*Populus tremuloides*	Native	1	11	2.0	Improbable	Fair	Medium	Retain	2 dead branches; sparse crown.
1674	Trembling Aspen	*Populus tremuloides*	Native	2	11	2.5	Improbable	Fair	Medium	Retain	1 dead branch with canker; a few dead lower branches; codominant stems.
1675	American Basswood	*Tilia americana*	Native	1	45	3.5	Probable	Very Poor	Low	Remove	Very significant decay in lower stem; dieback.
1676	American Basswood	*Tilia americana*	Native	2	20.5+23.4	4.0	Improbable	Fair	Medium	Remove	Minor defoliation and branch dieback; evidence of pruning cuts.
1678	American Basswood	*Tilia americana*	Native	1	31	4.0	Improbable	Fair	Medium	Remove	Minor defoliation and branch dieback; sucker growth at base; asymmetrical crown due to adjacent trees.
1679	Norway Spruce	*Picea abies*	Non-native	1	27	3.0	Improbable	Good	High	Retain	Asymmetrical crown due to adjacent trees; dumping ar base.
1680	Norway Spruce	*Picea abies*	Non-native	1	30	4.0	Improbable	Good	High	Retain	Asymmetrical crown due to neighbouring tree.
1681	Siberian Elm	*Ulmus pumila*	Non-native	1	41	4.5	Improbable	Good	High	Remove	Stem wound closed; minor thinning.
1682	Norway Spruce	*Picea abies*	Non-native	1	23	2.0	Improbable	Fair	Medium	Retain	Light pruning dieback; slightly asymmetrical crown
1683	Norway Spruce	*Picea abies*	Non-native	1	26	3.0	Improbable	Good	High	Retain	Self-pruning.
1684	Red Pine	*Pinus resinosa*	Native	1	22	1.5	Possible	Poor	Low	Retain	Crown dieback with minimal crown remaining; light pruning dieback
1685	Red Pine	*Pinus resinosa*	Native	1	15	1.0	Improbable	Fair	Medium	Retain	Natural pruning; asymmetrical crown due to adjacent trees; small scar at base.
1686	Red Pine	*Pinus resinosa*	Native	1	11	1.0	Possible	Fair	Medium	Retain	Slightly suppressed by adjacent tree; dieback in lower scaffold; dead red pines leaning on crown
1687	Red Pine	*Pinus resinosa*	Native	1	13	0.5	Imminent	Dead	Dead	Remove	
1688	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	1.0	Improbable	Good	High	Remove	Slightly suppressed.
1689	Red Pine	*Pinus resinosa*	Native	1	16		Probable	Dead	Dead	Remove	
1690	Red Pine	*Pinus resinosa*	Native	1	19	0.5	Probable	Dead	Dead	Remove	
1691	Red Pine	*Pinus resinosa*	Native	1	16	1.3	Improbable	Fair	Medium	Retain	Minor crown dieback; narrow crown due to adjacent trees
1692	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.5	Improbable	Fair	Medium	Retain	Relatively full crown with minor brown chlorosis
1693	Red Pine	*Pinus resinosa*	Native	1	11	1.0	Improbable	Fair	Medium	Retain	Irregular crown.
1694	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	1.0	Improbable	Fair	Medium	Retain	Good taper.
1695	Red Pine	*Pinus resinosa*	Native	1	20	1.5	Improbable	Fair	Medium	Retain	Light pruning dieback; asymmetrical crown
1696	Red Pine	*Pinus resinosa*	Native	1	19	2.0	Improbable	Fair	Medium	Retain	Some needles browning; minor dieback.
1697	Red Pine	*Pinus resinosa*	Native	1	20	2.0	Improbable	Fair	Medium	Retain	Irregular crown, self-pruning.
1698	Red Pine	*Pinus resinosa*	Native	1	16	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor chlorosis
1699	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	1.5	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor brown chlorosis
1700	Eastern White Cedar	*Thuja occidentalis*	Native	1	13	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor chlorosis
1701	Red Pine	*Pinus resinosa*	Native	1	21	2.5	Improbable	Fair	Medium	Retain	Leader lacks vigour; a few broken branches.
1702	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor chlorosis; evidence of decay on main stem
1703	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	2.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor chlorosis
1704	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	1.5	Improbable	Fair	Medium	Retain	Basal shoot.
1705	Red Pine	*Pinus resinosa*	Native	1	21	3.0	Possible	Poor	Low	Remove	Dead branches.
1706	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	2.5	Improbable	Good	High	Retain	Relatively full crown with minor chlorosis
1707	Red Pine	*Pinus resinosa*	Native	1	23	3.0	Improbable	Fair	Medium	Retain	Self-pruning; some needles browning.
1708	White Spruce	*Picea glauca*	Native	1	16	2.5	Improbable	Fair	Medium	Retain	Asymmetrical crown.
1709	Red Pine	*Pinus resinosa*	Native	1	20	2.5	Improbable	Fair	Medium	Retain	Slightly crooked stem; self-pruning.
1710	White Spruce	*Picea glauca*	Native	1	31	3.5	Improbable	Good	High	Retain	Minor epicormic growth.
1711	Red Pine	*Pinus resinosa*	Native	1	22	3.0	Improbable	Fair	Medium	Retain	Self-pruning; asymmetrical crown.

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Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
1712	Eastern White Cedar	*Thuja occidentalis*	Native	1	13	2.0	Improbable	Fair	Medium	Remove	Asymmetrical crown due to adjacent trees; minor chlorosis; light pruning dieback
1713	Eastern White Cedar	*Thuja occidentalis*	Native	1	13	1.5	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; minor chlorosis; light pruning dieback
1714	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	1.5	Improbable	Fair	Medium	Retain	Chlorosis; slightly asymmetrical
1715	Red Pine	*Pinus resinosa*	Native	1	15	2.0	Improbable	Fair	Medium	Retain	Narrow crown; chlorosis; light pruning dieback
1716	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.0	Improbable	Fair	Medium	Retain	Minor yellowing in foliage; minor branch dieback.
1717	Red Pine	*Pinus resinosa*	Native	1	23	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown with epicormic growth; selfpruning.
1718	Red Pine	*Pinus resinosa*	Native	1	22	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown; self-pruning; nearly overextended branches.
1719	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	2.0	Improbable	Fair	Medium	Retain	Minor yellowing in foliage.
1720	Norway Spruce	*Picea abies*	Non-native	1	24	2.0	Improbable	Fair	Medium	Retain	Light pruning dieback; some butt rot
1720	Red Pine	*Pinus resinosa*	Native	1	16	2.5	Improbable	Fair	Medium	Retain	Irregular crown; dead lower branches.
1721	Red Pine	*Pinus resinosa*	Native	1	23	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown; strong taper.
1722	Red Pine	*Pinus resinosa*	Native	1	10	0.5	Probable	Dead	Dead	Retain	Dead top; pronounced stem bend.
1723	Red Pine	*Pinus resinosa*	Native	1	17	2.0	Improbable	Fair	Medium	Retain	Natural pruning; asymmetrical crown; grapevine in mid stem.
1724	Norway Spruce	*Picea abies*	Non-native	1	22	2.5	Improbable	Good	High	Retain	
1724	Red Pine	*Pinus resinosa*	Native	1	24	3.5	Improbable	Fair	Medium	Retain	Self-pruning; minor epicormic growth.
1725	Red Pine	*Pinus resinosa*	Native	1	18	1.5	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; grapevine growing in mid stem.
1725	White Spruce	*Picea glauca*	Native	1	13	2.0	Improbable	Good	High	Retain	Self-pruning.
1726	Red Pine	*Pinus resinosa*	Native	1	16	2.5	Improbable	Fair	Medium	Retain	Self-pruning; asymmetrical crown.
1727	Red Pine	*Pinus resinosa*	Native	1	15	2.5	Possible	Fair	Medium	Retain	Weak leader; some needles browning; self-pruning.
1728	Red Pine	*Pinus resinosa*	Native	1	13	1.0	Improbable	Fair	Medium	Retain	Natural pruning; grapevine growing in crown; minor yellowing in foliage.
1729	Siberian Elm	*Ulmus pumila*	Non-native	1	19	4.0	Possible	Fair	Medium	Retain	Asymmetrical crown toward road; tight branch unions; bleeding from broken branch; minor thinning.
1730	White Spruce	*Picea glauca*	Native	1	16	1.5	Improbable	Fair	Medium	Remove	Asymmetrical crown due to adjacent trees; natural pruning.
1757	White Spruce	*Picea glauca*	Native	1	11	2.0	Improbable	Good	High	Remove	Slightly suppressed.
1782	Norway Spruce	*Picea abies*	Non-native	1	24	3.0	Improbable	Fair	Medium	Retain	Some light pruning dieback; slightly unbalanced root flare
1785	Norway Spruce	*Picea abies*	Non-native	1	19	2.0	Improbable	Fair	Medium	Retain	One sided crown; light pruning dieback
1786	Norway Spruce	*Picea abies*	Non-native	1	18	3.5	Improbable	Poor	Low	Remove	Scar in mid stem from adjacent tree failure; crown snapped off. Overcrowded plantation.
1788	Norway Spruce	*Picea abies*	Non-native	1	19	2.5	Improbable	Good	High	Remove	Asymmetrical crown; self-pruning.
1794	Norway Spruce	*Picea abies*	Non-native	1	17	1.0	Improbable	Fair	Medium	Retain	Light pruning dieback; girdling root; asymmetrical crown
1795	Norway Spruce	*Picea abies*	Non-native	1	19	2.5	Improbable	Fair	Medium	Retain	Crooked top.
1880	Norway Spruce	*Picea abies*	Non-native	2	26.0+12.8	3.5	Improbable	Good	High	Retain	Included bark.
1881	White Spruce	*Picea glauca*	Native	1	10	1.0	Improbable	Fair	Medium	Remove	Asymmetrical crown due to adjacent trees; suppressed by adjacent basswoods; virginia creeper vines in crown.
1882	Norway Spruce	*Picea abies*	Non-native	1	16	2.5	Improbable	Good	High	Retain	Self-pruning.
1886	Norway Spruce	*Picea abies*	Non-native	1	19	1.5	Improbable	Fair	Medium	Remove	Natural dieback in lower branches.
1887	White Spruce	*Picea glauca*	Native	1	11	1.0	Improbable	Fair	Medium	Remove	Asymmetrical crown due to adjacent trees; suppressed by adjacent basswood; natural pruning.
1895	Norway Spruce	*Picea abies*	Non-native	1	23	2.5	Possible	Poor	Low	Remove	Narrow crown; light pruning dieback; fruiting bodies around base suggesting root decay
1899	Norway Spruce	*Picea abies*	Non-native	1	17	1.0	Improbable	Fair	Medium	Remove	Natural dieback in lower branches.
1900	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.5	Possible	Poor	Low	Retain	Narrow crown with dieback; some bark loss on upper stem

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1973	American Basswood	*Tilia americana*	Native	1	36	4.0	Possible	Fair	Medium	Retain	Crown bound up with other trees; a few past branch failures.
1974	American Basswood	*Tilia americana*	Native	1	23	3.0	Possible	Fair	Medium	Retain	Bark seam and closed cankers; vigorous laterals.
1975	American Basswood	*Tilia americana*	Native	1	17	2.5	Improbable	Fair	Medium	Remove	Slightly asymmetrical; minor epicormic growth; vigorous lateral crossing stem.
1976	American Basswood	*Tilia americana*	Native	1	15	4.0	Possible	Poor	Low	Remove	Bark rub as growing around adjacent tree; wound with decay; narrow crown
1977	American Basswood	*Tilia americana*	Native	1	17	3.0	Improbable	Fair	Medium	Remove	Asymmetrical crown due to competition; large dead branch from adjacent tree leaning against main stem; crown relatively healthy; included bark
1977B	Sweet Cherry	*Prunus avium*	Non-native	1	15	2.0	Possible	Fair	Medium	Remove	Unbalanced root flare; light pruning dieback; one sided crown
1978	Manitoba Maple	*Acer negundo*	Native	2	34.3+13.2	2.5	Possible	Fair	Medium	Retain	Main stem leaning sharply toward road; secondary stem with long bark seam; water sprouts; past stem cut.
1979	Tree-of-Heaven	*Ailanthus altissima*	Non-native	1	16	4.0	Improbable	Fair	Medium	Remove	Old stem wound with compartmentalization; some crown dieback; overhanging road slightly
1980	Tree-of-Heaven	*Ailanthus altissima*	Non-native	1	10	2.0	Improbable	Fair	Medium	Remove	Slight phototrophic growth toward road; minor crown dieback; debris dumped around base
1998	Sweet Cherry	*Prunus avium*	Non-native	1	21	3.0	Possible	Very Poor	Low	Remove	Large wound at base with decay throughout; cavity in mid stem; considerable branch dieback.
1999	American Basswood	*Tilia americana*	Native	1	37	4.0	Improbable	Fair	Medium	Remove	Moderate branch dieback; previous branch failures; minor defoliation; some leaves browning at edges.
2000	American Basswood	*Tilia americana*	Native	1	32	4.0	Improbable	Fair	Medium	Remove	Asymmetrical crown with large scaffold branch causing imbalance; sign drilled into stem; minor defoliation and branch dieback.
1633b	White Spruce	*Picea glauca*	Native	1	20	1.5	Improbable	Fair	Medium	Retain	Self-pruning.
1662b	White Spruce	*Picea glauca*	Native	1	14	1.5	Improbable	Fair	Medium	Retain	Narrow, irregular crown.
1664b	Norway Spruce	*Picea abies*	Non-native	1	17	2.0	Improbable	Fair	Medium	Retain	High crown, self-pruning.
A	Freeman's Maple	*Acer x freemanii*	Native	2	11+10	2.5	Improbable	Fair	Medium	Remove	Codominant stems; decent form.
AA	Blue Spruce	*Picea pungens*	Non-native	1	17	2.5	Improbable	Fair	Medium	Remove	Irregular crown; 1 very vigorous lateral branch arches upward.
AB	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Good	High	Retain	Good form; vine entering crown.
AC	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Good	High	Retain	Good form.
AD	Blue Spruce	*Picea pungens*	Non-native	1	15	2.5	Improbable	Fair	Medium	Retain	Lacking some vigour compared to neighbours.
AE	White Spruce	*Picea glauca*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	Vigorous growth; many cones.
AF	White Spruce	*Picea glauca*	Native	1	15	2.5	Improbable	Good	High	Retain	Many cones.
AG	Norway Spruce	*Picea abies*	Non-native	1	22	3.0	Improbable	Good	High	Retain	Full crown.
AH	Blue Spruce	*Picea pungens*	Non-native	1	17	3.0	Improbable	Good	High	Retain	Full crown; heavy seed set .
AI	Blue Spruce	*Picea pungens*	Non-native	1	15	2.5	Improbable	Good	High	Retain	Good form .
AJ	Blue Spruce	*Picea pungens*	Non-native	1	15	2.0	Improbable	Good	High	Retain	Good form .
AK	White Spruce	*Picea glauca*	Native	1	15	2.5	Improbable	Good	High	Retain	Vigorous laterals; heavy seed set .
AL	Blue Spruce	*Picea pungens*	Non-native	1	20	3.5	Improbable	Good	High	Retain	Healthy crown; heavy seed set .
AM	Blue Spruce	*Picea pungens*	Non-native	1	18	3.0	Improbable	Fair	Medium	Retain	Minor thinning. ;
AN	Blue Spruce	*Picea pungens*	Non-native	1	18	2.0	Improbable	Fair	Medium	Retain	Good form.
AO	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Good	High	Retain	Good form.
AP	Blue Spruce	*Picea pungens*	Non-native	1	22	2.5	Improbable	Good	High	Retain	Healthy crown.
AQ	Blue Spruce	*Picea pungens*	Non-native	1	24	3.0	Improbable	Good	High	Retain	Healthy crown.
AR	Blue Spruce	*Picea pungens*	Non-native	1	20	3.0	Improbable	Fair	Medium	Retain	Irregular crown; minor thinning. ;
AS	Blue Spruce	*Picea pungens*	Non-native	1	19	2.5	Improbable	Good	High	Retain	
AT	Blue Spruce	*Picea pungens*	Non-native	1	19	2.5	Improbable	Good	High	Retain	Healthy crown.
AU	Blue Spruce	*Picea pungens*	Non-native	1	16	1.5	Improbable	Fair	Medium	Retain	Lower crown thinning.
AV	Blue Spruce	*Picea pungens*	Non-native	1	21	2.5	Improbable	Good	High	Retain	Good form.
AW	Blue Spruce	*Picea pungens*	Non-native	1	17	2.0	Improbable	Good	High	Retain	Self -pruning, interior.
AX	Paper Birch	*Betula papyrifera*	Native	2	11+10	2.5	Improbable	Good	High	Retain	Codominant stems. ;

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AY	Blue Spruce	*Picea pungens*	Non-native	1	21	2.5	Improbable	Good	High	Retain	Good form and seed set.
AZ	Blue Spruce	*Picea pungens*	Non-native	1	18	2.5	Improbable	Good	High	Retain	Broad crown with some self -pruning.
B1663	Norway Spruce	*Picea abies*	Non-native	1	29	3.0	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent trees; natural dieback. Overcrowded plantation.
B1663	Manitoba Maple	*Acer negundo*	Native	5	24+20+20+18+15	5.0	Improbable	Good	High	Retain	Stems spreading radially from base; decent form; good seed set.
BA	Blue Spruce	*Picea pungens*	Non-native	1	22	2.5	Improbable	Good	High	Retain	Good form.
BB	Blue Spruce	*Picea pungens*	Non-native	1	22	2.5	Improbable	Good	High	Retain	Good form.
BC	Blue Spruce	*Picea pungens*	Non-native	1	21	2.5	Improbable	Good	High	Retain	Good form.
BD	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Fair	Medium	Retain	Irregular crown; slightly suppressed.
BE	Blue Spruce	*Picea pungens*	Non-native	1	21	3.0	Improbable	Good	High	Retain	Good form.
BF	Silver Maple	*Acer saccharinum*	Native	3	18+16+12	4.0	Possible	Fair	Medium	Retain	1 stem and 1 scaffold branch dead.
BG	Black Pine	*Pinus nigra*	Non-native	1	21	3.0	Improbable	Good	High	Retain	1 vigorous lateral growing upward.
BH	Manitoba Maple	*Acer negundo*	Native	2	30+25	5.0	Improbable	Fair	Medium	Retain	1 broken branch, open wound; healthy crown.
BI	Silver Maple	*Acer saccharinum*	Native	2	15+14	2.5	Possible	Poor	Low	Retain	Upper half of 1 stem dead; codominant stems.
BJ	Trembling Aspen	*Populus tremuloides*	Native	1	15	2.0	Improbable	Fair	Medium	Retain	Weak leader but decent form; healthy crown.
BK	Trembling Aspen	*Populus tremuloides*	Native	1	14	2.0	Improbable	Fair	Medium	Retain	Good structure, couple crossing branches.
BL	Trembling Aspen	*Populus tremuloides*	Native	1	20	2.0	Possible	Poor	Low	Retain	Canker throughout; broken branches, asymmetrical crown.
BM	American Basswood	*Tilia americana*	Native	4	47+45+40+38	4.0	Possible	Poor	Medium	Retain	Codominant stems, 1 dead, others with significant failures; 30% live crown lost, overall.
BN	Black Pine	*Pinus nigra*	Non-native	1	36	3.5	Improbable	Fair	Medium	Remove	Weak leader; broad crown; minor sap exudation.
BO	Black Pine	*Pinus nigra*	Non-native	1	50	4.0	Improbable	Fair	Medium	Remove	Weak leader, 5 large laterals originate at 1m; broad crown; sapsucker holes.
BP	Eastern White Cedar	*Thuja occidentalis*	Native	3	12+11	1.0	Improbable	Good	High	Remove	Columnar; minor foliar necrosis.
BQ	Eastern White Cedar	*Thuja occidentalis*	Native	3	11+10	0.5	Improbable	Good	High	Remove	Columnar; minor foliar necrosis.
BR	Eastern White Cedar	*Thuja occidentalis*	Native	4	10+10	0.5	Improbable	Good	High	Remove	Columnar.
BS	Eastern White Cedar	*Thuja occidentalis*	Native	4	10+10	0.5	Improbable	Good	High	Remove	Columnar.
BT	Thornless Honey Locust	*Gleditsia triacanthos var. inermis*	Non-native	2	17+13	3.5	Possible	Fair	Medium	Remove	Bark crack at base; secondary stem; is vigorous basal shoot.
BU	Thornless Honey Locust	*Gleditsia triacanthos var. inermis*	Non-native	1	20	3.0	Possible	Fair	Medium	Remove	Codominant leaders; branch wounds; epicormic growth.
BV	Silver Maple	*Acer saccharinum*	Native	1	19	2.5	Possible	Good	High	Retain	Significant basal wound, suspected lawnmower damage; codominant leaders; healthy crown.
BW	Norway Maple	*Acer platanoides*	Non-native	2	18	2.0	Possible	Fair	Medium	Retain	Significant basal wound, suspected lawnmower damage; fairly healthy crown.
BX	Thornless Honey Locust	*Gleditsia triacanthos var. inermis*	Non-native	2	14+12	3.5	Possible	Fair	Medium	Retain	Significant basal wound, suspected lawnmower damage; codominant stems.
BY	Norway Maple	*Acer platanoides*	Non-native	1	20	1.5	Improbable	Fair	Medium	Retain	Upright form; dense branching; tight branch attacments.
BZ	European Ash	*Fraxinus excelsior*	Non-native	1	14	1.5	Possible	Dead	Dead	Retain	Shedding bark; insect galleries.
C	Manitoba Maple	*Acer negundo*	Native	2	20+17	3.5	Improbable	Good	High	Retain	Decent form; well into quarry property.
CA	Norway Maple	*Acer platanoides*	Non-native	2	17+14	2.0	Possible	Fair	Medium	Retain	Codominant stems, 1 with significant lower wounds; woundwood response; dense branching.
CB	Thornless Honey Locust	*Gleditsia triacanthos var. inermis*	Non-native	1	18	3.0	Improbable	Good	High	Retain	Basal wound, suspected lawnmower damage; good form.
CC	Norway Maple	*Acer platanoides*	Non-native	2	16+14	2.5	Possible	Fair	Medium	Retain	Basal wound; basal shoots; digging beside tree; dense crown, mostly healthy.
CD	American Basswood	*Tilia americana*	Native	7	16+15+14	3.5	Improbable	Good	High	Retain	Codominant stems from base; several tight branch attachments; crossing branches; full, healthy crown.
CE	Norway Maple	*Acer platanoides*	Non-native	1	24	3.0	Improbable	Good	High	Retain	Squat, broad crown; vigorous lateral branches.
CF	Norway Maple	*Acer platanoides*	Non-native	1	26	2.5	Possible	Fair	Medium	Retain	Canker in stem; epicormic growth; dense branching.
CG	White Spruce	*Picea glauca*	Native	1	18	2.0	Improbable	Good	High	Retain	Backyard tree; natural branch dieback.
CH	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Good	High	Retain	Backyard tree; branches extend beyond fence; natural branch dieback.

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CI	White Spruce	*Picea glauca*	Native	1	14	1.5	Improbable	Good	High	Retain	Backyard tree.
CJ	White Spruce	*Picea glauca*	Native	1	20	1.5	Improbable	Good	High	Remove	Backyard tree; grape vine intertwined with crown; some branching over fence line.
CK	Black Walnut	*Juglans nigra*	Native	1	12	2.5	Improbable	Good	High	Retain	Outside ROW; minor vine in crown; considerable mast.
CL	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Fair	Medium	Retain	Asymmetrical crown due to adjacent Spruce; minor lean.
CM	Sugar Maple	*Acer saccharum*	Native	1	36	4.0	Improbable	Fair	Medium	Retain	Small callous wound in lower branch; some included bark; evidence of pruning cuts completed poorly.
CN	Blue Spruce	*Picea pungens*	Non-native	1	27	3.0	Improbable	Good	High	Retain	Vigorous growth; asymmetrical crown due to adjacent trees.
CO	Silver Maple	*Acer saccharinum*	Native	8	30, 25, 25	5.0	Possible	Fair	Medium	Retain	shift point 3m south; measured 3 biggest dbh
CP	Silver Maple	*Acer saccharinum*	Native	6	30, 25, 25	5.0	Probable	Poor	Low	Remove	shift point 2m south; measured 3 biggest dbh
CQ	White Spruce	*Picea glauca*	Native	1	13	2.5	Improbable	Good	High	Retain	
CR	White Spruce	*Picea glauca*	Native	1	16	3.5	Improbable	Good	High	Retain	No dieback visible; plentiful needles
CS	Blue Spruce	*Picea pungens*	Non-native	1	18	3.5	Improbable	Fair	Medium	Retain	Stem dieback; grapevine entangled throughout
CT	Blue Spruce	*Picea pungens*	Non-native	1	20	3.5	Improbable	Good	High	Retain	Good form; rapevine entangled throughout
CU	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Fair	Medium	Retain	Crown curved form;
CV	White Spruce	*Picea glauca*	Native	1	18	2.5	Improbable	Good	High	Retain	Good straight form; no visible dieback
CW	White Spruce	*Picea glauca*	Native	1	15	2.0	Improbable	Good	High	Retain	Good straight form; no visible dieback
CX	White Spruce	*Picea glauca*	Native	1	19	2.5	Improbable	Good	High	Retain	Good straight form; no visible dieback
CY	White Spruce	*Picea glauca*	Native	1	22	2.8	Improbable	Good	High	Retain	Good straight form, balanced crown; no visible dieback
CZ	Blue Spruce	*Picea pungens*	Non-native	1	20	1.5	Improbable	Fair	Medium	Remove	Tree on a northeast lean; balanced crown; no visible dieback
D	Freeman's Maple	*Acer x freemanii*	Native	4	18+16+16	3.0	Improbable	Good	High	Retain	Multiple stems; good form; healthy crown.
DA	Blue Spruce	*Picea pungens*	Non-native	1	23	2.5	Improbable	Good	High	Retain	Good form; balanced crown; no visible dieback
DB	Blue Spruce	*Picea pungens*	Non-native	1	21	2.5	Improbable	Good	High	Retain	Good form; balanced crown; no visible dieback
DC	White Spruce	*Picea glauca*	Native	1	16	2.0	Improbable	Good	High	Retain	Good form; balanced crown; no visible dieback
DD	Blue Spruce	*Picea pungens*	Non-native	1	16	1.5	Improbable	Good	High	Retain	Good form; balanced crown; no visible dieback
DE	Norway Maple	*Acer platanoides*	Non-native	1	12	1.5	Improbable	Fair	Medium	Retain	Good form; minor crownnbranch dieback; leaves wilting; balanced crown; no visible dieback
DF	Blue Spruce	*Picea pungens*	Non-native	1	22	2.0	Improbable	Good	High	Retain	Good form; balanced crown; no visible dieback
DG	Blue Spruce	*Picea pungens*	Non-native	1	24	3.0	Improbable	Fair	Medium	Retain	branch rub and light prunimg lower branches from adjacent tree
DH	Blue Spruce	*Picea pungens*	Non-native	1	23	2.5	Improbable	Fair	Medium	Retain	Lower branch dieback bdue to understory shrubs; branch rub and light prunimg lower branches from adjacent tree
DI	Blue Spruce	*Picea pungens*	Non-native	1	21	2.0	Improbable	Good	High	Retain	Good form, balanced crown
DJ	Blue Spruce	*Picea pungens*	Non-native	1	22	2.5	Improbable	Good	High	Retain	Good form, balanced crown; understory shrub encroachment
DK	Blue Spruce	*Picea pungens*	Non-native	1	24	3.0	Improbable	Good	High	Retain	Good form, balanced crown; understory shrub encroachment
DL	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Good	High	Retain	Good form, grapevine entangled throughout; balanced crown; understory shrub encroachment
DM	Blue Spruce	*Picea pungens*	Non-native	1	20	2.0	Improbable	Good	High	Retain	Good form; minor dieback due to adjacent tree encroachment; balanced crown; understory shrub encroachment
DN	Blue Spruce	*Picea pungens*	Non-native	1	25	2.5	Improbable	Good	High	Retain	Good form; balanced crown
DO	Blue Spruce	*Picea pungens*	Non-native	1	23	2.5	Improbable	Good	High	Retain	Good form; balanced crown
DP	Thornless Honey Locust	*Gleditsia triacanthos var. inermis*	Non-native	1	14	3.0	Possible	Fair	Medium	Remove	Epicormic growth; main stem curved with callous wound and closed wound
DQ	Eastern Cottonwood	*Populus deltoides*	Native	1	30	5.5	Improbable	Good	High	Retain	Multiple leaders; some evidence of branch failure; some poor branch attatchment.
DR	Silver Maple	*Acer saccharinum*	Native	3	25, 27, 30	5.5	Improbable	Good	High	Retain	Basal shoots; epicormic growth; some poor branch attatchment; evidence of branch failure.

Bleams Road Class C EA - Environmental Impact Study
Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
DS	Eastern Cottonwood	*Populus deltoides*	Native	1	37	6.0	Improbable	Good	High	Retain	Double leader; poor branch attatchment; grown over wounds.
DT	Sugar Maple	*Acer saccharum*	Native	1	19	4.0	Improbable	Fair	Medium	Retain	Numerous basal shoots; epicormic growth; large healing wound near base; good crown structure.
DU	Sugar Maple	*Acer saccharum*	Native	2	27, 25	4.0	Improbable	Fair	Medium	Retain	Multiple leaders; poor branch attatchment; epicormic growth.
DV	Black Locust	*Robinia pseudoacacia*	Non-native	2	30, 35	6.0	Possible	Fair	Medium	Retain	Multiple leaders; signs of branch failure; multiple dead branches.
DW	Black Pine	*Pinus nigra*	Non-native	1	35	4.5	Improbable	Good	High	Retain	Good crown structure; minor self pruning.
DX	Norway Maple	*Acer platanoides*	Non-native	1	48	11.5	Probable	Fair	Medium	Retain	Numerous large branch failures; multiple dead branches; multiple leaders; peeling bark on some large branches; poor crown structure.
DY	Norway Spruce	*Picea abies*	Non-native	1	56	6.5	Improbable	Good	High	Remove	Good crown structure ; minor defoliation.
DZ	Norway Maple	*Acer platanoides*	Non-native	1	40	5.0	Improbable	Good	High	Remove	Numerous leaders; few dead branches; some poor branch attatchment.
E	White Spruce	*Picea glauca*	Native	1	12	1.5	Possible	Poor	Low	Retain	50% of tree has yellowing needles and dieback, including leader.
EA	White Spruce	*Picea glauca*	Native	1	46	5.0	Improbable	Good	High	Retain	Good crown structure; minor defoliation.
EB	Eastern White Cedar	*Thuja occidentalis*	Native	3	12, 14, 15	1.0	Improbable	Good	High	Remove	Good crown structure; some self pruning.
EC	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.0	Improbable	Good	High	Remove	Good crown structure; some self pruning.
ED	Eastern White Cedar	*Thuja occidentalis*	Native	4	10, >10, >10, >10	1.0	Improbable	Good	High	Remove	Good crown structure; some self pruning.
EE	Norway Maple	*Acer platanoides*	Non-native	1	15	1.5	Improbable	Good	High	Retain	Tar spot; relatively balanced crown; private tre behind concrete fence
EF	Blue Spruce	*Picea pungens*	Non-native	1	34	3.0	Improbable	Good	High	Retain	Full, relatively vigorous tree; crown at fenceline
EG	White Spruce	*Picea glauca*	Native	1	15	3.0	Improbable	Good	High	Retain	Heavy cone production; full crown; on private property behind wood fence; crown overlapping fence by 1m
EH	White Spruce	*Picea glauca*	Native	1	14	2.5	Improbable	Good	High	Retain	Relatively vigorous tree; riverbank grape in lower branches; behind wood fence with tip of crown overhanging
EI	White Spruce	*Picea glauca*	Native	1	14	1.5	Improbable	Good	High	Retain	Minor light pruning dieback; crown otherwise full; behind fence with tip of crown overhanging
EJ	Sugar Maple	*Acer saccharum*	Native	1	35	5.0	Improbable	Fair	Medium	Retain	Some crown dieback; evidence of decay in scaffold branch; epicormic growth; crown extends to telephone wires
EK	Sugar Maple	*Acer saccharum*	Native	1	33	6.0	Improbable	Fair	Medium	Retain	Decay in scaffold branch; epicormic growth; some crown dieback
EL	Sugar Maple	*Acer saccharum*	Native	1	36	6.5	Possible	Fair	Medium	Retain	Decay in old prune cuts; staining; included bark; minor crown dieback
EM	Sugar Maple	*Acer saccharum*	Native	1	29	4.5	Possible	Poor	Low	Retain	Small darkface scar wuth decay in large lower branch; open wound with decay from previous branch failure; multiple areas of included bark.
EN	Freeman's Maple	*Acer x freemanii*	Native	3	10 + 10	1.5	Improbable	Good	High	Retain	Minor dieback.
EO	Freeman's Maple	*Acer x freemanii*	Native	5	15 + 15	1.5	Improbable	Fair	Medium	Retain	Some small broken branches.
EP	Freeman's Maple	*Acer x freemanii*	Native	2	25	4.0	Improbable	Fair	Medium	Retain	Codominant leaders with included bark; assymetrical growth east; minor dieback.
F	Russian Olive	*Elaeagnus angustifolia*	Non-native	1	20	3.5	Possible	Fair	Medium	Retain	Significant branch failure; water sprouts; abutting fence.
G	White Spruce	*Picea glauca*	Native	1	13	2.0	Improbable	Fair	Medium	Retain	Good form; self-pruning.
H	Blue Spruce	*Picea pungens*	Non-native	1	15	2.0	Improbable	Good	High	Retain	Stem and root zone not visible behind fence.
I	Willow species	*Salix sp,*	Native	1	16	2.5	Improbable	Good	High	Retain	Heavy seed set; vine up to mid-crown.
J	White Spruce	*Picea glauca*	Native	1	14	2.0	Improbable	Good	High	Retain	Slightly crooked, once lost leader; vigorous; heavy seed set.
K	English Oak	*Quercus robur*	Non-native	1	10	1.0	Improbable	Fair	Medium	Retain	Bare mid-crown; irregular shape.
L	Black Walnut	*Juglans nigra*	Native	1	41	4.0	Improbable	Good	High	Retain	Good structure and form; interior thinning.
M	Blue Spruce	*Picea pungens*	Non-native	1	39	3.0	Improbable	Good	High	Retain	

Bleams Road Class C EA - Environmental Impact Study
Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Comments
N	Blue Spruce	*Picea pungens*	Non-native	1	35	3.0	Improbable	Good	High	Retain	Exuding sap in lower stem.
O	Blue Spruce	*Picea pungens*	Non-native	1	14	2.0	Improbable	Fair	Medium	Retain	Suppressed, slightly crooked.
P	Sugar Maple	*Acer saccharum*	Native	1	36	4.0	Improbable	Good	High	Retain	Good form; decent structure with a few tight branch unions; 2 branches with significant wounds; minor epicormic growth.
Q	Blue Spruce	*Picea pungens*	Non-native	1	35	3.0	Improbable	Good	High	Retain	
R	Blue Spruce	*Picea pungens*	Non-native	1	30	2.5	Improbable	Good	High	Retain	
S	Blue Spruce	*Picea pungens*	Non-native	1	34	3.0	Improbable	Good	High	Retain	Minor dieback.
T	Sugar Maple	*Acer saccharum*	Native	1	24	3.0	Improbable	Fair	Medium	Retain	Basal wound partially closed; low vigour.
U	Little-leaf Linden	*Tilia cordata*	Non-native	1	22	3.0	Possible	Poor	Low	Retain	Basal wound shows some decay; dense crown with included bark; stunted growth.
V	Silver Maple	*Acer saccharinum*	Native	5	35+25+27	6.0	Improbable	Good	High	Retain	1 scaffold branch with wounds and broken leader; minor epicormic growth; included bark.
W	Silver Maple	*Acer saccharinum*	Native	2	25+22	5.0	Improbable	Fair	Medium	Retain	Codominant stems; 1 dead scaffold branch; good form; minor epicormic growth.
X	White Spruce	*Picea glauca*	Native	1	13	2.0	Improbable	Good	High	Retain	Good form; heavy seed set.
Y	White Spruce	*Picea glauca*	Native	1	18	2.5	Improbable	Good	High	Retain	Good form; heavy seed set; dripline over fence.
Z	Blue Spruce	*Picea pungens*	Non-native	1	20	2.5	Improbable	Excellent	High	Retain	Good form .

Section 1

TRUSSLER RD

BLEAMS RD

808 TRUSSLER ROAD

2135 BLEAMS ROAD
KITCHENER GREEN DEVELOPMENT

Section 2

BLEAMS-RD

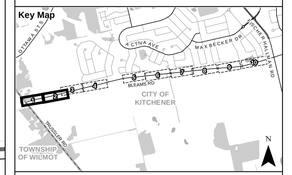
125 - STREET SOUTH
REGION OF WATERLOO
MANNHEIM WATER TREATMENT PLANT

Map 1 - Section 1 and 2

Bleams Road
Detailed Design

Tree Preservation Plan

Key Map



Legend

- Project Limit
- Site Plan
- Existing Parcel Boundary
- Existing Conditions
- Existing Embankment
- Existing Fence
- Existing Servicing
- Inventoried Tree to be Removed (Crown to Scale)
- Inventoried Tree to be Retained (Crown to Scale)

Priority

- High
- Medium
- Low
- Dead

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Project: 2455
Date: February 22, 2023

NAD83 - UTM Zone 17
Size: 24x36"
1:350

0 4 8 12 16 20 Metres

N

Section 3

BLEAMS RD

2150 BLEAMS ROAD
ROMANIAN ORTHODOX CHURCH
ST. JOHN THE BAPTIZER &
ROMANIAN CULTURAL CENTRE

87 ELIZA AVENUE

Section 4

NYLES DR

BLEAMS RD

79, 77, 75, 73 ELIZA AVENUE

71, 69, 67, 65 ELIZA AVENUE

8, 6, 4, 2 NYLES DRIVE

9, 7, 5, 3 NYLES DRIVE

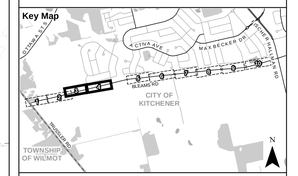
2091 BLEAMS ROAD

Map 1 - Section 3 and 4

Bleams Road Detailed Design

Tree Preservation Plan

Key Map



Legend

- Project Limit
- Site Plan
- Existing Parcel Boundary
- Existing Conditions
- Existing Embankment
- Existing Fence
- Existing Servicing
- Inventoried Tree to be Removed (Crown to Scale)
- Inventoried Tree to be Retained (Crown to Scale)

Priority

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- Low
- Dead

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Project: 2455 Date: February 22, 2023	NAD83 - UTM Zone 17 Size: 24x36" 1:350

0 4 8 12 16 20 Metres

N

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Section 5

BLEAMS RD

Section 6

RED CLOVER CRT

BLEAMS RD

1200mmø Steel Casing
750mmø Watermain

Ex. WV
(not surveyed)

1801 BLEAMS ROAD

GEHL PL

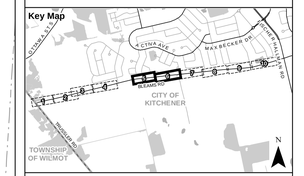
Ex. WV
(not surveyed)

Map 1 - Section 5 and 6

Bleams Road
Detailed Design

Tree Preservation Plan

Key Map



Legend

- Project Limit
- Site Plan
- Existing Parcel Boundary
- Existing Conditions
- Existing Embankment
- Existing Fence
- Existing Servicing
- Inventoried Tree to be Removed (Crown to Scale)
- Inventoried Tree to be Retained (Crown to Scale)

Priority

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- Medium
- Low
- Dead

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Project: 2455 Date: February 22, 2023	NAD83 - UTM Zone 17 Size: 24x36" **1:350**

0 4 8 12 16 20 Metres

N

Section 7

BLEAMS RD

LOT 140 - BLEAMS ROAD

Section 8

DONNENWERTH DR

BLEAMS RD

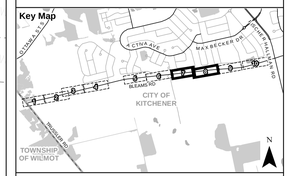
1643 BLEAMS ROAD

Map 1 - Section 7 and 8

Bleams Road
Detailed Design

Tree Preservation Plan

Key Map



Legend

- Project Limit
- Site Plan
- Existing Parcel Boundary
- Existing Conditions
- Existing Embankment
- Existing Fence
- Existing Servicing
- Inventoried Tree to be Removed (Crown to Scale)
- Inventoried Tree to be Retained (Crown to Scale)

Priority

- High
- Medium
- Low
- Dead

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Project: 2455 Date: February 22, 2023	NAD83 - UTM Zone 17 Size: 24x36" **1:350**

0 4 8 12 16 20 Metres

N

Section 9

Section 10

BLEAMS RD

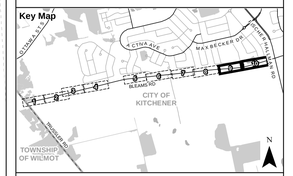
HELENA FEASBY ST

Map 1 - Section 9 to 10

Bleams Road
Detailed Design

Tree Preservation Plan

Key Map



Legend

- Project Limit
- Site Plan
- Existing Parcel Boundary
- Existing Conditions
- Existing Embankment
- Existing Fence
- Existing Servicing
- Inventoried Tree to be Removed (Crown to Scale)
- Inventoried Tree to be Retained (Crown to Scale)

Priority

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- Medium
- Low
- Dead

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Aquatic, Terrestrial and Wetland Biologists

Project: 2455 Date: February 22, 2023	NAD83 - UTM Zone 17 Size: 24x36" 1:350

0 4 8 12 16 20 Metres

N

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APPENDIX III Wildlife known to occur in the Study area

Bird Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	OBBA*	NHIC Data**
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Martin 1996	Cadman et al. 2007	MNRF 2020b
Anatidae	**Ducks, Geese & Swans**								
Aix sponsa	Wood Duck	S5					√*	CO	
Anas platyrhynchos	Mallard	S5						CO	
Anas rubripes	American Black Duck	S4					√	CO	
Branta canadensis	Canada Goose	S5						CO	
Lophodytes cucullatus	Hooded Merganser	S5B,S5N					√	PR	
Mergus merganser	Common Merganser	S5B,S5N					√	PR	
Spatula discors	Blue-winged Teal	S4						PR	
Odontophoridae	**New World Quails**								
Colinus virginianus	Northern Bobwhite	S1	END	E	E	Schedule 1	√	PO	
Phasianidae	**Partridges, Grouse & Turkeys**								
Bonasa umbellus	Ruffed Grouse	S4						PO	
Meleagris gallopavo	Wild Turkey	S5						CO	
Podicipediformes	**Grebes**								
Podilymbus podiceps	Pied-billed Grebe	S4B,S4N					√	PR	
Columbidae	**Pigeons & Doves**								
Columba livia	Rock Pigeon	SNA						CO	
Zenaida macroura	Mourning Dove	S5						CO	
Cuculiformes	**Cuckoos & Anis**								
Coccyzus americanus	Yellow-billed Cuckoo	S4B					√	PO	
Coccyzus erythropthalmus	Black-billed Cuckoo	S5B					√	PO	
Caprimulgidae	**Goatsuckers**								
Chordeiles minor	Common Nighthawk	S4B	SC	SC	T	Schedule 1	√*	PR	
Apodidae	**Swifts**								
Chaetura pelagica	Chimney Swift	S4B,S4N	THR	T	T	Schedule 1		PR	
Trochilidae	**Hummingbirds**								
Archilochus colubris	Ruby-throated Hummingbird	S5B					√	PR	
Rallidae	**Rails, Gallinules & Coots**								
Gallinula galeata	Common Gallinule	S4B					√	PR	
Porzana carolina	Sora	S4B					√	PR	
Rallus limicola	Virginia Rail	S5B					√	PR	
Charadriidae	**Plovers & Lapwings**								
Charadrius vociferus	Killdeer	S5B,S5N						CO	
Scolopacidae	**Sandpipers & Allies**								
Actitis macularia	Spotted Sandpiper	S5						CO	
Gallinago delicata	Wilson's Snipe	S5B					√	PO	
Scolopax minor	American Woodcock	S4B						CO	
Ardeidae	**Herons & Bitterns**								

Ardea herodias	Great Blue Heron	S4					√	CO	
Butorides virescens	Green Heron	S4B					√	PR	
Cathartidae	**Vultures**								
Cathartes aura	Turkey Vulture	S5B					√	CO	
Accipitridae	**Hawks, Kites, Eagles & Allies**								
Accipiter cooperii	Cooper's Hawk	S4	NAR	NAR	NS	No schedule	√	CO	
Accipiter striatus	Sharp-shinned Hawk	S5	NAR	NAR	NS	No schedule	√	CO	
Buteo jamaicensis	Red-tailed Hawk	S5	NAR	NAR	NS	No schedule		CO	
Circus hudsonius	Northern Harrier	S4B	NAR	NAR	NS	No schedule	√	PO	
Strigidae	**Typical Owls**								
Asio otus	Long-eared Owl	S4					√	PR	
Bubo virginianus	Great Horned Owl	S4						CO	
Megascops asio	Eastern Screech-Owl	S4	NAR	NAR	NS	No schedule		PR	
Alcedinidae	**Kingfishers**								
Megaceryle alcyon	Belted Kingfisher	S4B					√	PR	
Picidae	**Woodpeckers**								
Colaptes auratus	Northern Flicker	S4B						CO	
Dryobates pubescens	Downy Woodpecker	S5						CO	
Dryobates villosus	Hairy Woodpecker	S5						CO	
Dryocopus pileatus	Pileated Woodpecker	S5					√	PR	
Melanerpes carolinus	Red-bellied Woodpecker	S4					√	CO	
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	SC	E	T	Schedule 1	√	CO	
Sphyrapicus varius	Yellow-bellied Sapsucker	S5B					√	PO	
Falconidae	**Caracaras & Falcons**								
Falco sparverius	American Kestrel	S4						CO	
Tyrannidae	**Tyrant Flycatchers**								
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC	SC	Schedule 1		CO	X
Empidonax alnorum	Alder Flycatcher	S5B					√	PO	
Empidonax minimus	Least Flycatcher	S4B					√	PR	
Empidonax traillii	Willow Flycatcher	S5B						CO	
Myiarchus crinitus	Great Crested Flycatcher	S4B						CO	
Sayornis phoebe	Eastern Phoebe	S5B						PR	
Tyrannus tyrannus	Eastern Kingbird	S4B						CO	
Vireonidae	**Vireos**								
Vireo flavifrons	Yellow-throated Vireo	S4B					√	PO	
Vireo gilvus	Warbling Vireo	S5B						CO	
Vireo olivaceus	Red-eyed Vireo	S5B						PR	
Vireo solitarius	Blue-headed Vireo	S5B						PO	
Corvidae	**Crows & Jays**								
Corvus brachyrhynchos	American Crow	S5B						CO	
Cyanocitta cristata	Blue Jay	S5						CO	
Alaudidae	**Larks**								
Eremophila alpestris	Horned Lark	S5B						CO	
Hirundinidae	**Swallows**								
Hirundo rustica	Barn Swallow	S5B	THR	T	T	Schedule 1		CO	X
Petrochelidon pyrrhonota	Cliff Swallow	S4B					√*	CO	
Riparia riparia	Bank Swallow	S4B	THR	T	T	Schedule 1		CO	

Stelgidopteryx serripennis	Northern Rough-winged Swallow	S4B						CO	
Tachycineta bicolor	Tree Swallow	S4B						CO	
Paridae	**Chickadees & Titmice**								
Baeolophus bicolor	Tufted Titmouse	S4					√	PR	
Poecile atricapillus	Black-capped Chickadee	S5						CO	
Sittidae	**Nuthatches**								
Sitta canadensis	Red-breasted Nuthatch	S5					√	PR	
Sitta carolinensis	White-breasted Nuthatch	S5						CO	
Certhiidae	**Creepers**								
Certhia americana	Brown Creeper	S5B					√	PR	
Troglodytidae	**Wrens**								
Thryothorus ludovicianus	Carolina Wren	S4					√	PR	
Troglodytes aedon	House Wren	S5B						CO	
Troglodytes hiemalis	Winter Wren	S5B					√	PO	
Polioptilidae	**Gnatcatchers**								
Polioptila caerulea	Blue-gray Gnatcatcher	S4B					√	PR	
Regulidae	**Kinglets**								
Regulus satrapa	Golden-crowned Kinglet	S5B					√	CO	
Turdidae	**Thrushes**								
Catharus fuscescens	Veery	S4B					√	PO	
Hylocichla mustelina	Wood Thrush	S4B	SC	T	T	Schedule 1		CO	
Sialia sialis	Eastern Bluebird	S5B	NAR	NAR	NS	No schedule	√	CO	
Turdus migratorius	American Robin	S5B						CO	
Mimidae	**Mockingbirds, Thrashers & Allies**								
Dumetella carolinensis	Gray Catbird	S4B						CO	
Toxostoma rufum	Brown Thrasher	S4B					√	CO	
Sturnidae	**Starlings**								
Sturnus vulgaris	European Starling	SNA						CO	
Bombycillidae	**Waxwings**								
Bombycilla cedrorum	Cedar Waxwing	S5B						PR	
Passeridae	**Old World Sparrows**								
Passer domesticus	House Sparrow	SNA						CO	
Fringillidae	**Finches & Allies**								
Haemorhous mexicanus	House Finch	SNA						CO	
Haemorhous purpureus	Purple Finch	S4B					√	PO	
Spinus pinus	Pine Siskin	S4B					√	PR	
Spinus tristis	American Goldfinch	S5B						CO	
Emberizidae	**New World Sparrows & Allies**								
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	SC	Schedule 1	√	PR	
Melospiza georgiana	Swamp Sparrow	S5B						PR	
Melospiza melodia	Song Sparrow	S5B						CO	
Passerculus sandwichensis	Savannah Sparrow	S4B						CO	
Pipilo erythrophthalmus	Eastern Towhee	S4B						PO	
Pooecetes gramineus	Vesper Sparrow	S4B					√	PR	
Spizella pallida	Clay-colored Sparrow	S4B					√	PR	
Spizella passerina	Chipping Sparrow	S5B						CO	
Spizella pusilla	Field Sparrow	S4B						CO	

Zonotrichia albicollis	White-throated Sparrow	S5B					√	PR	
Icteridae	**Troupials & Allies**								
Agelaius phoeniceus	Red-winged Blackbird	S4						CO	
Dolichonyx oryzivorus	Bobolink	S4B	THR	T	T	Schedule 1		CO	X
Icterus galbula	Baltimore Oriole	S4B						CO	
Molothrus ater	Brown-headed Cowbird	S4B						CO	
Quiscalus quiscula	Common Grackle	S5B						CO	
Sturnella magna	Eastern Meadowlark	S4B	THR	T	T	Schedule 1		PR	X
Parulidae	**Wood Warblers**								
Geothlypis philadelphia	Mourning Warbler	S4B					√	PR	
Geothlypis trichas	Common Yellowthroat	S5B						CO	
Mniotilta varia	Black-and-white Warbler	S5B					√	PO	
Parkesia noveboracensis	Northern Waterthrush	S5B					√	PR	
Seiurus aurocapilla	Ovenbird	S4B					√	PO	
Setophaga coronata	Yellow-rumped Warbler	S5B					√	PR	
Setophaga pensylvanica	Chestnut-sided Warbler	S5B					√	PR	
Setophaga petechia	Yellow Warbler	S5B						CO	
Setophaga pinus	Pine Warbler	S5B					√	PR	
Setophaga ruticilla	American Redstart	S5B					√	CO	
Setophaga virens	Black-throated Green Warbler	S5B					√	PR	
Vermivora cyanoptera	Blue-winged Warbler	S4B					√	PO	
Cardinalidae	**Cardinals, Grosbeaks & Allies**								
Cardinalis cardinalis	Northern Cardinal	S5						CO	
Passerina cyanea	Indigo Bunting	S4B						CO	
Pheucticus ludovicianus	Rose-breasted Grosbeak	S4B						CO	
Piranga olivacea	Scarlet Tanager	S4B					√	PO	
Total								**118**	**4**

*OBBA Atlas Squares: 17NJ30, 17NJ40

**NHIC Atlas Squares: 17NJ3604, 17NJ3605, 17NJ3703, 17NJ3706, 17NJ3806, 17NJ3904, 17NJ3906, 17NJ4004, 17NJ4005, 17NJ4006, 17NJ4104, 17NJ4105

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Reptile and Amphibian Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	ORAA*	NHIC Data**
		MNRF 2019a	MNRF 2019a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Ontario Nature 2019	MNRF 2020b
Turtles								
Chelydra serpentina	Snapping Turtle	S4	SC	SC	SC	Schedule 1	X	
Chrysemys picta marginata	Midland Painted Turtle	S4		SC	NS	No schedule	X	
Emydoidea blandingii	Blanding's Turtle (Great Lakes / St. Lawre	S3	THR	E	T	Schedule 1	X	X
Trachemys scripta	Pond Slider	SNA					X	
Snakes								
Lampropeltis triangulum	Milksnake	S4	NAR	SC	SC	Schedule 1	X	
Opheodrys vernalis	Smooth Greensnake	S4					X	
Nerodia sipedon sipedon	Northern Watersnake	S5	NAR	NAR	NS	No schedule	X	
Storeria dekayi	Dekay's Brownsnake	S5	NAR	NAR	NS	No schedule	X	
Storeria occipitomaculata	Red-bellied Snake	S5					X	
Thamnophis sauritus septentrionalis	Northern Ribbonsnake	S4	SC	SC	SC	Schedule 1	X	X
Thamnophis sirtalis sirtalis	Eastern Gartersnake	S5					X	
Salamanders								
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	E	Schedule 1	X	
Ambystoma laterale	Blue-spotted Salamander	S4					X	
Ambystoma maculatum	Spotted Salamander	S4					X	
Notophthalmus viridescens viridescens	Red-spotted Newt	S5					X	
Plethodon cinereus	Eastern Red-backed Salamander	S5					X	
Frogs and Toads								
Anaxyrus americanus	American Toad	S5					X	
Hyla versicolor	Gray Treefrog	S5					X	
Pseudacris triseriata pop. 2	Western Chorus Frog (Great Lakes / St. L	S4	NAR	T	T	Schedule 1	X	
Pseudacris crucifer	Spring Peeper	S5					X	
Lithobates catesbeianus	American Bullfrog	S4					X	
Lithobates clamitans	Green Frog	S5					X	
Lithobates palustris	Pickerel Frog	S4	NAR	NAR	NS	No schedule	X	
Lithobates pipiens	Northern Leopard Frog	S5	NAR	NAR	NS	No schedule	X	
Lithobates sylvaticus	Wood Frog	S5					X	
Total							**25**	**2**

*ORAA Atlas Squares: 17NJ30, 17NJ40

**NHIC Atlas Squares: 17NJ3604, 17NJ3605, 17NJ3703, 17NJ3706, 17NJ3806, 17NJ3904, 17NJ3906, 17NJ4004, 17NJ4005, 17NJ4006, 17NJ4104, 17NJ4105

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Mammal Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Ontario Mammal Atlas	NHIC Data**
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Dobbyn 1994	MNRF 2020b
Didelphimorphia	**Opossums**							
Didelphis virginiana	Virginia Opossum	S4					X	
Eulipotyphla	**Shrews, Moles, Hedgehogs, and Allies**							
Blarina brevicauda	Northern Short-tailed Shrew	S5					X	
Condylura cristata	Star-nosed Mole	S5					X	
Parascalops breweri	Hairy-tailed Mole	S4					X	
Sorex cinereus	Masked Shrew	S5					X	
Sorex fumeus	Smoky Shrew	S5					X	
Sorex palustris	Water Shrew	S5					X	
Chiroptera	**Bats**							
Eptesicus fuscus	Big Brown Bat	S4					X	
Lasionycteris noctivagans	Silver-haired Bat	S4					X	
Lasiurus borealis	Eastern Red Bat	S4					X	
Lasiurus cinereus	Hoary Bat	S4					X	
Myotis leibii	Eastern Small-footed Myotis	S2S3	END				X	
Myotis lucifugus	Little Brown Myotis	S3	END	E	E	Schedule 1	X	
Myotis septentrionalis	Northern Myotis	S3	END	E	E	Schedule 1	X	
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	E	Schedule 1	X	
Lagomorpha	**Rabbits and Hares**							
Lepus americanus	Snowshoe Hare	S5					X	
Lepus europaeus	European Hare	SNA					X	
Sylvilagus floridanus	Eastern Cottontail	S5					X	
Rodentia	**Rodents**							
Castor canadensis	Beaver	S5					X	
Erethizon dorsatum	Porcupine	S5					X	
Glaucomys sabrinus	Northern Flying Squirrel	S5					X	
Marmota monax	Woodchuck	S5					X	
Microtus pennsylvanicus	Meadow Vole	S5					X	
Microtus pinetorum	Woodland Vole	S3?	SC	SC	SC	Schedule 1	X	
Mus musculus	House Mouse	SNA					X	
Napaeozapus insignis	Woodland Jumping Mouse	S5					X	
Ondatra zibethicus	Muskrat	S5					X	
Peromyscus leucopus	White-footed Mouse	S5					X	
Peromyscus maniculatus	Deer Mouse	S5					X	
Rattus norvegicus	Norway Rat	SNA					X	
Sciurus carolinensis	Eastern Gray Squirrel	S5					X	
Synaptomys cooperi	Southern Bog Lemming	S4					X	
Tamias striatus	Eastern Chipmunk	S5					X	
Tamiasciurus hudsonicus	Red Squirrel	S5					X	
Zapus hudsonius	Meadow Jumping Mouse	S5					X	
Canidae	**Canines**							
Canis latrans	Coyote	S5					X	
Vulpes vulpes	Red Fox	S5					X	
Felidae	**Felines**							
Lynx rufus	Bobcat	S4					X	
Mephitidae	**Skunks and Stink Badgers**							
Mephitis mephitis	Striped Skunk	S5					X	
Mustelidae	**Weasels and Allies**							
Mustela erminea	Ermine	S5					X	
Mustela frenata	Long-tailed Weasel	S4					X	
Neovison vison	American Mink	S4					X	
Taxidea taxus jacksoni	American Badger (Southwestern Ontario	S1	END	E	E	Schedule 1	X	
Procyonidae	**Raccoons and Allies**							
Procyon lotor	Northern Raccoon	S5					X	
Ursidae	**Bears**							
Ursus americanus	American Black Bear	S5	NAR	NAR	NS	No schedule	X	
Artiodactyla	**Deer and Bison**							
Odocoileus virginianus	White-tailed Deer	S5					X	
Total							**46**	**0**

*Mammal Atlas Square Numbers: 17NJ30, 17NJ40
**NHIC Atlas Squares: 17NJ3604, 17NJ3605, 17NJ3703, 17NJ3706, 17NJ3806, 17NJ3904, 17NJ3906, 17NJ4004, 17NJ4005, 17NJ4006, 17NJ4104, 17NJ4105

Mammal Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

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Butterfly Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	City of Guelph Status	TEA Atlas*
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Linton 2012	Macnaughton et al. 2020
Hesperiidae	**Skippers**							
Anatrytone logan	Delaware Skipper	S4					X	X
Ancyloxypha numitor	Least Skipper	S5						X
Carterocephalus palaemon	Arctic Skipper	S5						X
Epargyreus clarus	Silver-spotted Skipper	S4						X
Erynnis baptisiae	Wild Indigo Duskywing	S4					X	X
Erynnis icelus	Dreamy Duskywing	S5						X
Erynnis juvenalis	Juvenal's Duskywing	S5						X
Erynnis lucilius	Columbine Duskywing	S4						X
Erynnis martialis	Mottled Duskywing	S2	END	E	NS	No schedule	X	X
Euphyes bimacula	Two-spotted Skipper	S4						X
Euphyes conspicua	Black Dash	S3					X	X
Euphyes dion	Dion Skipper	S4					X	X
Euphyes vestris	Dun Skipper	S5						X
Hylephila phyleus	Fiery Skipper	SNA						X
Pholisora catullus	Common Sootywing	S4					X	X
Poanes hobomok	Hobomok Skipper	S5						X
Poanes viator	Broad-winged Skipper	S4						X
Polites mystic	Long Dash Skipper	S5						X
Polites origenes	Crossline Skipper	S4						X
Polites peckius	Peck's Skipper	S5						X
Polites themistocles	Tawny-edged Skipper	S5						X
Pompeius verna	Little Glassywing	S4					X	X
Thymelicus lineola	European Skipper	SNA						X
Wallengrenia egeremet	Northern Broken Dash	S5						X
Papilionidae	**Swallowtails**							
Papilio cresphontes	Giant Swallowtail	S4					X	X
Papilio glaucus	Eastern Tiger Swallowtail	S5						X
Papilio polyxenes	Black Swallowtail	S5						X
Papilio troilus	Spicebush Swallowtail	S4						X
Pieridae	**Whites and Sulphurs**							
Colias eurytheme	Orange Sulphur	S5						X
Colias philodice	Clouded Sulphur	S5						X
Pieris oleracea	Mustard White	S4						X
Pieris rapae	Cabbage White	SNA						X
Lycaenidae	**Harvesters, Coppers, Hairstreaks, Blues**							
Callophrys niphon	Eastern Pine Elfin	S5						X
Celastrina lucia	Northern Spring Azure	S5						X
Celastrina neglecta	Summer Azure	S5						X
Celastrina sp.	Azure species	SNA						X
Cupido comyntas	Eastern Tailed Blue	S5						X
Feniseca tarquinius	Harvester	S4						X
Glaucopsyche lygdamus	Silvery Blue	S5						X
Lycaena hyllus	Bronze Copper	S5						X
Satyrium acadica	Acadian Hairstreak	S4						X
Satyrium calanus	Banded Hairstreak	S4						X
Satyrium caryaevorus	Hickory Hairstreak	S4					X	X
Satyrium liparops	Striped Hairstreak	S5						X
Satyrium titus	Coral Hairstreak	S5						X
Nymphalidae	**Brush-footed Butterflies**							
Aglais milberti	Milbert's Tortoiseshell	S5						X
Asterocampa clyton	Tawny Emperor	S3					X	X
Boloria bellona	Meadow Fritillary	S5						X
Boloria selene	Silver-bordered Fritillary	S5						X
Cercyonis pegala	Common Wood-Nymph	S5						X
Chlosyne nycteis	Silvery Checkerspot	S5						X
Coenonympha tullia	Common Ringlet	S5						X
Danaus plexippus	Monarch	S2N,S4B	SC	E	SC	Schedule 1	X	X
Euphydryas phaeton	Baltimore Checkerspot	S4						X
Euptoieta claudia	Variegated Fritillary							X
Junonia coenia	Common Buckeye	SNA						X
Lethe anthedon	Northern Pearly-Eye	S5						X
Lethe appalachia	Appalachian Brown	S4						X
Lethe eurydice	Eyed Brown	S5						X
Libytheana carinenta	American Snout	SNA						X
Limenitis archippus	Viceroy	S5						X
Limenitis arthemis arthemis	White Admiral	S5						X
Limenitis arthemis astyanax	Red-spotted Purple	S5						X
Megisto cymela	Little Wood-Satyr	S5						X
Nymphalis antiopa	Mourning Cloak	S5						X
Nymphalis l-album	Compton Tortoiseshell	S5						X
Phyciodes cocyta	Northern Crescent	S5						X
Phyciodes tharos	Pearl Crescent	S4						X
Polygonia comma	Eastern Comma	S5						X
Polygonia interrogationis	Question Mark	S5						X
Polygonia progne	Gray Comma	S5						X
Pontia protodice	Checkered White							X
Pyrisitia lisa	Little Yellow							X
Speyeria aphrodite	Aphrodite Fritillary	S5						X
Speyeria atlantis	Atlantis Fritillary	S5						X
Speyeria cybele	Great Spangled Fritillary	S5						X
Vanessa atalanta	Red Admiral	S5						X
Vanessa cardui	Painted Lady	S5						X
Vanessa virginiensis	American Lady	S5						X
Total								**76**

*TEA Atlas Squares: 17NJ30, 17NJ40
**NHIC Atlas Squares: 17NJ3604, 17NJ3605, 17NJ3703, 17NJ3706, 17NJ3806, 17NJ3904, 17NJ3906, 17NJ4004, 17NJ4005, 17NJ4006, 17NJ4104, 17NJ4105

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Odonate Species Reported from the Study Area - Bleams Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Odonate Atlas*	NHIC Data**
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Region of Waterloo 1985	OOAD 2020	MNRF 2020b
Lestidae	**Spreadwings**								
Lestes dryas	Emerald Spreadwing	S5					X	X	
Coenagrionidae	**Narrow-winged Damselflies**								
Amphiagrion saucium	Eastern Red Damsel	S4					X	X	
Argia apicalis	Blue-fronted Dancer	S4					X	X	
Enallagma annexum	Northern Bluet	S4					Expected	X	
Enallagma civile	Familiar Bluet	S5					X	X	
Enallagma ebrium	Marsh Bluet	S5					X	X	
Enallagma exsulans	Stream Bluet	S5					X	X	
Enallagma vesperum	Vesper Bluet	S4					Expected	X	
Ischnura verticalis	Eastern Forktail	S5					X	X	
Corduliidae	**Emeralds**								
Epitheca cynosura	Common Baskettail	S5					X	X	
Libellulidae	**Skimmers**								
Leucorrhinia intacta	Dot-tailed Whiteface	S5					X	X	
Libellula pulchella	Twelve-spotted Skimmer	S5					X	X	
Plathemis lydia	Common Whitetail	S5					X	X	
Total								**13**	**0**

**Odonate Atlas Square Numbers: 17NJ30, 17NJ40*
***NHIC Atlas Squares: 17NJ3604, 17NJ3605, 17NJ3703, 17NJ3706, 17NJ3806, 17NJ3904, 17NJ3906, 17NJ4004, 17NJ4005, 17NJ4006, 17NJ4104, 17NJ4105*

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Ministry of Natural Resources and Forestry (MNRF). 2019a. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2019-02-07. Available: https://www.ontario.ca/page/get-natural-heritage-information
Government of Canada. 2019. Species at Risk Public Registry: Species Search. Updated: 2019-12-06. Available: https://species-registry.canada.ca/index-en.html#/species?sortBy=commonNameSort&sortDirection=asc&pageSize=10
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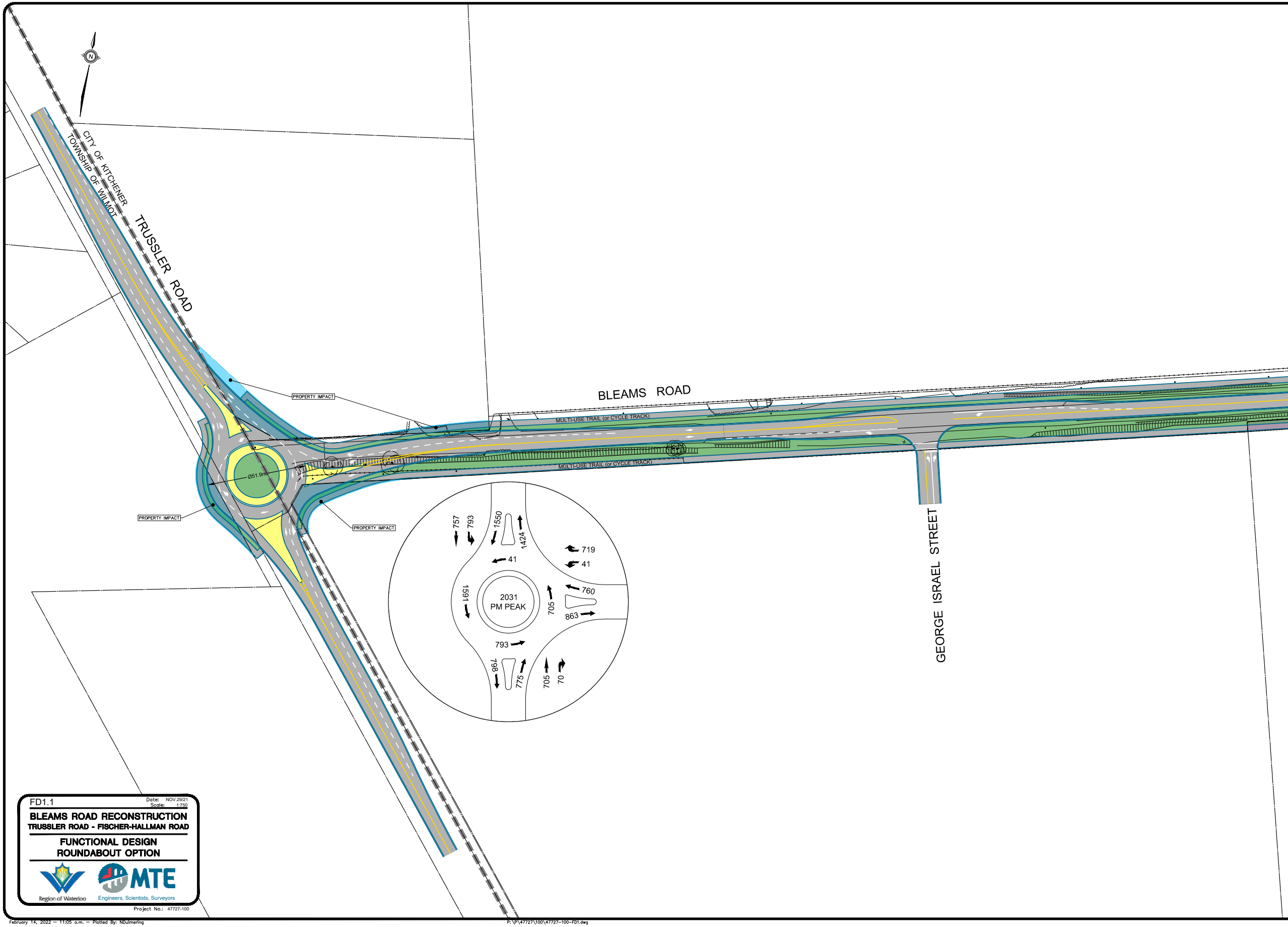
Fish Species Reported from the Study Area - Bleam Road Det Design (Project #2455)

Scientific Name	Common Name	SRANK[1]	COSEWIC[2]	COSSARO[3]	Thermal Regime[4]	Habitat Preference[4]	Background Source	Suitable Habitats Within Subject Property	Observed by NRSI
Pimephales promelas	Fathead Minnow	S5	NAR	NAR	Warmwater	Ponds, lakes, creeks and small rivers with muddy substrate.	Stantec Consulting Ltd. 2014	Within Strasburg Creek and Unnamed Pond.	12-Nov-14
Semotilus atromaculatus	Creek Chub	S5	NAR	NAR	Coolwater	pools of clear creeks and small rivers.	Stantec Consulting Ltd. 2014	Within Strasburg Creek	
Catostomus commersonii	White Sucker	S5	NAR	NAR	Coolwater	pools and riffles of creeks and rivers,	Stantec Consulting Ltd. 2014	Within Strasburg Creek	
Perca flavescens	Yellow Perch	S5	NAR	NAR	Coolwater	lakes, ponds and pools of creeks and small to large rivers with moderate aquatic vegetation.	Stantec Consulting Ltd. 2014	Within Strasburg Creek	
Salvelinus fontinalis	Brook Trout	S5	NAR	NAR	Coldwater	Cold, clear, well-oxygenated streams, rivers, ponds and lakes with maximum water temperature less than 22°C;	CH2M-Hill and North-South Environmental Inc. 2008 and Stantec Consulting Ltd. 2014)	Within Strasburg Creek	
Culaea inconstans	Brook Stickleback	S5	NAR	NAR	Coolwater	Small, boggy headwater streams, shallow lake margins.	Stantec Consulting Ltd. 2014	Within Strasburg Creek and Unnamed Pond.	
Rhinichthys obtusus	Western Blacknose Dace	S5	NAR	NAR	Coolwater	Riffles and runs of cool, small- to medium-sized streams.	Stantec Consulting Ltd. 2014	Within Strasburg Creek	

[1]OMNR 2013, [2]COSEWIC 2014, [3]OMNRF 2014, [4]Eakins 2014

APPENDIX IV Design Alternatives


N
CITY OF KITCHENER
TOWNSHIP OF WILMOT
TRUSSLER ROAD
PROPERTY IMPACT
BLEAMS ROAD
MULTI-USE TRAIL (or CYCLE TRACK)
MULTI-USE TRAIL (or CYCLE TRACK)
Ø51.9m
PROPERTY IMPACT
PROPERTY IMPACT
GEORGE ISRAEL STREET
757
793
1550
1424
719
41
41
760
863
705
1591
2031
PM PEAK
793
798
775
705
70

FD1.1

Date: NOV.29/21
Scale: 1:750

BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Region of Waterloo
MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100

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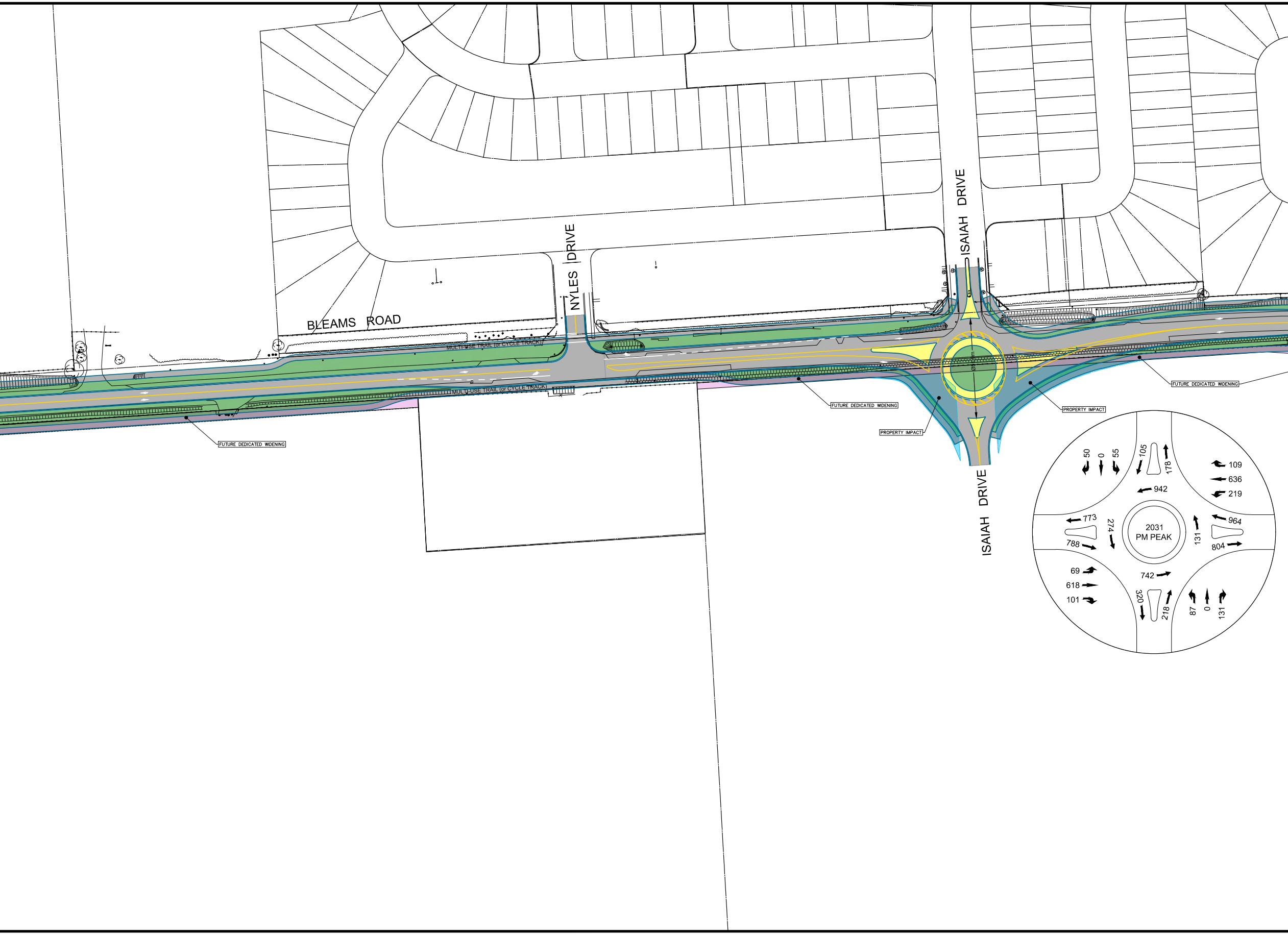
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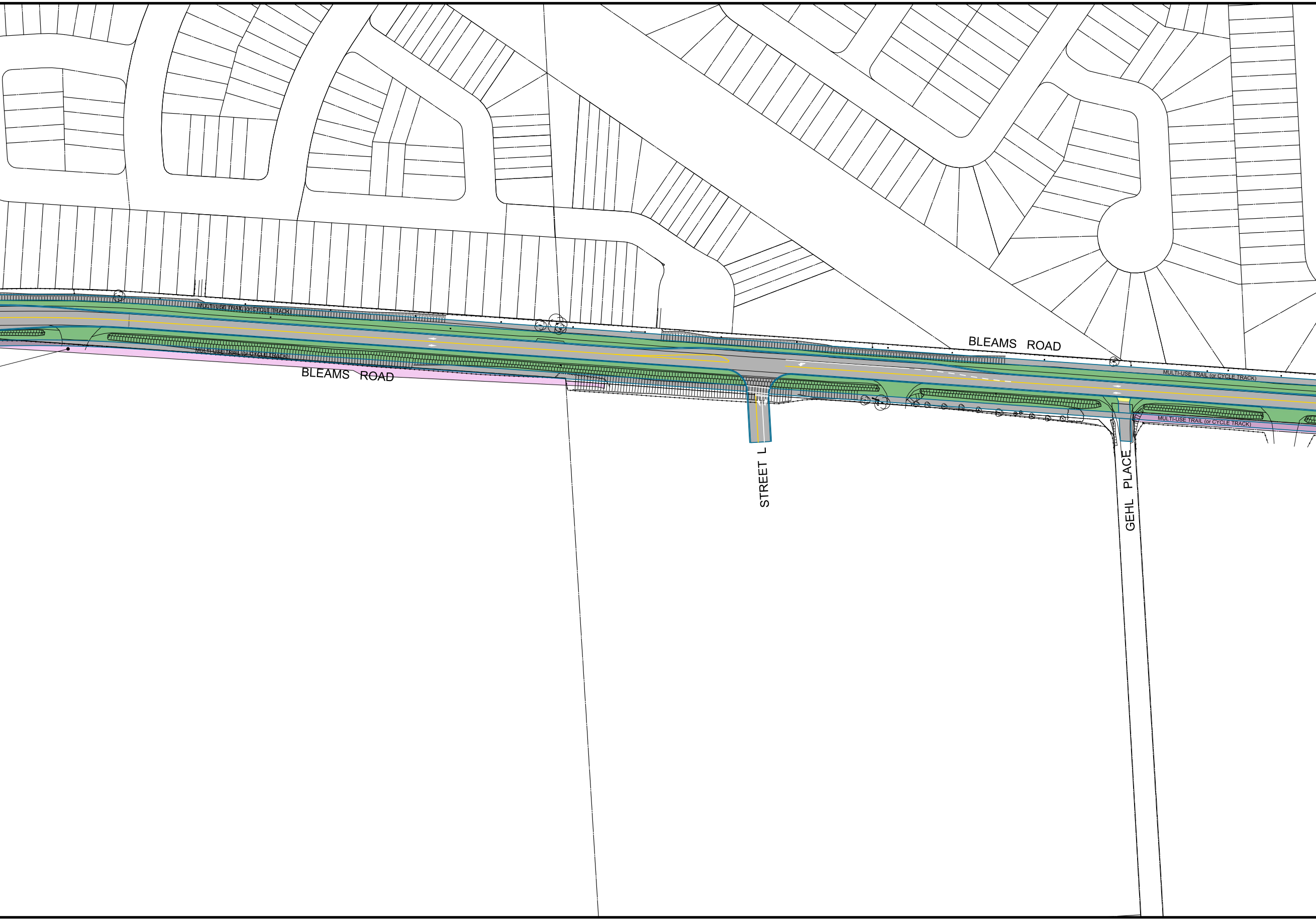
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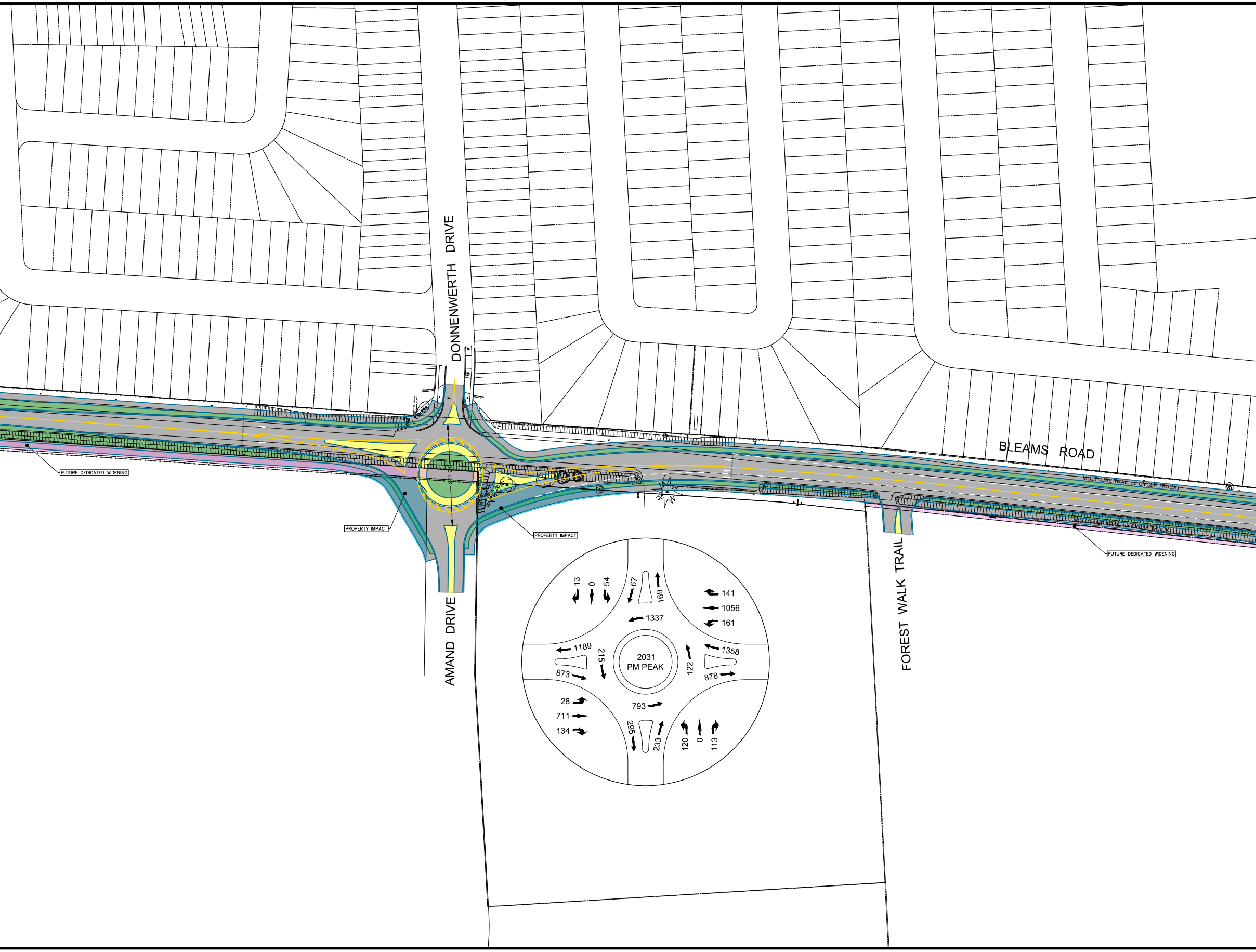
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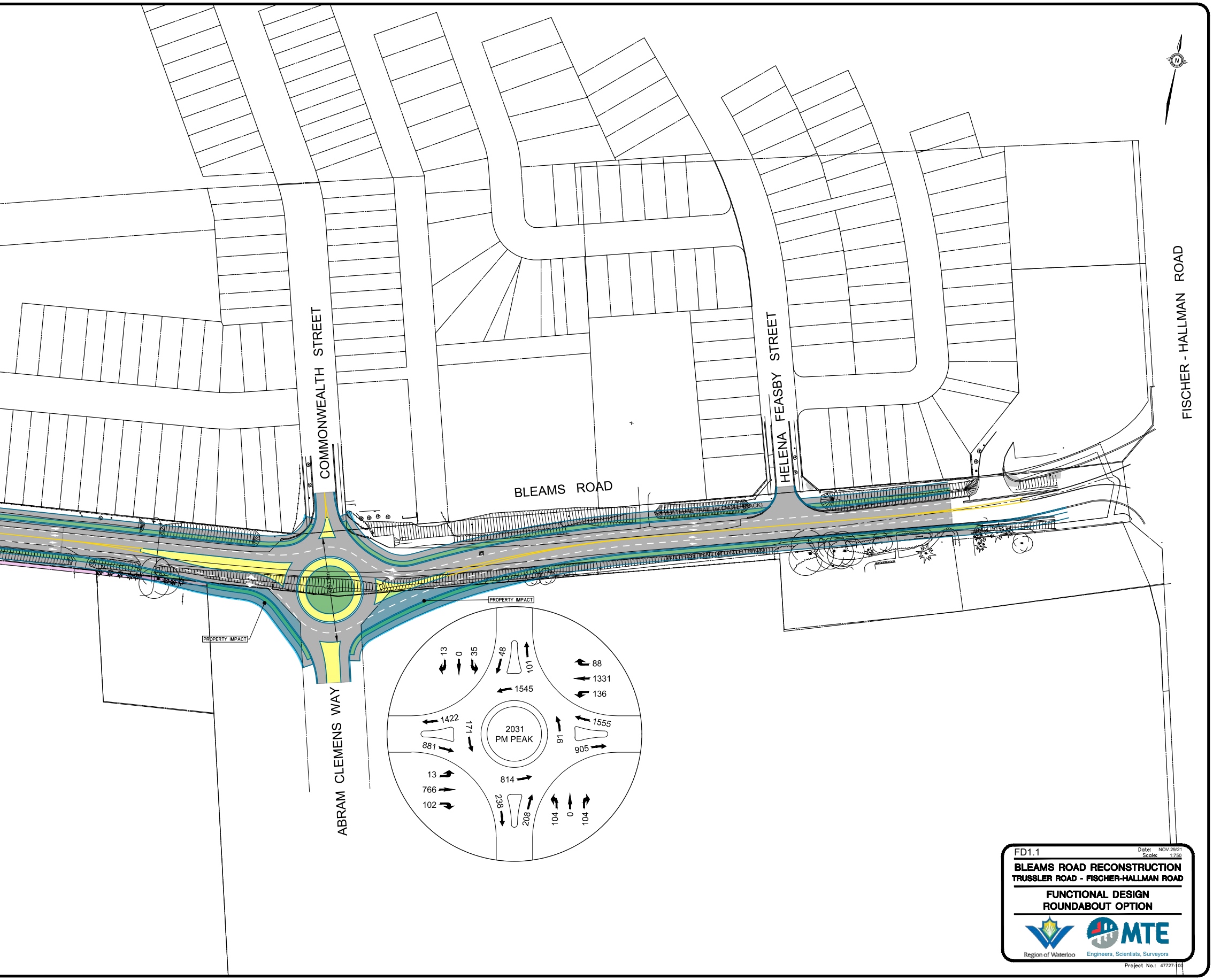
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Region of Waterloo

Engineers, Scientists, Surveyors

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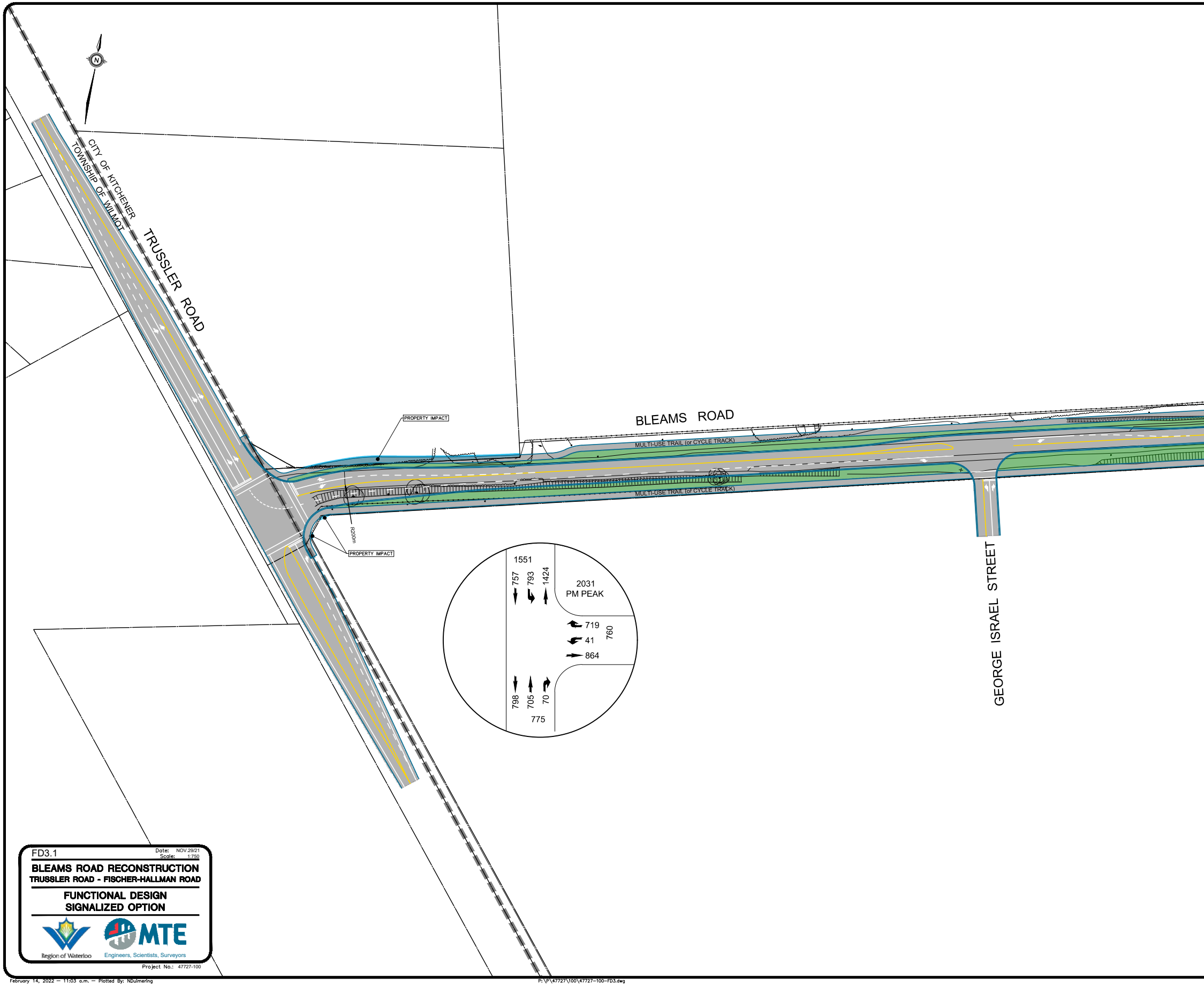
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
SIGNALIZED OPTION

Region of Waterloo
MTE
Engineers, Scientists, Surveyors

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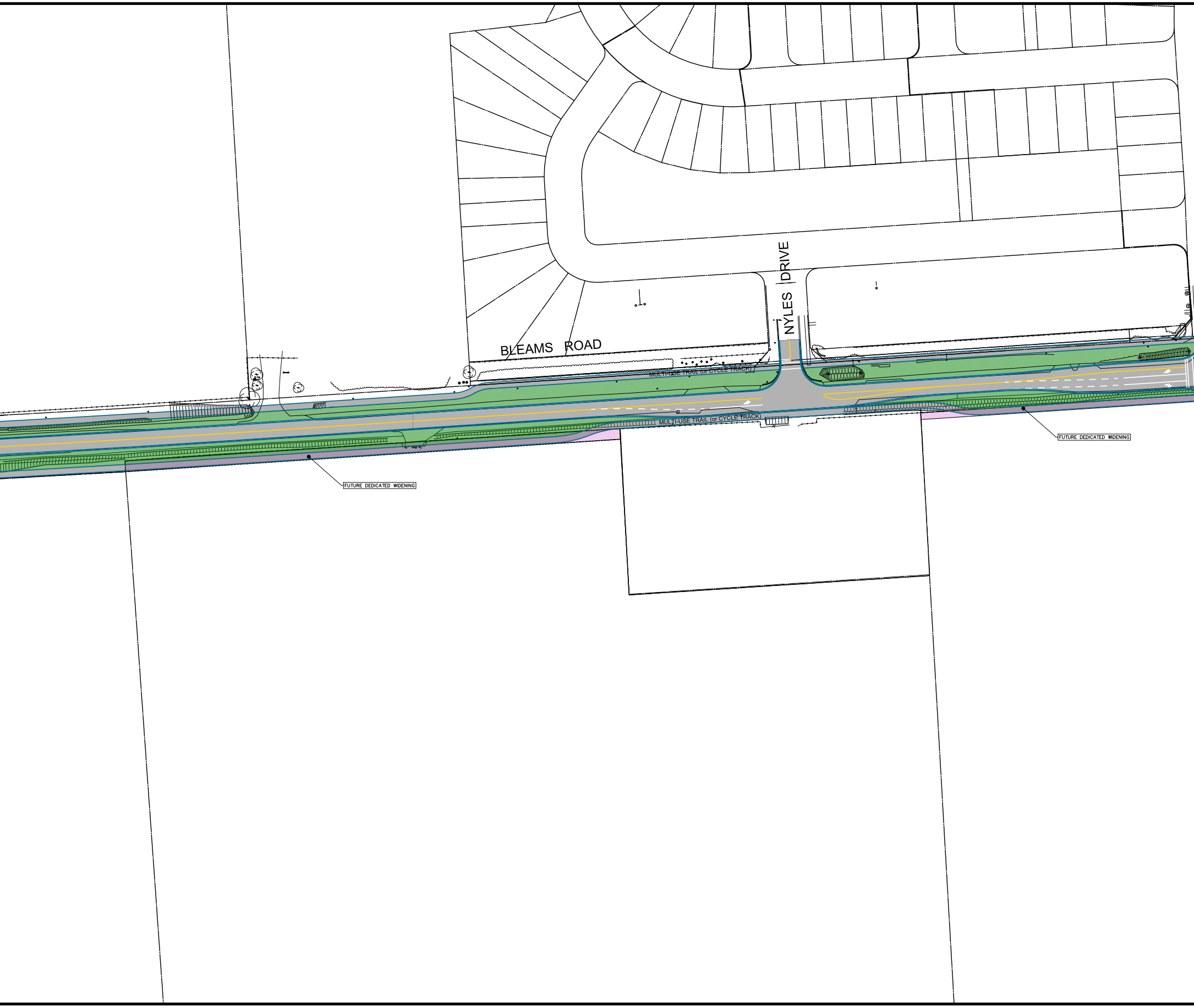
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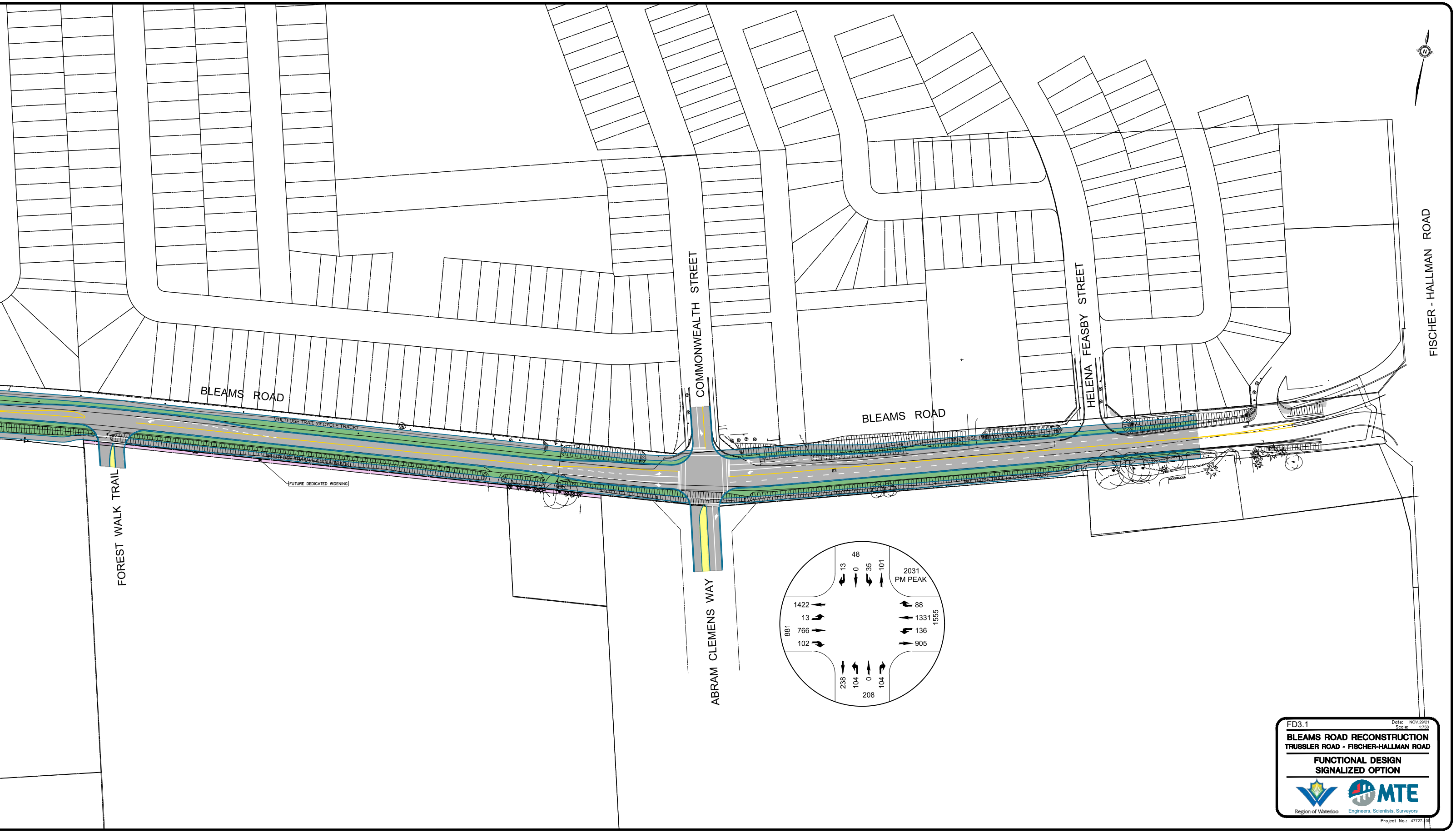
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
SIGNALIZED OPTION

Region of Waterloo

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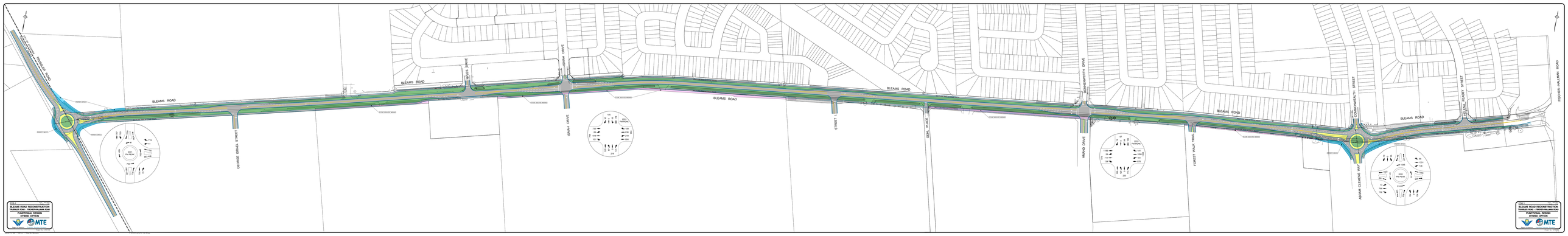

TOWN OF HALTON HILLS
BLEAMS ROAD RECONSTRUCTION
TRAFALGAR ROAD - FISCHER-HALLMAN ROAD
CLASS ENVIRONMENTAL ASSESSMENT
FUNCTIONAL DESIGN
LANE CONFIGURATION

MTE

Appendix B

Archeaological Impact Study

Stage 1 and 2 Archaeological Assessments
Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road
City of Kitchener
Regional Municipality of Waterloo
Part of Lots 129, 132, 133, 139 and 140, German Company Tract
and Part of Histand's Tract
Geographic Township of Waterloo
Former Waterloo County, Ontario

Prepared for
MTE Consultants Inc.
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Kitchener, ON N2B 3X9
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Licensed under
P.J. Racher
MCM Licence #P007
PIF #P007-1289-2022 and #P007-1404-2022
ARA File #2020-0104 and #2022-0387

28/02/2023

Original Report

EXECUTIVE SUMMARY

Under contracts awarded in September 2021 and August 2022, Archaeological Research Associates Ltd. carried out Stage 1 and 2 assessments of lands with the potential to be impacted by the reconstruction of Bleams Road from just west of Fischer-Hallman Road to Trussler Road in the City of Kitchener, Regional Municipality of Waterloo, Ontario. The project seeks to urbanize this section of roadway with the addition of curb and gutter, catch basins, storm sewers, illumination and intersection improvements. The assessments were carried out as part of a Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and fieldwork involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The Stage 1 assessment was conducted in December 2021 under Project Information Form (PIF) #P007-1289-2022, whereas the Stage 2 assessment was carried out in November 2022 under PIF #P007-1404-2022. The investigation encompassed the entire study area. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the property owner. At the time of assessment, the study area comprised parts of various roadway platforms as well as adjacent ditches, grassed areas, treed areas and the edges of several agricultural fields.

The Stage 1 assessment determined that the study area comprised a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. The Stage 2 assessment did not result in the identification of any archaeological materials. It is recommended that no further assessment be required within the study area.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
CHVI – Cultural Heritage Value or Interest
GCT – German Company Tract
MCM – Ministry of Citizenship and Multiculturalism
PIF – Project Information Form
S&Gs – Standards and Guidelines for Consultant Archaeologists

PERSONNEL

Project Director: P.J. Racher (#P007)
Operations Manager: C.E. Gohm (#R187)
Project Archaeologists: S. Bolstridge (#R471), J. Gardner (#P1020), M. Maika (#P1021)
Field Director (Stage 1): S. Clarke (#R446), M. Maika*
Field Director (Stage 2): J. Gardner
Field Technician (Stage 2): C. Shipley
Cartographers: A. Bailey (#R1069), K. Brightwell (#R341)
Report Writers: D. Worby (#R1190), L. Zepf (#P1033)
Editor: C.J. Gohm

*M. Maika was the original licence holder for the Stage 1 assessment but did not participate in any fieldwork. In accordance with current Ministry requirements, she has been included as a Field Director because work was done under her licence.

ENGAGED GROUPS

Department of Consultation & Accommodation
Mississaugas of the Credit First Nation
Contact: A. LaForme
Field Representatives: J. Sault, C. Tobicoe

Haudenosaunee Development Institute
Haudenosaunee Confederacy Chiefs Council
Contacts: O. Greene, W. Hill, S. Martin, T. Williams
Field Representatives: K. Bomberry, T. Tobicoe

Six Nations Lands & Resources Office
Six Nations of the Grand River Elected Council
Contacts: T. Hill-Montour, D. LaForme
Field Representative: D. Jacobs

1.0 PROJECT CONTEXT

1.1 Development Context

Under contracts awarded in September 2021 and August 2022, Archaeological Research Associates Ltd. (ARA) carried out Stage 1 and 2 assessments of lands with the potential to be impacted by the reconstruction of Bleams Road from just west of Fischer-Hallman Road to Trussler Road in the City of Kitchener, Regional Municipality of Waterloo, Ontario. The project seeks to urbanize this section of roadway with the addition of curb and gutter, catch basins, storm sewers, illumination and intersection improvements. The assessment was carried out as part of a Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and fieldwork involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The study area consists of an irregularly-shaped parcel of land with an area of 11.05 ha (Map 1). This parcel is generally bounded by residential neighbourhoods to the north, Fischer-Hallman Road to the east, commercial and agricultural lands to the south and a mixture of agricultural, residential and wooded lands to the west. In legal terms, the study area falls on part of Lots 129, 132, 133, 139 and 140, German Company Tract (GCT) and part of Histand's Tract in the Geographic Township of Waterloo, former Waterloo County. The Crown obtained these lands from the Mississaugas as part of a much larger purchase in 1784, but there were uncertainties relating to the area involved. The extent of the cession was clarified during the Between the Lakes Purchase (Treaty 3) in 1792. The Haldimand Proclamation of 1784 granted a tract of land along the Grand River to Six Nations, and the clarifying Simcoe Patent (Treaty 4) was issued in 1793.

The Stage 1 assessment was conducted in December 2021 under Project Information Form (PIF) #P007-1289-2022, whereas the Stage 2 assessment was carried out in November 2022 under PIF #P007-1404-2022. The investigation encompassed the entire study area. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the property owner. In compliance with the objectives set out in Section 1.0 and Section 2.0 of the 2011 *Standards and Guidelines for Consultant Archaeologists* (*S&Gs*), the investigation was carried out in order to:

- Provide information concerning the geography, history and current land condition of the study area;
- Determine the presence of known archaeological sites in the study area;
- Evaluate in detail the archaeological potential of the study area;
- Empirically document all archaeological resources within the study area;
- Determine whether the study area contains archaeological resources requiring further assessment; and
- Recommend appropriate Stage 3 assessment strategies, if any archaeological resources requiring further assessment are identified.

The Ministry of Citizenship and Multiculturalism (MCM) is asked to review the results and recommendations presented herein and enter the report into the Ontario Public Register of Archaeological Reports. A Record of Indigenous Engagement is included in the project report

package in accordance with the requirements set out in Section 7.6.2 of the 2011 *S&Gs*. The additional directions provided in the 2018 *Mississaugas of the Credit First Nation Standards and Guidelines for Archaeology* were considered throughout the investigation.

1.2 Historical Context

After a century of archaeological work in southern Ontario, scholarly understanding of the historical usage of the area has become very well-developed. With occupation beginning in the Palaeo period approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Indigenous and Euro-Canadian histories. Section 1.2.1 summarizes the region's settlement history, whereas Section 1.2.2 documents past and present land uses. Multiple previous archaeological reports containing relevant background information were obtained during the research component of the study. These reports are summarized in Section 1.3.3, and the references (including title, author and PIF number) appear in Section 8.0.

1.2.1 Settlement History

1.2.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprise a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972; Ellis and Ferris 1990; Warrick 2000; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Gainey, Barnes and Crowfield traditions; Small bands; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Fluted points
Late Palaeo	8400–7500 BC	Holcombe, Hi-Lo and Lanceolate biface traditions; Continuing mobility; Campsite/Way-Station sites; Smaller territories are utilized; Non-fluted points
Early Archaic	7500–6000 BC	Side-Notched, Corner-Notched (Nettling, Thebes) and Bifurcate traditions; Growing diversity of stone tool types; Heavy woodworking tools appear (e.g., ground stone axes and chisels)
Middle Archaic	6000–2500 BC	Stemmed (Kirk, Stanly/Neville), Brewerton Side- and Corner-Notched traditions; Reliance on local resources; Populations increasing; More ritual activities; Fully ground and polished tools; Net-sinkers common; Earliest copper tools
Late Archaic	2500–900 BC	Narrow Point (Lamoka), Broad Point (Genesee) and Small Point (Crawford Knoll) traditions; Less mobility; Use of fish-weirs; True cemeteries appear; Stone pipes emerge; Long-distance trade (marine shells and galena)
Early Woodland	900–400 BC	Meadowood tradition; Crude cord-roughened ceramics emerge; Meadowood cache blades and side-notched points; Bands of up to 35 people
Middle Woodland	400 BC–AD 600	Saugeen tradition; Stamped ceramics appear; Saugeen projectile points; Cobble spall scrapers; Seasonal settlements and resource utilization; Post holes, hearths, middens, cemeteries and rectangular structures identified
Middle/Late Woodland Transition	AD 600–900	Princess Point tradition; Cord roughening, impressed lines and punctate designs on pottery; Adoption of maize horticulture at the western end of Lake Ontario; Oval houses and 'incipient' longhouses; First palisades; Villages with 75 people

Sub-Period	Timeframe	Characteristics
Late Woodland (Early)	AD 900–1300	Glen Meyer tradition; Settled village-life based on agriculture; Small villages (0.4 ha) with 75–200 people and 4–5 longhouses; Semi-permanent settlements
Late Woodland (Middle)	AD 1300–1400	Uren and Middleport traditions; Classic longhouses emerge; Larger villages (1.2 ha) with up to 600 people; More permanent settlements (30 years)
Late Woodland (Late)	AD 1400–1600	Pre-Contact Neutral tradition; Larger villages (1.7 ha); Examples up to 5 ha with 2,500 people; Extensive croplands; Also hamlets, cabins, camps and cemeteries; Potential tribal units; Fur trade begins ca. 1580; European trade goods appear

Although Iroquoian-speaking populations tended to leave a much more obvious mark on the archaeological record and are therefore emphasized in the Late Woodland entries above, it must be understood that Algonquian-speaking populations also represented a significant presence in southern Ontario. Due to the sustainability of their lifeways, archaeological evidence directly associated with the Anishinaabeg remains elusive, particularly when compared to sites associated with the more sedentary agriculturalists. Many artifact scatters in southern Ontario were likely camps, chipping stations or processing areas associated with the more mobile Anishinaabeg, utilized during their travels along the local drainage basins while making use of seasonal resources. This part of southern Ontario represents the ancestral territory of various Indigenous groups, each with their own land use and settlement pattern tendencies.

1.2.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Smith 1846; Sutherland 1864; Coyne 1895; Lajeunesse 1960; Cumming 1972; Janusas 1988; Ellis and Ferris 1990; Surtees 1994; Hayes 1997; Bloomfield 2006; AO 2022)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Brûlé explores southern Ontario in 1610/11; Champlain travels through in 1613 and 1615/1616, making contact with a number of Indigenous groups (including the Algonquin, Huron-Wendat and other First Nations); European trade goods become increasingly common and begin to put pressure on traditional industries
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Early to mid-18th century	Growth and spread of the fur trade; Peace between the French and English with the Treaty of Utrecht in 1713; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid- to late 18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in 1764; The Niagara Purchase (Treaty 381) in 1781 included this area

Historical Event	Timeframe	Characteristics
Loyalist Influx	Late 18th century	United Empire Loyalist influx after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; Between the Lakes Purchase completed with the Mississaugas in 1784 and confirmed in 1792 (Treaty 3); Haldimand Proclamation of 1784 grants land to Six Nations (the Haldimand Tract), clarified by the Simcoe Patent (Treaty 4) in 1793; *Constitutional Act* of 1791 creates Upper and Lower Canada
County Development	Late 18th to early 19th century	Became part of York County's 'West Riding' in 1792; Brant surrenders Blocks 1–6 of the Haldimand Tract to the Crown in 1798; Became part of the Gore District and Halton County in 1816; Wellington District and Waterloo County created in 1840; Waterloo County independent after the abolition of the district system in 1849
Township Formation	Early 19th century	Waterloo initially comprised Block 2 of the Haldimand Tract; Purchased by United Empire Loyalist R. Beasley and his partners in 1798; Deeds could not be issued until full payment was made to Six Nations; Nearly 5,750 ha sold to Pennsylvania Mennonites and non-Mennonites in 1800; German Company formed to facilitate a bulk sale of land to Pennsylvania Mennonites, represented by D. Erb and S. Bricker; Remaining 24,281 ha purchased in 1805 with clear title; Lots drawn by shareholders in Pennsylvania; Steady and rapid stream of settlers ensued, disrupted only by the Napoleonic Wars and the War of 1812
Township Development	Mid-19th to early 20th century	Population reached 4,424 by 1841 (mostly Pennsylvania Dutch and German); 33,518 ha taken up by 1846, with 12,151 ha under cultivation; 20 saw mills and 8 grist mills in operation at that time; Traversed by the Grand Trunk Railway (1856), Galt & Guelph Railway (1855/57), Preston & Berlin Railway (1857/1873) and Waterloo Junction Railway (1889/91); Principal settlements at Berlin, Hespeler, Preston and Waterloo, Other communities at Blair, Bloomingdale, Breslau, Bridgeport, Doon, Freeport, Freiburg, German Mills, New Aberdeen, Oregon (Upper Doon), Shantz, Strasburg and Williamsburg

1.2.2 Past and Present Land Use

1.2.2.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, deciduous trees and open areas. Indigenous communities would have managed the landscape to some degree, particularly during the Late Woodland period when clearings were made for agriculture. During the early 19th century, Pennsylvania Mennonites and later Euro-Canadian settlers arrived in the area and continued to clear the forests for agricultural and settlement purposes. The study area traversed the western part of the historical community of Williamsburg. The land use at the time of assessment can be classified as infrastructural.

1.2.2.2 Williamsburg

Williamsburg, located along Bleams Road about halfway between the Township of Wilmot and German Mills, was first settled in the 1840s. Abraham Clemens and William Moyer built sawmills here in 1844 and 1845, respectively (Janusas 1988:164). The village itself was formally founded by Anton Wilhelm and Philip Fischer in 1846, and it contained a blacksmith, a shoemaker, a turner, two carpenters, two coopers and two tailors by 1861. Williamsburg also had a schoolhouse which served the local community from the 1840s onwards (Bloomfield 2006:51, 206).

1.2.2.3 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land uses, two historical settlement maps, two topographic maps and four aerial images were examined during the research component of the study. Specifically, the following resources were consulted:

- *Tremaines' Map of the County of Waterloo, Canada West* (1861) (OHCMP 2019);
- The *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881) (MU 2001);
- Topographic maps from 1916 and 1927 (OCUL 2022); and
- Aerial images from 1945, 1946, 1955 and 1963 (UW 2016).

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 2–Map 7. The study area traversed several road allowances as well as parts of multiple properties. A summary of the identified historical occupants appears in Table 3.

Table 3: Occupation History

Lot	Concession	1861	1881
129	GCT	Peter Weis; J.L.	Unspecified
132	GCT	John Scheller; Michael Donnewerth; T. Woods	Unspecified
133	GCT	Conrad Siebert, George Baker, Thomas Woods	Unspecified
139	GCT	Henry Woods; T. Woods	Unspecified
140	GCT	Henry Woods; Margaret Gehl	Henry Becker; J.C. Woods
N/A	Histand's Tract	Hacker; Abraham D. Clemens	Joseph S. Clemens; A.S. Clemens

Tremaines' Map of the County of Waterloo, Canada West (1861) does not depict any structures within the study area, although the Hacker farmhouse and a schoolhouse are shown immediately north of the eastern terminus and the Woods farmhouse appears to the south of Bleams Road within Lot 140, GCT (Map 2). A steam saw mill is depicted within the north-central part of Clemens' holding along Middle Strasburg Creek, and the early alignments of Trussler Road, Bleams Road and Fischer-Hallman Road (possibly called Williamsburg Road at that time) are shown.

The *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881) continues to show the Woods farmhouse within Lot 140, GCT and also depicts structures associated with Joseph Clemens and A.S. Clemens within Histand's Tract (Map 3). Interestingly, the schoolhouse at Williamsburg is now shown on the south side of the roadway. Given that this publication only included information for its subscribers, the absence of occupants and/or structures within the remaining lands should not be taken as evidence that they were vacant or otherwise unimproved.

The topographic maps from 1916 and 1927 depict one wooden (black) home partly within the study area east of Gehl Place, and several other wooden homes are shown north and south of Bleams Road (Map 4). One brick or stone structure (red) is shown north of Bleams Road and west of Fischer-Hallman Road. The aerial images from 1945–1963 show the actual locations of the structures illustrated on the 1916 topographic map and reveal that the land uses remained largely consistent (Map 5–Map 7). The most significant change was the growth of a quarry north of

Bleams Road and south of Ottawa Street South between 1955 and 1963. The lands along the roadway were predominantly agricultural, although numerous wooded areas are visible.

1.3 Archaeological Context

The Stage 1 assessment (property inspection) was conducted on December 22, 2021 under PIF #P007-1289-2022, whereas the Stage 2 assessment was carried out on November 1 and 3, 2022 under PIF #P007-1404-2022. ARA utilized an Apple iPhone 11 and an Apple iPhone 13 with built-in GPS/GNSS receivers during the investigation (UTM17/NAD83). The limits of the study area were confirmed using project-specific GIS data translated into GPS points for reference in the field, in combination with aerial imagery showing physical features in relation to the subject lands.

The archaeological context of any given study area must be informed by 1) the condition of the property as found (Section 1.3.1), 2) a summary of registered or known archaeological sites located within a minimum 1 km radius (Section 1.3.2) and 3) descriptions of previous archaeological fieldwork carried out within the limits of, or immediately adjacent to the property (Section 1.3.3).

1.3.1 Condition of the Property

The study area lies within the Great Lakes–St. Lawrence forest region, which is a transitional zone between the southern deciduous forest and the northern boreal forest. This forest extends along the St. Lawrence River across central Ontario to Lake Huron and west of Lake Superior along the border with Minnesota, and its southern portion extends into the more populated areas of Ontario. This forest is dominated by hardwoods, featuring species such as maple, oak, yellow birch, white and red pine. Coniferous trees such as white pine, red pine, hemlock and white cedar commonly mix with deciduous broad-leaved species, such as yellow birch, sugar and red maples, basswood and red oak (MNRF 2022).

In terms of local physiography, the study area falls within the Waterloo Hills. This region consists mainly of sandy hills, including ridges of sandy till (unsorted glacial sediment), kames and kame moraines (large deposits of till, sand and gravel left after melting). Outwash sands occupy the hollows between the hills. An extensive area of alluvial terraces adjoins the hilly region, which are associated with the Grand River spillway system (Chapman and Putnam 1984:136–137).

According to the Ontario Soil Survey, the study area consists of a variety of soil types (Map 8). The western portion includes a gravel pit and Lisbon sandy loam (GP>Li) as well as a grouping of Lisbon sandy loam and Fox sandy loam (Li>Fo), whereas the centre has groupings of Burford gravelly loam and Lisbon sandy loam (Bg>Li); Waterloo fine sandy loam, Heidelberg fine sandy loam and Brant loam (Wa>He=Ba); and Burford gravelly loam, Lisbon sandy loam and Caledon sandy loam (Bg>Li=Ca). The eastern portion comprises groupings of Caledon sandy loam, Brookton sandy loam and Waterloo fine sandy loam (Ca>Bo=Wa) and Fox sandy loam, muck and peat and Brady sandy loam (Fo>Mc=By). The characteristics of these soil types are summarized in Table 4 (Presant and Wicklund 1971; Cressman 1996:Sheet 3).

Table 4: Soil Types

Soil Code	Soil Type	Association	Topography	Drainage
Ba	Brant loam	Brant-Waterloo	Gently sloping	Good
Bg	Burford gravelly loam	Burford-Fox	Gently sloping	Good
Bo	Bookton sandy loam	Bennington-Bookton	Gently sloping	Good
By	Brady sandy loam	Burford-Fox	Level	Imperfect
Ca	Caledon sandy loam	Burford-Fox	Very gently sloping	Good
Fo	Fox sandy loam	Burford-Fox	Gently sloping	Good
GP	Gravel pit	N/A	N/A	N/A
He	Heidelberg fine sandy loam	Brant-Waterloo	Very gently sloping	Imperfect
Li	Lisbon sandy loam	Burford-Fox	Gently sloping	Good
Mc	Organic soil (12–36 inches deep)	Organic	Level	Very Poor
Wa	Waterloo fine sandy loam	Brant-Waterloo	Gently sloping	Good

The study area falls within the Alder Creek and Strasburg Creek drainage basins, both of which are under the jurisdiction of the Grand River Conservation Authority (GRCA 2020). Specifically, the study area is located 263 m north of a tributary of Strasburg Creek (Middle Strasburg Creek), 360 m north of the Strasburg Creek Wetland Complex Provincial Swamp, 700 m east of tributaries of Alder Creek and 800 m south of the Laurentian West Wetland Complex Swamp.

At the time of assessment, the study area comprised parts of various roadway platforms as well as adjacent ditches, grassed areas, treed areas and the edges of several agricultural fields. Soil conditions were ideal for the activities conducted. No unusual physical features were encountered that affected fieldwork strategy decisions or the identification of artifacts or cultural features (e.g., dense root mats, boulders, rubble, etc.).

1.3.2 Registered or Known Archaeological Sites

The Ontario Archaeological Sites Database and the Ontario Public Register of Archaeological Reports were consulted to determine whether any registered or known archaeological resources occur within a 1 km radius of the study area. In response to a request for assistance, the Archaeological Data Coordinator indicated that there are 61 registered sites located within the specified distance. In terms of other known resources (e.g., Isolated Non-Diagnostic Find Spots, Leads or unreported deposits), 14 unregistered sites were identified within a 1 km radius. The sites are summarized in Table 5.

Table 5: Registered or Known Archaeological Sites

Borden No. / ID No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
AiHc-23	-	Pre-Contact	Indigenous	Camp/campsite	300 m–1 km
AiHc-48	Glencairn 1	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-49	Glencairn 2	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-55	Williamsburg 1	Post-Contact	Euro-Canadian	House	50 m–300 m
AiHc-56	Williamsburg 2	Post-Contact	Euro-Canadian	Scatter	50 m–300 m
AiHc-57	Off Corridor	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-85	Huron Business Park 1	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-86	Huron Business Park 2	Archaic, Early	Indigenous	Findspot	300 m–1 km
AiHc-87	Huron Business Park 3	Pre-Contact	Indigenous	Findspot	300 m–1 km

Borden No. / ID No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
AiHc-92	Bleams Road - Corduroy Road	Post-Contact	Euro-Canadian	Road	50 m–300 m
AiHc-104	Site A	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-105	Site O	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-106	Site P	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-107	Site C	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-108	Site B	Woodland, Early	Indigenous	Camp/campsite	300 m–1 km
AiHc-109	Site Q	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-110	Site D	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-111	Site R	Pre-Contact	Indigenous	Findspot	300 m–1 km
AiHc-116	Site F	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-163	Lujan	Pre-Contact	Indigenous	Findspot	50 m–300 m
AiHc-164	Keyoke	Pre-Contact	Indigenous	Scatter	50 m–300 m
AiHc-223	Norris-Sternberg	Archaic	Indigenous	Tool manufacturing; hunting	50 m–300 m
AiHc-413	Findspot 1	Pre-Contact	Indigenous	Camp/campsite	300 m–1 km
AiHc-414	Location 1	Woodland, Late	Indigenous	Village	50 m–300 m
AiHc-415	Location 2	Pre-Contact	Indigenous	Scatter	50 m–300 m
AiHc-416	Location 4	Woodland, Late	Indigenous	Hamlet; village	50 m–300 m
AiHc-419	Findspot 12	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHc-420	Location 12-15	Archaic, Middle	Indigenous	Camp/campsite	300 m–1 km
AiHc-421	Findspot 16	Archaic, Late; Archaic, Middle	Indigenous	Camp/campsite	300 m–1 km
AiHc-422	Findspot 18	Archaic; Post-Contact	Indigenous; Euro-Canadian	Chipping station; unspecified	300 m–1 km
AiHc-423	Findspot 19	Archaic, Late; Archaic, Middle	Indigenous	Camp/campsite	300 m–1 km
AiHc-424	Location 21	Woodland, Late; Post-Contact	Indigenous; Euro-Canadian	Village; hamlet	300 m–1 km
AiHc-425	Findspot 23	Post-Contact; Pre-Contact	Indigenous, Euro-Canadian	Unspecified; cabin; midden	50 m–300 m
AiHc-426	Location 25	Archaic, Late; Archaic, Middle	Indigenous	Camp/campsite	300 m–1 km
AiHc-427	Location 27	Woodland, Late; Post-Contact	Indigenous; Euro-Canadian	Village; unspecified	300 m–1 km
AiHc-428	Location 28	Woodland, Late; Post-Contact	Indigenous; Euro-Canadian	Village; unspecified	300 m–1 km
AiHc-429	Findspot 29	Archaic, Middle; Archaic, Late; Post-Contact	Indigenous, Euro-Canadian	Camp/campsite; hunting; seasonal; unspecified	300 m–1 km
AiHc-430	Findspot 3	Post-Contact	Euro-Canadian	Farmstead; outbuilding	300 m–1 km
AiHc-451	Location 12	Unspecified	Unspecified	Unspecified	300 m–1 km
AiHc-456	Location 2	Unspecified	Unspecified	Unspecified	300 m–1 km
AiHc-460	Location 3	Archaic, Late; Woodland, Middle; Post-Contact	Indigenous, Euro-Canadian	Camp/campsite; farmstead	300 m–1 km
AiHc-471	Findspot 1	Pre-Contact	Indigenous	Scatter	50 m–300 m
AiHc-472	Findspot 2	Woodland, Early	Indigenous	Findspot	50 m–300 m
AiHc-482	-	Post-Contact	Euro-Canadian	Possible residence	50 m–300 m
AiHd-92	Gehl	Post-Contact	Euro-Canadian	Homestead	300 m–1 km
AiHd-93	Tarbox	Pre-Contact	Indigenous	Findspot	< 50 m
AiHd-94	Nutria	Pre-Contact	Indigenous	Findspot	50 m–300 m
AiHd-95	Sacalait	Pre-Contact	Indigenous	Scatter	300 m–1 km

Borden No. / ID No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
AiHd-96	Bruly	Archaic, Early	Indigenous	Findspot	300 m–1 km
AiHd-102	-	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHd-103	-	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHd-104	-	Archaic, Middle	Indigenous	Findspot	300 m–1 km
AiHd-106	-	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHd-107	-	Pre-Contact	Indigenous	Scatter	50 m–300 m
AiHd-108	-	Pre-Contact	Indigenous	Camp/campsite	300 m–1 km
AiHd-155	-	Woodland, Early	Indigenous	Scatter	300 m–1 km
AiHd-156	Bleams 1	Woodland, Middle	Indigenous	Village	300 m–1 km
AiHd-157	P1	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHd-158	P2	Pre-Contact	Indigenous	Scatter	300 m–1 km
AiHd-159	P7	Archaic, Late	Indigenous	Camp/campsite; seasonal	300 m–1 km
AiHd-160	P2, P3, P6, P19, P22, P24	Archaic, Early; Archaic, Late; Woodland, Early; Woodland, Late	Indigenous	Scatter	300 m–1 km
Unregistered	Findspot 2 (ARA 2008)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 3 (ARA 2010)	Pre-Contact	Indigenous	Findspot	< 50 m
Unregistered	Findspot 5 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 6 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 7 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 10 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 11 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 13 (ARA 2010)	Pre-Contact	Indigenous	Scatter	300 m–1 km
Unregistered	Findspot 15 (ARA 2010)	Pre-Contact	Indigenous	Findspot	300 m–1 km
Unregistered	Findspot 17 (ARA 2010)	Pre-Contact	Indigenous	Scatter	300 m–1 km
Unregistered	Findspot 20 (ARA 2010)	Pre-Contact	Indigenous	Scatter	50 m–300 m
Unregistered	Findspot 22 (ARA 2010)	Pre-Contact	Indigenous	Scatter	< 50 m
Unregistered	Findspot 24 (ARA 2010)	Pre-Contact; Post-Contact	Indigenous; Euro-Canadian	Scatter; scatter	300 m–1 km
Unregistered	Findspot 26 (ARA 2010)	Pre-Contact	Indigenous	Scatter	300 m–1 km

The Tarbox site (AiHd-93), Findspot 3 and Findspot 22 are located within 50 m of the study area. As relevant archaeological resources that could impact fieldwork strategy decisions and recommendations, these sites are fully discussed in Section 1.3.3. Sixteen other sites are located within 300 m of the study area and must also be considered as relevant features of archaeological potential. The remaining sites represent more distant archaeological resources.

1.3.3 Previous Archaeological Work

Reports documenting assessments conducted within the subject lands and assessments that resulted in the discovery of sites within adjacent lands were sought during the research component of the study. In order to ensure that all relevant past work was identified, an investigation was launched to identify reports involving assessments within 50 m of the study area. The investigation determined that there are multiple available reports documenting previous archaeological fieldwork within the specified distance. Several additional reports concerning more distant lands were also consulted. The relevant results and recommendations are summarized below as required by Section 7.5.8 Standards 4–5 of the 2011 *S&Gs* (Map 9–Map 13; SD Map 1).

1.3.3.1 Bleams Road – Corduroy Road (Stage 4)

In July and August 1989, the equivalent of a Stage 4 excavation was carried out for the Bleams Road – Corduroy Road site (AiHc-92) site as well as Williamsburg 1 (AiHc-55) and Williamsburg 2 (AiHc-56) under Licence #89-143C (RMW 1989). The assessed area falls within 50 m of the eastern edge of the study area. At AiHc-92, a 10 x 15 m area was excavated by heavy machinery and 14 logs were exposed (12 of which comprised part of the corduroy road). Mechanical topsoil removal at AiHc-55 revealed the outline of a historical structure, which may have dated from ca. 1850–1875. Excavations at AiHc-56 revealed several 20th-century ash pits with glass and modern refuse. All of the sites were subsequently destroyed by the construction of the Mannheim Artificial Recharge System.

1.3.3.2 Gehl Place and Bleams Road (Stage 1–2)

Between May 1990 and November 1991, the equivalent of Stage 1 and 2 assessments were carried out for a proposed gravel pit at Gehl Place and Bleams Road under Licence #90-021 and #91-15 (ASI 1992). The assessed area overlaps the southern part of the study area. The investigation resulted in the discovery of five locations of archaeological materials, including the Tarbox site (AiHd-93) within adjacent lands. This site consisted of an isolated end scraper fragment of Onondaga chert. None of the sites were found to have further cultural heritage value or interest (CHVI), and the property was not recommended for any additional assessment (ASI 1992:8). The overlapping area of previous assessment is therefore of no further archaeological concern.

1.3.3.3 1531 Bleams Road (Stage 1–2)

In May and August 2008, Stage 1 and 2 assessments were conducted for a proposed subdivision development at 1531 Bleams Road under PIF #P007-159-2008 (ARA 2008). The assessed area overlaps the southern edge of the study area. The investigation resulted in the identification of two locations of archaeological materials, neither of which are within adjacent lands. One of the sites, Bleams 1 (AiHd-156), was found to have further CHVI and was subject to a Stage 3 assessment in June and July 2008 under PIF #P007-172-2008. The site was found to have further CHVI and required Stage 4 mitigation of development impacts (ARA 2008:17). The associated report was entered into the Ontario Public Register of Archaeological Reports on December 9, 2008. The remainder of the property was not recommended for any further work, and the overlapping area of previous assessment is therefore of no further archaeological concern.

1.3.3.4 Williamsburg South Subdivision (Stage 1–4)

Between June and October 2008, Stage 1 and 2 assessments were conducted for a proposed subdivision development within the Williamsburg South (Schlegal) property at 1291 Fischer-Hallman Road under PIF #P007-167-2008 (ARA 2010). The assessed area overlaps the southeastern part of the study area. The investigation resulted in the discovery of 29 locations of archaeological materials, including Findspots 3 and 22 within adjacent lands. Findspot 3 comprised a single primary flake, whereas Findspot 22 consisted of a 20 x 5 m scatter of four lithic flakes. Although neither of these deposits required additional assessment, sixteen other sites were found to be of further CHVI and were recommended for Stage 3 assessment (ARA 2010:22–23). The associated report was entered into the Ontario Public Register of Archaeological Reports on

July 23, 2010. The remainder of the property was not recommended for any additional work, and the overlapping area of previous assessment is therefore of no further archaeological concern.

In November 2015, Stage 1 and 2 assessments were conducted for additional lands required for the Williamsburg South Subdivision at 1255 Fischer-Hallman Road under PIF #P256-0382-2015 (Stantec 2016a). The assessed area falls within 50 m of the southeastern edge of the study area. The investigation did not result in the identification of any archaeological materials, and it was recommended that no further assessment be required (Stantec 2016a:5.1).

Multiple Stage 3 assessments were conducted within the Williamsburg South project lands as part of the Union Gas Owen Sound Replacement project in 2013 (TMHC 2013b) and the subdivision development itself in 2015 (e.g., Stantec 2016b). Subsequent Stage 4 mitigations of development impacts were conducted for AiHc-414 and AiHc-415 (BRI 2017a, 2017b). None of the sites documented in these reports fall within lands adjacent to the study area.

1.3.3.5 Kitchener Zone 4 Trunk Watermain (Stage 1–2)

A Stage 1 assessment was conducted for the Kitchener Zone 4 Trunk Watermain project in September 2011 under PIF #P007-339-2011 (ARA 2011). The assessed area overlaps the central part of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. It was recommended that the identified areas of archaeological potential be subject to a Stage 2 assessment (ARA 2011:32). The overlapping area of previous assessment consisted of both disturbed lands as well as lands requiring test pit survey (ARA 2011:Map 23). The associated report was entered into the Ontario Public Register of Archaeological Reports on March 13, 2013.

Adjustments to the preferred alignment subsequently occurred, and Stage 1 and 2 assessments were completed in May 2013 under PIF #P007-501-2012 (ARA 2013). The assessed area also overlaps the central part of the study area, but the corridor was narrower. The investigation did not result in the discovery of any archaeological materials, and it was recommended that no further assessment be required (ARA 2013:39). The overlapping area of previous assessment is therefore of no further archaeological concern. The associated report was entered into the Ontario Public Register of Archaeological Reports on July 16, 2013.

1.3.3.6 Fischer-Hallman Road Improvements – Ottawa to Bleams (Stage 1–2)

In February 2012, a Stage 1 assessment was carried out for improvements to Fischer-Hallman Road from Ottawa Street to Bleams Road under PIF #P094-120-2012 (ASI 2012). The assessed area overlaps the eastern end of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. It was recommended that the areas of archaeological potential required Stage 2 assessment (ASI 2012:12). The overlapping area of previous assessment consisted of disturbed lands and lands that required test pit survey (ASI 2012:Figure 8).

A Stage 2 assessment was conducted for lands northeast of the intersection at 1198 Fischer-Hallman Road in April 2017 under PIF #P219-0026-2017 (Amec 2017a). The assessed area falls within 50 m of the northeastern corner of the study area. The investigation resulted in the discovery

of one location of archaeological materials: AiHc-482. This site is located more than 50 m away from the study area. AiHc-482 was found to be of further CHVI and required Stage 3 assessment (Amec 2017a:22–23). Another Stage 2 assessment was completed for adjacent lands in October 2017 under PIF #P348-0030-2017 (Amec 2017b). The assessed area falls within 60 m of the northeastern corner of the study area. The investigation resulted in the discovery of additional artifacts associated with AiHc-482, but no further work was recommended (Amec 2017b:24–25).

In April 2018, a Stage 2 assessment was conducted for lands southwest of the intersection at 1375 Bleams Road under PIF #P348-0039-2018 (Wood 2018a). The assessed area overlaps the southeastern corner of the study area. The investigation did not result in the discovery of any archaeological materials, and it was recommended that no further assessment be required (Wood 2018a:28). Another Stage 2 assessment was conducted for lands northeast of the intersection in June 2018 under PIF #P348-0040-2018 (Wood 2018b). The assessed area falls within 50 m of the eastern edge of the study area. The investigation did not result in the discovery of any archaeological materials, and no further assessment was required (Wood 2018b:19).

1.3.3.7 Union Gas Owen Sound Pipeline (Stage 1–3)

Between September 2012 and April 2013, Stage 1 and 2 assessments were conducted for the proposed replacement of the Owen Sound natural gas pipeline system under PIF #P349-074-2012 (TMHC 2013a). The assessed area encompassed multiple corridors, several of which traverse the study area. The investigation resulted in the discovery of two locations of archaeological materials, neither of which are within adjacent lands. Location 2 was found to be of further CHVI and was recommended for a Stage 3 site-specific assessment. It was also recommended that seven of the sites identified at 1531 Bleams Road be subject to Stage 3 assessment (TMHC 2012:39–41). The remaining lands were not recommended for any further work, and the overlapping areas of previous assessment are therefore of no further archaeological concern.

A Stage 2 assessment was conducted within additional lands required for the project as well as within previously assessed lands to relocate five known sites in May and August 2013 under PIF #P357-010-2013 (TMHC 2013b). The assessed area comprised several parcels, one of which traverses the western end of the study area and two of which overlap the eastern part. The investigation resulted in the successful relocation of AiHc-421, AiHc-422, AiHc-423, AiHc-425 and AiHc-429 as well as the discovery of one new location of Indigenous artifacts: AiHc-460. This site is located more than 300 m away from the study area. The Stage 3 assessments of AiHc-421, AiHc-422, AiHc-423, AiHc-429 and AiHc-460 were documented under the same cover, and all five sites were found to have further CHVI (TMHC 2013b:69–72).

1.3.3.8 1314 Fischer-Hallman Road (Stage 1–2)

In May 2014, Stage 1 and 2 assessments were conducted for a proposed development at 1314 Fischer-Hallman Road under PIF #P007-0644-2014 (ARA 2014). The assessed area falls within approximately 160 m of the southeastern corner of the study area. The investigation resulted in the discovery of two locations of archaeological materials, neither of which are within adjacent lands. Both sites were found to be of no further CHVI, and no further work was recommended (ARA 2014:38). The associated report was entered into the Ontario Public Register of Archaeological Reports on August 26, 2014.

1.3.3.9 Fischer-Hallman Road Improvements – Bleams to Plains (Stage 1–2)

In September 2014, a Stage 1 assessment was carried out for improvements to Fischer-Hallman Road from Bleams Road to Plains Road under PIF #P392-0106-2014 (ASI 2016). The assessed area overlaps the eastern end of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological and previously assessed lands of no further concern. It was recommended that the areas of archaeological potential be subject to Stage 2 assessment and that the Williamsburg Cemetery be avoided by the detail design (ASI 2016:15). The overlapping area of previous assessment consisted of lands of no further concern and lands requiring test pit survey (ASI 2016:Figure 8).

In September and October 2018, a Stage 2 assessment was conducted along the western boulevard of Fischer-Hallman Road under PIF #P348-0043-02018 (Wood 2019a). The assessed area falls within approximately 80 m of the southeastern corner of the study area. The investigation resulted in the recovery of additional archaeological materials associated with the Middleport village site designated as AiHc-414. Although many of the artifacts were recovered from disturbed contexts, the site was found to be of further CHVI. It was recommended that portions of AiHc-414 be subject to a Stage 3 site-specific assessment, that a 20 m protective buffer be observed and that 50 m monitoring buffer be implemented (Wood 2019a:28–29).

In 2019, another Stage 1 assessment was conducted to update information on any additional studies and to summarize all pertinent recommendations for the project under PIF #P348-0049-2019 (Wood 2019b). The assessed area overlaps the southeastern corner of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. It was recommended that the areas of archaeological potential be subject to Stage 2 assessment, that the portion of AiHc-414 within the western boulevard undergo Stage 3 assessment, that appropriate buffers be observed and that the Williamsburg Cemetery be avoided by the detail design (Wood 2019b:38–40).

In July 2019, a Stage 2 assessment was conducted along the eastern boulevard of Fischer-Hallman Road under PIF #P348-0067-2019 (Wood 2019c). The assessed area falls within approximately 60 m of the southeastern corner of the study area. Although these lands were initially not recommended for further work, the discovery of artifacts associated with AiHc-414 within the western boulevard and the 50 m monitoring buffer around the site led to additional assessment. The investigation did not result in the discovery of any archaeological materials. Due to the close proximity of AiHc-414, it was recommended that a portion of the assessed area be subject to Stage 3 assessment and that a monitoring buffer be implemented (Wood 2019c:30–31).

1.3.3.10 1643 Bleams Road (Stage 1–2)

In September 2016, Stage 1 and 2 assessments were conducted in advance of future development at 1643 Bleams Road under PIF #P344-0112-2016 (BRI 2016). The assessed area overlaps the southern part of the study area. The investigation did not result in the discovery of any archaeological materials, and no further assessment was recommended (BRI 2016:5.1). The overlapping area of previous assessment is therefore of no further archaeological concern.

1.3.3.11 1250, 1270 and 1314 Fischer-Hallman Road (Stage 1–2)

In November 2016, Stage 1 and 2 assessments were carried out for a proposed development at 1250, 1270 and 1314 Fischer-Hallman Road under PIF #P007-0784-2016 (ARA 2017). The assessed area falls within 50 m of the eastern edge of the study area. The investigation did not result in the discovery of any archaeological materials, and it was recommended that no further assessment be required (ARA 2017:19). The associated report was entered into the Ontario Public Register of Archaeological Reports on April 24, 2017.

1.3.3.12 Bleams Road Improvements – Strasburg to Fischer-Hallman (Stage 1)

A Stage 1 assessment was carried out for improvements to Bleams Road from Strasburg Road to Fischer-Hallman Road in June 2017 under PIF #P1066-0039-2017 (ASI 2017). The assessed area traverses the eastern part of the study area. The investigation identified a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. It was recommended that the areas of archaeological potential be subject to Stage 2 assessment (ASI 2017:17). The overlapping area of previous assessment consisted of disturbed lands, lands cleared of concern and lands requiring test pit survey (ASI 2017:Figure 9).

1.3.3.13 2219 Ottawa Road South and 808 Trussler Road (Stage 1–2)

In November 2017, Stage 1 and 2 assessments were conducted for a proposed subdivision development at 2219 Ottawa Road South and 808 Trussler Road under PIF #P344-0170-2017 (BRI 2017c). The assessed area overlaps the western part of the study area. The investigation did not result in the discovery of any archaeological materials, and it was recommended that no further assessment be required (BRI 2017c:5.1).

2.0 STAGE 1 BACKGROUND STUDY

2.1 Background

The Stage 1 assessment involved background research to document the geography, history, previous archaeological fieldwork and current land condition of the study area. This desktop examination included research from archival sources, archaeological publications and online databases. It also included the analysis of a variety of historical maps and aerial imagery. The results of the research conducted for the background study are summarized below.

With occupation beginning approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Pre-Contact and Post-Contact histories (Section 1.2.1). Artifacts associated with Palaeo, Archaic, Woodland and Early Contact traditions are well-attested in the City of Kitchener, and Euro-Canadian archaeological sites dating to pre-1900 and post-1900 contexts are likewise common. The presence of 75 previously identified sites in the surrounding area demonstrates the desirability of this locality for early settlement (Section 1.3.2). The investigation confirmed that none of these sites extend into the subject lands. Background research identified multiple areas of previous assessment within the study area (Section 1.3.3).

The natural environment of the study area would have been attractive to both Indigenous and Euro-Canadian populations as a result of proximity to Middle Strasburg Creek. The areas of well-drained soils would have been ideal for agriculture, and the diverse local vegetation would also have encouraged settlement throughout Ontario's lengthy history. Euro-Canadian populations would have been particularly drawn to the historical thoroughfares and community of Williamsburg.

In summary, the background study included an up-to-date listing of sites from the Ontario Archaeological Sites Database (within at least a 1 km radius), the consideration of previous local archaeological fieldwork (within at least a 50 m radius), the analysis of historical maps (at the most detailed scale available) and the study of aerial imagery. ARA therefore confirms that the standards for background research set out in Section 1.1 of the 2011 *S&Gs* were met.

2.2 Field Methods (Property Inspection)

In order to gain first-hand knowledge of the geography, topography and current condition of the study area, a property inspection was conducted on December 22, 2021. Environmental conditions were acceptable during the inspection, with light flurries, overcast skies, bright lighting and a temperature of -4 °C. Although there was light snow cover, there was no reduction in the ability to observe features of potential or identify previously impacted lands (the findings were confirmed during the Stage 2). ARA therefore confirms that fieldwork was carried out under weather and lighting conditions that met the requirements set out in Section 1.2 Standard 2 of the 2011 *S&Gs*.

The study area was subjected to random spot-checking. Specifically, the inspection began on the north side of Bleams Road in the eastern part of the study area and continued to the west before crossing to the south side of Bleams Road and returning to the east. The inspection confirmed that all surficial features of archaeological potential were present where they were previously identified and did not result in the identification of any additional features of archaeological potential not visible on mapping (e.g., relic water channels, patches of well-drained soils, etc.).

The inspection determined that many parts of the study area were disturbed by past construction activities. No natural features (e.g., permanently wet lands, sloped lands, overgrown vegetation, heavier soils than expected, etc.) that would affect assessment strategies were identified. The Williamsburg School at 1385 Bleams Road (designated under Part IV of the *Ontario Heritage Act*) was also observed. Several other potential built heritage resources and cultural heritage landscapes were documented during ARA's heritage assessment (ARA 2022). No other significant built features (e.g., plaques, monuments, cemeteries, etc.) were encountered.

2.3 Analysis and Conclusions

In addition to relevant historical sources and the results of past archaeological assessments, the archaeological potential of a property can be assessed using its soils, hydrology and landforms as considerations. Section 1.3.1 of the 2011 *S&Gs* recognizes the following features or characteristics as indicators of archaeological potential: previously identified sites, water sources (past and present), elevated topography, pockets of well-drained sandy soil, distinctive land formations, resource areas, areas of Euro-Canadian settlement, early transportation routes, listed or designated properties, historic landmarks or sites, and areas that local histories or informants have identified with possible sites, events, activities or occupations.

The Stage 1 assessment resulted in the identification of numerous features of archaeological potential in the vicinity of the study area (Map 14–Map 18; SD Map 2–SD Map 3). The closest and most relevant indicators of archaeological potential (i.e., those that would affect survey interval requirements) include multiple previously identified sites (e.g., AiHc-55, AiHc-93, AiHc-414 and AiHc-482), one primary water source (Middle Strasburg Creek), multiple historical roadways (e.g., Bleams Road, Fischer-Hallman Road, Trussler Road, etc.), one historical community (Williamsburg) and several historical structure localities (e.g., late 19th-century farmhouses, a church and a schoolhouse). Background research did not identify any features indicating that the study area had potential for deeply buried archaeological resources of further CHVI. The characteristics and construction techniques associated with the historical corduroy road preserved elsewhere along Bleams Road have been well-documented (RMW 1989).

Although proximity to a feature of archaeological potential is a significant factor in the potential modelling process, current land conditions must also be considered. Section 1.3.2 of the 2011 *S&Gs* emphasizes that 1) quarrying, 2) major landscaping involving grading below topsoil, 3) building footprints and 4) sewage/infrastructure development can result in the removal of archaeological potential, and Section 2.1 states that 1) permanently wet areas, 2) exposed bedrock and 3) steep slopes (> 20°) in areas unlikely to contain pictographs or petroglyphs can also be evaluated as having no or low archaeological potential. Areas previously assessed and not recommended for further work also require no further assessment.

Multiple previously assessed areas of no further concern were identified within the study area, none of which warranted additional assessment. ARA's visual inspection, coupled with the analysis of historical sources and digital environmental data, resulted in the identification of numerous areas of no archaeological potential. Specifically, deep land alterations have resulted in the removal of archaeological potential from the established roadway platforms, ditched areas, embankments, driveways and quarry sections (Image 1–Image 12). These areas have clearly been

impacted by past earth-moving/construction activities, resulting in the disturbance of the original soils to a significant depth and severe damage to the integrity of any archaeological resources.

The remainder of the study area had potential for Indigenous and Euro-Canadian archaeological materials or required test pit survey to confirm disturbance. The areas of archaeological potential included several small pockets of grassed and/or overgrown lands on the south side of Bleams Road. It seemed likely that two small areas adjacent to the quarry were previously impacted, but this could not be verified based on the visual inspection alone. Accordingly, these lands were categorized as areas of archaeological potential and required empirical testing to confirm that archaeological potential had been removed.

3.0 STAGE 2 PROPERTY ASSESSMENT

3.1 Field Methods

The Stage 2 assessment involved test pit survey and a combination of visual inspection and test pit survey to confirm disturbance. Environmental conditions were ideal during the investigation, permitting good visibility of land features and providing an increased chance of finding evidence of archaeological resources. A breakdown of the specific fieldwork activities, weather and lighting conditions appears in Table 6. ARA therefore confirms that fieldwork was carried out under weather and lighting conditions that met the requirements set out in Section 1.2 Standard 2 and Section 2.1 Standard 3 of the 2011 *S&Gs*.

Table 6: Fieldwork Activities and Environmental Conditions

Date	Activity	Lighting	Cloud Cover	Precipitation	Temperature (°C)
01/11/2022	Test pit survey; Combination survey	Bright	None	None	14
03/11/2022	Test pit survey; Combination survey	Diffuse	Overcast	None	8

The test pit survey method was utilized to complete the assessment because ploughing was not possible or viable. Using this method, ARA crewmembers hand excavated small regular test pits with a minimum diameter of 30 cm at prescribed intervals in accordance with Section 2.1.2 of the 2011 *S&Gs*. Since the areas to be tested were located less than 300 m from any feature of archaeological potential, an interval of 5 m was warranted (Image 13–Image 14). Disturbed soils were encountered throughout the surveyed lands, save for a strip of natural soils along the edge of Trussler Road. Most of the areas of disturbance were surveyed at an interval of 5 m, although a combination of visual inspection and test pit survey was utilized to confirm the extent of disturbance in two locations in accordance with Section 2.1.8 of the 2011 *S&Gs*. Test pits were excavated according to professional judgement to verify that these areas had been completely disturbed by previous land alterations (Image 15–Image 16).

Each test pit was excavated into at least the first 5 cm of subsoil (or to the maximum depth achievable due to compacted gravel), and the resultant pits were examined for stratigraphy, potential features and/or evidence of fill. As noted above, natural test pits were only encountered on a rise above the road near the intersection of Bleams Road and Trussler Road in the west. Test pits in this area contained light brown to slightly reddish sandy loam topsoil with small stone inclusions over light grey medium sand subsoil. These test pits were dug to a depth of 60 cm to confirm that subsoil was properly identified. The remainder of the study area was disturbed by past land alterations, and test pits typically contained redeposited topsoil over a disturbed gravel layer, gravel fill or a sod layer over gravel fill (the latter was encountered near recently added bike lanes and roadwork). All soils were screened through mesh with an aperture of no greater than 6 mm and examined for archaeological resources. No locations of archaeological materials were encountered during the test pit survey. The test pits were backfilled upon completion.

The utilized field methods are presented in Map 19–Map 23. The study area is depicted as a layer in these maps. A breakdown of field methods appears in Table 7.

Table 7: Field Methods

Category	Study Area
Property assessed by pedestrian survey at an interval of 5 m	0.00% (0.00 ha)
Property assessed by test pit survey at an interval of 5 m	0.21% (0.02 ha)
Property assessed by test pit survey at an interval of 10 m	0.00% (0.00 ha)
Property assessed by combination of visual inspection and test pit survey to confirm disturbance	0.58% (0.06 ha)
Property assessed with a modified survey interval due to a physical or cultural constraint	0.00% (0.00 ha)
Property not assessed due to physical constraint	0.00% (0.00 ha)
Property not assessed because of permanently wet areas	0.00% (0.00 ha)
Property not assessed because of exposed bedrock	0.00% (0.00 ha)
Property not assessed because of sloped areas	0.00% (0.00 ha)
Property not assessed because of disturbed areas	58.69% (6.49 ha)
Property previously assessed and of no further concern	40.51% (4.48 ha)
Total	**100.00% (11.05 ha)**

3.2 Record of Finds

The investigation did not result in the discovery of any archaeological materials. The inventory of the documentary record, which includes a quantitative summary of the field notes, photographs and mapping materials associated with the project, appears in Table 8.

Table 8: Documentary Record

Field Documents	Total	Nature	Location
Photographs	159	Digital	On server at 219-900 Guelph Street, Kitchener
Notes	12	Digital	On server at 219-900 Guelph Street, Kitchener
Maps	10	Digital	On server at 219-900 Guelph Street, Kitchener

3.3 Analysis and Conclusions

No archaeological sites were identified within the assessed lands.

4.0 RECOMMENDATIONS

The Stage 1 assessment determined that the study area comprised a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. The Stage 2 assessment did not result in the identification of any archaeological materials. It is recommended that no further assessment be required within the study area.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

Section 7.5.9 of the 2011 *S&Gs* requires that the following information be provided for the benefit of the proponent and approval authority in the land use planning and development process:

- This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.
- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar at the Ministry of Public and Business Service Delivery.

6.0 IMAGES



Image 1: Disturbed Lands
(December 22, 2021; Facing Northwest)



Image 2: Disturbed Lands
(December 22, 2021; Facing Southwest)



Image 3: Disturbed Lands
(December 22, 2021; Facing Southwest)



Image 4: Disturbed Lands
(December 22, 2021; Facing Northeast)



Image 5: Disturbed Lands
(December 22, 2021; Facing South)



Image 6: Disturbed Lands
(December 22, 2021; Facing Southwest)



Image 7: Disturbed Lands
(December 22, 2021; Facing South)



Image 8: Disturbed Lands
(December 22, 2021; Facing West)



Image 9: Disturbed Lands
(December 22, 2021; Facing East)



Image 10: Disturbed Lands
(December 22, 2021; Facing West)



Image 11: Disturbed Lands
(December 22, 2021; Facing Northeast)



Image 12: Disturbed Lands
(December 22, 2021; Facing West)



Image 13: Test Pit Survey
(November 1, 2022; Facing South)



Image 14: Test Pit Survey
(November 3, 2022; Facing West)

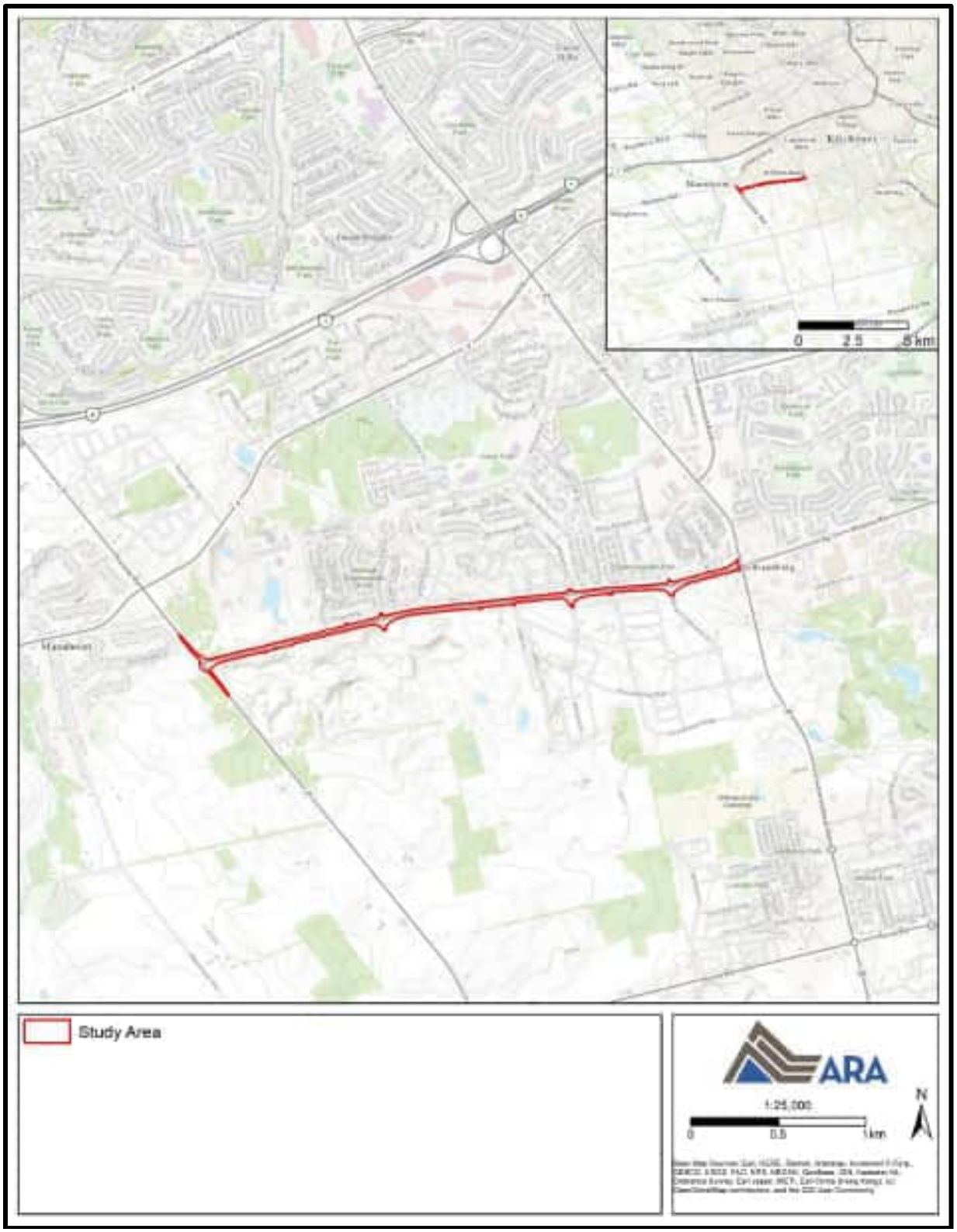


Image 15: Combination Survey
(November 1, 2022; Facing North)

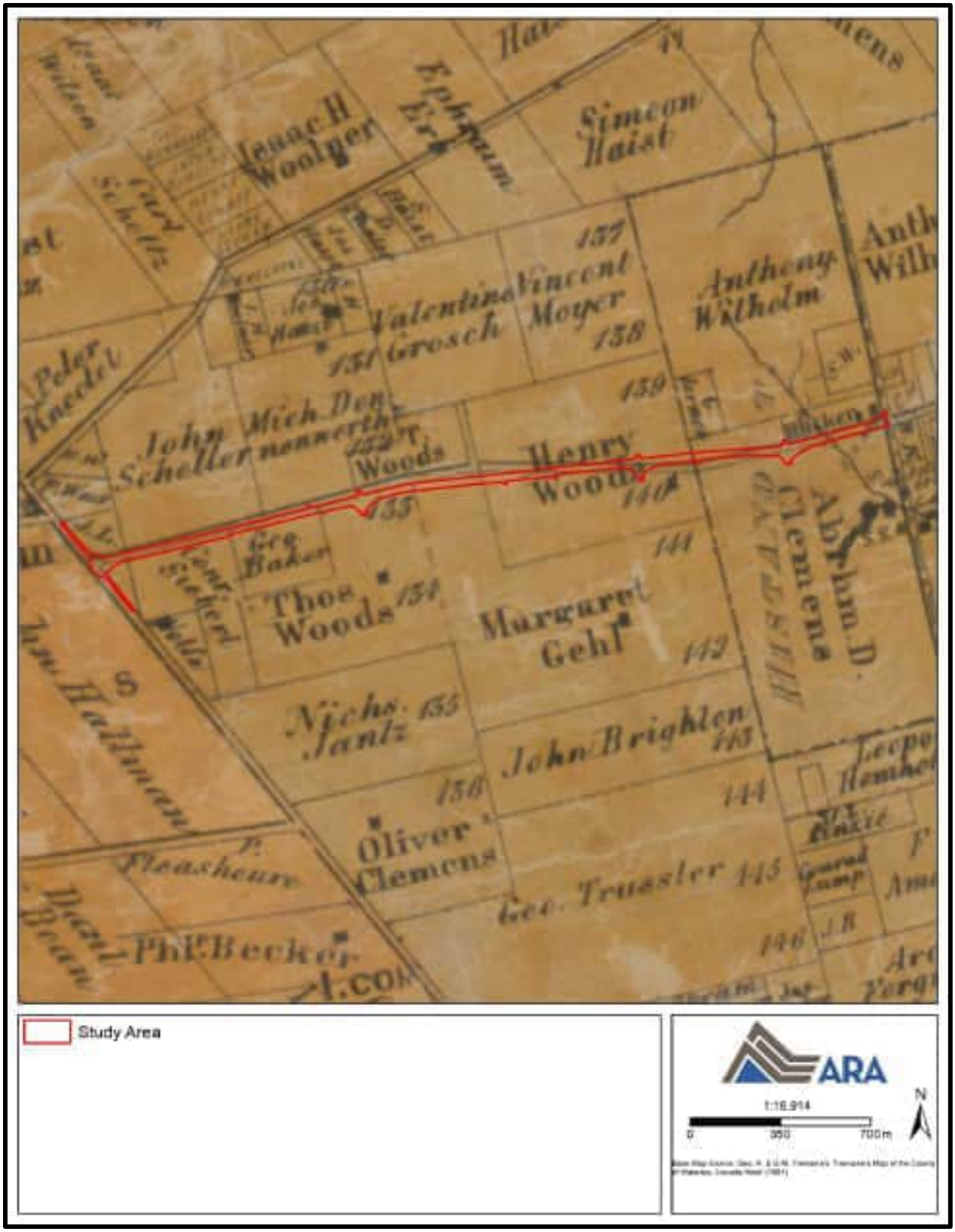


Image 16: Combination Survey
(November 3, 2022; Facing West)

7.0 MAPS



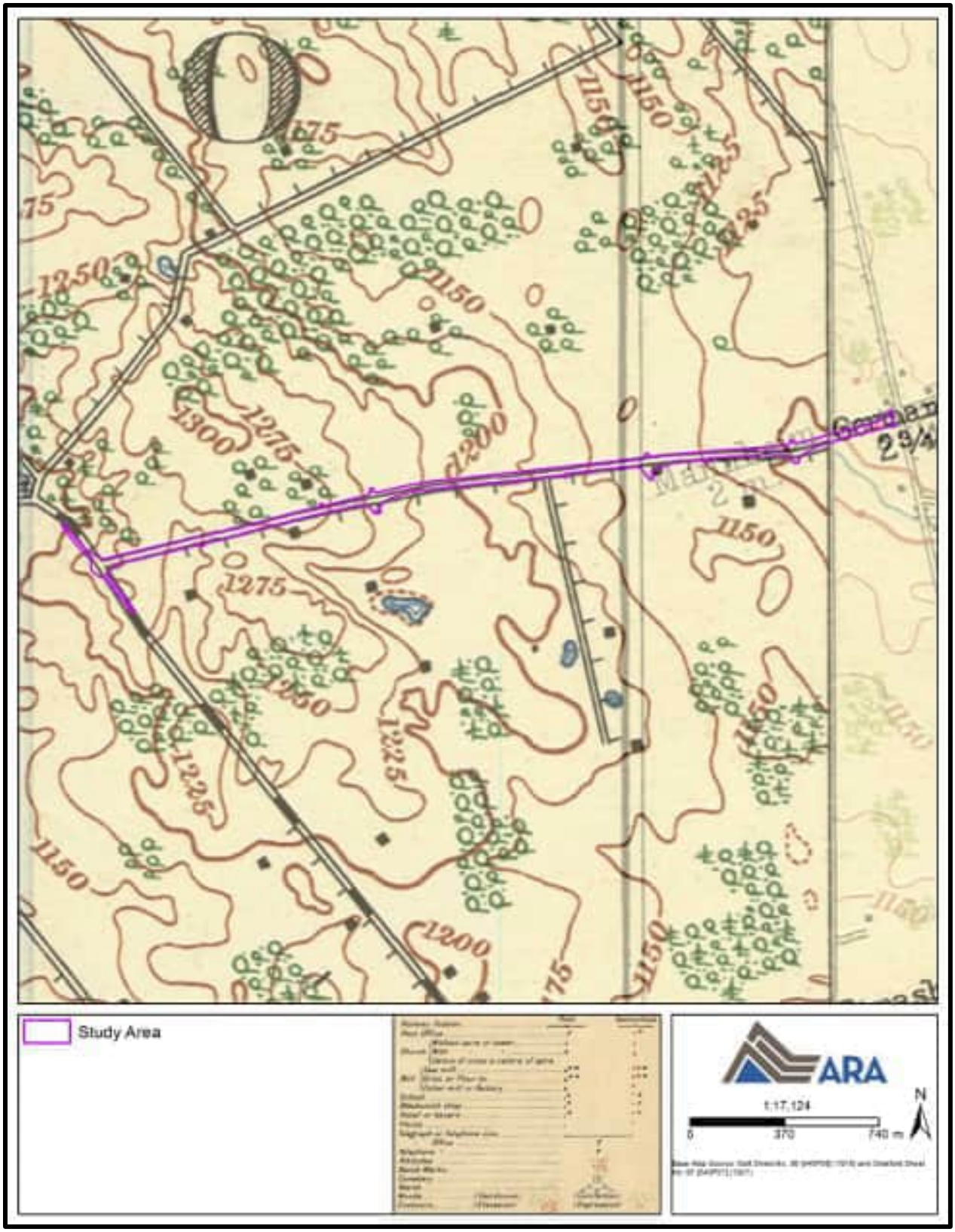
Map 1: Location of the Study Area
(Produced under licence using ArcGIS® software by Esri, © Esri)



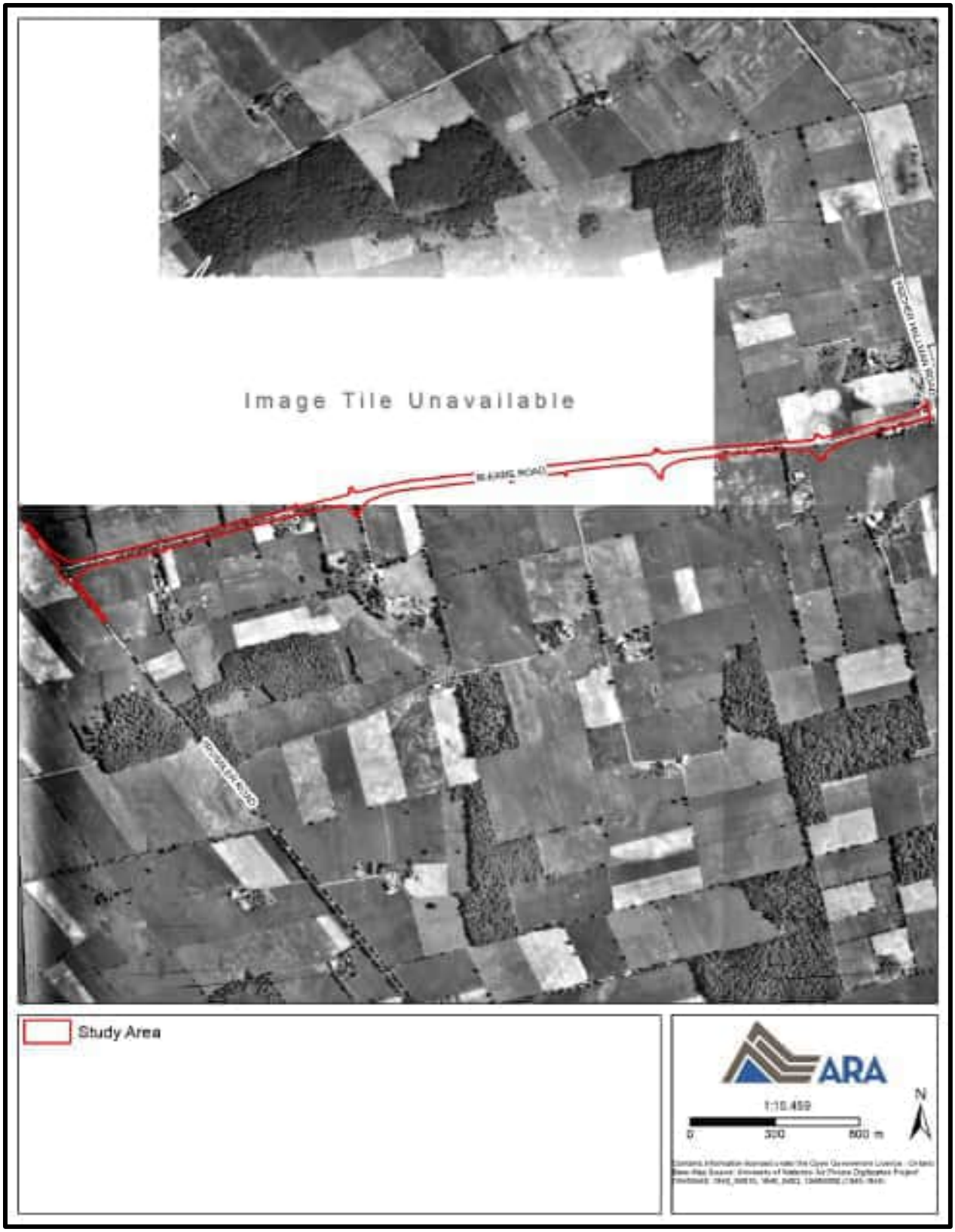
Map 2: ***Tremaines' Map of the County of Waterloo, Canada West*** **(1861)**
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



Map 3: *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



Map 4: Topographic Map (1916/1927)
(Produced under licence using ArcGIS® software by Esri, © Esri; OCUL 2022)



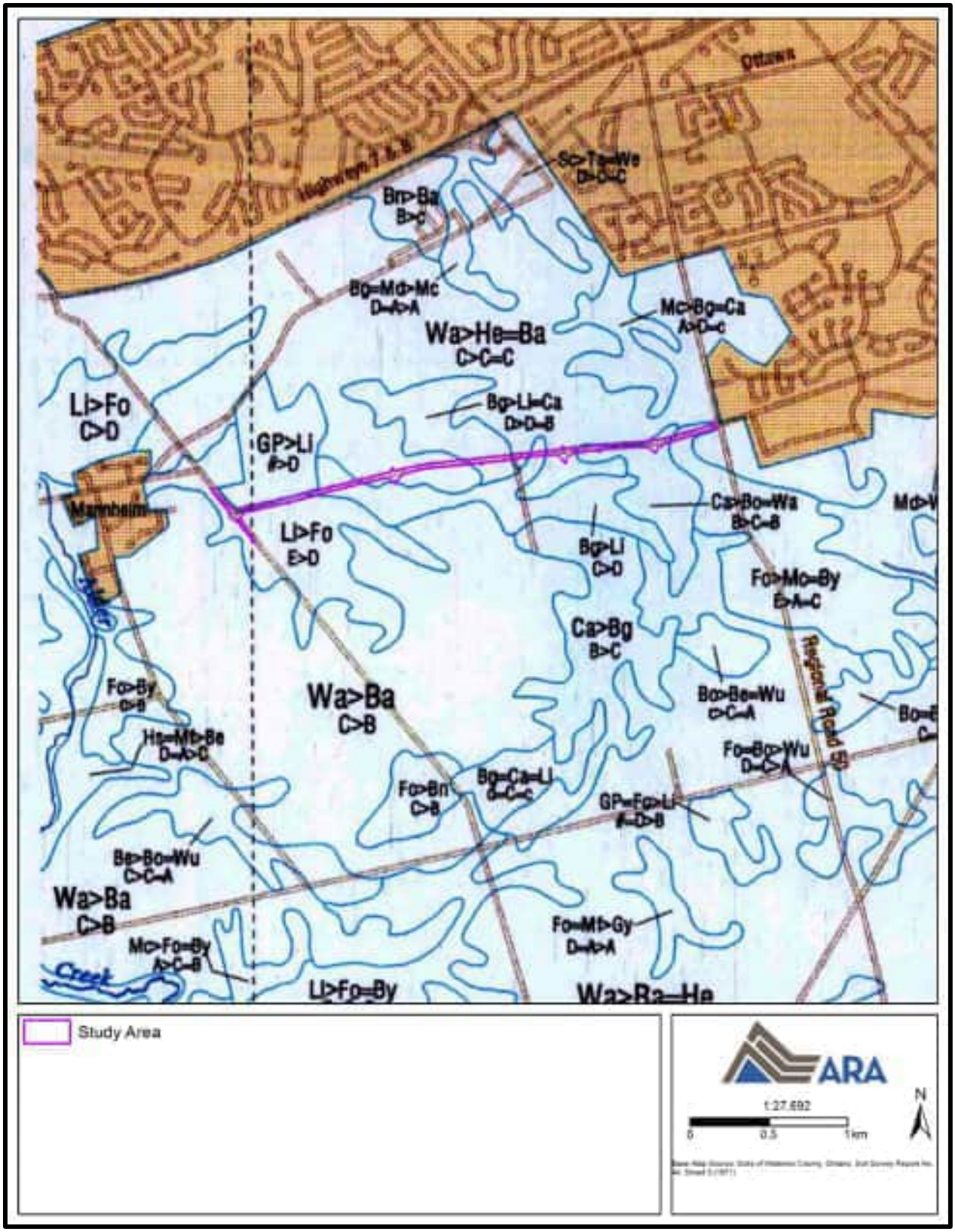
Map 5: Aerial Image (1945/1946)
(Produced under licence using ArcGIS® software by Esri, © Esri; UW 2016)



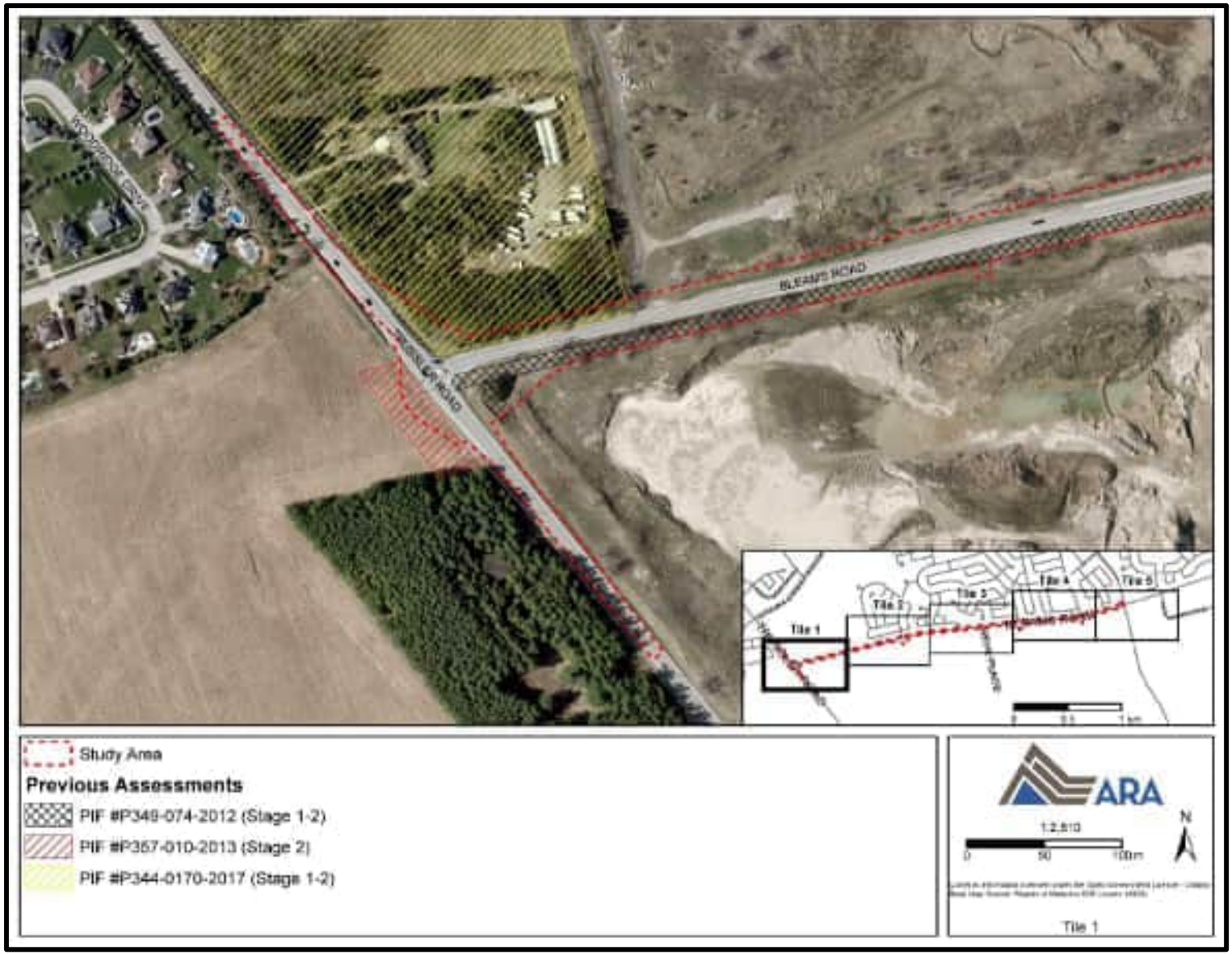
Map 6: Aerial Image (1955)
(Produced under licence using ArcGIS® software by Esri, © Esri; UW 2016)



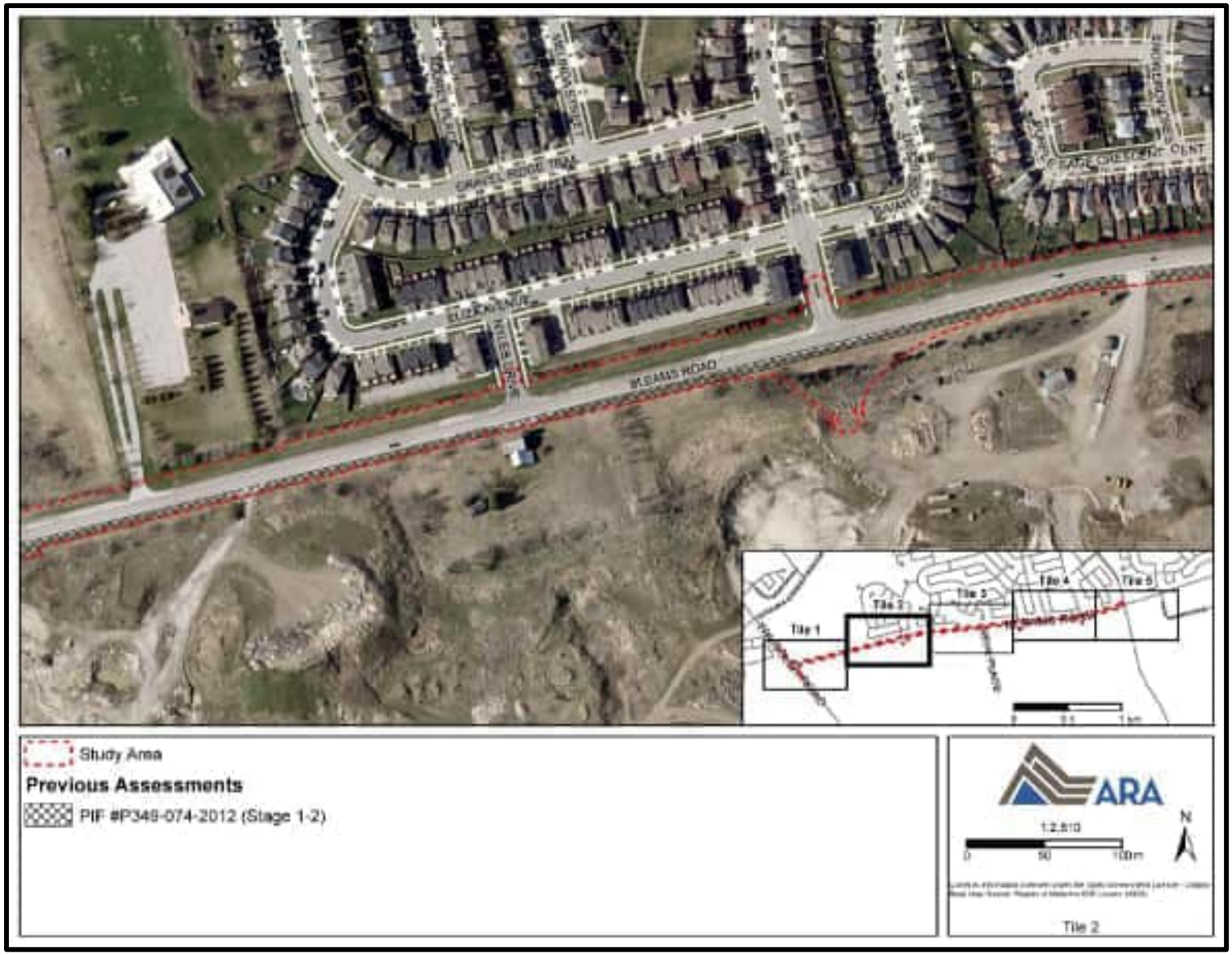
Map 7: Aerial Image (1963)
(Produced under licence using ArcGIS® software by Esri, © Esri; UW 2016)



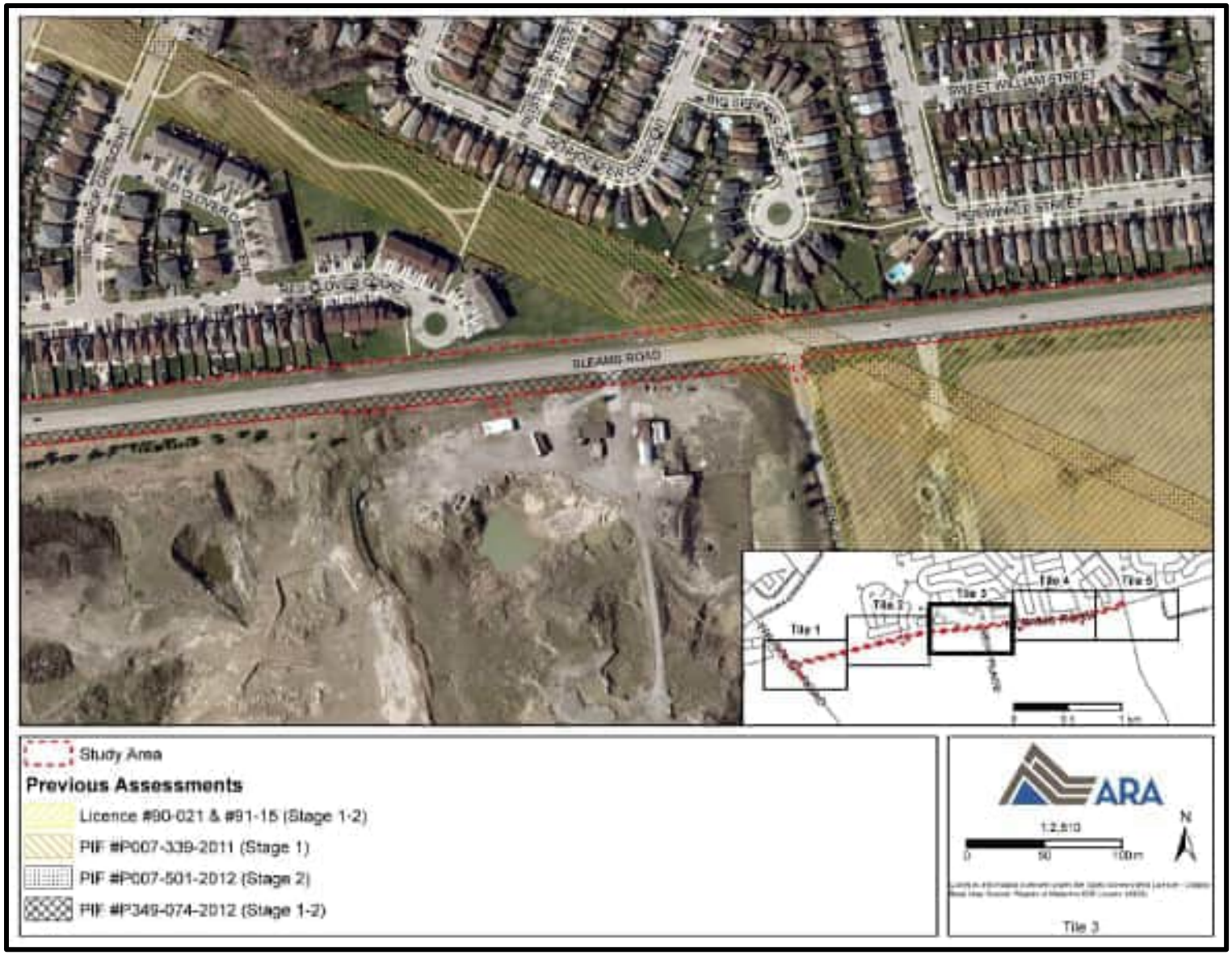
Map 8: Soil Map
(Produced under licence using ArcGIS® software by Esri, © Esri; Cressman 1996:Sheet 3)



Map 9: Previous Stage 1–2 Assessments (Tile 1)
(Produced under licence using ArcGIS® software by Esri, © Esri)



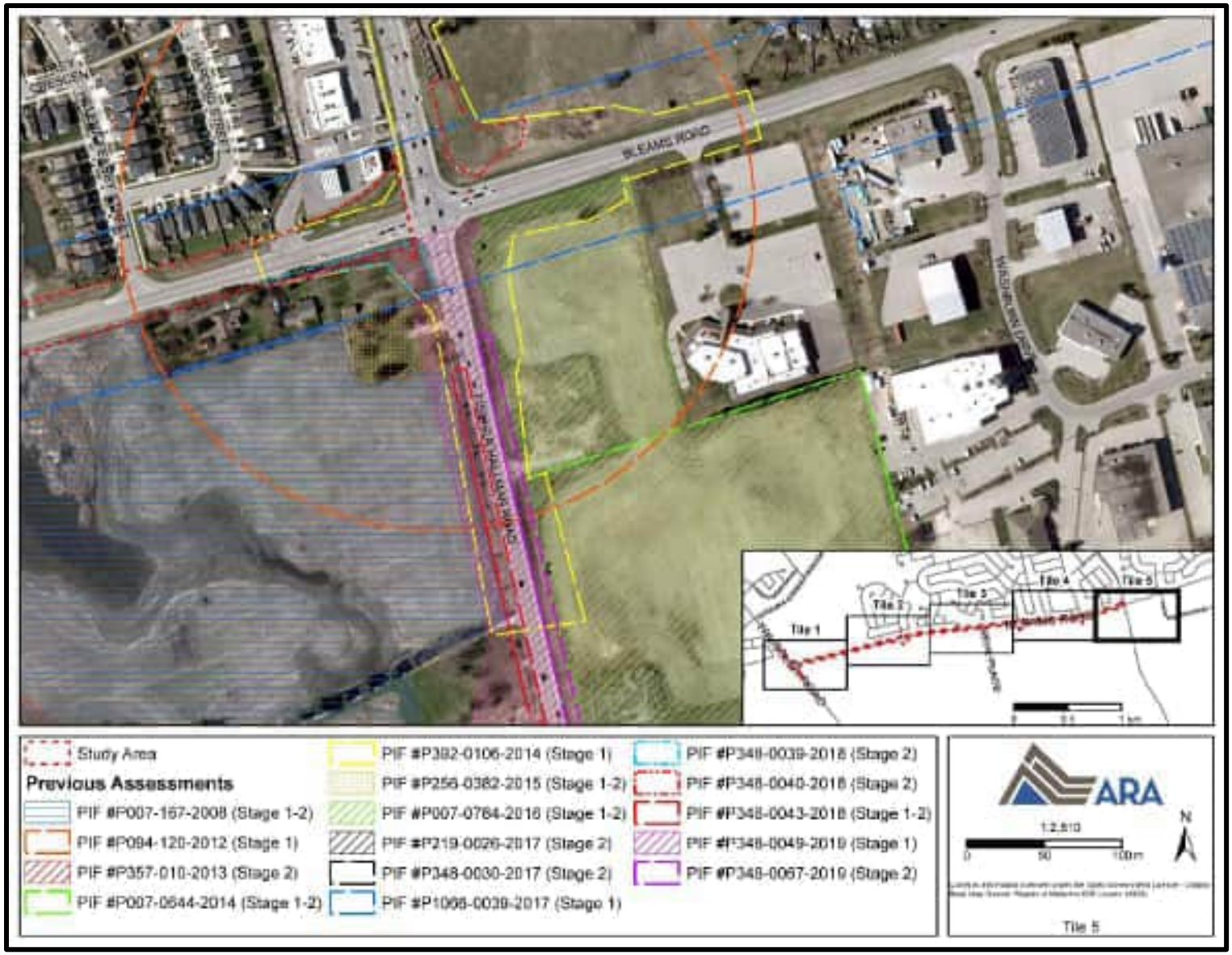
Map 10: Previous Stage 1–2 Assessments (Tile 2)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 11: Previous Stage 1–2 Assessments (Tile 3)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 12: Previous Stage 1–2 Assessments (Tile 4)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 13: Previous Stage 1–2 Assessments (Tile 5)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 14: Features of Potential (Tile 1)
(Produced under licence using ArcGIS® software by Esri, © Esri)



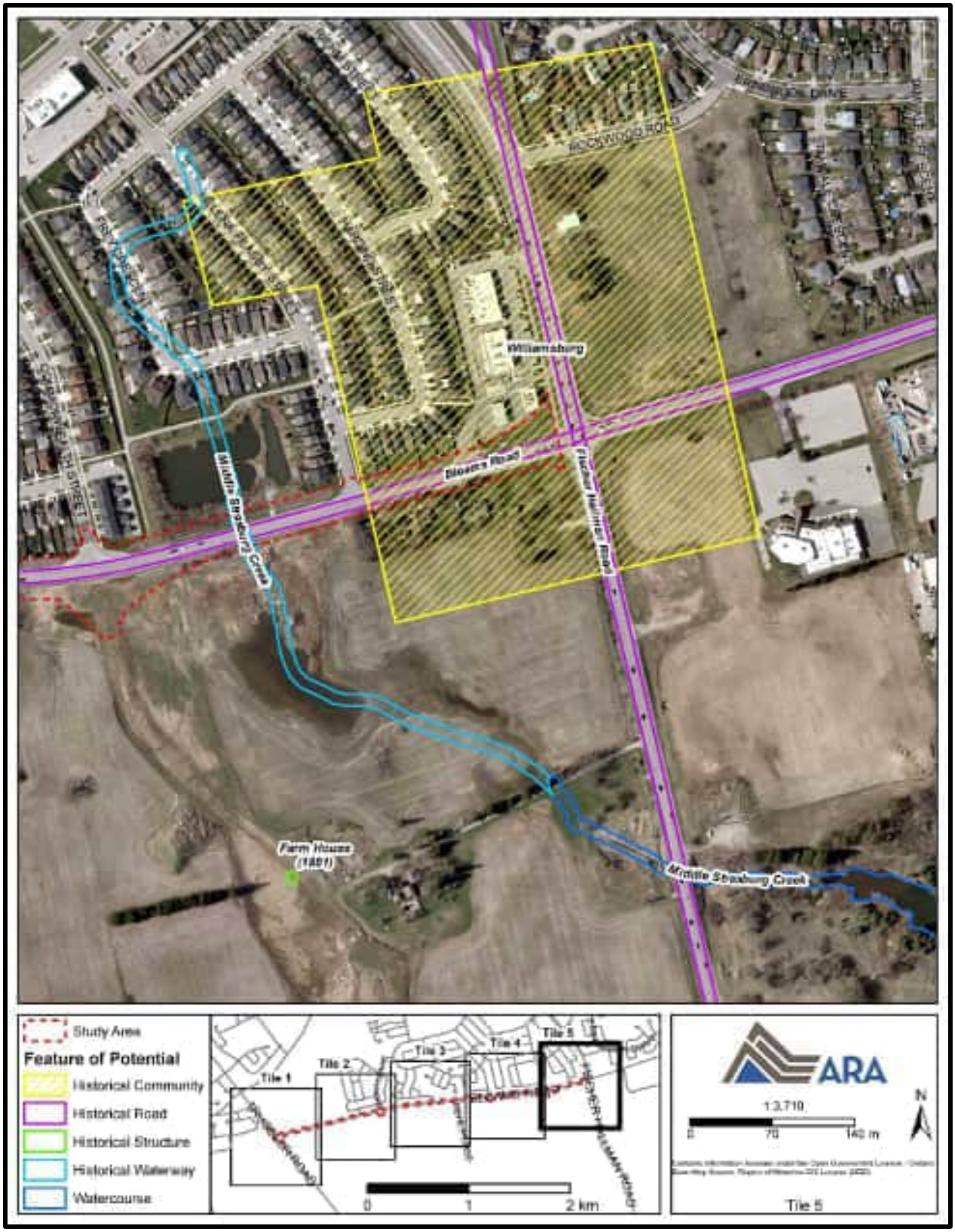
Map 15: Features of Potential (Tile 2)
(Produced under licence using ArcGIS® software by Esri, © Esri)



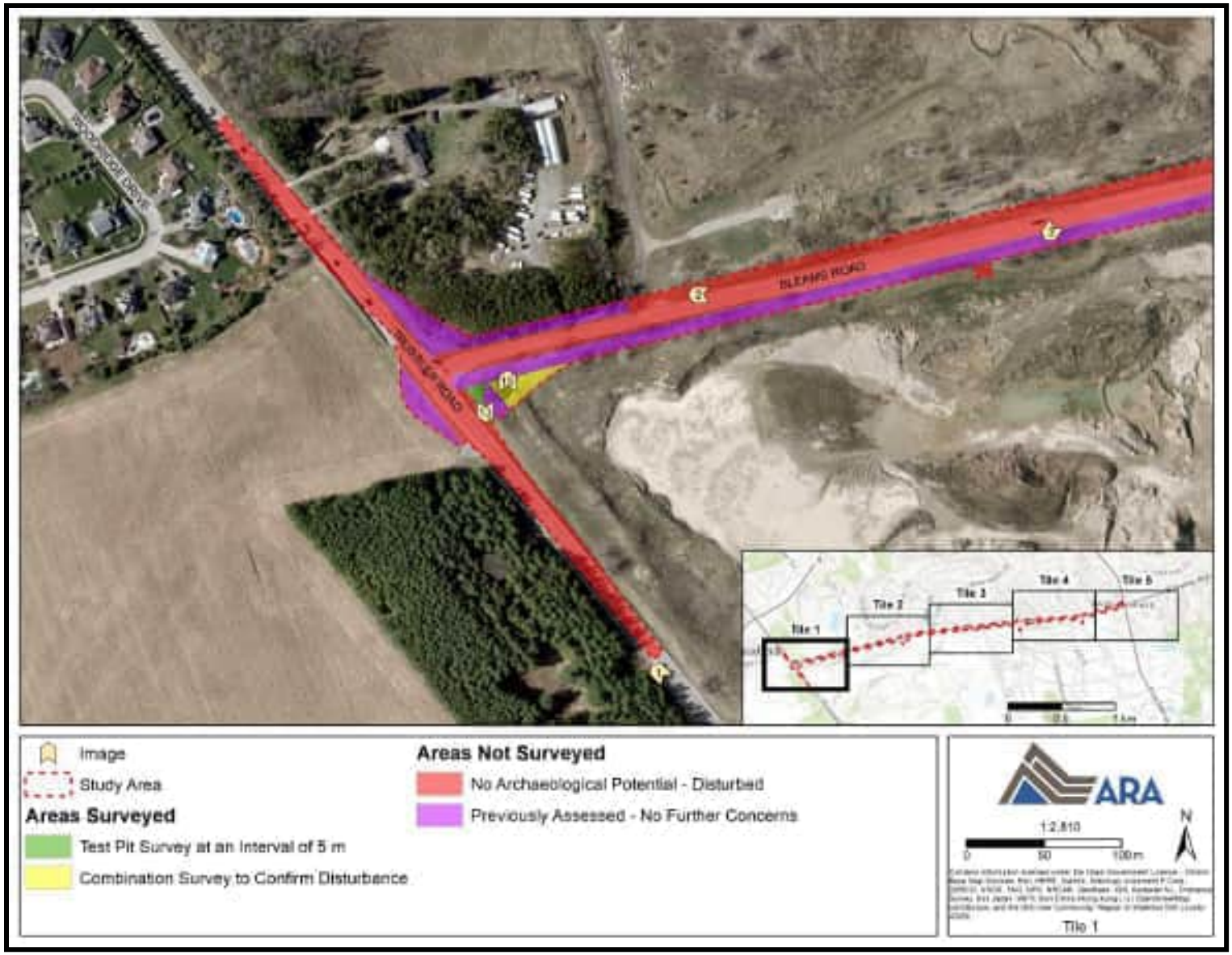
Map 16: Features of Potential (Tile 3)
(Produced under licence using ArcGIS® software by Esri, © Esri)



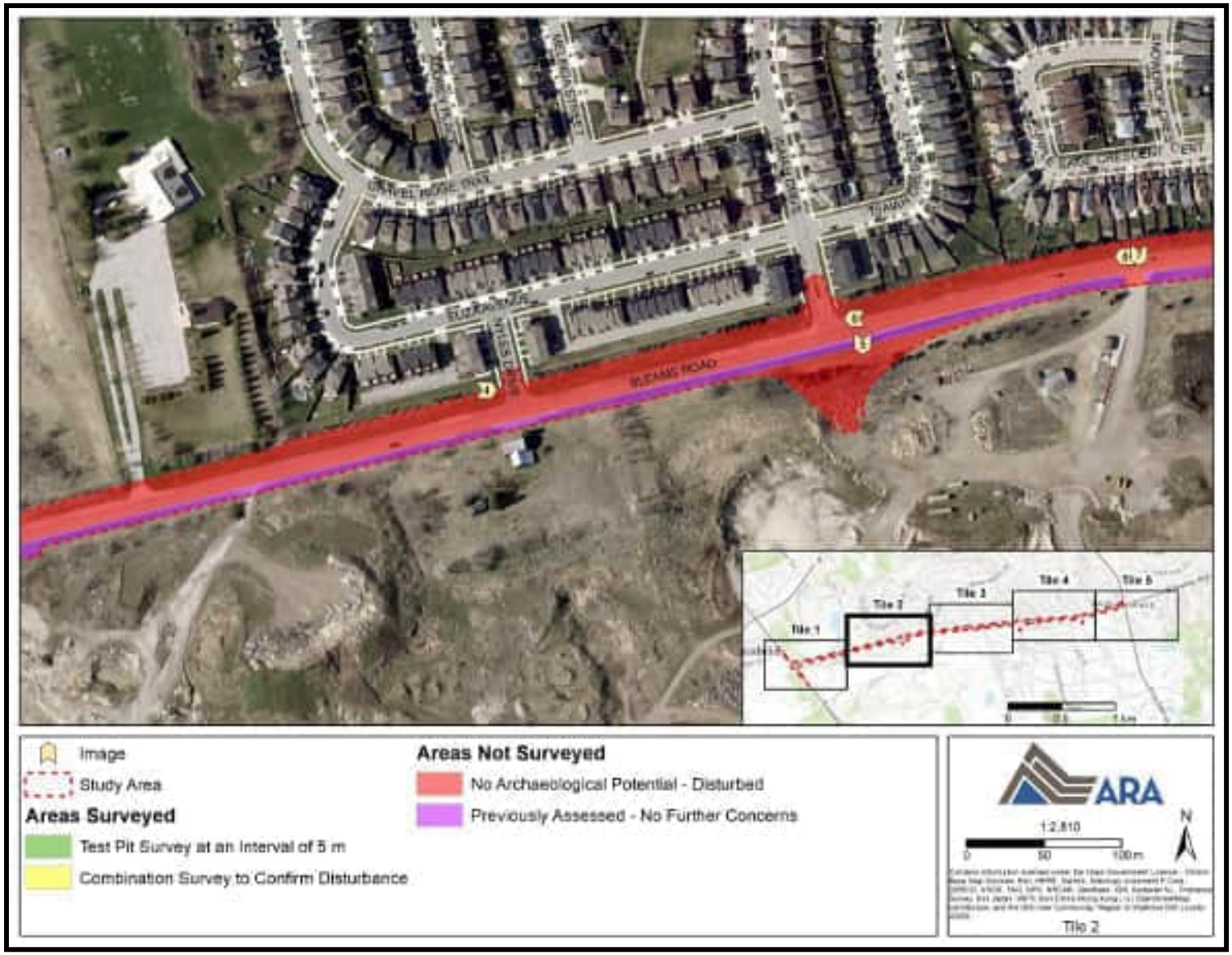
Map 17: Features of Potential (Tile 4)
(Produced under licence using ArcGIS® software by Esri, © Esri)



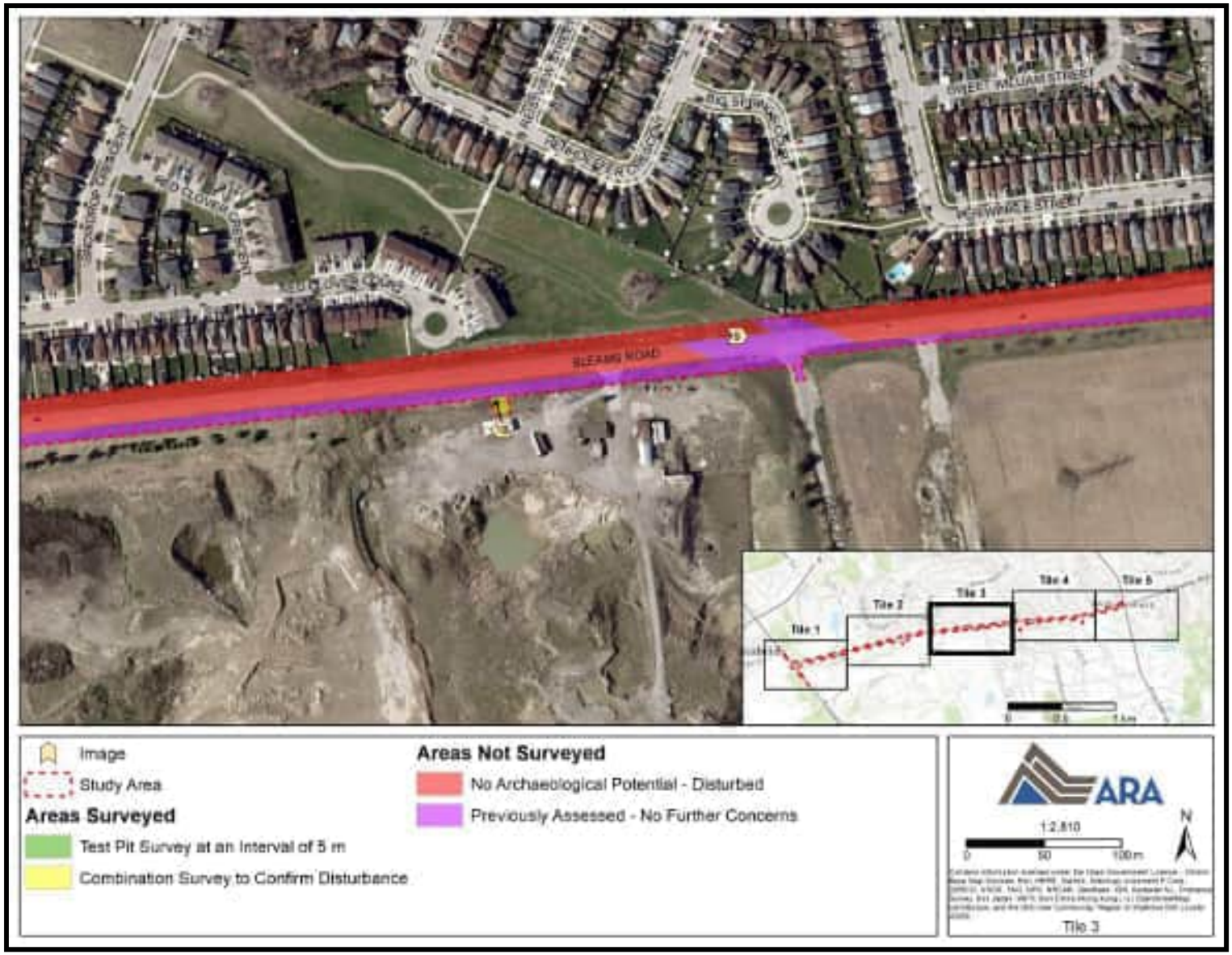
Map 18: Features of Potential (Tile 5)
(Produced under licence using ArcGIS® software by Esri, © Esri)



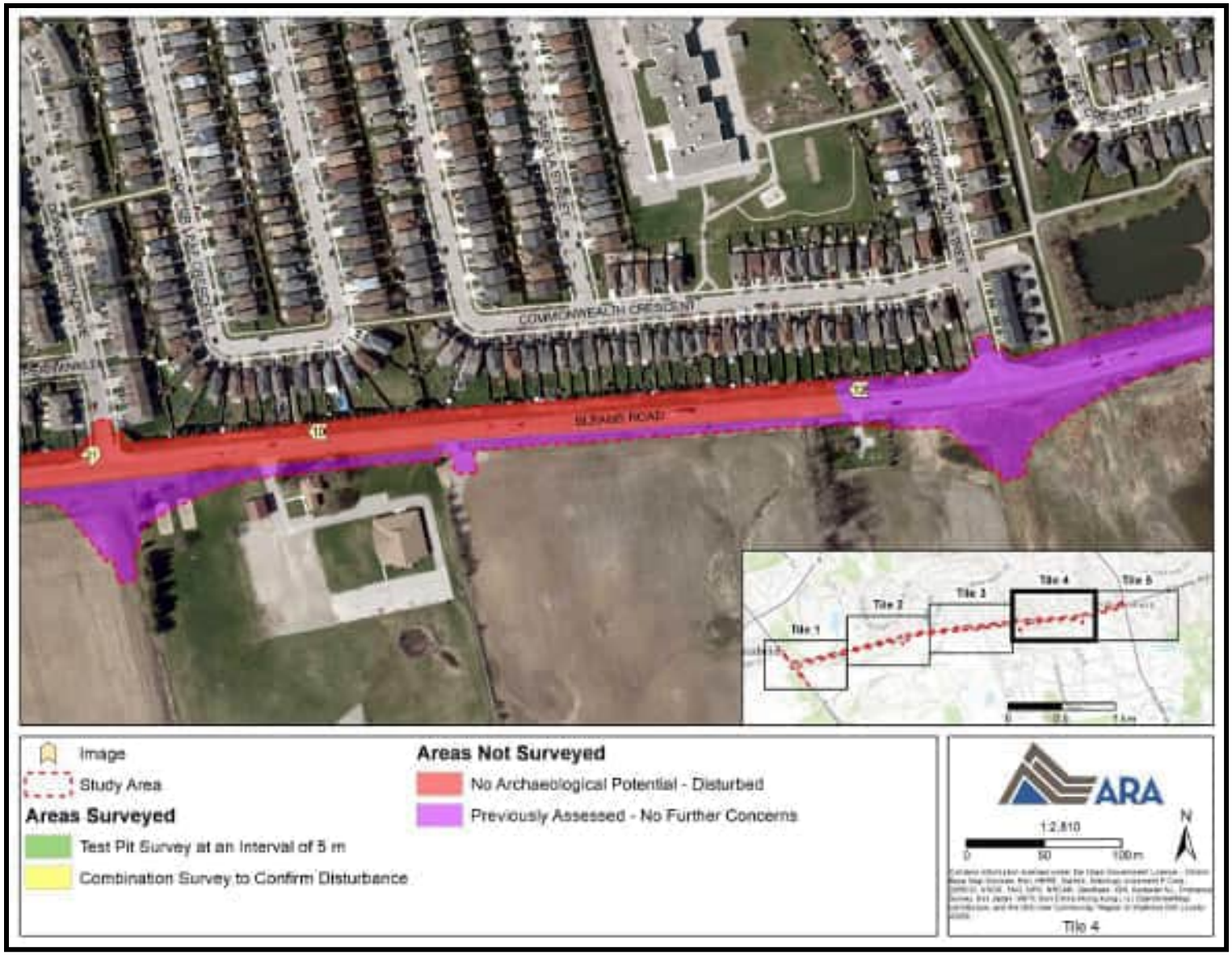
Map 19: Field Methods (Tile 1)
(Produced under licence using ArcGIS® software by Esri, © Esri)



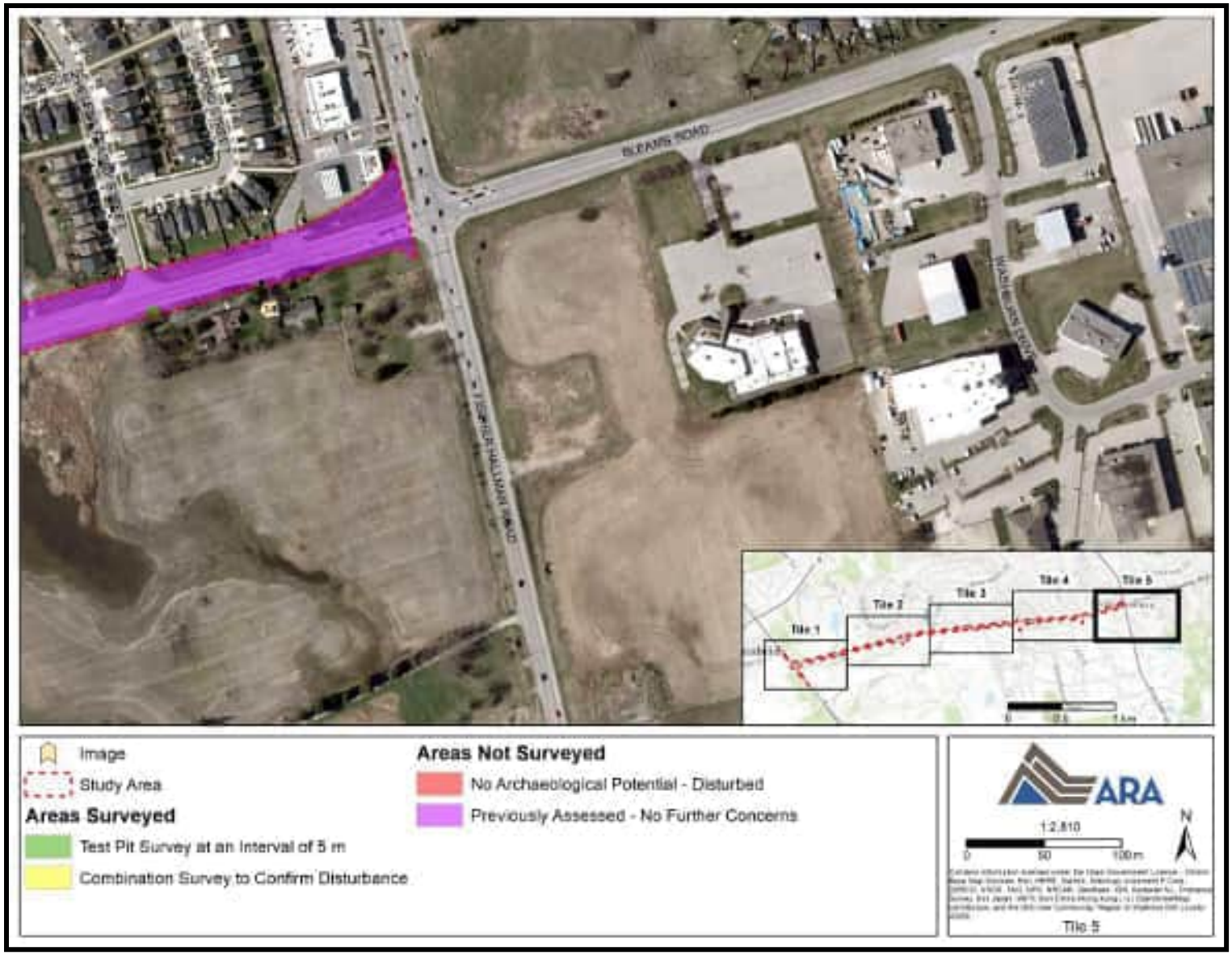
Map 20: Field Methods (Tile 2)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 21: Field Methods (Tile 3)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 22: Field Methods (Tile 4)
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 23: Field Methods (Tile 5)
(Produced under licence using ArcGIS® software by Esri, © Esri)

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Stage 1 and 2 Archaeological Assessments
Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road
City of Kitchener
Regional Municipality of Waterloo
Part of Lots 129, 132, 133, 139 and 140, German Company Tract
and Part of Histand's Tract
Geographic Township of Waterloo
Former Waterloo County, Ontario

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PIF #P007-1289-2022 and #P007-1404-2022
ARA File #2020-0104 and #2022-0387

28/02/2023

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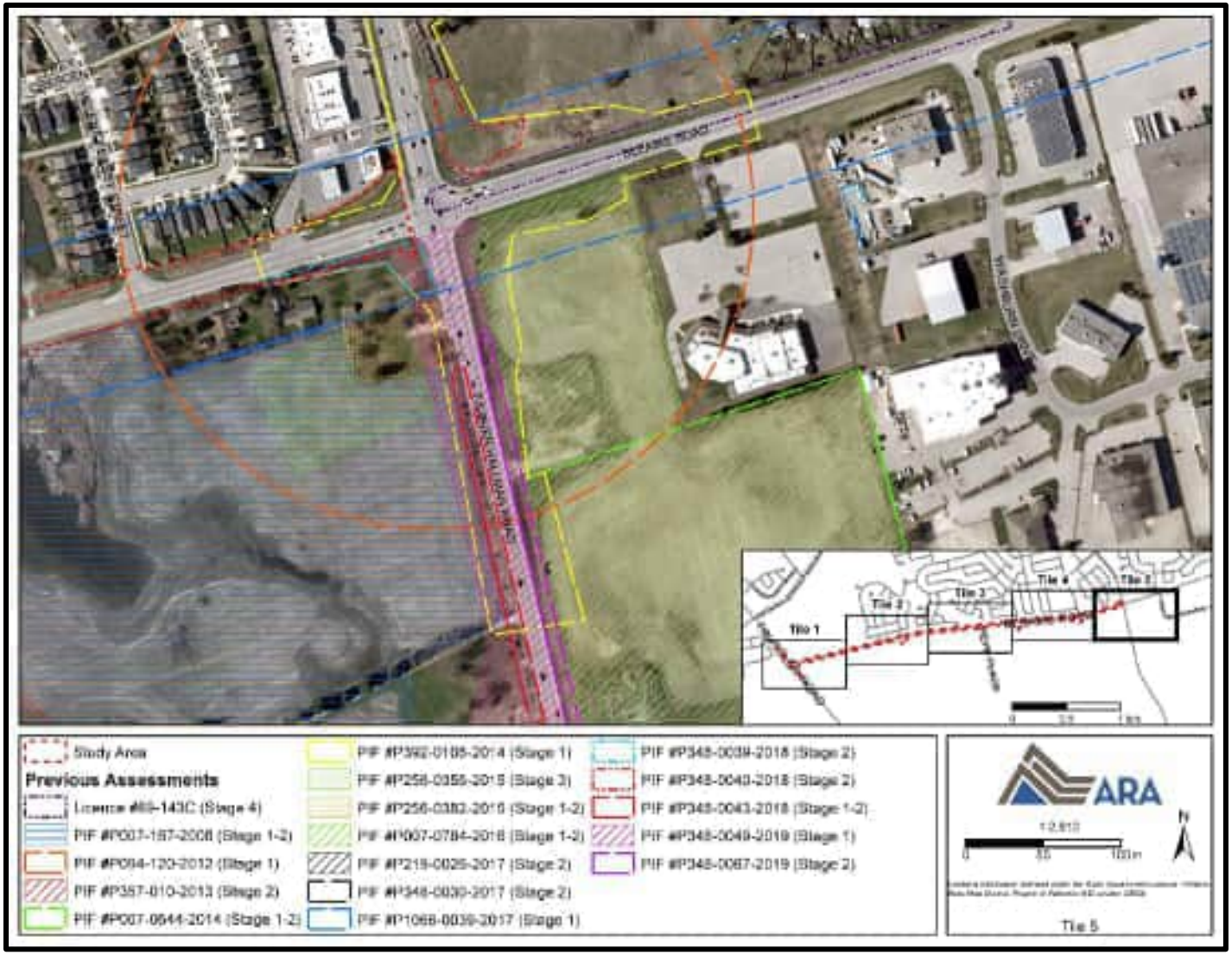
1.0 SUPPLEMENTARY DOCUMENTATION

1.1 Detailed Site Location Information

In keeping with Section 7.6.1 of the 2011 *Standards and Guidelines for Consultant Archaeologists*, detailed site location information was not included within the project report. The Stage 3 and 4 investigations conducted within adjacent lands appear in SD Map 1, and the previously identified archaeological sites falling within 300 m of the study area are shown in SD Map 2–SD Map 3.

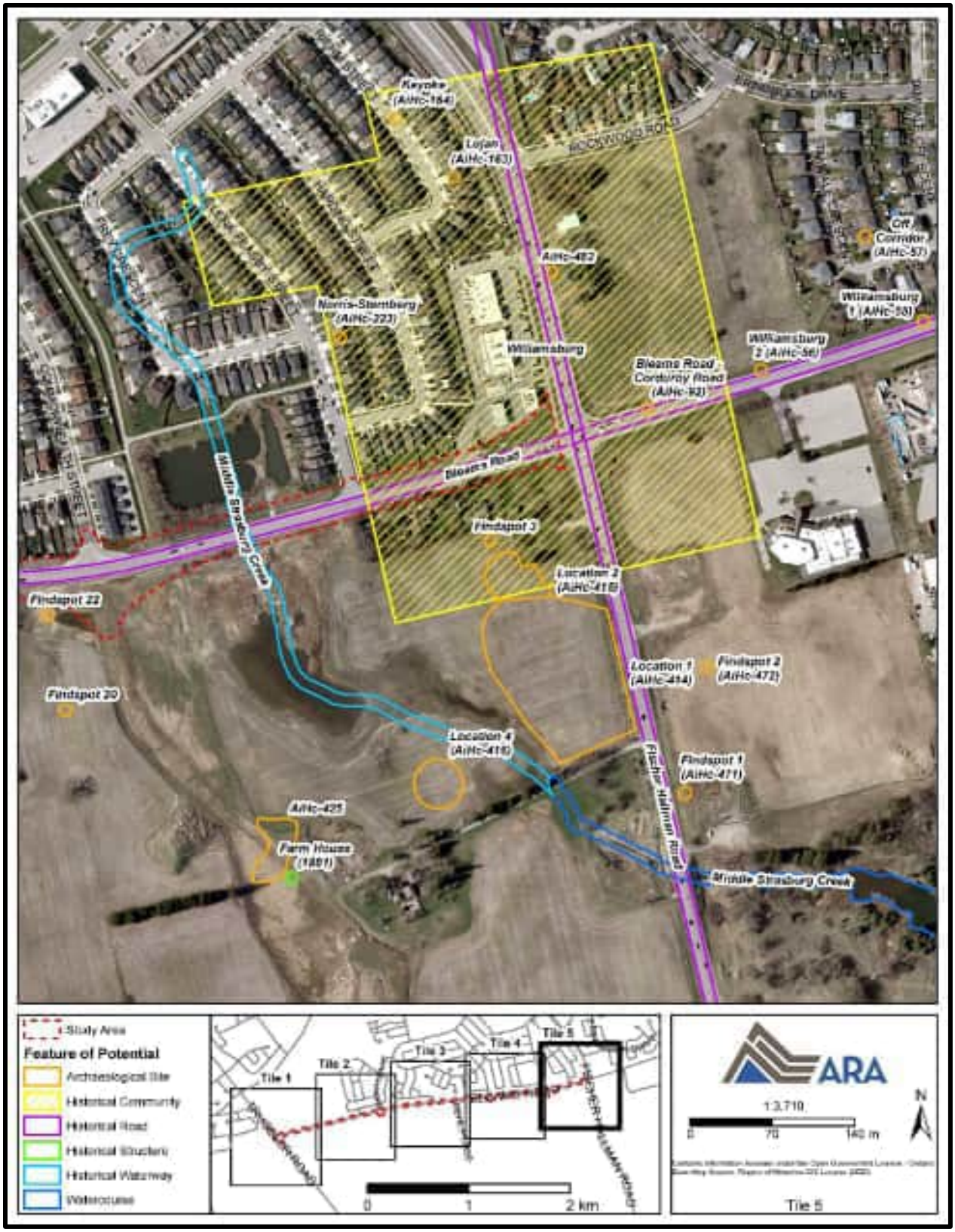
2.0 SD MAPS



SD Map 1: Previous Stage 1–4 Assessments (Tile 5)
(Produced under licence using ArcGIS® software by Esri, © Esri)



SD Map 2: Features of Potential with Site Information (Tile 4)
(Produced under licence using ArcGIS® software by Esri, © Esri)



SD Map 3: Features of Potential with Site Information (Tile 5)
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Appendix C

Record of Indigenous Engagement

Stage 1 and 2 Archaeological Assessments
Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road
City of Kitchener
Regional Municipality of Waterloo
Part of Lots 129, 132, 133, 139 and 140, German Company Tract
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1.0 RECORD OF INDIGENOUS ENGAGEMENT

1.1 Summary of Events

The identification of Indigenous engagement contacts was based on knowledge about treaty areas and traditional territories as well as direction from the proponent. The following groups were contacted to determine whether they had an interest in participating in the project:

- The Department of Consultation & Accommodation (DOCA) on behalf of the Mississaugas of the Credit First Nation (MCFN);
- The Haudenosaunee Development Institute (HDI) on behalf of the Haudenosaunee Confederacy Chiefs Council (HCCC); and
- The Six Nations Lands & Resources Office (SNLR) on behalf of the Six Nations of the Grand River Elected Council (SNGREC).

Archaeological Research Associates Ltd. (ARA) engaged with each of these groups over the course of the investigation. In keeping with the requirements set out in Section 7.6.2 of the 2011 *Standards and Guidelines for Consultant Archaeologists*, a description of ARA's involvement in the process is summarized below. The 2011 *Engaging Aboriginal Communities in Archaeology* draft technical bulletin was also consulted for guidance.

ARA's involvement in the engagement process consisted of the circulation of an invitation to participate, conversations with the coordinators regarding the scheduling of fieldwork, on-site discussions with the field representatives and the distribution of the draft report for review and comment. A summary of engagement events appears in RoIE Table 1, and a breakdown of representative participation is presented in RoIE Table 2. It is ARA's understanding that each representative concurred with the strategies, methods and results of the investigation.

RoIE Table 1: Summary of Engagement Events

Group	Date	Engagement Event	Nature
DOCA on behalf of the MCFN *Contact: A. LaForme*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	27-Oct-21	MCFN indicated that they do not require a monitor in field for the Stage 1 site visit but that they would need to review the report.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email
	13-Feb-22	Circulation of the report for review and comment.	Email
	24-Feb-23	Follow up on the status of the report review. A. LaForme replied that following his review of the draft report, he agrees with the recommendations.	Email
HDI on behalf of the HCCC *Contacts: O. Greene, W. Hill, S. Martin, T. Williams*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	31-Oct-21	W. Hill confirmed interest in participating in the Stage 1 assessment.	Email
	01-Nov-21	V. Cafik responded to request that HDI forward their standard agreement to the contact at the City of Kitchener.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email

Group	Date	Engagement Event	Nature
	13-Feb-22	Circulation of the report for review and comment.	Email
	24-Feb-23	Follow up on the status of the report review.	Email
	28-Feb-23	No comments received.	-
SNLR on behalf of the SNGREC *Contacts: T. Hill-Montour, D. LaForme*	26-Oct-21	Stage 1 project introduction and invitation to participate circulated.	Email
	12-Nov-21	V. Cafik followed up to determine whether the community had an interest in being engaged for the Stage 1 assessment. T. Hill-Montour indicated that they were interested, and D. LaForme provided a standard agreement for signature.	Email
	23-Nov-21	V. Cafik indicated that a clause needed to be added to the agreement at the request of the Region. If the SNEC was agreeable to the clause, then V. Cafik would facilitate signatures at the Region and the project would be put into the schedule the following week.	Email
	17-Dec-21	ARA provided Stage 1 deployment details for the following week	Email
	09-Sep-22	Stage 2 project introduction and invitation to participate circulated.	Email
	28-Oct-22	Deployment details circulated for the following week.	Email
	31-Oct-22	Updated deployment details circulated for the following day.	Email
	13-Feb-22	Circulation of the report for review and comment.	Email
	21-Feb-23	T. Hill-Montour replied that the area is of significant interest to SNGREC and that following a review of the draft report, SNGREC have no comments or concerns.	Email

RoIE Table 2: Summary of Participating Representatives

Group	Representative	Participation
DOCA on behalf of the MCFN	J. Sault	November 1, 2022
	C. Tobicoe	November 3, 2022
HDI on behalf of the HCCC	K. Bomberry	December 22, 2021
	T. Tobicoe	November 1, 2022
SNLR on behalf of the SNGREC	D. Jacobs	November 1, 2022

Appendix D

Built Cultural Heritage

Cultural Heritage Assessment Report

Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road
City of Kitchener
Regional Municipality of Waterloo
Lots 129, 132, 133, 139 and 140, German Company Tract
and Part of Histand's Tract
Geographic Township of Waterloo
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HR-393-2002
ARA File # 2022-0077

14/04/2023

EXECUTIVE SUMMARY

Under a contract awarded in February 2022, Archaeological Research Associates Ltd. carried out a Cultural Heritage Assessment Report (CHAR), for the proposed improvements to Bleams Road (henceforth proposed project) in the City of Kitchener, Regional Municipality of Waterloo, Ontario. The proposed project includes a three-kilometre section of Bleams Road from just west of Fischer-Hallman Road to Trussler Road, City of Kitchener. This assessment was carried out as part of a Schedule 'C' Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*.

The purpose of this assessment is to identify and evaluate the cultural heritage resources within and adjacent to the study area that may be impacted by the reconstruction of a section of Bleams Road. This assessment was conducted in accordance with the aims of the *Environmental Assessment Act*, R.S.O. 1990, *Provincial Policy Statement* (2020) and the *Ontario Heritage Act*, R.S.O. 1990, c. O.18, *Region of Waterloo Official Plan* (2015) and the *City of Kitchener Official Plan* (2014).

The Cultural Heritage Assessment Report approach included:

- Background research concerning the project and historical context of the study area;
- Consultation with City of Kitchener and Region of Waterloo Planning staff regarding heritage matters in the study area;
- Identification of any designated or recognized properties within and adjacent to the study area;
- On-site inspection and creation of an inventory of all properties with potential Built Heritage Resources and Cultural Heritage Landscapes within and adjacent to the study area;
- A description of the location and nature of potential cultural heritage resources;
- Evaluation of each potential cultural heritage resource against the criteria set out in Ontario Regulation 9/06 for determining cultural heritage value or interest;
- Evaluation of potential project impacts; and
- Provision of suggested strategies for the future conservation of identified cultural heritage resources.

As a result of consultation and field surveys the following Built Heritage Resources were identified within and adjacent to the study area: 1385 Bleams Road (BHR-1), 1643 Bleams Road (BHR-2), and 2291 Ottawa Street South (BHR-3). As a result of consultation and the field survey the following Cultural Heritage Landscapes were identified within and adjacent to the study area: Trussler Road (CHL-1), and 2091 Bleams Road (CHL-2). Detailed designs or plans for the road reconstruction were not available at the time this report was written, however there is the potential that the identified Built Heritage Resources and Cultural Heritage Landscapes may be directly or indirectly impacted by the proposed project. All identified Built Heritage Resources and Cultural Heritage Landscapes with the exception of BHR-3 fall within the heritage assessed area. Depending on the nature and extent of the proposed project and project location, the Built Heritage Resources and Cultural Heritage Landscapes have the potential for direct and indirect impacts.

As a result of this Cultural Heritage Assessment Report, the following mitigation strategies are recommended:

- That any construction and staging areas should avoid the use of land which are part of BHR-1 at 1385 Bleams Road, BHR-2 at 1643 Bleams Road and BHR-3 at 2219 Ottawa Street South as well as,CHL-1 along Trussler Road, CHL-2 at 2091 Bleams Road.
- That should project-related activities be expected to impact the property associated with BHR-1 BHR-2, BHR-3 CHL-1, or CHL-2, a qualified heritage consultant should be contracted to complete property specific or Cultural Heritage Landscape specific Cultural Heritage Impact Assessment and provide detailed mitigation options to address the proposed design on the resources;
- To protect the BHRs during the construction period, vibrations should be identified through a vibration impact study and/or vibration monitoring implementation strategy. It is recommended that City of Kitchener staff provide guidance on the scope required and at what stage of the planning process the study should be undertaken;
- That design alternatives should consider the heritage attributes of CHL-1. Specifically, the narrow two-lane alignment without shoulders, the scenic views to surrounding agricultural fields, the diverse roadside vegetation that abuts the road and provides a defined edge as well as the corresponding and undulating topography which is part of the original historic alignment; this may be achieved through appropriate setbacks;
- That public consultation may result in additional potential cultural heritage resources being identified. These potential cultural heritage resources should be reviewed by a qualified heritage consultant to: 1) determine their cultural heritage value or interest, 2) evaluate potential project impacts, and 3) suggest strategies for future conservation of any identified cultural heritage resources;
- That should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That should the proposed project create publicly accessible areas, this may provide an opportunity to interpret some of the identified cultural heritage resources associated with the Cultural Heritage Landscapes (i.e., with plaques, public art);
- That this Cultural Heritage Assessment Report should be provided to staff/planners at the City of Kitchener; and
- Stage 1 and 2 assessments were conducted in May and July 2022 under Project Information Form #P007-1369-2022. The investigation encompassed the entire study area. One known site was identified within the subject lands: AiHc-482. This site was previously mitigated and does not represent a concern for the project. The Stage 2 assessment resulted in the identification of one new location of archaeological materials: Site 1. Site 1 was found to be of no further cultural heritage value or interest. It is recommended that no further assessment be required within the study area.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
BHR – Built Heritage Resource
CHAR – Cultural Heritage Assessment Report
CHL – Cultural Heritage Landscape
CHVI – Cultural Heritage Value or Interest
EA – Environmental Assessment
HSMBC – Historic Sites and Monuments Board of Canada
MCEA – Municipal Class Environmental Assessment
MCM – Ministry of Citizenship and Multiculturalism
OHA – Ontario Heritage Act
OHT – Ontario Heritage Trust
OP – Official Plan
O. Reg. – Ontario Regulation
PPS – Provincial Policy Statement
RSCHR – Regionally Significant Cultural Heritage Resources

PERSONNEL

Heritage Operations Manager (Acting): J. McDermid, BA, CAHP
Project Manager: J. McDermid
Field Surveyors: V. Cafik, BA, CAHP, J. McDermid
Historical Research: S. Clarke, BA, CAHP
Photography: J. McDermid
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Senior Review: K. Jonas Galvin, MA, CAHP, RPP, MCIP
Editor: D. Worby, MA

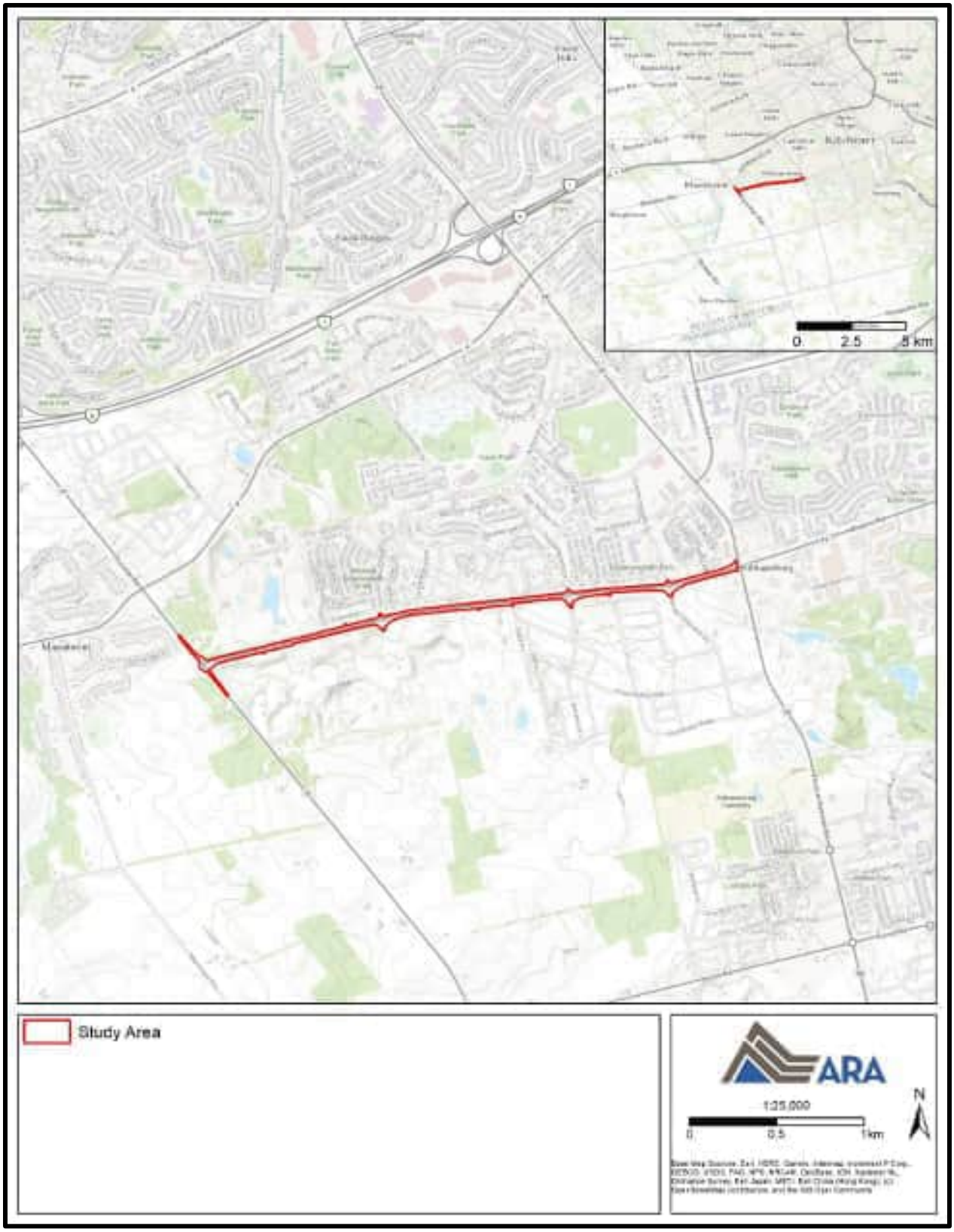
Two-page Curriculum Vitae (CV) for key team members that demonstrate the qualifications and expertise necessary to perform cultural heritage work in Ontario are provide in Appendix B.

1.0 PROJECT CONTEXT

Under a contract awarded in February 2022, Archaeological Research Associates Ltd. (ARA) carried out a Cultural Heritage Assessment Report (CHAR), for the proposed improvements to Bleams Road (henceforth proposed project) in the City of Kitchener, Regional Municipality of Waterloo, Ontario. The proposed project includes a three-kilometre section of Bleams Road from just west of Fischer-Hallman Road to Trussler Road, City of Kitchener. This assessment was carried out as part of a Schedule 'C' Municipal Class Environmental Assessment (MCEA) in accordance with the *Environmental Assessment Act*.

The study area is characterized by rolling topography, agricultural fields, low rise large lot residential dwelling and estates and other infill lots, roadways, and steep slopes and grade changes surrounding the valley and roadways. In legal terms, the study area falls on Lots 129, 132, 133, 139 and 140, German Company Tract (GCT) and part of Histand's Tract in the Geographic Township of Waterloo, former Waterloo County (see Map 1).

The purpose of this assessment is to identify and evaluate the cultural heritage resources within and adjacent to the study area that may be impacted by the proposed project (known as the heritage assessed area). This assessment was conducted in accordance with the aims of the *Environmental Assessment Act*, R.S.O. 1990, *Provincial Policy Statement* (2020) and the *Ontario Heritage Act*, R.S.O. 1990, c. O.18, *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (MCM 1992), *Ontario Heritage Tool Kit series* (MCM 2006a), the *Region of Waterloo Official Plan* (2015) and the *City of Kitchener Official Plan* (2014).



Map 1: Study Area in the City of Kitchener
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)

2.0 LEGISLATION AND POLICY REVIEW

The framework for this assessment report is provided by federal guidelines, provincial environmental and planning legislation, and policies as well as regional and local municipal Official Plans and guidelines.

2.1 Federal Guidelines

At the national level, *The Standards and Guidelines for Conservation of Historic Places in Canada* (Parks Canada 2010) provides guidance for the preservation, rehabilitation, and restoration of historic places, including cultural heritage landscapes (CHLs) and built heritage resources (BHRs). Such guidance includes the planning and implementation of heritage conservation activities.

2.2 Provincial Policies and Guidelines

2.2.1 Environmental Assessment Act and Guideline

Within the *Environmental Assessment Act,* the environment includes "any building, structure, machine or other device or thing made by humans." An Environmental Assessment (EA) is a study that evaluates both the potential positive and/or negative effects of a project on the environment. This study is conducted as part of a streamlined EA process known as a Municipal Class EA (MCEA), which applies to routine projects grouped into classes that range from A (minor undertakings) to C (new construction of large facilities). The MCEA applies to municipal infrastructure undertakings including roads, water, and wastewater projects.

The *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* indicates a need to describe the "affected environment" that is "a spatially defined area within which land will be altered as a result of the proponent's development" (MCM 1992:3). As such, ARA completes in-depth research and evaluation of any potential cultural heritage resource within the study area. ARA's business practice also considers the study area and any adjacent properties. This ensures that every BHR and CHL that may be subject to potential indirect project impacts is identified.

2.2.2 Planning Act

Section 2 of the Ontario *Planning Act* indicates that a council of a Municipality have regard for matters of provincial interest such as: "(d) the conservation of features of significant architectural, cultural, historical, archaeological or scientific interest" (Government of Ontario 2018). Section 3 of the *Planning Act* directs a municipal Council's decisions to be consistent with the *Provincial Policy Statement* (PPS 2020).

2.2.3 The Provincial Policy Statement (2020)

The *Provincial Policy Statement* (PPS 2020) contains a combined statement of the Province's land use planning policies. It provides the provincial government's policies on a range of land use planning issues including cultural heritage outlined. As outlined in Section 2.0 on Wise Use of and Management of Resources: "Ontario's long-term prosperity, environmental health, and social well-

being depend on conserving biodiversity, protecting the health of the Great Lakes, and protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources for their economic, environmental and social benefits" (MMAH 2020:24). The PPS 2020 promotes the conservation of cultural heritage resources through detailed polices in Section 2.6, such as "2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved" and "2.6.3 Planning authorities shall not permit development and site alteration on adjacent lands to protected heritage property except where the proposed development and site alteration has been evaluated and it has been demonstrated that the heritage attributes of the protected heritage property will be conserved." (MMAH 2020:31).

2.2.4 Ontario Heritage Act

The *Ontario Heritage Act* (*OHA*), R.S.O. 1990, c.018 is the guiding piece of provincial legislation for the conservation of significant cultural heritage resources in Ontario. The *OHA* gives provincial and municipalities governments the authority and power to conserve Ontario's heritage. The *OHA* has policies which address individual properties (Part IV), heritage districts (Part IV), and allows municipalities to create a register of non-designated properties which may have cultural heritage value or interest (Section 27).

In order to objectively identify cultural heritage resources, 9/06 as amended by 569/22 made under the *OHA* sets out nine criteria for determining cultural heritage value or interest (CHVI) (MCM 2006b:20–27). The criteria set out in the regulation were developed to identify and evaluate properties for designation under the *OHA*. Best practices in evaluating properties that are not yet protected employ O. Reg. 9/06 to determine if they have CHVI. In the absence of specific CHL evaluation criteria, potential CHLs O. Reg 9/06 is also applied to consider the built and natural features and the property as a whole. The O. Reg. 9/06 criteria are as follows:.

1. *is a rare, unique, representative or early example of a style, type, expression, material or construction method,*
2. *displays a high degree of craftsmanship or artistic merit, or*
3. *demonstrates a high degree of technical or scientific achievement.*
4. *has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community,*
5. *yields, or has the potential to yield, information that contributes to an understanding of a community or culture, or*
6. *demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.*
7. *is important in defining, maintaining or supporting the character of an area,*
8. *is physically, functionally, visually or historically linked to its surroundings, or*
9. *is a landmark.* O. Reg. 9/06, s. 1 (2).

The *OHA* provides three key tools for the conservation of built heritage resources (BHRs) and cultural heritage landscapes (CHLs). It allows for protection as:

1. A single property (i.e., farmstead, park, garden, estate, cemetery), a municipality can designate BHRs and CHLs as individual properties under Part IV of the *OHA*.

2. Multiple properties or a specific grouping of properties may be considered a CHL, as such, a municipality can designate the area as a Heritage Conservation District (HCD) under Part V of the *OHA*.
3. Lastly, a municipality has the authority to add an individual or grouping of non-*OHA* designated property(ies) (often called "listed" properties) of heritage value or interest on their Municipal Heritage Register.

An *OHA* designation provides the strongest heritage protection available for conserving cultural heritage resources.

2.3 Municipal Policies

2.3.1 Region of Waterloo Official Plan

The Region of Waterloo *Regional Official Plan 2031* Chapter 3 focuses on "Liveability in Waterloo." Section 3.G contains policies related specifically to cultural heritage in Waterloo Region. Policy 3.G.1 indicates that: "The Region and Area Municipalities will ensure that cultural heritage resources are conserved using the provisions of the Heritage Act, the Planning Act, the Environmental Assessment Act…" (2015:48). This policy is relevant for the current project. Building on Policy 3.G.1, Policy 3.G.3 states:

> *Area Municipalities will identify cultural heritage resources by establishing and maintaining a register of properties that are of cultural heritage value or interest. Area Municipalities will include on their register properties designated under Part IV, V or VI of the Heritage Act, and will consider including, but not be limited to, the following additional cultural heritage resources of cultural heritage value or interest:*
>
> > *(a) properties that have heritage conservation easements or covenants registered against title;*
> > *(b) cultural heritage resources of Regional interest; and*
> > *(c) cultural heritage resources identified by the Grand River Conservation Authority and the Federal or Provincial governments* (Region of Waterloo 2015:48-49).

In Policy 3.G.4 the Region indicates it will also coordinate and maintain a "region-wide inventory of cultural heritage resources" which will include the resources noted above as well as resources identified by "postsecondary institutions or local historical societies" (Region of Waterloo 2014:49).

There are policies that are for the identification and protection of Regionally Significant Cultural Heritage Resources. The policy information below is also outlined in the *Regional Implementation Guideline for Conserving Regionally Significant Cultural Heritage Resources* (*RSCHR)* (2018:9).

> *3.G.2 The Region will prepare and update a Regional Implementation Guideline for Conserving Regionally Significant Cultural Heritage Resources. In accordance with the Ontario Heritage Act, this guideline will outline the criteria and processes the Region will follow to identify and conserve cultural*

> *heritage resources of Regional interest including regional roads that have cultural heritage value or interest* (Region of Waterloo 2018:49).

OP Policy 3.G.4 indicates that the Region will coordinate and maintain a region-wide inventory of cultural heritage resources including those of "d) of Regional interest…" (Region of Waterloo 2018: 49).

The property, 1385 Bleams Road (Williamsburg School) has been identified as likely meeting the criteria for Regional Significance (B. Coady, Region of Waterloo Pers. Comm. 2022). As such, the *Guidelines for Conserving Regionally Significant Cultural Heritage Resources* are explored in more detail below.

2.3.2 Guidelines for Conserving Regionally Significant Cultural Heritage Resources

The *Guidelines for Conserving Regionally Significant Cultural Heritage Resources* (2018) detail the existing policy context, define Regionally Significant Cultural Heritage Resources (RSCHR), the rationale for RSCHR identification and evaluation, and the objectives of the RSCHR identification process. RSHCRs may include:

- *buildings;*
- *monuments;*
- *bridges and other infrastructure;*
- *rivers and waterways;*
- *roads;*
- *parks and open space;*
- *districts;*
- *cemeteries;*
- *cultural heritage landscapes; and*
- *archaeological sites* (Region of Waterloo 2018:4).

The guidelines outline the "key steps" to be taken in the conservation of a RSCHRs and how to undertake them (Region of Waterloo 2018c). These steps include: Identification of Candidate RSCHR; Evaluation of Regional Significance; Documentation of RSCHR; HPAC [Heritage Planning Advisory Committee] Consideration and Recommendation to Regional Council; and Council Approval and Update of WRHI [Region of Waterloo Heritage Inventory]" (Region of Waterloo 2018: 13).

2.3.3 City of Kitchener Official Plan

The *City of Kitchener Official Plan* outlines goals of the OP which includes providing:

> *…a framework for the creation and maintenance of a safe and healthy urban environment within which opportunities are provided for people to satisfy their social, economic, cultural and physical needs and for maintaining and conserving the integrity of the natural and cultural heritage* (City of Kitchener 2014:2-4).

Section 12 of *City of Kitchener Official Plan* contains policies addressing cultural heritage resources. Within this section there are objectives for the conservation of cultural heritage resources including:

> *12.C.1.1. To conserve the city's cultural heritage resources through their identification, protection, use and/or management in such a way that their heritage values, attributes and integrity are retained.*
> *12.C.1.2. To ensure that all development or redevelopment and site alteration is sensitive to and respects cultural heritage resources and that cultural heritage resources are conserved.* (2014:12-1).

Similar to the Region, the City of Kitchener will use legislation to conserve cultural heritage resources which will include the *Environmental Assessment Act*, legislation which this project falls under (Policy 12.C.1.1 City of Kitchener 2014:12-1). Cultural heritage resources to be included in a list maintained by the City include:

> *a) properties listed as non-designated properties of cultural heritage value or interest on the Municipal Heritage Register;*
> *b) properties designated under Part IV and V of the Ontario Heritage Act; c) cultural heritage landscapes; and,*
> *d) heritage corridors* (Policy 12.C.1.3. City of Kitchener 2014:12-2).

The City also acknowledges that all cultural heritage resources have not been identified and as such, Policy 12.C.1.4. provides for properties that are not "listed or designated to be considered as having cultural heritage value or interest" (2014:12-2).

Beyond these policies the OP contains cultural heritage policies within Section 12 that address Heritage Conservation Districts; archaeology; conservation measures for cultural heritage resources; Heritage Impact Assessments and Heritage Conservation Plans; Heritage Permit application process; the demolition/damage of cultural heritage resources; public infrastructure; incentives; the role and resources of Kitchener including leading by example with the care and management of City-owned cultural heritage resources; and the design and integration of cultural heritage resources in the City.

Section 13 of the OP entitled "Integrated Transportation System" focusses on the creation of "An integrated transportation system [which] is an essential part of the city's urban structure and a key element in shaping the form and character of growth in the city" (City of Kitchener 2014:13-1). A component of the integrated transportation system is the conservation of cultural heritage resources.

2.4 Cultural Heritage Landscape Study

The *City of Kitchener Cultural Heritage Landscape Study* (2014) is a planning tool which provides a legislative framework and planning tools to guide and manage change within identified CHLs. The purpose of the CHL Study to build upon the existing database and consider "large scale areas that express both the historical process of development and the physical outcomes of that process" (2014: 5). The CHL study considered numerous factors which influence the formation of a CHL. This includes:

- Natural Features (Rivers, Water Bodies, and Drainage Patterns);
- Settlement Patterns (Original Surveys); and
- Historical Themes

The Study resulted in the identification of 55 CHLs with the City of Kitchener. The CHLs are categorized within one of the following nine categories:

- Residential Neighbourhoods
- Parks, Natural Areas and other Public/Private Open Spaces
- Transportation Corridors and Streetscapes
- Institutional Landscapes
- Commercial Industrial and Retail Landscapes.
- Agricultural Landscapes
- Large Lot Residential/Estate Landscapes
- Cemeteries
- Grand River Valley Landscapes

The CHL Study resulted in a comprehensive data sheet for each CHL which included the following information:

- Location
- Historic Theme
- Landscape Type
- Archaeological Potential
- Identification of any properties recognized under the Ontario Heritage Act or Municipal Register
- A Description
- An evaluation against the criteria for significance (Historical Integrity, Cultural Value and Community value)
- Character defining elements
- Photographs and map

The CHL Study, and applicable datasheets, have been considered as part of this report.

2.5 Policy Conclusion

The Official Plan policies in the Regional Official Plan and the City of Kitchener's OP call for the conservation of cultural heritage resources, the maintaining of heritage registers and provide policies related to potential development impacts to cultural heritage resources. The Federal guidelines outline best practices for activities on heritage properties. This CHAR will address these cultural heritage policies as they relate to MCEA for the proposed improvements to Bleams Road.

3.0 KEY CONCEPTS

The following concepts require clear definition in advance of the methodological overview and proper understanding is fundamental for any discussion pertaining to cultural heritage resources:

- **Cultural Heritage Value or Interest** (CHVI), also referred to as Heritage Value, is identified if a property meets one of the criteria outlined in O. Reg. 9/06 namely historic or associate value, design or physical value and/or contextual value. Provincial significance is defined under *Ontario Heritage Act (OHA) O. Reg*. 10/06.
- **Built Heritage Resource** (BHR) can be defined in the *PPS* as: "a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including Indigenous community. Built heritage resources are located on property that has been designated under Parts IV or V of the *Ontario Heritage Act,* or that may be included on local, provincial and/or federal and/or international registers" (MMAH 2020:41).
- **Cultural Heritage Landscape** (CHL) is defined in the *PPS* as: "a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Aboriginal community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Examples may include, but are not limited to, heritage conservation districts designated under the *Ontario Heritage Act*; villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, viewsheds, natural areas and industrial complexes of heritage significance; and areas recognized by federal or international designation authorities (e.g., a National Historic Site or District designation, or a UNESCO World Heritage Site)" (MMAH 2020:42).
- **Conserved** means "the identification, protection, management and use of built heritage resources, cultural heritage landscapes and archaeological resources in a manner that ensures their cultural heritage value or interest is retained. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment, and/or heritage impact assessment that has been approved, accepted or adopted by relevant planning authority and/or decision-makers. Mitigative measures and/or alternative development approaches can be included in these plans and assessments" (MMAH 2020:41).
- **Heritage Attributes** are defined as: "the principal features or elements that contribute to a protected heritage property's cultural heritage value or interest, and may include the property's built, constructed, or manufactured elements, as well as natural landforms, vegetation, water features, and its visual setting (e.g., significant views or vistas to or from a protected heritage property)." (MMAH 2020:44-45).
- **Protected heritage property** is defined as "property designated under Parts IV, V or VI of the Ontario Heritage Act; property subject to a heritage conservation easement under Parts II or IV of the Ontario Heritage Act; property identified by the Province and prescribed public bodies as provincial heritage property under the Standards and Guidelines for Conservation of Provincial Heritage Properties; property protected under federal legislation, and UNESCO World Heritage Sites" (MMAH 2020:49).

- **Significant** in reference to cultural heritage is defined as: "resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the Ontario Heritage Act" (MMAH 2020:51).

Key heritage definitions from the *Region of Waterloo Official Plan* are as follows:

- **Built heritage resources** are defined as "one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to the community. These resources may be identified through designation or heritage conservation easement under the *Ontario Heritage Act*, or listed by local, regional, provincial or federal jurisdictions" (2015:G-4).
- **Cultural Heritage Impact Assessment** is detailed as "a study to determine if cultural heritage resources will be negatively impacted by a proposed development or site alteration. It can also demonstrate how the cultural heritage resource will be conserved in the context of redevelopment or site alteration. Mitigative or avoidance measures or alternative development approaches may also be recommended" (2015:G-5).
- **Cultural heritage landscape** is "a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts" (2015:G-5).
- **Cultural heritage resources** are "the physical remains and the intangible cultural traditions of past human activities. These include, but are not limited to:
  - buildings (residential, commercial, institutional, industrial and agricultural);
  - cultural heritage landscapes (designed, organic/evolved);
  - structures (water tower; bridge, fence and dam);
  - monuments (cenotaph, statue and cairn);
  - archaeological resources;
  - cemeteries;
  - scenic roads;
  - vistas/viewsheds;
  - culturally significant natural features (tree and landform);
  - movable objects (archival records and artifacts); and
  - cultural traditions (language, stories, music, dance, food, celebrations, art and crafts) (2015:G-6).

Key heritage definitions from the *City of Kitchener Official Plan* are as follows:

- **Adaptive Re-use** "the recycling of a building and/or structure usually for a new function, such as the use of a former industrial building for residential purposes." (2014:A-1).
- **Cultural Heritage Resources "**includes buildings, structures and properties designated under the Ontario Heritage Act or listed on the Municipal Heritage Register, properties on the Heritage Kitchener Inventory of Historic Buildings, built heritage resources and cultural heritage landscapes as defined in the Provincial Policy Statement." (2014:A-5).

- **Cultural Heritage Landscapes** "a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, viewsheds, natural areas and industrial complexes of heritage significance; and areas recognized by federal or international designation authorities (2014:A-5).

4.0 HISTORICAL CONTEXT

The history of study area was constructed using background information obtained from aerial photographs, historical maps (i.e., illustrated atlases) and published secondary sources (online and print). Given the limited time frame for the production of this report there is always the possibility that additional historical information exists but may not have been identified or accessible for review.

The City of Kitchener and Waterloo County have a long history of settlement including pre-contact and post-contact Indigenous campsites and villages due to its productive riverside lands, as well as favourable farmland. The study area has strong associations with Indigenous communities, and the heritage resources considered in this report can be associated with both Pre-Contact and Post-Contact cultural developments. Accordingly, this historical context section spans the Pre-Contact Indigenous occupation history through Euro-Canadian settlement history to present. The early history of the study area can be effectively discussed in terms of major historical events.

4.1 Settlement History

4.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic, and Woodland. Each of these periods comprise a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972; Ellis and Ferris 1990; Warrick 2000; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Gainey, Barnes and Crowfield traditions; Small bands; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Fluted points
Late Palaeo	8400–7500 BC	Holcombe, Hi-Lo and Lanceolate biface traditions; Continuing mobility; Campsite/Way-Station sites; Smaller territories are utilized; Non-fluted points
Early Archaic	7500–6000 BC	Side-notched, Corner-notched (Nettling, Thebes) and Bifurcate traditions; Growing diversity of stone tool types; Heavy woodworking tools appear (e.g., ground stone axes and chisels)
Middle Archaic	6000–2500 BC	Stemmed (Kirk, Stanly/Neville), Brewerton Side- and Corner-Notched traditions; Reliance on local resources; Populations increasing; More ritual activities; Fully ground and polished tools; Net-sinkers common; Earliest copper tools
Late Archaic	2500–900 BC	Narrow Point (Lamoka), Broad Point (Genesee) and Small Point (Crawford Knoll) traditions; Less mobility; Use of fish-weirs; True cemeteries appear; Stone pipes emerge; Long-distance trade (marine shells and galena)
Early Woodland	900–400 BC	Meadowood tradition; Crude cord-roughened ceramics emerge; Meadowood cache blades and side-notched points; Bands of up to 35 people
Middle Woodland	400 BC–AD 600	Saugeen tradition; Stamped ceramics appear; Saugeen projectile points; Cobble spall scrapers; Seasonal settlements and resource utilization; Post holes, hearths, middens, cemeteries and rectangular structures identified

Sub-Period	Timeframe	Characteristics
Middle/Late Woodland Transition	AD 600–900	Princess Point tradition; Cord roughening, impressed lines and punctate designs on pottery; Adoption of maize horticulture at the western end of Lake Ontario; Oval houses and 'incipient' longhouses; First palisades; Villages with 75 people
Late Woodland (Early)	AD 900–1300	Glen Meyer tradition; Settled village-life based on agriculture; Small villages (0.4 ha) with 75–200 people and 4–5 longhouses; Semi-permanent settlements
Late Woodland (Middle)	AD 1300–1400	Uren and Middleport traditions; Classic longhouses emerge; Larger villages (1.2 ha) with up to 600 people; More permanent settlements (30 years)
Late Woodland (Late)	AD 1400–1600	Pre-Contact Neutral tradition; Larger villages (1.7 ha); Examples up to 5 ha with 2,500 people; Extensive croplands; Also hamlets, cabins, camps and cemeteries; Potential tribal units; Fur trade begins ca. 1580; European trade goods appear

Although Iroquoian-speaking populations tended to leave a much more obvious mark on the archaeological record and are therefore emphasized in the Late Woodland entries above, it must be understood that Algonquian-speaking populations also represented a significant presence in southern Ontario. Due to the sustainability of their lifeways, archaeological evidence directly associated with the Anishinaabeg remains elusive, particularly when compared to sites associated with the more sedentary agriculturalists. Many artifact scatters in southern Ontario were likely camps, chipping stations or processing areas associated with the more mobile Anishinaabeg, utilized during their travels along the local drainage basins while making use of seasonal resources. It must be recognized that this part of southern Ontario represents the ancestral territory of various Indigenous groups, each with their own land use and settlement pattern tendencies.

4.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Smith 1846; Sutherland 1864; Coyne 1895; Lajeunesse 1960; Cumming 1972; Janusas 1988; Ellis and Ferris 1990; Surtees 1994; Hayes 1997; Bloomfield 2006; AO 2015)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Brûlé explores southern Ontario in 1610/11; Champlain travels through in 1613 and 1615/1616, making contact with a number of Indigenous groups (including the Algonquin, Huron-Wendat and other First Nations); European trade goods become increasingly common and begin to put pressure on traditional industries
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Early to mid-18th century	Growth and spread of the fur trade; Peace between the French and English with the Treaty of Utrecht in 1713; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760

Historical Event	Timeframe	Characteristics
British Control	Mid- to late 18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in 1764; The Niagara Purchase (Treaty 381) in 1781 included this area
Loyalist Influx	Late 18th century	United Empire Loyalist influx after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; Between the Lakes Purchase completed with the Mississaugas in 1784 and confirmed in 1792 (Treaty 3); Haldimand Proclamation of 1784 grants land to Six Nations (the Haldimand Tract), clarified by the Simcoe Patent (Treaty 4) in 1793; *Constitutional Act* of 1791 creates Upper and Lower Canada
County Development	Late 18th to early 19th century	Became part of York County's 'West Riding' in 1792; Brant surrenders Blocks 1–6 of the Haldimand Tract to the Crown in 1798; Became part of the Gore District and Halton County in 1816; Wellington District and Waterloo County created in 1840; Waterloo County independent after the abolition of the district system in 1849
Township Formation	Early 19th century	Waterloo initially comprised Block 2 of the Haldimand Tract; Purchased by United Empire Loyalist R. Beasley and his partners in 1798; Deeds could not be issued until full payment was made to Six Nations; Nearly 5,750 ha sold to Pennsylvania Mennonites and non-Mennonites in 1800; German Company formed to facilitate a bulk sale of land to Pennsylvania Mennonites, represented by D. Erb and S. Bricker; Remaining 24,281 ha purchased in 1805 with clear title; Lots drawn by shareholders in Pennsylvania; Steady and rapid stream of settlers ensued, disrupted only by the Napoleonic Wars and the War of 1812
Township Development	Mid-19th to early 20th century	Population reached 4,424 by 1841 (mostly Pennsylvania Dutch and German); 33,518 ha taken up by 1846, with 12,151 ha under cultivation; 20 saw mills and 8 grist mills in operation at that time; Traversed by the Grand Trunk Railway (1856), Galt & Guelph Railway (1855/57), Preston & Berlin Railway (1857/1873) and Waterloo Junction Railway (1889/91); Principal settlements at Berlin, Hespeler, Preston and Waterloo, Other communities at Blair, Bloomingdale, Breslau, Bridgeport, Doon, Freeport, Freiburg, German Mills, New Aberdeen, Oregon (Upper Doon), Shantz, Strasburg and Williamsburg

4.1.3 Williamsburg

The Hamlet of Williamsburg, which is northeast of the project location, is located along Bleams Road (former corduroy road) at the historic intersection of the Histand and Bechtel Tracts. Named for settler Anthony Wilhelm, Williamsburg comprised various industrial enterprises by 1861 including a blacksmith, shoemaker, turner, two carpenters, two coopers, two tailors, a millwright and a sawyer. The Hamlet of Williamsburg was settled primarily by German families who aligned with either the Roman Catholic or Lutheran religions. A school (S.S. #7) was established in 1840 at Williamsburg (Bloomfield 2006:206).

The Histand Tract and Bechtel Tract are situated within the Township of Waterloo, which is considered to have the most "complex survey system and associated pattern of land ownership of the more than 500 townships in southern Ontario" (Bloomfield 2006:404). The Bechtel Tract consisted of 3,150 acres of land that were sold by Richard Beasley to George Bechtel in July of 1800. The Bechtel Tract lots were not numbered and remained unsettled until the 1800s, with the exception of the presence of Phillip Bleams' mill. The Histand Tract comprised a total of 726 acres, of which 306 were purchased from Beasley and the remaining 420 from Jacob Bechtel in 1804. The Histand Tract lands abut the Bechtel Tract lands to the west. Like the Bechtel Tract lands, the Histand Tract lands were not numbered (Bloomfield 2006:404).

4.2 Study Area History

4.2.1 Mapping and Imagery Analysis

In order to gain a general understanding of the study area, two historic settlement maps, one topographic map and four aerial images were examined during the research component of the study. Specifically, the following resources were consulted:

- *Tremaine's Map of the County of Waterloo, Canada West* (1861) (OCHMP 2019);
- The *Illustrated Historical Atlas of the County of Waterloo, Ontario* (1881) (MU 2001);
- Topographic map from 1916 (OCUL 2022); and
- Aerial images from 1945-1946, 1954, 1955 and 1963 (UW 2016; U of T 2022).

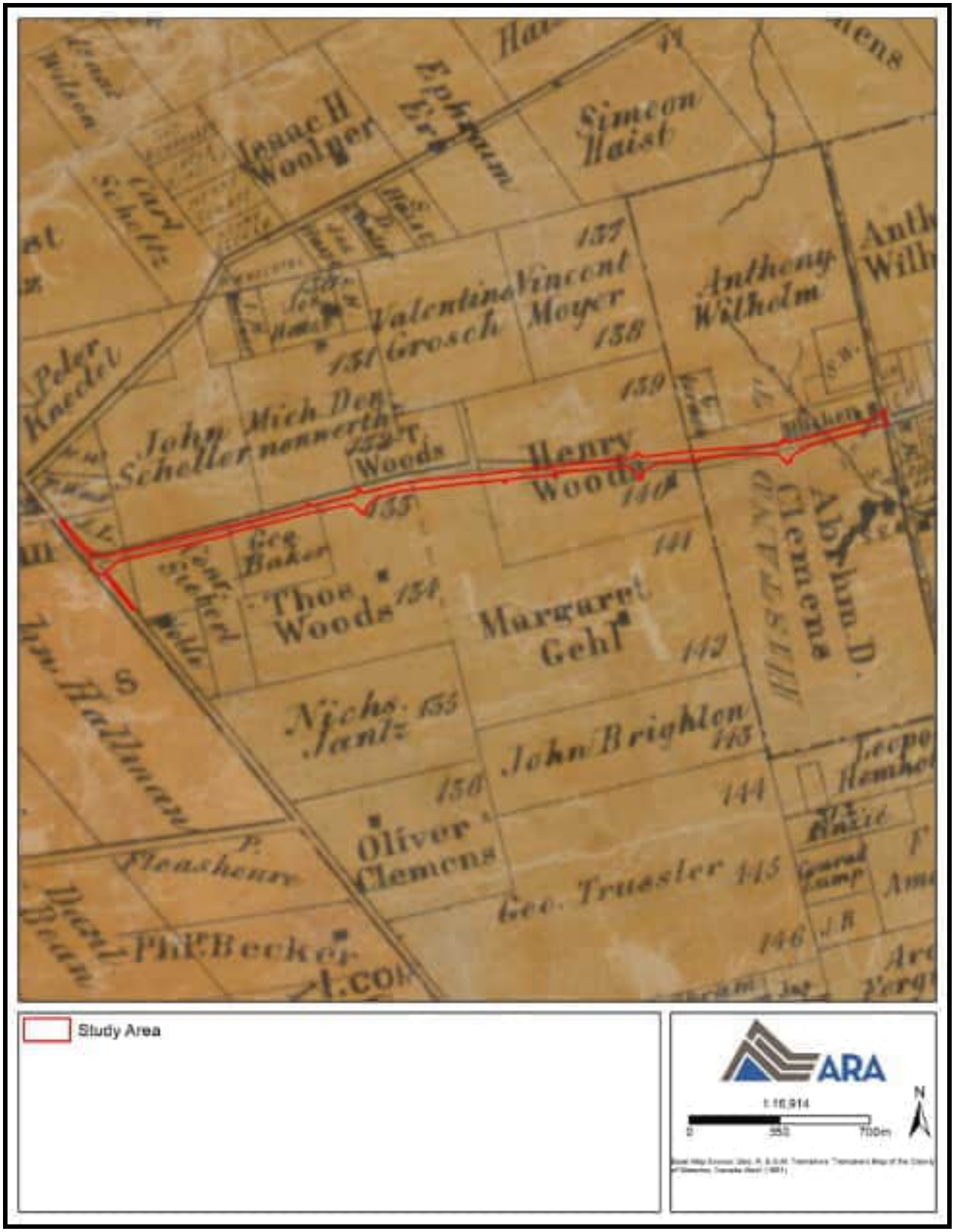
The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 2–Map 8.

Tremaines' Map of the County of Waterloo, Canada West (1861) indicates that the study area comprises part of Histand's Tract and the German Company Tract. Bleams Road had been established by this time and it traversed through the lands of Henry Woods and Abraham D. Clemens at the east end of the study area (see Map 2). Additionally, Trussler Road at the western extent of the study area and Fischer-Hallman Road at the eastern extent of the study area were also established. Lands on the north and south sides of the study area were well settled rural properties. Lands within the Histand Tract on the south side of the study area, both east and west of Fischer-Hallman Road made use of a creek for industrial enterprises such as a saw mill and the settlement of Williamsburg was primarily located on the east side of Fischer-Hallman Road.

The *Illustrated Historical Atlas of the County of Waterloo, Ontario* (1881) is not as detailed as the 1861 map. In 1881, Bleams Road continued to traverse the Woods and Clemens properties at eastern extent of the study area (see Map 3). The settlement at Williamsburg at the east end of the study area had extended to the west side of Fischer-Hallman Road and ancillary roads flanked Bleams Road at the central part of the study area.

A topographic map from 1916 indicates that frame houses were extant on the north and south sides of Bleams Road, as well as at the Hamlet of Williamsburg at the eastern extent of the study area (see Map 4). A stone house is also indicated at Williamsburg at the northwest corner of the intersection of Bleams and Fischer-Hallman Roads. Gehl Place extended south of Bleams Road by this time and two frame residences are indicated on the east side of Gehl Place. The creek at Williamsburg formerly used for milling remained extant on the landscape at this time.

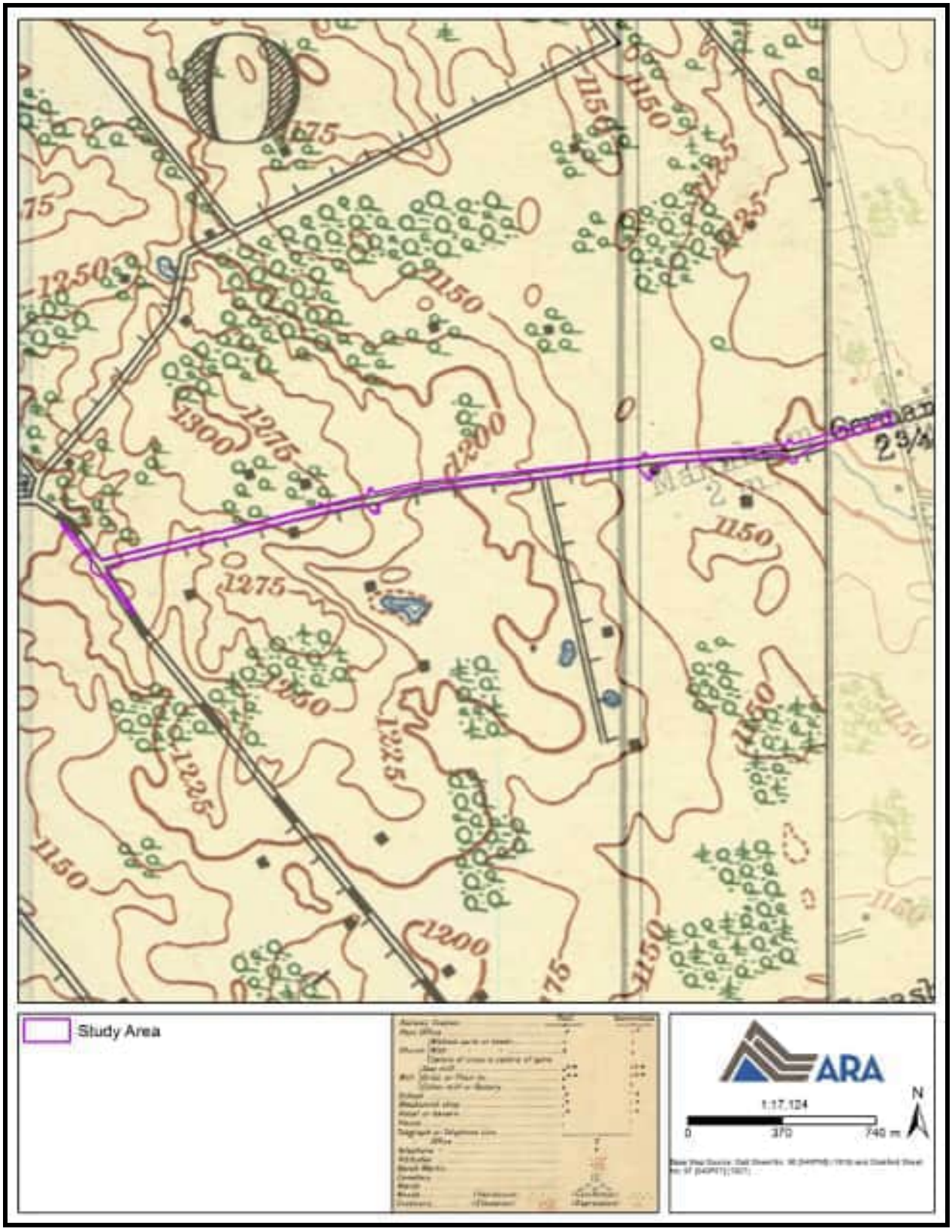
Aerial images of the study area from 1945/1946 to 1955 indicate that the surrounding area remained largely unchanged during this time and appears much the same as it did in 1916 (see Map 5–Map 7). By 1963, quarrying is evident at the western end of the study area between Bleams Road and Ottawa Street South.



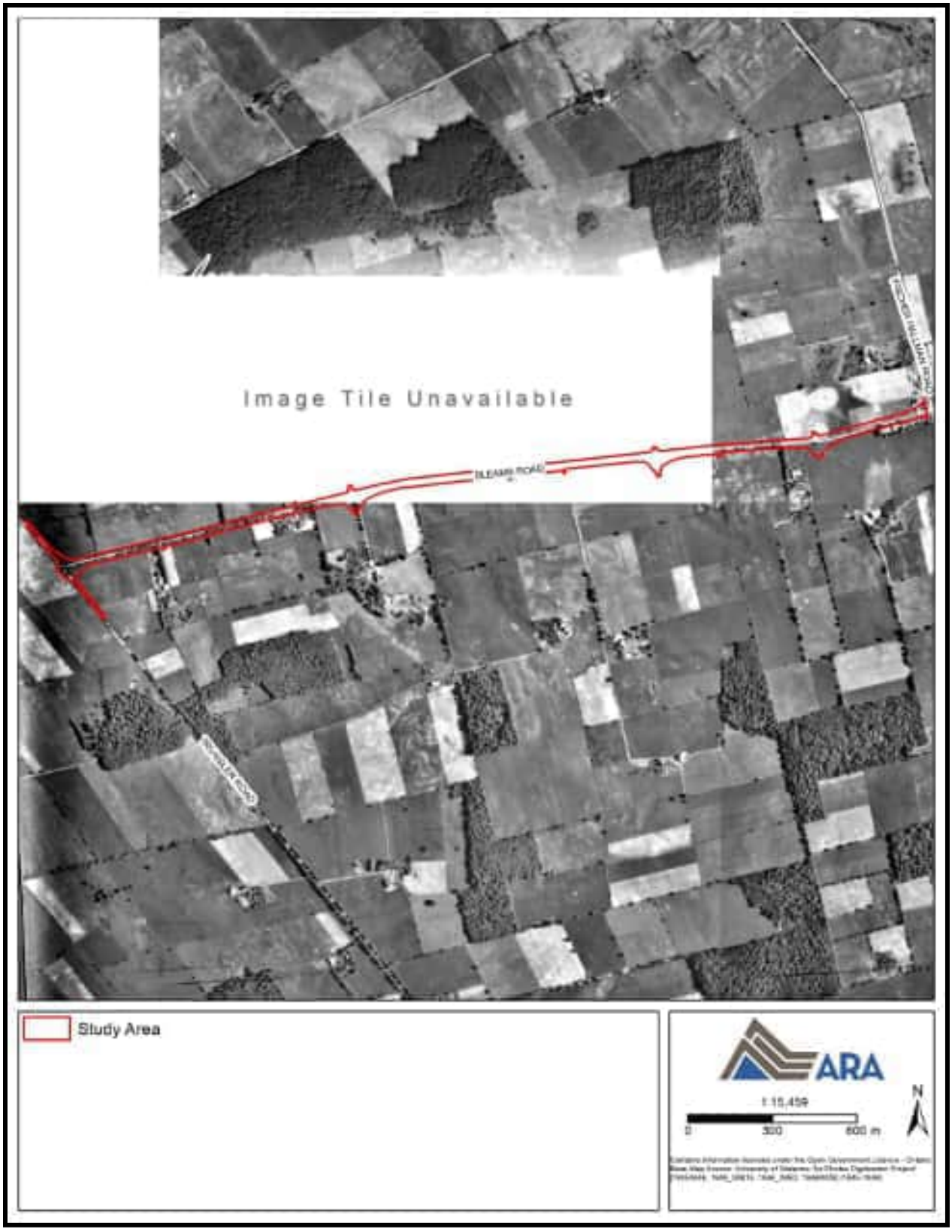
Map 2: *Tremaine's Map of the County of Waterloo, Canada West* (1861)
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



Map 3: ***Illustrated Historical Atlas of the County of Waterloo, Ontario*** **(1881)**
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



Map 4: Topographic Map (1916)
(Produced under licence using ArcGIS® software by Esri, © Esri, OCUL 2022)



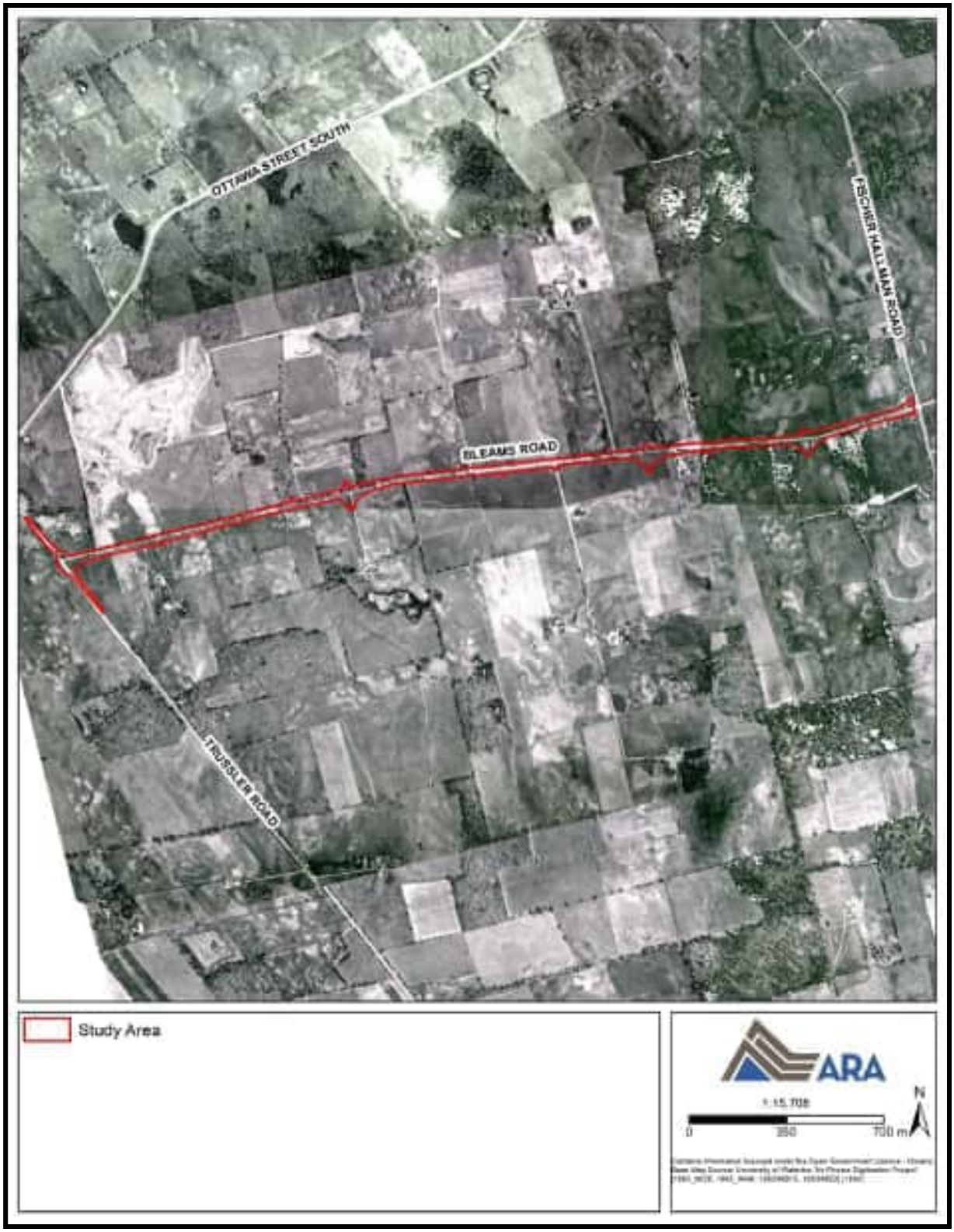
Map 5: Aerial Image (1945/1946)
(Produced under licence using ArcGIS® software by Esri, © Esri; UW 2016)



Map 6: Aerial Image (1954)
(Produced under licence using ArcGIS® software by Esri, © Esri; U of T 2022)



Map 7: Aerial Image (1955)
(Produced under licence using ArcGIS® software by Esri, © Esri; UW 2016)



Map 8: Study Area on Aerial Image (1963)
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5.0 CONSULTATION

BHRs and CHLs are broadly referred to as cultural heritage resources. A variety of types of recognition exist to commemorate and/or protect cultural heritage resources in Ontario.

The Minister of Canadian Heritage, on the advice of the Historic Sites and Monuments Board of Canada (HSMBC), makes recommendations to declare a site, event or person of national significance. The National Historic Sites program commemorates important sites that had a nationally significant effect on, or illustrates a nationally important aspect of, the history of Canada. A National Historic Event is a recognized event that evokes a moment, episode, movement or experience in the history of Canada. National Historic People are people who are recognized as those who through their words or actions, have made a unique and enduring contribution to the history of Canada. There exists Parks Canada's online *Directory of Federal Heritage Designations* which captures these national commemorations. This directory also lists Heritage Railway Stations, Federal Heritage Buildings and Heritage Lighthouses. The *Federal Canadian Heritage Database* was searched, and no plaques or properties were noted within or adjacent to the study area (Parks Canada 2022). It is important to note that these federal commemoration programs do not offer protection from alteration or destruction.

The Ontario Heritage Trust (OHT) operates the Provincial Plaque Program that has over 1,250 provincial plaques recognizing key people, places and events that shaped the province. Additionally, properties owned by the province may be recognized as a "provincial heritage property" (MCM 2010). The OHT plaque database were searched and none of the properties within or adjacent to the study area are commemorated with an OHT plaque (OHT 2021).

The Canadian Register of Historic Places, developed under the Historic Places Initiative, a federal-provincial-territorial partnership, is an online register of locally, provincially and federally recognized heritage properties from across Canada. One property was listed within the study area. The Canadian Heritage River System Program recognizes 40 of Canada's river which have been recognized for natural, cultural and recreational heritage. There are no Canadian Rivers located within or adjacent to the study area. It is important to note that these federal commemoration programs do not offer protection from alteration or destruction.

MCM's current list of Heritage Conservation Districts was consulted. No designated districts were identified in or adjacent to the study area (MCM 2022). The list of properties designated by the MCM under Section 34.5 of the *OHA* was consulted. No properties in or adjacent to the study area are listed.

Many municipal heritage committees and historical societies provide plaques for local places of interest. "One role of municipal heritage groups (i.e., municipal heritage committees, historical societies) is to educate and inform the community on local heritage and several ways this could occur could include: producing descriptive guides and newsletters or by installing commemorative plaques" (MCM 2007:8).

The City of Kitchener's Municipal Heritage Register was consulted (City of Kitchener 2022). It was determined that there is one property that falls within the heritage assessed area along the

study area that is listed as a Designated Property under Part IV of the *OHA*. The property is located at 1385 Bleams Road.

At project commencement, ARA contacted the City of Kitchener and Region of Waterloo Planning staff via email to inquire about: 1) protected properties within or adjacent to the study area, 2) a copy of the by-law for the designated property at 1385 Bleams Road or further information about the listed CHL at 1255–1291 Fischer Hallman Road, 3) properties with other types of recognition in or adjacent to the study area, 4) previous studies relevant to the current study, and 5) other heritage concerns regarding the study area.

In response, City of Kitchener and Region of Waterloo staff identified several heritage related items to be considered as part of this report. It was noted that Trussler Road has been identified in the 2014 *Cultural Heritage Landscape Study* as a CHL (L-RD-13), 2219 Ottawa Street South is on the Heritage Kitchener Inventory, and that 1385 Bleams Road is a Part IV Designated property. A fourth heritage resource was also included, a Part IV designated property at 397 Gravel Ridge Trail, but it was subsequently determined that it was not within or adjacent to the study area and was not considered as part of this report. The City Planner also addressed ARA's inquiry about 1255–1291 Fischer Hallman Road and stated that it has no heritage status, noting that it was considered by the Heritage Kitchener committee, but was determined not to be of significant cultural heritage interest or value.

ARA also consulted the Region of Waterloo with the same inquiries posed to the City of Kitchener. The Region's Planner responded to state that 1) 1385 Bleams Road is a designated property and that it has the potential to meet criteria for Regional Significance as outlined in the Region's Implementation Guideline for Conserving Regionally Significant Cultural Heritage Resources, 2) indicated that 1643 Bleams Road is an unofficially listed property and 3) 2091 Bleams Road is an unofficially listed property.

6.0 INDIGENOUS COMMUNITY CONSULTATION

Following the initial project introduction, ARA contacted the following groups: The Department of Consultation & Accommodation (DOCA) on behalf of the Mississaugas of the Credit First Nation (MCFN), The Haudenosaunee Development Institute (HDI) on behalf of The Haudenosaunee Confederacy Chiefs Council (HCCC); and the Six Nations Lands & Resources Office (SNLR) on behalf of The Six Nations of the Grand River Elected Council (SNGREC) to inquire about any Traditional or Ecological Knowledge the groups may have to share about the study area and to determine whether they had an interest in participating in the project. All three groups indicated their interest in receiving the report to review and comment. Information regarding pre-contact history has been generated by ARA and is found in Section 4.1.1 of this report.

7.0 FIELD SURVEY

The field survey component of an assessment involves the collection of primary data through systematic photographic documentation of all potential cultural heritage resources within the study area, as identified through historical research and consultation. Generally, potential cultural heritage resources are identified by applying a 40-year rolling timeline. This timeline is considered an industry best practice (i.e., MTO 2008). A date of 40 years does not automatically attribute CHVI to a resource; rather, that it should be flagged as a potential resource and evaluated for CHVI.

Additional cultural heritage resources may also be identified during the survey itself. Photographs capturing all properties with potential BHRs and CHLs are taken, as are general views of the surrounding landscape. The field survey also assists in confirming the location of each potential cultural heritage resource and helps to determine the relationship between resources. Given that such surveys are limited to areas of public access (i.e., roadways, intersections, non-private lands, etc.), there is always the possibility that obscured cultural heritage resources may be missed or that heritage attributes may be refined upon closer inspection.

A field survey was conducted on April 5, 2022 to photograph and document the study area. The field survey enables the team to record any local features that could enhance ARA's understanding of their setting in the landscape and contribute to the cultural heritage evaluation process. The field survey was conducted from publicly accessible, non-private lands.

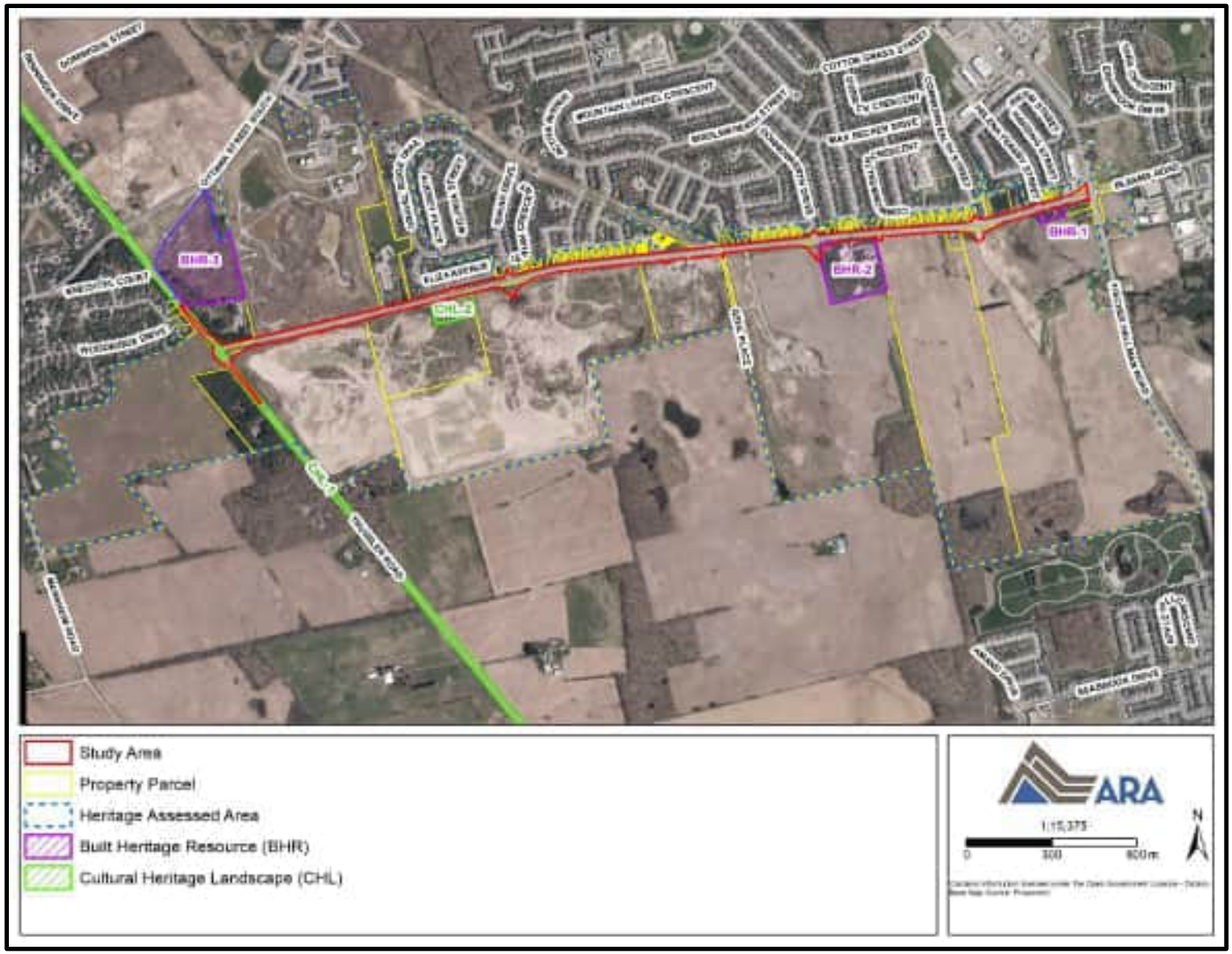
8.0 HERITAGE ASSESSMENT

As a result of consultation with Region of Waterloo and City of Kitchener staff, existing heritage considerations, and the field survey, the following BHRs and CHLs were considered, and their potential heritage status is summarized in Table 3.

Table 3: Potential Cultural Heritage Resources Examined

Address/Name	Type	CHVI (Y/N)	Discussion
1385 Bleams Road	BHR-1	Yes	The one-storey building at 1385 Bleams Road is the former Williamsburg School and designated under Part IV of the Ontario Heritage Act. See Table 4 and Table 5 for assessment summary and Appendix A BHR-1 for an information sheet.
1643 Bleams Road	BHR-2	Yes	The two-storey vernacular farmhouse has the potential to meet the criteria for CHVI. See Table 4 and Table 5 for assessment summary and Appendix A BHR-2 for an information sheet.
2219 Ottawa Street South	BHR-3	Yes	The two-storey mid-century modern residence has the potential to meet the criteria for CHVI. See Table 4 and Table 5 for assessment summary and Appendix A BHR-3 for an information sheet.
Trussler Road	CHL-1	Yes	Trussler Road is recognized as a CHL in the City of Kitchener CHL Study (2014). See Table 4 and Table 5 for assessment summary and Appendix A CHL-1 for an information sheet.
2091 Bleams Road	CHL-2	Yes	The Bank Barn present on 2091 Bleams Road has the potential to meet the criteria for cultural heritage value or interest. See Table 4 and Table 5 for assessment summary and Appendix A CHL-2 for an information sheet.

A summary of the results of the evaluation of remaining BHRs and CHLs against the criteria set out in O. Reg. 9/06 can be found in Table 4 and Table 5 and the information sheets with background information, and the evaluations of each heritage resource can be found in Appendix A. Heritage attributes may include, but are not limited to, those listed in this table. The assessment determined that three BHRs and two CHLs met, or have the potential to meet one or more, O. Reg. 9/06 criteria.



Map 9: Heritage Resource Assessment Results Map
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)

Table 4: BHRs and CHLs with CHVI

Type and Number	Address/Name	Adjacent/ Participating	CHVI (Y/N)	Criteria Met
BHR-1	1385 Bleams Road	Participating	Y	Design and Physical Value, Historical and/or Associative Value, Contextual Value
BHR-2	1643 Bleams Road	Participating	Y	Design and Physical Value, Contextual Value
BHR-3	2219 Ottawa Street South	Adjacent	Y	Design and Physical Value, Associative Value
CHL-1	Trussler Road	Participating	Y	Historical and/or Associative Value, Contextual Value
CHL-2	2091 Bleams Road	Participating	Y	Design and Physical Value, Historical and/or Associative Value, Contextual Value

Table 5: BHR and CHL Value Statements and Heritage Attributes

Type and Number	Address/Name	Value Statement(s)	Heritage Attributes
BHR-1	1385 Bleams Road	The property's designation bylaw states: *The designation described herein has been made on historic and architectural grounds. The Williamsburg School was constructed in 1864 and is one of the few original buildings remaining to the former hamlet of Williamsburg. In terms of architecture, the school house is an example of rubble stone foundation.*	• Bell tower • One storey rubble stone construction • Gable roof • Two brick chimneys • Nine over six double hung windows • Porch • Basement • Cloakroom • Board and batten woodshed • Stone addition
BHR-2	1643 Bleams Road	The property contains a former residence designed in a Georgian architectural style. The two-storey residence with a three-bay façade has a hipped roof and rests on a fieldstone foundation. The residence is sits on a rise of land on the south side of Bleams Road and reinforces the rural and historic character of the surrounding area.	• Location on a rise of land on the south side of Bleams Road • The two-storey residence with a three-bay façade and hip roof • Fieldstone foundation.
BHR-3	2219 Ottawa Street South	The property contains a two-storey mid-century modern residence commissioned and designed by John Lingwood in 1967.	• The association to John Lingwood, one of Waterloo Region's most influential modernist architects. • The two-storey modernist residence with stone and wood detailing • Placement of structure within the site's natural topography
CHL-1	Trussler Road	*Trussler Road is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities and became a connecting transportation route for the County of Waterloo; relates to the development of the County of Waterloo for agricultural purposes in the nineteenth century; is bounded by cultivated fields and a rural landscape;*	• *The narrow two-lane alignment without shoulders;* • *The scenic views to surrounding agricultural fields* • *The diverse roadside vegetation that abuts the roadside provides a defined edge to the road; and* • *The correspondence to the undulating topography which is part of the original historic alignment.*

Type and Number	Address/Name	Value Statement(s)	Heritage Attributes
		and, continues to form part of the local road network.	
CHL-2	2091 Bleams Road	The property contains a representative example of a Central Ontario Barn, also referred to as a "bank barn". The two-storey barn includes a gable roof and timber construction. The barn rests on a stone foundation. The barn is highly visible from Bleams Road. The barn reinforces the rural character of the surrounding area.	• The visibility of the barn from Bleams Road. • The two storey bank barn with gable roof, timber construction and stone foundation.

* The value statement and heritage attributes which have been taken directly from CHL Datasheets or existing plans or by-laws are noted in italics.

9.0 DEVELOPMENT PLAN

This CHAR is being completed as part of a Schedule "C" Municipal Class Environmental Assessment Study (Class EA) to aid in the process of generating alternatives and generating a preliminary design for improvements to Bleams Road from Fischer-Hallman Road to Trussler Road in the City of Kitchener. This project design outlined in Figure 1 and Figure 2 entails the construction of four roundabouts along Bleams Road as well as road widening associated with these roundabouts. The CHAR will aid in the determination of a preferred option and preliminary design.

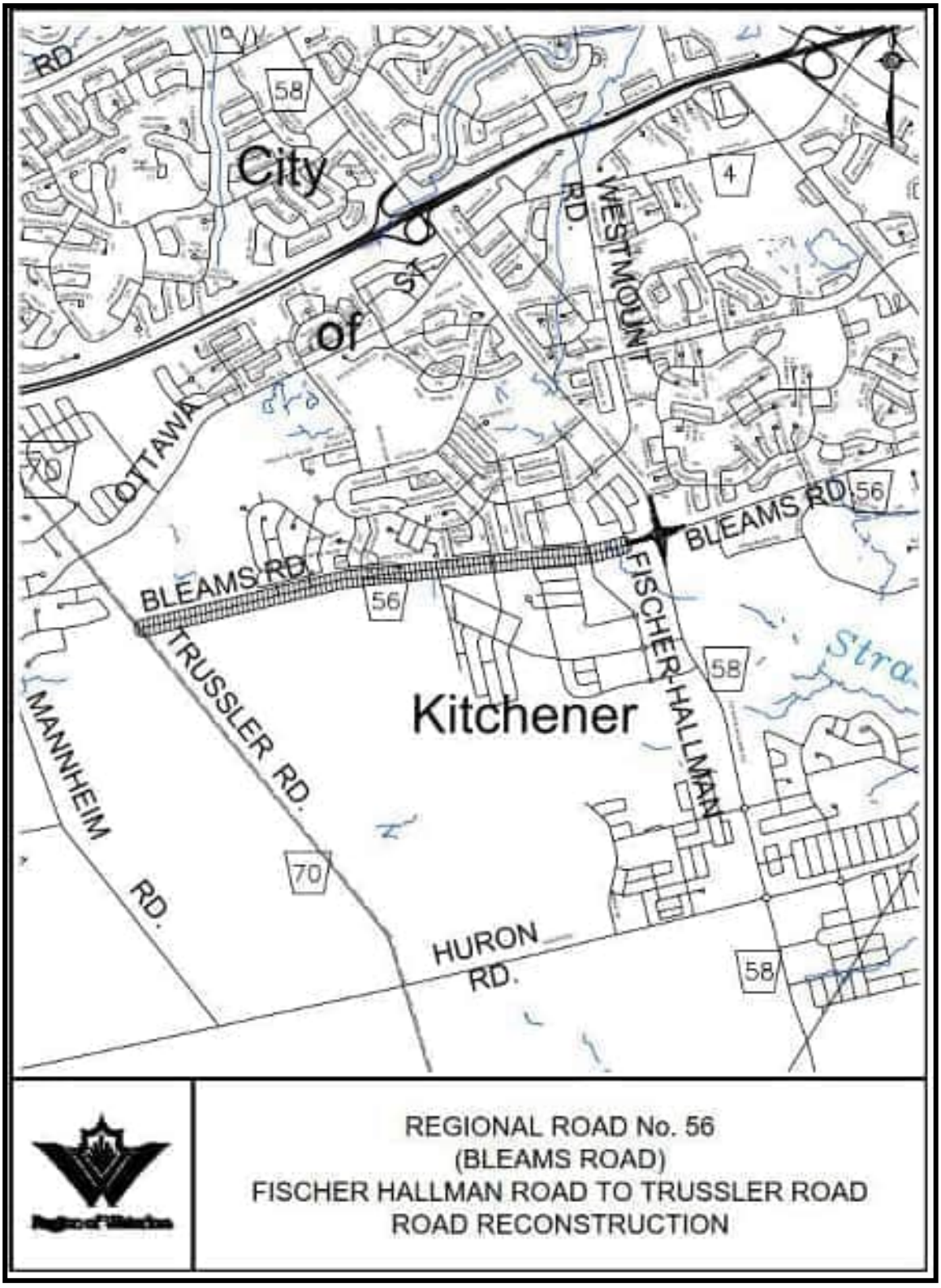


Figure 1: Bleams Road Reconstruction Key Plan
(Region of Waterloo 2021)



Figure 2: Bleams Road Reconstruction – Functional Design
(MTE Consultants 2021)

10.0 ANALYSIS OF POTENTIAL IMPACTS

The reconstruction of Bleams Road has the potential to affect cultural heritage resources. MCM InfoSheet #5: *Heritage Impact Assessments and Conservation Plans* (MCM 2006d:3) provides a list of potential negative impacts (for evaluating against any proposed development impacts) which can be classified as either direct or indirect.

Direct impacts (those that physically affect the heritage resources themselves) include, but are not limited to: initial project staging, excavation/levelling operations, construction of access roads and renovations or repairs over the life of the project. These direct impacts may destroy some or all significant heritage attributes or may alter soils and drainage patterns and adversely impact unknown archaeological resources.

Indirect impacts include but are not limited to: alterations that are not compatible with the historic fabric and appearance of the area, the creation of shadows that alter the appearance of an identified heritage attribute, the isolation of a heritage attribute from its surrounding environment, the obstruction of significant views and vistas, change in land use such as rezoning allowing for a reduction in open spaces and other less-tangible impacts. There may be positive environmental and cultural effects as a result of an EA undertaking.

An EA project has the potential for creating the above negative impacts. However, there may be positive effects as well. For example, more recent infrastructure may be removed to restore the original views to cultural heritage resources or streetscape improvements might be made.

The existing project design proposed in Figure 1 and Figure 2 entails the construction of four roundabouts along Bleams Road as well as road widening associated with these roundabouts. The project design may be further refined during subsequent design phases at which time these impacts and mitigations may need refinement depending on the scope considered for implementation. As such, potential impacts and mitigation options related to the project will be discussed at a high level as they relate to the development plan outlined in Section 9.0.

No shadows will be cast near any of the identified cultural heritage resources, as the proposed improvements will take place at or below ground level. None of the BHRs or CHLs identified in Table 3 will be isolated from their surrounding environment, context or significant relationship. Furthermore, no rezoning is anticipated. Archaeological and environmental impacts are to be addressed in separate reports.

Two of the BHRs and one CHL within the study area have narrow or no setbacks. Any proposed reduction in properties' frontage that may occur during the preliminary or detailed design may have impacts on the following BHRs and CHL which have no setback: BHR–1, BHR–2 and CHL-2. Construction activities have the potential to create vibrations that could impact these cultural heritage resources located close the road.

The heritage value associated with the Trussler Road CHL (CHL-1) may be directly or indirectly impacted by the proposed project, specifically the narrow two-lane alignment without shoulders, the scenic views to surrounding agricultural fields, the diverse roadside vegetation that abuts the

road and provides a defined edge and the corresponding and undulating topography which is part of the original historic alignment may be impacted during the roundabout construction at the intersection of Bleams Road and Trussler Road.

Any impacts to potential, and known, archaeological sites are being addressed through the archaeological assessment process.

11.0 MITIGATION MEASURES AND RECOMMENDATIONS

As a result of consultation and field survey the following BHRs and CHLs were identified within and adjacent to the study area: 1385 Bleams Road (BHR-1), 1643 Bleams Road (BHR-2), 2219 Ottawa Street South (BHR-3), Trussler Road (CHL-1), and 2091 Bleams Road (CHL-2).

Detailed designs or plans for the reconstruction of the Bleams Road roadway were not available at the time this report was written, however there is potential that the identified BHRs and CHLs may be directly or indirectly impacted by the proposed project. All identified BHRs and CHLs fall within the heritage assessed area along the roadway study area. Depending on the nature and extent of the proposed project and study area, the BHRs and CHLs have potential for direct and indirect impacts.

Given that potential impacts have been identified, mitigation measures must be recommended. The MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (2006c:3) lists specific methods to minimize any potential negative impacts.

As a result of this CHAR, the following mitigation strategies are recommended:

- That any construction and staging areas should avoid the use of land which are part of BHR-1 at 1385 Bleams Road, BHR-2 at 1643 Bleams Road and BHR-3 at 2219 Ottawa Street South as well as, CHL-1 along Trussler Road and CHL-2 at 2091 Bleams Road.
- That should project-related activities be expected to impact the property associated with BHR-1 BHR-2, BHR-3 CHL-1, or CHL-2, a qualified heritage consultant should be contracted to complete property specific or Cultural Heritage Landscape specific Cultural Heritage Impact Assessments and provide detailed mitigation options to address the proposed design on the resources;
- As BHR-1 was identified by the Region of Waterloo's heritage planner to likely meet the criteria for Regional Significance, should any project-related activities be expected to impact this BHR, a qualified heritage consultant should be contracted to complete property specific Cultural Heritage Evaluation or Cultural Heritage Impact Assessment according to the Region's Guidelines for Conserving Regionally Significant Cultural Heritage Resources (Region of Waterloo 2018);
- To protect the BHRs and CHL located along the study area roadway, specifically, BHR-1, BHR-2 and CHL-2 during the construction period, vibrations should be identified through a vibration impact study and/or vibration monitoring implementation strategy. It is recommended that City of Kitchener staff provide guidance on the scope required and at what stage of the planning process the study should be undertaken;
- That design alternatives should consider the heritage attributes of CHL-1. Specifically, the narrow two-lane alignment without shoulders, the scenic views to surrounding agricultural fields, the diverse roadside vegetation that abuts the road and provides a defined edge as well as the corresponding and undulating topography which is part of the original historic alignment; this may be achieved through appropriate setbacks;
- That public consultation may result in additional potential cultural heritage resources being identified. These potential cultural heritage resources should be reviewed by a qualified heritage consultant to: 1) determine their cultural heritage value or interest, 2) evaluate

potential project impacts, and 3) suggest strategies for future conservation of any identified cultural heritage resources;

- That should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That should the proposed project create publicly accessible areas, this may provide an opportunity to interpret some of the identified cultural heritage resources associated with the Cultural Heritage Landscapes (i.e., with plaques, public art);
- That this CHAR should be provided to staff/planners at the City of Kitchener and Region of Waterloo; and
- Stage 1 and 2 assessments were conducted in May and July 2022 under Project Information Form #P007-1369-2022. The investigation encompassed the entire study area. One known site was identified within the subject lands: AiHc-482. This site was previously mitigated and does not represent a concern for the project. The Stage 2 assessment resulted in the identification of one new location of archaeological materials: Site 1. Site 1 was found to be of no further cultural heritage value or interest. It is recommended that no further assessment be required within the study area.

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Appendix A: Built Heritage Resources and Cultural Heritage Landscapes

BUILT HERITAGE RESOURCE NO. 1

DESCRIPTION OF PROPERTY	
Street Address	1385 Bleams Road
Name	Williamsburg School, S.S. #7 Waterloo Township
Recognition	Part IV of the Ontario Heritage Act (By-law 87-309), , Region of Waterloo Planner indicated that the property has been identified as likely meeting the criteria for Regional Significance
Location	City of Kitchener
Type of Property	Institutional/Residential
Date(s)	1864
Description	A description of 1385 Bleams Road is included on Canada's Historic Places website HistoricPlaces.ca - HistoricPlaces.ca): *The Williamsburg School is located at 1385 Bleams Road, on the south side of Bleams Road west of Fischer-Hallman Road, in the City of Kitchener. The one storey rubble stone schoolhouse was constructed in 1864.* *The property was designated, by the City of Kitchener in 1987 for its heritage value under Part IV of the Ontario Heritage Act (By-law 87-309).* *The Williamsburg School is one of the few remaining buildings associated with the former hamlet of Williamsburg. In 1863, Abram and Veronica Clements sold three quarters of an acre of their farm to the Trustees of School Section Number Seven (S.S. #7). In 1864 the one room schoolhouse was built.* *The rubble stone construction and simple features such as the bell tower of the Williamsburg School reflect the building's original purpose as a rural schoolhouse and meeting place. Community groups such as the Beaver Literary Society and the Farmer's Club met there. In 1874 the interior of the school was expanded to allow for more students, and from 1875 to 1890, the building was also used for church services. In 1922 a basement and a cloakroom were built to accommodate growing community meetings. Finally, in February 1966 the Williamsburg School was closed and the building was converted into a private residence. A stone addition was added in 1987.* The Historic Places Website lists Character Defining Elements (also known as heritage attributes) as: • *bell tower* • *one storey rubble stone construction* • *gable roof* • *two brick chimneys* • *nine over six double hung windows* • *porch* • *basement* • *cloakroom* • *board and batten woodshed* • *stone addition* By-Law 87-309 Lists the following attributes: • rubble stone facades of the original schoolhouse • belfry • wood shed • fence

Photographs	 
Date of Photos	April 5, 2022

EVALUATION OF PROPERTY			
Criteria	**Description**	✓	**Value Statement(s)**
Design or Physical Value	Is a rare, unique, representative or early example of a style, type, expression, material or construction method	✓	Representative example of a one room schoolhouse from the mid-19th century.
	Displays a high degree of craftsmanship or artistic value		
	Displays a high degree of technical or scientific achievement		
Historical or Associative Value	Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community	✓	The property is associated with former Williamsburg community groups such as the Beaver Literary Society and the Farmer's Club.
	Yields or has the potential to yield information that contributes to the understanding of a community or culture		
	Demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community		
Contextual Value	Is important in defining, maintaining or supporting the character of an area		
	Is physically, functionally, visually or historically linked to its surroundings	✓	The property is historically linked to its surroundings as one of the few remaining buildings associated with the former hamlet of Williamsburg. Further, the school is a physical link to the location of the former Williamsburg hamlet.
	Is a landmark		

RESULTS OF HERITAGE ASSESSMENT	
CHVI Evaluation	Has CHVI.
Heritage Attributes	• bell tower • one-storey rubble stone construction • gable roof • two brick chimneys • nine over six double hung windows • porch • basement • cloakroom • board and batten woodshed • stone addition • stone façade of original schoolhouse • belfry • woodshed • fence

BUILT HERITAGE RESOURCE NO. 2

DESCRIPTION OF PROPERTY	
Street Address	1643 Bleams Road
Name	n/a
Recognition	None – noted as 'unofficially listed' by Region of Waterloo Heritage Planner
Location	City of Kitchener
Type of Property	Residential
Date(s)	1854
Description	The structure located at 1643 Bleams Road can be described as a two-and-a-half storey, three-bay Georgian house. The house is situated on the south side of Bleams Road on a rise of land with a short setback from the road. There is a retaining wall and fence along the property line along Bleams Road. Two large trees flank the building one on either side that could be contemporary with the structure. The house is built on a rubble stone foundation and there is an addition on the south elevation of the building. The facade has a central doorway with sidelights and is there is a window opening on either side of the door. The second storey has the same layout with central doorway flanked by two window openings. A new two storey deck has been added to the façade of the home. The structure has a hip roof with a central dormer. The structure is currently clad in vinyl siding. The structure is currently owned and utilized by the Freedom in Christ Pentecostal Assembly. The property is noted as a historic building on the Waterloo Region Generation's website. The website lists that the residence was constructed in 1854 by Henry Woods and was once the home of Maxwell Becker (Waterloo Region Generations 2022a). Further in consultation with the Region of Waterloo's planner, the property was described as unofficially listed by the Region as a property of potential cultural heritage interest.

Georgian Characteristics (Adapted from Fram 1988)	1643 Bleams Road Characteristics
Box-like	Yes
Symmetrical façade	Yes
One to three-storeys	Yes
Center-hall plan	Unknown
five-bay façade, residences often 3-bay	Yes
Stone or brick cladding	Unknown
Side-gable roof	No
Simple cornices with return eaves	No
Small-paned double hung windows (typically twelve-over-twelve)	No
Paneled doors	Unknown
Flat top or shallow arched fanlights, transom and side lights at central entry	Unknown – side lights visible

Photographs	 

	 
Date of Photos	April 5, 2022

EVALUATION OF PROPERTY			
Criteria	**Description**	✓	**Value Statement(s)**
Design or Physical Value	Is a rare, unique, representative or early example of a style, type, expression, material or construction method	✓	The property contains a representative example of a Georgian style residence built in the 19th century.
	Displays a high degree of craftsmanship or artistic value		
	Displays a high degree of technical or scientific achievement		
Historical or Associative Value	Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community		
	Yields or has the potential to yield information that contributes to the understanding of a community or culture		
	Demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community		
Contextual Value	Is important in defining, maintaining or supporting the character of an area		
	Is physically, functionally, visually or historically linked to its surroundings		
	Is a landmark		

RESULTS OF HERITAGE ASSESSMENT	
CHVI Evaluation	Has CHVI
Heritage Attributes	• The location of the residence on a rise of land • The two-and-a-half storey, Georgian residence with three-bay façade, hipped roof and fieldstone foundation.

BUILT HERITAGE RESOURCE NO. 3

DESCRIPTION OF PROPERTY	
Street Address	2219 Ottawa Street South
Name	n/a
Recognition	Listed in City of Kitchener Heritage Inventory
Location	City of Kitchener
Type of Property	Residential
Date(s)	1967
Description	The property contains a two-storey mid-century modern residence commissioned and designed by John Lingwood in 1967 (Storring 2019, Davis 2019). In consultation with the City of Kitchener's planner, the property was described as listed on the City's Heritage Inventory as a property of potential cultural heritage interest.

Mid-Century Modern Characteristics (adapted Ennals 1972; Kyles 2016a)	**2219 Ottawa Street South Characteristics**
Asymmetrical massing	Yes
Flat planes with horizontal emphasis	Yes
Flat roof	Yes
Split level arrangement, open floor plan	Unknown
Large windows	Yes
Lack of ornamentation	Yes
Integration with nature	Yes

Photograph	
Date of Photo	April 5, 2022

EVALUATION OF PROPERTY			
Criteria	**Description**	✓	**Value Statement(s)**
Design or Physical Value	Is a rare, unique, representative or early example of a style, type, expression, material or construction method	✓	The property contains a representative example of a mid-century modern style residence.
	Displays a high degree of craftsmanship or artistic value		
	Displays a high degree of technical or scientific achievement		
Historical or Associative Value	Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community	✓	The property is associated with Keith Shantz, a successful industrialist and owner of Morval-Durafoam Ltd. and his wife Winifred Shantz, a potter and artist who supported the local arts community through numerous bursaries and internships.
	Yields or has the potential to yield information that contributes to the understanding of a community or culture		
	Demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community	✓	The property associated with John Lingwood, a prominent modernist architect who practiced in the Waterloo Region.
Contextual Value	Is important in defining, maintaining or supporting the character of an area		
	Is physically, functionally, visually or historically linked to its surroundings		
	Is a landmark		

RESULTS OF HERITAGE ASSESSMENT	
CHVI Evaluation	Has CHVI
Heritage Attributes	• The two-storey mid-century modern residence with asymmetrical massing, horizontal massing, large windows and flat roof • Placement of residence within property's natural topography.

CULTURAL HERITAGE LANDSCAPE NO. 1

DESCRIPTION OF PROPERTY	
Boundary	Trussler Road starting at Ira Needles Boulevard and ending at Dundee Drive
Name	Trussler Road
Recognition	Cultural Heritage Landscape Study (L-RD-13)
Location	City of Kitchener
Type of Landscape	As per the Cultural Heritage Landscape Datasheet, Trussler Road is identified as a as Transportation Corridor (L-RD-13) Associated Historic Themes: Pioneer Settlement, Transportation, Agriculture.
Description	In 2014, the City of Kitchener completed a Cultural Heritage Landscape Study which identified Trussler Road as a Cultural Heritage Landscape (L-RD-13). The Cultural Heritage Landscape Data Sheet (2019) provided additional information about the cultural heritage value or interest of the road. The datasheet identified the following associated historic themes with Trussler Road: • *Pioneer Settlement,* • *Transportation,* • *Agriculture.* The datasheet provides the following description of Trussler Road. *Trussler Road, from Ira Needles Boulevard to New Dundee Road, is a paved rural road which forms the boundary between Kitchener and Wilmot Township. Trussler was a significant control for the Waterloo County survey because it is a boundary for all five townships. The road follows boundaries of the Beasley's New Survey, the German Company Small Lots Survey and Upper Block according to the 1881 atlas of Waterloo County. The road follows the undulating topography of the kame moraine landscape that is typical of the southwest and west side of Kitchener. The road is straddled by agricultural lands and a single wood pole hydro line runs parallel to the road on the east side for most of the length of the road. The road runs through very open farmland with clear views of adjacent cultivated fields framed by random scattered trees paralleling its alignment on both sides of the road. There are a few short sections of the road which are bordered by woodlots. Trussler was an important survey boundary and an exception to many of the other roads in the Township of Waterloo which were not formally laid out during township surveys. The surrounding agricultural landscape remains largely intact except as the road approaches Ira Needles Boulevard where residential neighbourhoods are beginning to encroach on the right-of-way. At present, Trussler Road continues to form part of the local road network. Trussler Road is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities and became a connecting transportation route for the County of Waterloo; relates to the development of the County of Waterloo for agricultural purposes in the nineteenth century; is bounded by cultivated fields and a rural landscape; and, continues to form part of the local road network. The following attributes are evocative of the road's historic and scenic character: the narrow two-lane alignment without shoulders; the scenic views to surrounding agricultural fields; the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and, the undulating kame topography and original historic alignment.* The Datasheet includes an assessment of Trussler Road which considered Historical Integrity, Cultural Value, and Community Value. The following outline where criteria was met along with additional information: *Historical Integrity:* • *Land Use- Continuity of Use* *Trussler Road, from Ira Needles Boulevard to New Dundee Road, is a paved rural road which forms the boundary between Kitchener and Wilmot Township and which retains its relationship with rural agricultural lands.* *Cultural Value:* • *Historic Value- Historic Understanding of Area* • *Contextual Value- Historically, Physically, Functionally, or Visually linked to surrounding*.

	Trussler Road was a significant control for the Waterloo County survey because it is a boundary for all five townships. Trussler was an important survey boundary and an exception to many of the other roads in the Township of Waterloo which were not formally laid out during township surveys. The road follows boundaries of the Beasleys New Survey, the German Company Small Lots Survey and Upper Block according to the 1881 atlas of Waterloo County. *Community Value:* *Trussler Road is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities and became a connecting transportation route for the County of Waterloo; and, continues to form part of the local road network.* Lastly, the CHL Datasheet notes the following Character Defining Elements (also known as heritage attributes) of Trussler Road as: • *the narrow two-lane alignment without shoulders;* • *the scenic views to surrounding agricultural fields;* • *the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and,* • *the undulating topography and original historic alignment.*
Photographs	

	
	
Date of Photos	April 5, 2021

EVALUATION OF PROPERTY			
Criteria	**Description**	✓	**Value Statement(s)***
Design or Physical Value	Is a rare, unique, representative or early example of a style, type, expression, material or construction method		
	Displays a high degree of craftsmanship or artistic value		
	Displays a high degree of technical or scientific achievement		
Historical or Associative Value	Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community	✓	Trussler Road is historically associated with the theme of pioneer settlement, transportation, and agriculture. *Trussler Road was a significant control for the Waterloo County survey because it is a boundary for all five townships. Trussler was an important survey boundary and an exception to many of the other roads in the Township of Waterloo which were not formally laid out during township surveys. The road follows boundaries of the Beasleys New Survey, the German Company Small Lots Survey and Upper Block according to the 1881 atlas of Waterloo County.*
	Yields or has the potential to yield information that contributes to the understanding of a community or culture		The CHL datasheet does not note the CHLs as having archaeological potential.
	Demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community		
Contextual Value	Is important in defining, maintaining or supporting the character of an area	✓	Trussler Road is important in maintaining and supporting the character of the surrounding landscape through its *scenic views to surrounding agricultural fields, the diverse roadside vegetation that abuts the roadside* and *provides a defined edge to the road. And the topography which is part of the historic alignment.*
	Is physically, functionally, visually or historically linked to its surroundings	✓	*Trussler Road is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities and became a connecting transportation route for the County of Waterloo; and, continues to form part of the local road network*
	Is a landmark		

* The value statement which has been taken directly from the CHL Datasheet are noted in italics.

RESULTS OF HERITAGE ASSESSMENT	
CHVI Evaluation	Has CHVI
Heritage Attributes*	The heritage attributes, as identified by the CHL Study include: • *the narrow two-lane alignment without shoulders;* • *the scenic views to surrounding agricultural fields;* • *the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and,* • *the undulating topography and original historic alignment.*

CULTURAL HERITAGE LANDSCAPE NO. 2

DESCRIPTION OF PROPERTY	
Name	2091 Bleams Road – Barn and silo
Recognition	None – noted as 'unofficially listed' by Region of Waterloo Heritage Planner.
Location	City of Kitchener
Type of Landscape	Former agricultural landscape
Description	The property is a remnant of a former agricultural landscape and includes a farmhouse, barn and silo surrounded by agricultural fields. The farmhouse is a two-storey L-shaped residence with an intersecting gable roof. The farmhouse is listed on the Waterloo Region Generations website which lists the home as a log and wood frame building constructed circa 1880. The house is also described as being formerly clad in white aluminum siding that was removed in 2010 (Waterloo Region Generations 2022b). The two-storey wooden barn at 3277 Bleams Road is a representative example of a Central Ontario bank barn with gable roof and fieldstone foundation. Bank barns are commonly found throughout Ontario. The silo, located to the east of the barn is constructed of reinforced concrete.
Photographs	

	
Date of Photos	April 5, 2022

EVALUATION OF PROPERTY			
Criteria	**Description**	✓	**Value Statement(s)***
Design or Physical Value	Is a rare, unique, representative or early example of a style, type, expression, material or construction method	✓	The property contains a representative example of a bank barn with fieldstone foundation commonly found in rural Ontario
	Displays a high degree of craftsmanship or artistic value		
	Displays a high degree of technical or scientific achievement		
Historical or Associative Value	Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community		
	Yields or has the potential to yield information that contributes to the understanding of a community or culture		
	Demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community		
Contextual Value	Is important in defining, maintaining or supporting the character of an area	✓	The barn maintains the historical rural character of the surrounding area
	Is physically, functionally, visually or historically linked to its surroundings		
	Is a landmark		

RESULTS OF HERITAGE ASSESSMENT	
CHVI Evaluation	Has CHVI
Heritage Attributes	• The two-storey wooden vernacular barn with gable roof and fieldstone foundation

Appendix B: Team Member Curriculum Vitae

Jacqueline McDermid, BA, CAHP
Acting Heritage Team Lead – Project Manager
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Biography

Jacqueline McDermid has ten years of technical writing and management experience; Seven years direct heritage experience. She has gained seven years of experience conducting primary and secondary research for archaeological and heritage assessments and drafting reports and evaluating property according to Ontario Regulation 9/06 and 10/06 as part of Municipal Heritage Registers. Jacqueline is expert at copy editing heritage reports including checking grammar, consistency and fact checking, to ensure a high-quality product is delivered to clients. She has experience assisting with the drafting of Heritage Conservation District Studies through the drafting of reports for potential Heritage Conservation Districts in the City of Toronto (Weston HCD) and Township of Bradford West Gwillimbury (Bond Head HCD). Jacqueline has proven project management experience gained by completing projects on time and on budget as well as formal Project Management training. In 2018, under a six-month contract as the Heritage Planner at the Ministry of Transportation, acquired considerable experience conducting technical reviews of consultant heritage reports for Ministry compliance including Cultural Heritage Evaluation Reports, Heritage Impact Assessment, Strategic Conservation Plans, and Cultural Heritage Resource Assessments as well as gained valuable insight on provincial heritage legislation (*Ontario Heritage Bridge Guidelines*, *Ontario MTO Environmental Standards and Practices for Cultural Heritage, MTO Environmental Reference for Highway Design – Heritage*, MCM' *Heritage Identification & Evaluation Process* as well as the new *MHTCI Information Bulletins on Heritage Impact Assessments* and *Strategic Conservation Plans*, and inter-governmental processes. She has extensive knowledge of heritage and environmental policies including the *Planning Act*, *Provincial Policy Statement*, the *Ontario Heritage Act*, Official Plans, *Environmental Assessment Act* and *Green Energy Act*. Working knowledge of the *Standards and Guidelines for Consultant Archaeologists* (2011), Ministry of Tourism, Culture and Sport.

Education

2000–2007 Honours B.A., Wilfrid Laurier University, Waterloo, Ontario
Major: Near Eastern Archaeology.

Work Experience

2020–present **Project Manager – Heritage, Archaeological Research Associates, Stoney Creek, ON**

2015–2020 **Technical Writer and Researcher – Heritage, Archaeological Research Associates Ltd., Kitchener, ON**
Research and draft designation by-laws, heritage inventories, Heritage Impact Assessments, Built Heritage and Cultural Heritage Landscape Assessments, and

Cultural Heritage Resource Evaluations using Ontario Regulation 9/06, 10/06 and the Ontario Heritage Bridge Guidelines.

2018 **Environmental Planner – Heritage Ministry of Transportation, Central Region** – Six-month contract.
Responsibilities included: project management and coordination of MTO heritage program, managed multiple consultants, conducted and coordinated field assessments and surveys, estimated budgets including $750,000 retainer contracts. Provided advice on heritage-related MTO policy to Environmental Policy Office (EPO) and the bridge office.

2017–2018 **Acting Heritage Team Lead – Heritage Archaeological Research Associates Ltd., Kitchener, ON**
Managed a team of Heritage Specialists, oversaw the procurement of projects, retainers; managed all Heritage projects, ensured quality of all outgoing products.

2014–2015 **Technical Writer – Archaeology, Archaeological Research Associates Ltd., Kitchener, ON**
Report preparation; correspondence with the Ministry of Tourism, Culture, and Sport; report submission to the Ministry and clients; and administrative duties (PIF and Borden form completion).

Professional Development

2019 OPPI and WeirFoulds Client Seminar: Bill 108 – More Homes, More Choice, 2019.
2019 Ontario Heritage Conference, Goderich, ON (Two-days).
2019 Rural Heritage, Webinar, National Trust for Canada.
2019 Information Session: Proposed Amendments to the *OHA*, by the Ministry of Tourism, Culture and Sport.
2019 Indigenous Heritage Places and Perspectives, Webinar, National Trust for Canada.
2018 Indigenous Canada, University of Alberta.
2018 Grand River Watershed 21st Annual Heritage Day Workshop and Celebration (One-day).
2017 Leadership Training for Managers Course, Dale Carnegie Training.
2015 Introduction to Blacksmithing (One-Day).
2015 Ontario Heritage Trust symposium, topics included: Cultural landscapes, City building, Tangible heritage, How the public engages with heritage, and Conserving intangible heritage.
2014 Community Heritage Ontario, webinar, Part IV and V of the *Ontario Heritage Act*.

Presentations

2019 **Cemeteries and Burials Research.** Cultural Heritage Planning and Archaeology Symposium, Burlington.

Penny M. Young, MA, CAHP (#P092)
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Biography

Penny Young has 27 years of cultural heritage management experience, 21 years working in government, as a Heritage Planner, Heritage Coordinator, Regional Archaeologist and Archaeological Database Coordinator where she managed and coordinated the impacts to cultural heritage resources including built heritage, archaeological sites and cultural heritage landscapes for compliance with municipal, provincial and federal legislation and policy. She has conducted results-driven and collaborative management of complex cultural heritage resource projects within the public sector involving developing project terms of reference, defining scope of work, preparation of budgets and conducting sites visits to monitor and provide heritage/archaeological and environmental advice and direction. At the Ministry of Transportation Penny revised, updated and developed policy, as part of a team, for the *Ontario Heritage Bridge Guidelines for Provincially Owned Bridge Guidelines for Provincially Owned Bridges*. She received the MTO Central Region Employee Recognition Award in 2001 and 2002. While at MTO she provided technical advice and input into the development of the *MTO Environmental Reference for Highway Design - Section 3.7 Built Heritage and Cultural Heritage Landscapes* and the *MTO Environmental Guide for Built Heritage and Cultural Heritage Landscapes.* She is a professional member of the Canadian Association of Heritage Planners (CAHP) and holds Professional License #P092 from MCM. She also holds memberships in the Ontario Professional Planners Institute (OPPI) and the Ontario Archaeological Society (OAS).

Education

1990–1993	Master of Arts, Department of Anthropology McMaster University, Hamilton Ontario. Specializing in Mesoamerican and Ontario archaeology.
1983–1987	Honours Bachelor of Arts (English and Anthropology), McMaster University, Hamilton, Ontario.

Professional Memberships and Accreditations

Current	Professional Member, Canadian Association of Heritage Professionals (CAHP)
Current	Member of Ontario Archaeological Society
Current	Pre-Candidate Member, Ontario Professional Planners Institute (OPPI)
Current	Ministry of Tourism Culture & Sport Professional Licence (#P092)

Work Experience

Current **Project Manager - Heritage, Archaeological Research Associates Ltd.**
Coordinates ARA project teams and conducts heritage assessment projects including Heritage Impact Assessments, Built Heritage and Cultural Heritage Landscape Assessments, and Cultural Heritage Resource Evaluations. Additional responsibilities include the completion of designation by-laws and heritage

inventories. Liaises with municipal staff, provincial ministries and Indigenous communities to solicit relevant project information and to build relationships.

2008–2016 **Heritage Planner, Culture Services Unit, Ministry of Tourism, Culture & Sport (MCM)**
Responsible for advising and providing technical review for management of cultural heritage resources in environmental assessment undertakings and planning projects affecting provincial ministries, municipalities, private sector proponents and Indigenous communities. Advised on municipalities' Official Plan (OP) policies cultural heritage conservation policies. Provided guidance on compliance with the Public Work Class EA, other Class EA legislation and 2010 *Standards and Guidelines for Provincial Heritage Properties*.

2014 **Senior Heritage Planner, Planning and Building Department, City of Burlington** (temporary assignment)
Project manager of the study for a potential Heritage Conservation District. Provided guidance to a multiple company consultant team and reported to municipal staff and the public. Liaised with Municipal Heritage Committee and municipal heritage property owners approved heritage permits and provided direction on Indigenous engagement, archaeological site assessments and proposed development projects.

2011 **Heritage Coordinator, Building, Planning and Design Department, City of Brampton** (temporary assignment)
Project lead for new Heritage Conservation District Study. The assignment included directing consultants, managing budgets, organizing a Public Information Session, and reporting to Senior Management and Council. Reviewed development/planning documents for impacts to heritage including OP policies, OP Amendments, Plans of subdivision and Committee of Adjustment applications and Municipal Class EA undertakings.

2010–2011 **Senior Heritage Coordinator, Culture Division, City of Mississauga** (temporary assignment)
Provided advice to Senior Management and Municipal Council on heritage conservation of built heritage, archaeological sites and cultural heritage landscapes. Liaised with multiple municipal staff including the Clerks' office, Parks and development planners and the public. Supervised and directed project work for junior heritage planner.

1999–2008 **Regional Archaeologist, Planning and Environmental Section, Ministry of Transportation (MTO)**
Responsibilities included: project management and coordination of MTO archaeology and heritage program, managed multiple consultants, conducted and coordinated field assessments, surveys and excavations, liaised with First Nations' communities and Band Councils, estimated budgets including $200,000 retainer contracts.

Sarah Clarke, BA, CAHP (#R446)
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Biography

Sarah Clarke is Archaeological Research Associates Ltd.'s Heritage Research Manager. Sarah has over 12 years of experience in Ontario archaeology and 10 years of experience with background research. Her experience includes conducting archival research (both local and remote), artifact cataloguing and processing, and fieldwork at various stages in both the consulting and research-based realms. As Team Lead of Research, Sarah is responsible for conducting archival research in advance of ARA's archaeological and heritage assessments. In this capacity, she performs Stage 1 archaeological assessment field surveys, conducts preliminary built heritage and cultural heritage landscape investigations and liaises with heritage resource offices and local community resources in order to obtain and process data. Sarah has in-depth experience in conducting historic research following the *Ontario Heritage Toolkit* series, and the *Standards and Guidelines for Provincial Heritage Properties*. Sarah holds an Honours B.A. in North American Archaeology, with a Historical/Industrial Option from Wilfrid Laurier University and is currently enrolled in Western University's Intensive Applied Archaeology MA program. She is a member of the Ontario Archaeological Society (OAS), the Society for Industrial Archaeology, the Ontario Genealogical Society (OGS), the Canadian Archaeological Association, and is a Council-appointed citizen volunteer on the Brantford Municipal Heritage Committee. Sarah holds an R-level archaeological license with the MCM (#R446).

Education

Current	MA Intensive Applied Archaeology, Western University, London, Ontario. Proposed thesis topic: Archaeological Management at the Mohawk Village.
1999–2010	Honours BA, Wilfrid Laurier University, Waterloo, Ontario. Major: North American Archaeology, Historical/Industrial Option.

Professional Memberships and Accreditations

Current	Member of the Ontario Archaeological Society
Current	Member of the Society for Industrial Archaeology
Current	Member of the Brant Historical Society
Current	Member of the Ontario Genealogical Society
Current	Member of the Canadian Archaeological Association
Current	Member of the Archives Association of Ontario

Work Experience

Current	**Team Lead – Research; Team Lead – Archaeology, Archaeological Research Associates Ltd.** Manage and plan the research needs for archaeological and heritage projects. Research at offsite locations including land registry offices, local libraries and local

and provincial archives. Historic analysis for archaeological and heritage projects. Field Director conducting Stage 1 assessments.

2013–2015 **Heritage Research Manager; Archaeological Monitoring Coordinator, Archaeological Research Associates Ltd.**
Stage 1 archaeological field assessments, research at local and distant archives at both the municipal and provincial levels, coordination of construction monitors for archaeological project locations.

2010–2013 **Historic Researcher, Timmins Martelle Heritage Consultants Inc.**
Report preparation, local and offsite research (libraries, archives); correspondence with the Ministry of Tourism, Culture, and Sport; report submission to the MCM and clients; and administrative duties (PIF and Borden form completion and submission, data requests).

2008–2009 **Field Technician, Archaeological Assessments Ltd.**
Participated in field excavation and artifact processing.

2008–2009 **Teaching Assistant, Wilfrid Laurier University.**
Responsible for teaching and evaluating first year student lab work.

2007–2008 **Field and Lab Technician, Historic Horizons.**
Participated in excavations at Dundurn Castle and Auchmar in Hamilton, Ontario. Catalogued artifacts from excavations at Auchmar.

2006–2010 **Archaeological Field Technician/Supervisor, Wilfrid Laurier University.**
Field school student in 2006, returned as a field school teaching assistant in 2008 and 2010.

Professional Development

2019 Annual attendance at Ontario Heritage Conference, Goderich, ON.
2018 Cultural Heritage, Archaeology and Planning Symposium.
2018 Grand River Watershed 21st Annual Heritage Day Workshop & Celebration.
2018 Mississaugas of the New Credit First Nation Historical Gathering and Conference.
2017 Ontario Genealogical Society Conference.
2016 Ontario Archaeological Society Symposium.
2015 Introduction to Blacksmithing Workshop, Milton Historical Society.
2015 Applied Research License Workshop, MCM.
2014 Applied Research License Workshop, MCM.
2014 Heritage Preservation and Structural Recording in Historical and Industrial Archaeology. Four-month course taken at Wilfrid Laurier University, Waterloo, ON. Professor: Meagan Brooks.

Presentations

2018 *The Early Black History of Brantford.* Brant Historical Society, City of Brantford.
2017 *Mush Hole Archaeology.* Ontario Archaeological Society Symposium, Brantford.
2017 *Urban Historical Archaeology: Exploring the Black Community in St. Catharines, Ontario.* Canadian Archaeological Association Conference, Gatineau, QC.

Volunteer Experience

Current Council-appointed citizen volunteer for the Brantford Municipal Heritage Committee.

Aly Bousfield-Bastedo, BA, Dip. Heritage Conservation
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Education

2017–2020 Post-Graduate Diploma in Heritage Conservation, Willowbank School of Restoration Arts. Queenston, ON

2016–2017 Post-Graduate Certificate in Urban Design, Simon Fraser University, Vancouver, BC

2009–2013 Honours BA, University of Guelph, Guelph, ON
Major: Sociology

Professional Memberships and Accreditations

Current Member, International Network for Traditional Building, Architecture & Urbanism, Guelph Chapter.

Work Experience

Current **Technical Writer and Researcher, Archaeological Research Associates Ltd.**
Produce deliverables for ARA's heritage team, including historic research, heritage assessment and evaluation for designation by-laws, Heritage Impact Assessments, Built Heritage and Cultural Heritage Landscape Assessments, and Cultural Heritage Resource Evaluations.

2021 **Cultural Consultant, Ministry of Tourism, Culture and Sport**
Provided liaison and advisory services to municipalities and stakeholders in the heritage sector on cultural heritage legislation in Ontario.

2020 **Heritage Planning Consultant, Megan Hobson & Associates**
Provided heritage consulting services, including site investigation and documentation. Provided cultural heritage value assessment and evaluations.

2019–2020 **Cultural Heritage Planning Intern, ERA Architects**
Coordinated and authored various heritage related contracts. Duties included historic research, heritage impact assessments, cultural heritage assessments and evaluations.

2016–2017 **Heritage Vancouver, Programs and Communications**
Conducted research and analysis of heritage properties and neighbourhoods in Vancouver. Assisted in the creation of a cultural heritage landscape assessment of Vancouver's Chinatown neighbourhood through historical research and community engagement.

Professional Development

2021 COP26 and Climate Heritage Action – Seizing Momentum and the 'Heritage Reset'. Webinar. Presented by the National Trust for Canada.

2021 "Standard Specification for Mortars for the Repair of Historic Masonry Confirmation". Webinar. Presented by APT.
2021 "Drafting Statements of Significance." Webinar presented by ARA's K. Jonas Galvin for ACO's job shadow students.
2021 "Architectural Styles." Webinar presented by ARA's K. Jonas Galvin for ACO's job shadow students.
2021 "Perspectives on Cultural Heritage Landscapes". Cultural Heritage, Archaeology and Planning Symposium. ARA Ltd.
2019 University of Toronto, Mark Laird "Selected topics on Landscape Architecture", Course audit.
2019 "Planning for Golf's Decline", INTBAU speaker series.
Messors, "Fornello Sustainable Preservation Workshop", Cultural Landscape Field School.
2018 Points of Departure. Association for Preservation Technology (APT) Conference. Buffalo, NY.

Presentations
2018 Essential issues or themes for education in heritage conservation: Montreal Roundtable on Heritage (Canada Research Chair on Built Heritage).

Appendix E

Traffic Study

SALVINI CONSULTING
Transportation Engineering and Planning

Bleams Road
Fischer-Hallman Road to Trussler Road
Municipal Class Environmental Assessment

Transportation Report

Prepared for:
Region of Waterloo

Located in:
City of Kitchener

April 2023

Executive Summary

This Transportation Report is provided in support of the Bleams Road Municipal Class EA extending from Fisher-Hallman Road to Trussler Road in the City of Kitchener. The corridor has been identified for improvements to both the vehicular roadway and the active transportation infrastructure to accommodate future traffic. The Class EA considers transportation concerns and needs in the corridor to a planning horizon of 2031, assessing infrastructure for walking and cycling, public transit, safety and collisions, and traffic operations.

Recommendations for future infrastructure needs were made in the context of the Region's Transportation Master Plan along with current guidelines and policies related to transportation. The area around the Bleams Road corridor has been the subject of multiple transportation studies and significant planned growth in recent years. The traffic forecasts developed for this Transportation Study reflect the ongoing and planned development in the area and the broader Region.

It is the recommendation of this study that the following considerations be included in the preferred alternative for the corridor:

- Multi-use paths on both sides of Bleams Road to accommodate both pedestrians and cyclists in accordance with the Region's Transportation Master Plan.
- The design of the road should accommodate GRT buses so that they may use the intersections for routing as needed.
- The major intersections in the corridor – Trussler Road, Isaiah Drive, Donnenwerth/Amand, and Commonwealth/Abram Clemens – can proceed as either signalized intersections or as roundabouts.
- The minor intersections in the corridor – George Israel Street, Nyles Drive, Street L, Forestwalk Street, and Helena Feasby Street – should proceed as side street stop-controlled intersections.
- The intersections at Forestwalk Street and Helena Feasby Street have been assessed as right turns only. Left turn capacity at these two intersections is limited and adjacent major intersections are provided that allow for alternate access to Bleams Road.
- The George Israel Street intersection warrants the inclusion of an eastbound right turn lane and a westbound left turn lane.
- The Nyles Drive intersection warrants the inclusion of an eastbound left turn lane.
- The Street L intersection warrants the inclusion of a westbound left turn lane.



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1.0 Introduction

1.1 Background

The Region of Waterloo is undertaking a Municipal Class Environmental Assessment (Class EA) for Bleams Road, from Fischer-Hallman Road to Trussler Road, in the City of Kitchener. Figure 1 shows the study area. This segment of Bleams Road is about three kilometres long. The study area does not include the intersection with Fischer-Hallman Road, as future plans for a roundabout at the Bleams/Fischer-Hallman intersection have already been made.

The Class EA considers transportation concerns and needs in the corridor to a planning horizon of 2031, assessing infrastructure for walking and cycling, public transit, safety and collisions, and traffic operations. This Transportation Report provides the information needed to recommend the best transportation alternative for the corridor.

Figure 1: Study Area



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1.2 Justification

The Regional Official Plan designates Bleams Road as a Regional Road. The Transportation Capital Program includes the reconstruction of Bleams Road from Fischer-Hallman Road to Trussler Road, including intersection improvements at Nyles Drive. In addition, the Regional Transportation Master Plan (RTMP) has identified this section of Bleams Road for off-road cycling facilities.

1.3 Other Transportation Studies

Bleams Road is designated a Neighbourhood Connector – Avenue in the Context Sensitive Regional Transportation Corridor Design Guidelines. Neighbourhood Connectors are intended to move large volumes of people and goods, and Avenues should do this through a combination of private automobiles, public transit, cycling and walking. According to the guidelines, pedestrian facilities, landscaping zones, transit facilities and provisions for utilities are all “necessary” elements. Additionally, consideration for transit priority lanes, cycling facilities, passing lanes, auxiliary lanes at intersections and curbs is considered “important”.

In the guidelines, Trussler Road and Fischer-Hallman Road are also designated Neighbourhood Connector – Avenue.

The Region of Waterloo commissioned an Intersection Control Study (ICS) for the Bleams/Fischer-Hallman intersection, which was completed by Ourston Roundabout Engineering in May of 2012. The ICS recommended that a roundabout be installed at the intersection with a dual lane entry and exit to Bleams Road on the west leg. The reconstruction of Bleams Road will tie into the four-lane cross-section generated by the roundabout, which was recently constructed.

The land use on the south side of Bleams Road in the corridor is generally agricultural in nature. However, all of these lands are intended for redevelopment in the planning horizon of this study. The various land parcels have been the subject of several transportation studies over the last ten years, so a comprehensive transportation analysis that looks at traffic operations in the Bleams Road corridor with the full development of all of the lands has been included in this study.

1.4 Project Needs

There are a number of needs driving this project.

Deteriorated Road Condition

The pavement condition on Bleams Road is in fair to poor condition. In general, the deterioration is simply due to the age of the asphalt combined with poor drainage. The proposed works would replace the deteriorated pavement and urbanize the roadway by removing the existing ditches and installing an underground storm sewer system that will outlet to adjacent developments along the south side of Bleams Road.

Recent and Future Traffic Patterns

A study of the current and projected traffic patterns along Bleams Road, between Fischer-Hallman Road and Trussler Road has determined that there is a need for improvements to Bleams Road to accommodate the recent and future intensification of land along both sides of

Bleams Road. A detailed evaluation of the existing and proposed streets that intersect Bleams Road has suggested a number of potential intersection improvements that could increase the capacity and safety of the corridor to meet future needs in the area while providing a balance with the needs of other corridor users.

Pedestrian and Cycling Needs

Currently there are no pedestrian or cycling facilities on Bleams Road. The Region of Waterloo 2018 Transportation Master Plan identifies Bleams Road as having a "Future Boulevard Multi-Use Trail" on both sides. Accordingly, a multi-use trail is being considered on both the north and south sides of Bleams Road for the entire length from Fischer-Hallman Road to Trussler Road. A single-direction cycle track and sidewalk is also being considered as a potential alternative to the multi-use trail. Efficient and desirable interconnections for pedestrians and cyclists between proposed and existing developments on both sides of the roadway will be considered with the design.

2 Existing Traffic Conditions

2.1 Road Conditions

Bleams Road is a Regional road with residential land uses to the north and new, planned residential subdivisions to the south. It currently carries AADT volumes between 6,000 and 10,000 vehicles. Generally, there is a single travel lane in each of the eastbound and westbound directions with a few exceptions:

- There is a slip around lane eastbound at Isaiah Drive for through vehicles to bypass left turning vehicles.
- There is a westbound right turn lane to Donnenwerth Drive.
- There is a westbound right turn lane to Commonwealth Street.

The speed limit on Bleams Road in the study area is 70 km/hr. The Trussler Road intersection is under traffic signal control and all the other intersections in the study area operate with side street stop control.

2.2 Land Use

The lands surrounding the corridor are generally built-out residential subdivisions with a mix of detached, semi-detached and townhouse uses on the north side and agricultural lands on the south side. There are two churches in the corridor: one on the north side east of Trussler Road and the other on the south side just east of Donnenwerth Drive. There is also a commercial plaza with a gas station on the northwest corner of the intersection with Fischer-Hallman Road.

2.3 Pedestrian Infrastructure and Traffic

The pedestrian network within the study area is extremely limited at present. There are no sidewalks on Bleams Road within the study area. As a result, pedestrian traffic volumes in the corridor are minimal.

The residential subdivisions to the north have been built in anticipation of future pedestrian infrastructure in the corridor, and sidewalks are provided on both sides of all the side road connections along with a number of existing trail connections built to the Bleams Road right-of-

way.

2.4 Cycling Infrastructure and Traffic

There are no cycling facilities in the Bleams Road corridor study area. Planned cycling infrastructure is discussed later in this report.

2.5 Public Transit

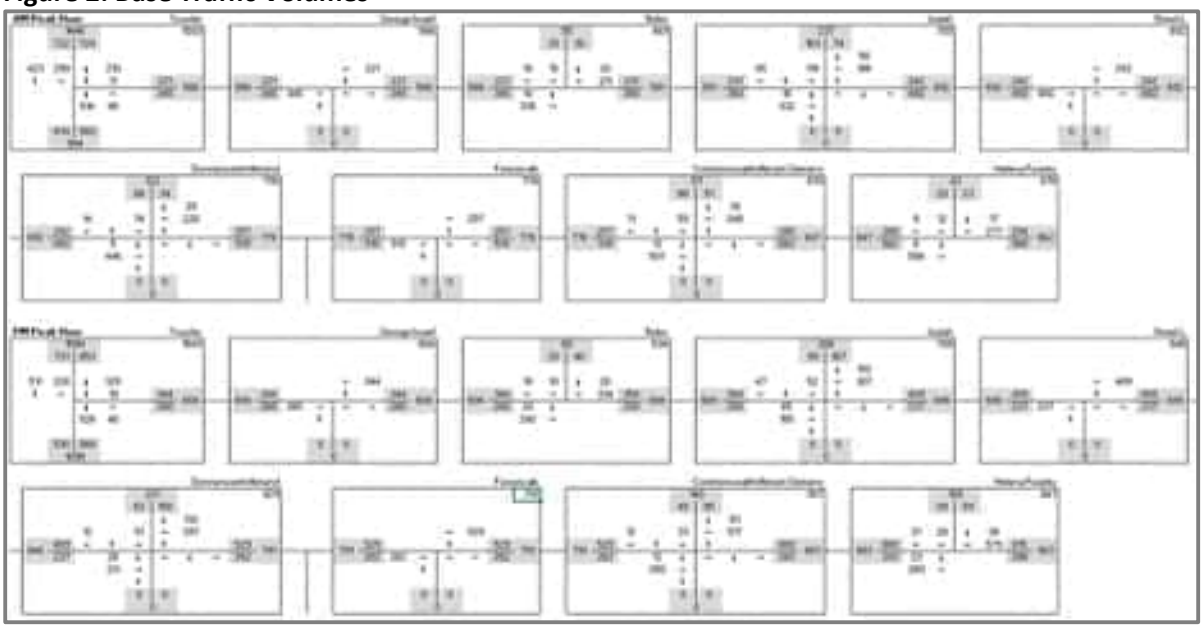
Presently there is no public transit service in the study area. Future planned services are discussed later in this report.

2.6 Traffic Volumes

The transportation analysis for this study was started in the fall of 2020 when covid restrictions severely impacted traffic volumes in the corridor. It was determined at that time that base traffic conditions would be developed using pre-pandemic traffic data. The Region supplied turning movement data at both the Trussler Road and Fischer-Hallman Road intersections and turning movement counts for the intervening road connections were gathered from the various transportation studies that have been completed over the last ten years for the subdivisions on the south side of Bleams Road.

Base traffic volumes in the weekday morning and afternoon peak hours in the study area are illustrated in Figure 2. A larger version of the diagram is provided in Appendix B.

Figure 2: Base Traffic Volumes



2.7 Heavy Vehicle Traffic

There is not significant heavy vehicle traffic in the corridor given the types of surrounding land use.

2.8 Collision Assessment

The five-year collision history (January 2014 to December 2018) in the corridor was reviewed along with the Region of Waterloo Annual Collision Report for 2020. There were no fatal collisions in the five year history and none of the collisions involved either pedestrians or cyclists.

A review of the Region's Annual Collision Report for 2020 indicates that the Trussler/Bleams intersection is number 81 on the list of the Top 100 Locations for collisions with an excess social cost of $6,991.

2.9 Region's Roundabout Policy

The Region of Waterloo has a Roundabout policy that states that an Initial Roundabout Screening be conducted when design work is being considered for:

- a new intersection on a Regional road
- an existing intersection where traffic signals are warranted
- an existing Regional road intersection that is programmed for improvements to address an identified safety or capacity problem
- any other location as determined by Regional staff or Regional Councillors.

Initial Roundabout Screenings related to proposed road improvements are reviewed later in this report.

3 Future Traffic Conditions

3.1 Planned Development

There is a substantial amount of planned development in the Bleams Road corridor. Almost the entirety of the south side of the corridor has been approved for new residential land uses with some neighborhood commercial. In the last ten years, Transportation Impact Studies have been completed for the various proposals to assist in planning for the transportation network locally. This study considers the combined travel demands of all the lands. The following sites were specifically accounted for in the future traffic projects.

- Big Springs/Williamsburg South located west of Fischer-Hallman Road and including a new connection to Bleams Road at Abram Clemens Street.
- South Estate/Cook/Mattamy west of Big Springs with a new connection to Bleams Road at Forestwalk Street.
- Stamm located west of Cook/Mattamy with a new connection to Bleams Road at Amand Drive.
- Mattamy west of Stamm to Trussler Road with multiple new connections to Bleams Road at Street L, Isaiah Drive and George Israel Street.

In addition, there is a development proposed for vacant lands at the northeast corner of the Trussler/Bleams intersection. However, access to that site is not planned to Bleams Road, other than potentially an emergency access. Traffic impacts to the Bleams Road corridor are anticipated to be minimal from this site and would be captured in background traffic growth.

The layout of the planned development south of Bleams Road includes for a continuous east-

west collector road (Rosenberg Way) that connects from Fischer-Hallman Road to Trussler Road. The intention is that Grand River Transit (GRT) bus service would run along Rosenberg Way providing closer access to transit services for the people living, working and studying in the new subdivisions.

3.2 Active Transportation Infrastructure

This Class EA implements the recommendations of the Region's Transportation Master Plan by providing multi-use trails on both sides of Bleams Road.

3.3 Transit Considerations

GRT bus services are planned to be provided on Rosenberg Way south of Bleams Road. However, the design of the intersections on Bleams Road should accommodate transit buses to provide flexibility for future services and also to provide options for the buses to turn around and return to the east as they reach the west end of Rosenberg Way.

3.4 Forecast Traffic Volumes

Future 2031 traffic volumes were forecast by including a background growth rate of 0.5 percent per year over the study horizon to 2031 and by specifically accounting for the planned development traffic in the corridor. Assumptions included in the forecast include the following:

- 0.5% per year growth on Bleams Road over 13 years since base data was collected in 2018
- 1% per year growth on Trussler Road over 13 years
- Horizon year of 2031
- Trip generation rates based on average rates in the ITE Trip Generation Manual (10th edition) plus a 10% reduction to account for a planned transit mode split
- 80% of school trips internal to the subdivisions
- 5% of the general traffic internal to the subdivisions
- 5% of the traffic destined to Trussler Road south
- A shifting distribution to the east and west along Bleams Road depending on the location of the site

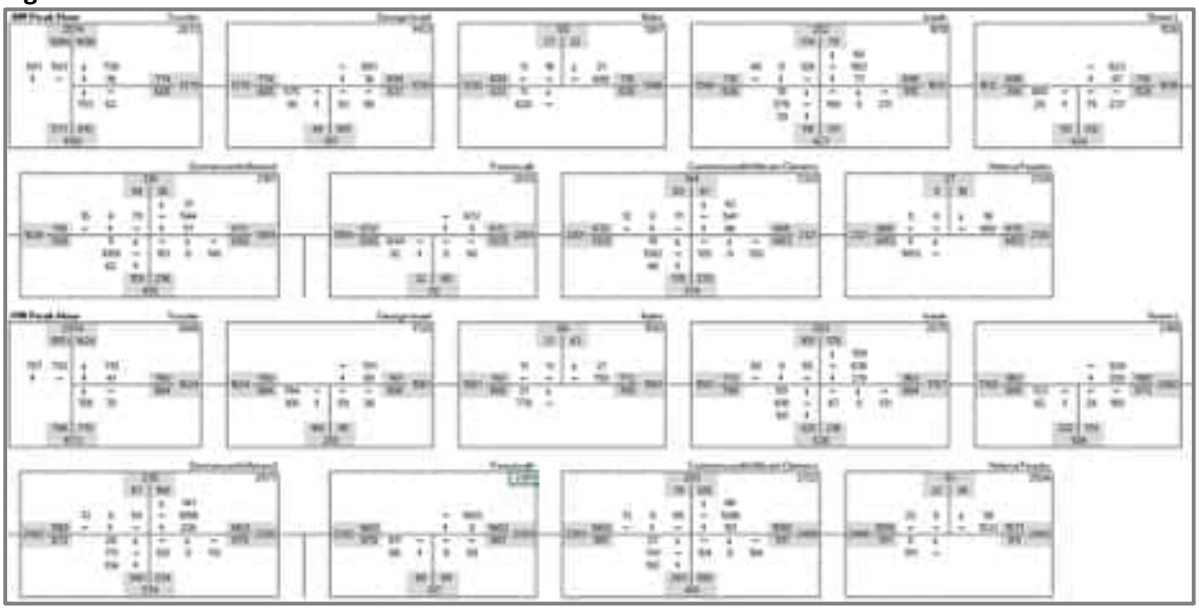
The table below provides a summary of the land use assumptions for each of the planned developments described above.

Table 1: Land Use Assumptions

Land Use	Metric	Site			
		Big Springs/ Williamsburg South	South Estate/Cook /Mattamy	Stamm	Mattamy West
Residential – singles	Units	522		305	1296
Residential – low-rise	Units	522		75	666
Residential – mid-rise	Units	704		365	635
Retail	GFA (sf)	85,000		53,100	-
Office	GFA (sf)	85,000		-	-
Elementary school	students	400		650	600

The resulting 2031 Traffic Volumes are shown in Figure 3. A larger scaled version of the traffic volumes is included in Appendix B.

Figure 3: Future Total Traffic Volumes



3.5 Intersection Improvements

Previous studies in the area have identified the need for turn lanes and enhanced traffic control at several intersections in the study area. A review of the traffic volumes in the future traffic forecast confirms the need for intersection improvements to accommodate future traffic. The previous recommendations were reviewed and updated to reflect consideration of the following:

- Bleams Road is planned to be urbanized and so the posted and design speed will be 60 kph in accordance with the Region's Context Sensitive Transportation Corridor Design Guidelines.
- Right turn lanes are considered when peak hour turning movement volumes reach 100 vehicles in one or more peak hours.
- Left turn lanes are considered when volumes meet the Provincial warrant criteria.
- Minimum right turn lane lengths of 30 metres.
- Multi-lane approaches on the side streets to accommodate traffic as needed.
- Traffic signals where warranted in accordance with Provincial criteria.

The following table provides an overview of the recommended improvements based on the review.

Table 2: Recommended Intersection Improvements

Intersection	Recommended Changes	Consideration
Trussler	Westbound Left Turn lane NB RT lane 2 SB LT lanes	High volumes Initial capacity analysis
George Israel	EB RT lane WB LT lane	PM peak hour volume > 100 Meets MTO warrant
Nyles	EB LT lane	Meets MTO warrant
Isaiah	Traffic signals EB RT and LT lane WB RT and LT lane	Previously warranted Initial capacity analysis
Street L	WB LT lane	Meets MTO warrant
Donnenwerth/Amand	Traffic signals EB RT and LT lane WB RT and LT lane	Previously warranted Initial capacity analysis
Forestwalk	WB LT lane	Meets MTO warrant
Commonwealth/Abram Clemens	Traffic signals EB RT and LT lane WB RT and LT lane	Warranted Initial capacity analysis
Helena Feasby	No improvements	Right turns only

3.6 Roundabout Screening

A number of intersections in the corridor were identified for roundabout screening in the Transportation Impact Studies that were prepared for the development proposals south of Bleams Road. Early in the work for this study, the cost information for the roundabout screenings was updated to identify those intersections that should be considered in an Intersection Control Study (ICS). The Table below summarizes the screening with the updated construction and collision costs and recommendations to proceed to ICS. The detailed screenings are included in Appendix A. The initial full screenings completed as part of the original studies in the corridor are included along with updated cost calculations to reflect updated Regional methodology and the updated traffic volumes. A summary table is provided in the beginning of the appendix.



Table 3: Roundabout Screening Summary

Intersection	New Geometry		Proceed to ICS?
	Roundabout	Non-Roundabout	
Trussler	2-lane	WB LT lane NB RT lane 2 SB LT lanes	Yes
George Israel	2-lane	EB RT lane WB LT lane	No
Nyles	2-lane	EB LT lane	No
Isaiah	2-lane	Traffic signals EB RT and LT lane WB RT and LT lane	Yes
Street L	2-lane	WB LT lane	No
Donnenwerth/Amand	2-lane	Traffic signals EB RT and LT lane WB RT and LT lane	Yes
Forestwalk	2-lane	WB LT lane	No
Commonwealth/Abram Clemens	2-lane	Traffic signals EB RT and LT lane WB RT and LT lane	Yes

3.7 Future Traffic Assessment

Three future options for the major intersections in the corridor were assessed as part of the traffic assessment portion of the study:

1. Major intersections signalized at Trussler Road, Isaiah Drive, Donnenwerth/Amand, and Commonwealth/Abram Clemens.
2. Major intersections with roundabouts.
3. Hybrid option with roundabouts at Trussler Road and Commonwealth/Abram Clemens and signalized intersections at Isaiah Drive and Donnenwerth/Amand.

In all three options, the minor side streets at George Israel Street, Nyles Drive, Street L, Forestwalk Street, and Helena Feasby Street would operate under stop control. The assessments are described below in more detail.

3.7.1 Signalized Intersection Option

Capacity analysis of the signalized intersection option was undertaken for the four major intersections in the weekday morning and afternoon peak hours for 2031 traffic levels in order to recommend geometry and identify any concerns with future intersection operations in the corridor. The analysis was undertaken using Synchro version 11 and in accordance with the Region's parameters. Measures of effectiveness include level of service, delay in seconds, volume to capacity ratios, and 95th percentile queues in metres. Storage in metres is also provided. The results are summarized in the tables below and the detailed printouts are provided in Appendix B.

Table 4: AM Peak Hour Future Total Traffic Analysis - Signalized Intersections

Intersection	Measure of Effectiveness	Approach/Direction/Lane									
		EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT
Trussler	LOS	-	-	-	C	-	D	D	A	E	A
	Delay (s)	-	-	-	26.2	-	47.1	42.3	9.5	73.9	9.0
	V/C	-	-	-	0.08	-	0.97	0.92	0.09	0.99	0.44
	95th Q (m)	-	-	-	12.0	-	187	187	10.1	81.8	59.5
	Storage (m)	-	-	-	30	-	-	-	30	110	-
Isaiah	LOS	A	B	A	B	B	A	B	A	-	B
	Delay (s)	7.3	11.6	2.8	10.1	11.3	2.8	16.6	4.7	-	17.1
	V/C	0.06	0.60	0.05	0.26	0.59	0.08	0.29	0.36	-	0.49
	95th Q (m)	3.8	70.2	3.4	12.1	67.6	4.5	20.0	12.5	-	29.2
	Storage (m)	30	-	30	30	-	30	-	30	-	-
Donnenwerth /Amand	LOS	A	B	A	D	A	A	D	A	-	C
	Delay (s)	5.2	17.1	2.8	36.9	7.3	1.5	37.4	9.5	-	21.2
	V/C	0.01	0.82	0.06	0.66	0.42	0.03	0.60	0.36	-	0.42
	95th Q (m)	1.4	216	4.8	37.6	56.7	2.1	36.9	15.7	-	18.9
	Storage (m)	30	-	30	30	-	30	-	30	-	-
Commonwealth /Abram Clemens	LOS	A	C	A	F	A	A	D	B	-	B
	Delay (s)	4.8	28.6	2.1	106	6.4	1.8	35.6	12.9	-	19.8
	V/C	0.04	0.95	0.05	0.96	0.41	0.04	0.52	0.35	-	0.38
	95th Q (m)	3.1	281	3.5	28.6	53.9	3.0	30.1	16.9	-	16.5
	Storage (m)	30	-	30	30	-	30	-	30	-	-

Table 5: PM Peak Hour Future Total Traffic Analysis - Signalized Intersections

Intersection	Measure of Effectiveness	Approach/Direction/Lane									
		EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT
Trussler	LOS	-	-	-	C	-	C	D	B	E	B
	Delay (s)	-	-	-	28.1	-	30.8	53.9	11.6	67.7	10.2
	V/C	-	-	-	0.11	-	0.88	0.96	0.12	1.0	0.59
	95th Q (m)	-	-	-	13.7	-	169	187	12.2	108	91.1
	Storage (m)	-	-	-	30	-	-	-	30	110	-
Isaiah	LOS	A	A	A	B	A	A	C	A	-	B
	Delay (s)	5.8	7.0	1.8	11.1	7.2	1.9	23.0	6.9	-	16.0
	V/C	0.16	0.47	0.10	0.50	0.49	0.10	0.29	0.29	-	0.35
	95th Q (m)	8.0	59.0	4.8	32.3	61.5	5.2	20.7	11.8	-	18.1
	Storage (m)	30	-	30	30	-	30	-	30	-	-
Donnenwerth /Amand	LOS	A	A	A	B	B	A	C	A	-	B
	Delay (s)	9.3	8.5	1.8	14.5	16.7	2.7	31.4	7.4	-	15.4
	V/C	0.20	0.56	0.13	0.56	0.83	0.14	0.49	0.29	-	0.27
	95th Q (m)	5.9	84.4	6.3	40.4	215	8.9	29.3	11.2	-	12.3
	Storage (m)	30	-	30	30	-	30	-	30	-	-
Commonwealth /Abram Clemens	LOS	C	A	A	A	C	A	C	A	-	B
	Delay (s)	22.3	7.3	1.7	9.9	22.7	2.8	33.4	8.0	-	19.1
	V/C	0.39	0.53	0.09	0.44	0.90	0.08	0.46	0.29	-	0.35
	95th Q (m)	16.8	85.7	5.2	29.6	287	6.5	26.4	11.1	-	15.1
	Storage (m)	30	-	30	30	-	30	-	30	-	-

The analysis indicates that the intersections would operate at acceptable levels in the future horizon under traffic signal control with the identified geometry.

3.7.2 Roundabout Option

Capacity analysis of the roundabout intersection option was undertaken for the four major intersections in the weekday morning and afternoon peak hours for 2031 traffic levels in order to recommend geometry and identify any concerns with future intersection operations in the corridor. The analysis was undertaken using Arcady and in accordance with the Region's parameters. Measures of effectiveness in the summary tables below include delay in seconds and level of service. The detailed printouts are provided in Appendix C with additional measures of effectiveness.

Initial analysis considered single lane roundabouts with options of a y-intercept of 95% or 90%. The results are summarized in the tables below.

Table 6: Future Total Traffic – Single Lane Roundabout Analysis

Intersection	Measure of Effectiveness	Scenario			
		y-intercept = 95%		y-intercept = 90%	
		AM Pk Hr	PM Pk Hr	AM Pk Hr	PM Pk Hr
Trussler	Overall Avg Delay (s)	69	312	111	377
	Overall LOS	F	F	F	F
Isaiah	Overall Avg Delay (s)	6	11	7	15
	Overall LOS	A	B	A	B
Donnenwerth /Amand	Overall Avg Delay (s)	29	167	51	216
	Overall LOS	D	F	F	F
Commonwealth /Abram Clemens	Overall Avg Delay (s)	131	268	178	323
	Overall LOS	F	F	F	F

The analysis indicates that the Isaiah Drive roundabout would function below level of service F under future total traffic conditions, but that the other major intersections would not, with some significant delays identified at the Trussler Road and Commonwealth/Abram Clemens intersections.

A further option with roundabouts providing for dual lane entry and exit on Bleams Road and Trussler Road were assessed. Once again, y-intercepts of 95% and 90% were considered in the analysis and a summary is provided in the table below. Detailed printouts are included in Appendix C.

Table 7: Future Total Traffic – Dual Lane Roundabout Analysis

Intersection	Measure of Effectiveness	Scenario			
		y-intercept = 95%		y-intercept = 90%	
		AM Pk Hr	PM Pk Hr	AM Pk Hr	PM Pk Hr
Trussler	Overall Avg Delay (s)	3	4	4	5
	Overall LOS	A	A	A	A
Isaiah	Overall Avg Delay (s)	4	3	4	4
	Overall LOS	A	A	A	A
Donnenwerth /Amand	Overall Avg Delay (s)	4	4	4	5
	Overall LOS	A	A	A	A
Commonwealth /Abram Clemens	Overall Avg Delay (s)	4	4	5	6
	Overall LOS	A	A	A	A

The dual lane roundabout option provides for overall level of service A at all four intersections with the level of service on the individual approaches at C or better in all options.

3.7.3 Hybrid Option

The hybrid option includes roundabouts at the Trussler Road and Commonwealth/Abram Clemens intersection and traffic signals at the Isaiah Drive and Donnenwerth/Amand intersections. The traffic operations would be similar for each intersection as the operations in the two options described above for the type of intersection control.

3.7.4 Minor Intersection Operations

Five minor street intersections are included in the Bleams Road corridor that will operate with side street stop control:

- George Israel Street
- Nyles Drive
- Street L
- Forestwalk Street
- Helena Feasby Street

All five intersection were assessed under future total traffic conditions in the weekday morning and afternoon peak hours. The analysis is summarized in the tables below and the detailed Synchro worksheets are included in Appendix B. The intersections at both Forestwalk Street and Helena Feasby Street are planned to include medians along Bleams Road restricting left turns, so only right turns to and from the side streets will be permitted.



Table 8: AM Peak Hour Future Total Traffic Analysis - Minor Street Intersections

Intersection	Measure of Effectiveness	Approach/Direction/Lane						
		EBL	EBR	WBL	WBR	NBL	NBR	SB
George Israel	LOS	-	-	A	-	E	B	-
	Delay (s)	-	-	8.8	-	46.1	12.8	-
	V/C	-	-	0.02	-	0.53	0.11	-
	95th Q (m)	-	-	0.4	-	20.2	2.7	-
	Storage (m)	-	30	40	-	50	-	-
Nyles	LOS	A	-	-	-	-	-	D
	Delay (s)	9.3	-	-	-	-	-	26.7
	V/C	0.01	-	-	-	-	-	0.14
	95th Q (m)	0.3	-	-	-	-	-	3.6
	Storage (m)	25	-	-	-	-	-	-
Street L	LOS	-	-	B	-	F	E	-
	Delay (s)	-	-	10.5	-	136.9	37.6	-
	V/C	-	-	0.12	-	0.84	0.70	-
	95th Q (m)	-	-	3.0	-	34.0	38.6	-
	Storage (m)	-	-	65	-	50	-	-
Forestwalk	LOS	-	-	-	-	-	F	-
	Delay (s)	-	-	-	-	-	69.3	-
	V/C	-	-	-	-	-	0.62	-
	95th Q (m)	-	-	-	-	-	24.2	-
	Storage (m)	-	-	-	-	-	-	-
Helena Feasby	LOS	-	-	-	-	-	-	B
	Delay (s)	-	-	-	-	-	-	10.6
	V/C	-	-	-	-	-	-	0.01
	95th Q (m)	-	-	-	-	-	-	0.3
	Storage (m)	-	-	-	-	-	-	-

Table 9: PM Peak Hour Future Total Traffic Analysis - Minor Street Intersections

Intersection	Measure of Effectiveness	Approach/Direction/Lane						
		EBL	EBR	WBL	WBR	NBL	NBR	SB
George Israel	LOS	-	-	B	-	F	B	-
	Delay (s)	-	-	10.0	-	70.5	14.8	-
	V/C	-	-	0.08	-	0.54	0.09	-
	95th Q (m)	-	-	1.9	-	19.0	2.2	-
	Storage (m)	-	30	40	-	50	-	-
Nyles	LOS	A	-	-	-	-	-	D
	Delay (s)	9.7	-	-	-	-	-	33.3
	V/C	0.03	-	-	-	-	-	0.15
	95th Q (m)	0.6	-	-	-	-	-	3.8
	Storage (m)	25	-	-	-	-	-	-
Street L	LOS	-	-	B	-	F	C	-
	Delay (s)	-	-	11.3	-	238.9	19.1	-
	V/C	-	-	0.31	-	0.70	0.37	-
	95th Q (m)	-	-	9.8	-	18.5	12.8	-
	Storage (m)	-	-	65	-	50	-	-
Forestwalk	LOS	-	-	-	-	-	C	-
	Delay (s)	-	-	-	-	-	17.3	-
	V/C	-	-	-	-	-	0.19	-
	95th Q (m)	-	-	-	-	-	5.3	-
	Storage (m)	-	-	-	-	-	-	-
Helena Feasby	LOS	-	-	-	-	-	-	C
	Delay (s)	-	-	-	-	-	-	16.5
	V/C	-	-	-	-	-	-	0.07
	95th Q (m)	-	-	-	-	-	-	1.6
	Storage (m)	-	-	-	-	-	-	-

The analysis indicates that the intersections are expected to operate at acceptable levels under the future configurations. Although some movements have delays indicating level of service F, the volume to capacity ratios are below 1.0 and there are other options for traffic to exit the residential areas using the major intersections where higher levels of control (either traffic signal or a roundabout) will be available to provide more capacity.

4 Conclusions and Recommendations

The following considerations should be included in the preferred alternative for the corridor.

- Multi-use paths on both sides of Bleams Road to accommodate both pedestrians and cyclists in accordance with the Region's Transportation Master Plan.
- The design of the road should accommodate GRT buses so that they may use the intersections for routing as needed.
- The major intersections in the corridor – Trussler Road, Isaiah Drive, Donnenwerth/Amand, and Commonwealth/Abram Clemens – can proceed as either signalized intersections or as roundabouts.
- The minor intersections in the corridor – George Israel Street, Nyles Drive, Street L, Forestwalk Street, and Helena Feasby Street – should proceed as side street stop-controlled intersections.
- The intersections at Forestwalk Street and Helena Feasby Street have been assessed as right turns only. Left turn capacity at these two intersections is limited and adjacent major intersections are provided that allow for alternate access to Bleams Road.
- The George Israel Street intersection warrants the inclusion of an eastbound right turn lane and a westbound left turn lane.
- The Nyles Drive intersection warrants the inclusion of an eastbound left turn lane.
- The Street L intersection warrants the inclusion of a westbound left turn lane.

Appendix A: Roundabout Screenings

Bleams Road EA: Fischer-Hallman To Trussler

Intersection Geometry Requirements and Roundabout Screening Information

Intersection	Roundabout Option				Non-roundabout Option				
	Geometric Requirements	Construction Cost	Collision Cost	Total Cost	Geometric Requirements	Construction Cost	Collision Cost	Total Cost	Proceed to ICS?
Trussler	2 lane roundabout	$1,200,000	$1,205,164	$2,405,164	Signal WBLTL – 30 m NBRTL – 30 m 2 SBLTL – 95 m	$1,000,000	$1,503,070	$2,503,070	Yes
George Israel	2 lane roundabout	$1,200,000	$332,444	$1,532.444	EBRTL – 30 m WBLTL – 40 m NBRTL – 30 m (not incl in cost)	$400,000	$167,420	$567,420	No
Nyles	2 lane roundabout	$1,200,000	$98,342	$1,298,342	EBLTL – 25 m	$250,000	$175,564	$425,564	No
Isaiah	2 lane roundabout	$1,200,000	$1,634,986	$2,834,986	Signal EBRTL – 30 m EBLTL – 30 m WBRTL – 30 m WBLTL – 30 m NBRTL – 30 m (not incl)	$900,000	$1,548,393	$2,448,393	Yes
Street L	2 lane roundabout	$1,200,000	$521,232	$1,721,232	WBLTL – 65 m NBRTL – 30 m (not incl)	$250,000	$231,422	$481,422	No
Donnenwerth/ Amand	2 lane roundabout	$1,200,000	$1,481,493	$2,681,493	Signal EBRTL – 30 m EBLTL – 30 m WBRTL – 30 m WBLTL – 30 m NBRTL – 30 m (not incl)	$900,000	$2,228,290	$3,128,290	Yes

Forest Walk	2 lane roundabout	$1,200,000	$362,244	$1,562,244	WBLTL – 25 m	$250,000	$420,768	$670,768	No
Commonwealth/ Abram Clemens	2 lane roundabout	$1,200,000	$1,164,279	$2,364,279	Signal EBRTL – 30 m EBLTL – 30 m WBRTL – 30 m WBLTL (cont) NBRTL – 30 m (not incl)	$900,000	$2,128,387	$3,028,387	Yes
Helena Feasby	2 lanes E & W	-	-	-	2 lanes E & W	-	-	-	-
Gas/Tims	2 lanes E & W	-	-	-	2 lanes E & W	-	-	-	-

- LTL warrants for EB and WB LTL on Bleams at unsignalized intersections
- Synchro 95th percentile queues for signalized intersection auxiliary lanes
- 100 vph threshold for needing RTL
- Minimum lengths
    - 15 metres for LTL unsignalized
    - 30 metres for LTL signalized
    - 30 metres for RTL
- Constructions Costs
    - $250,000 for LTL
    - $150,000 for RTL
    - $100,000 for signals
    - $750,000 for single lane roundabout
    - $1,200,000 for two lane roundabout
- Collisions costs from the Region's Intersection Control Studies Safety Assessment Methodology (HSM)
- AADT = 10x PM peak hour volume (attached below)


Blasms
Blasms
Blasms
Nyvej
Isalih
Isalih


Beams
Beams
Beams
Beams
Commonwealth
Helena Factory
Abram Clemens

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Trussler Road and Bleams Road - 2031 AADT

Major Road: Trussler Road

Minor Road: Bleams Road

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	1 Approach
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	YES
Number of approaches with FPLTP:	2

Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	YES
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 36

5-Year PDO Collisions: 30

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 29,740

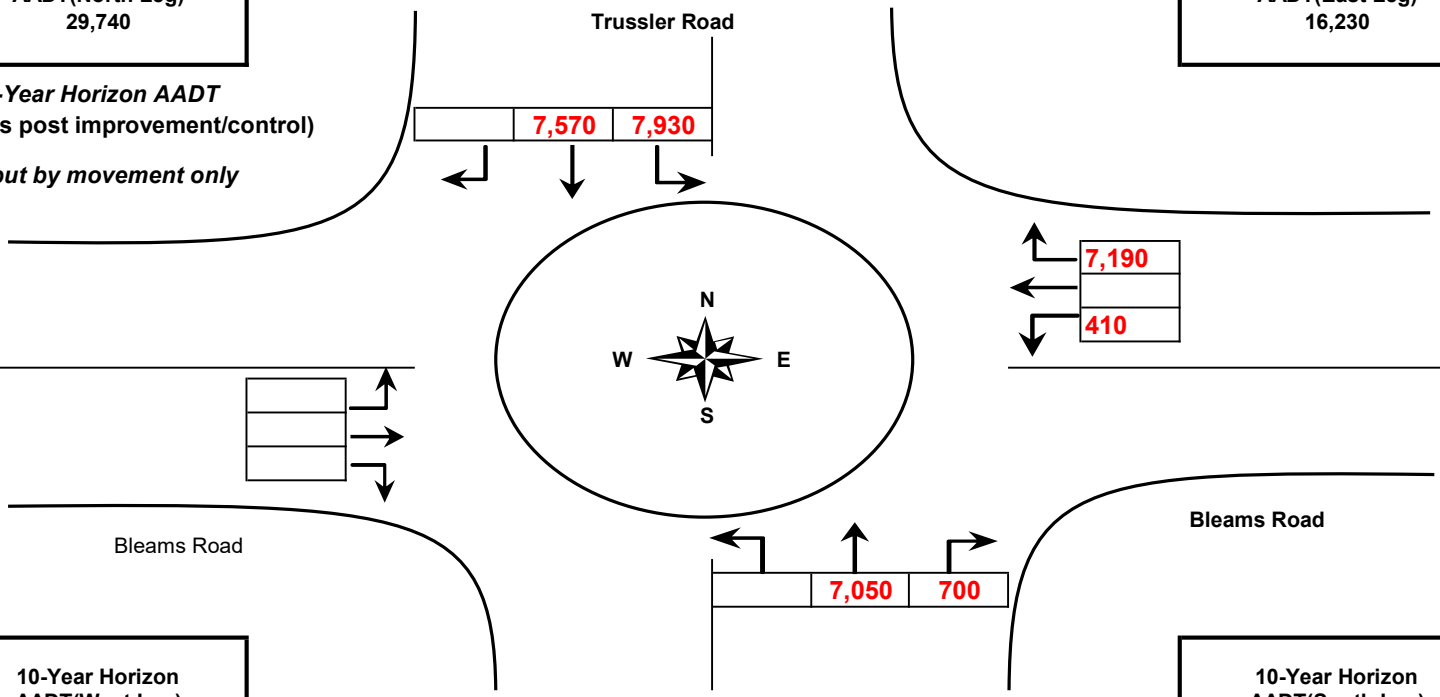
Minor Road (mid-block) 10-Year Horizon AADT: 16,230

10-Year Horizon AADT(North Leg) 29,740

10-Year Horizon AADT(East Leg) 16,230

***10-Year Horizon AADT** (10ys post improvement/control)*

Input by movement only



10-Year Horizon AADT(West Leg) 0

10-Year Horizon AADT(South Leg) 15,730

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO_{SIG} = $5,000

PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	**$1,503,070.09**	**$301,085.43**	**$1,144,984.89**	**$56,999.77**
Roundabout	**$1,205,164.05**	**$483,258.85**	**$721,905.20**	**$0.00**

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Trussler Road and Bleams Road - 2031 AADT**

Major Road: **Trussler Road**
Minor Road: **Bleams Road**

Major Road Direction: North / South

Urban or Rural: Urban

Proposed Control: Signalized

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: **23610**

5-Year Total Collisions: **36**

5-Year PDO Collisions: **30**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**6.90**	**5.25**	**1.65**	**0.00**
Roundabout	**10.40**	**9.36**	**1.04**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-12.13**	**1.11**	**0.26**	**0.33**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-13.24**	**1.14**	**0.3**	**0.36**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.86	**0.92**	**1.59**	Total	PDO
				1.106241145	**1.270879506**
	Illumination	Protected LT Phasing			
	0.91	**0.88**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and George Israel Street - 2031 AADT

Major Road: Bleams Road

Minor Road: George Israel Street

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	Major	1 Approach
Minor	1 Approach	Minor	1 Approach

Is there going to be any fully protected left-turn phasing?	SELECT
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	SELECT
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 16,240

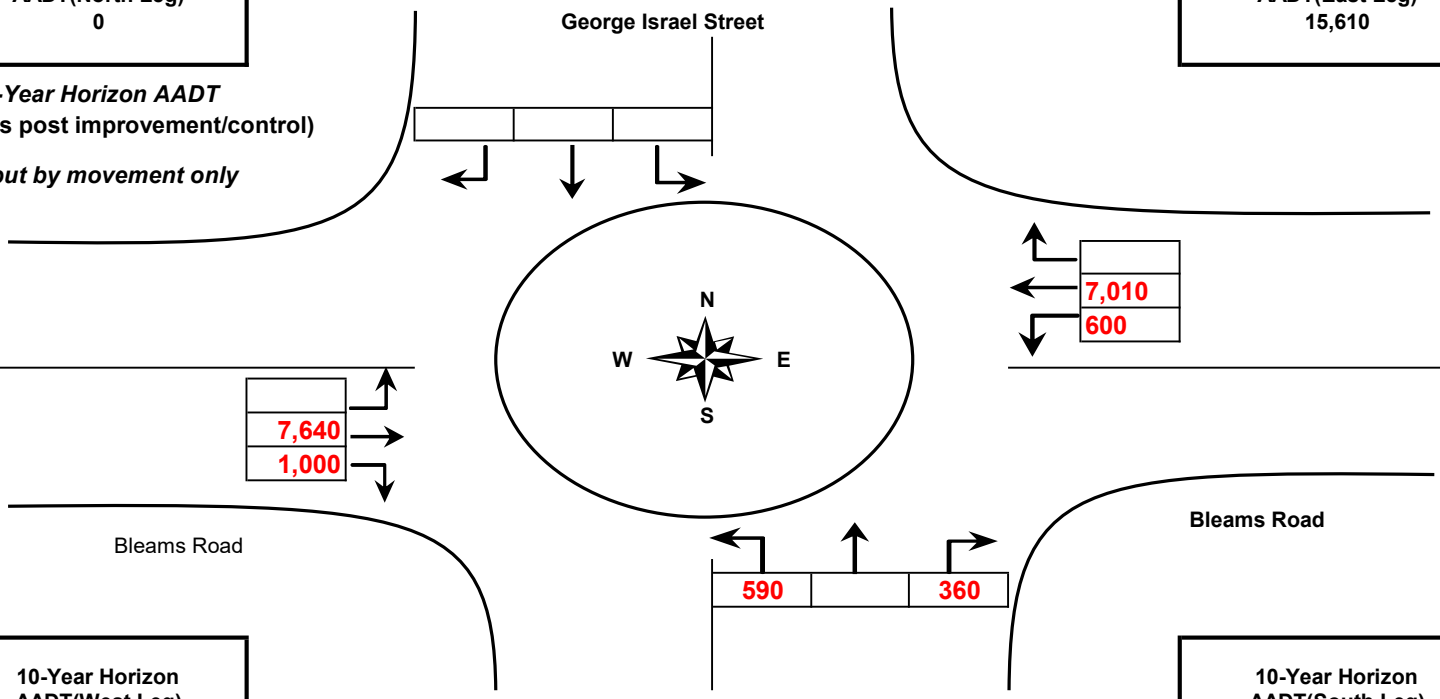
Minor Road (mid-block) 10-Year Horizon AADT: 2,550

10-Year Horizon AADT(North Leg) 0

10-Year Horizon AADT(East Leg) 15,610

**** 10-Year Horizon AADT***
(10ys post improvement/control)

**** Input by movement only***



10-Year Horizon AADT(West Leg) 16,240

10-Year Horizon AADT(South Leg) 2,550

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDOSIG = $5,000
PDORA = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	$167,420.71	$23,513.34	$124,907.44	$18,999.92
Roundabout	$332,444.22	$133,306.84	$199,137.38	$0.00

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and George Israel Street - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **George Israel Street**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**4860**
Urban or Rural:	Urban		
Proposed Control:	Stop Control	**5-Year Total Collisions:**	**0**
Proposed Config.	3-Leg Intersection	**5-Year PDO Collisions:**	**0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.59**	**0.41**	**0.18**	**0.00**
Roundabout	**2.87**	**2.58**	**0.29**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.67	**0.86**	**0.61**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Nyles Drive - 2031 AADT

Major Road: Bleams Road

Minor Road: Nyles Drive

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing?	SELECT
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	YES
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 2

5-Year PDO Collisions: 1

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 15,600

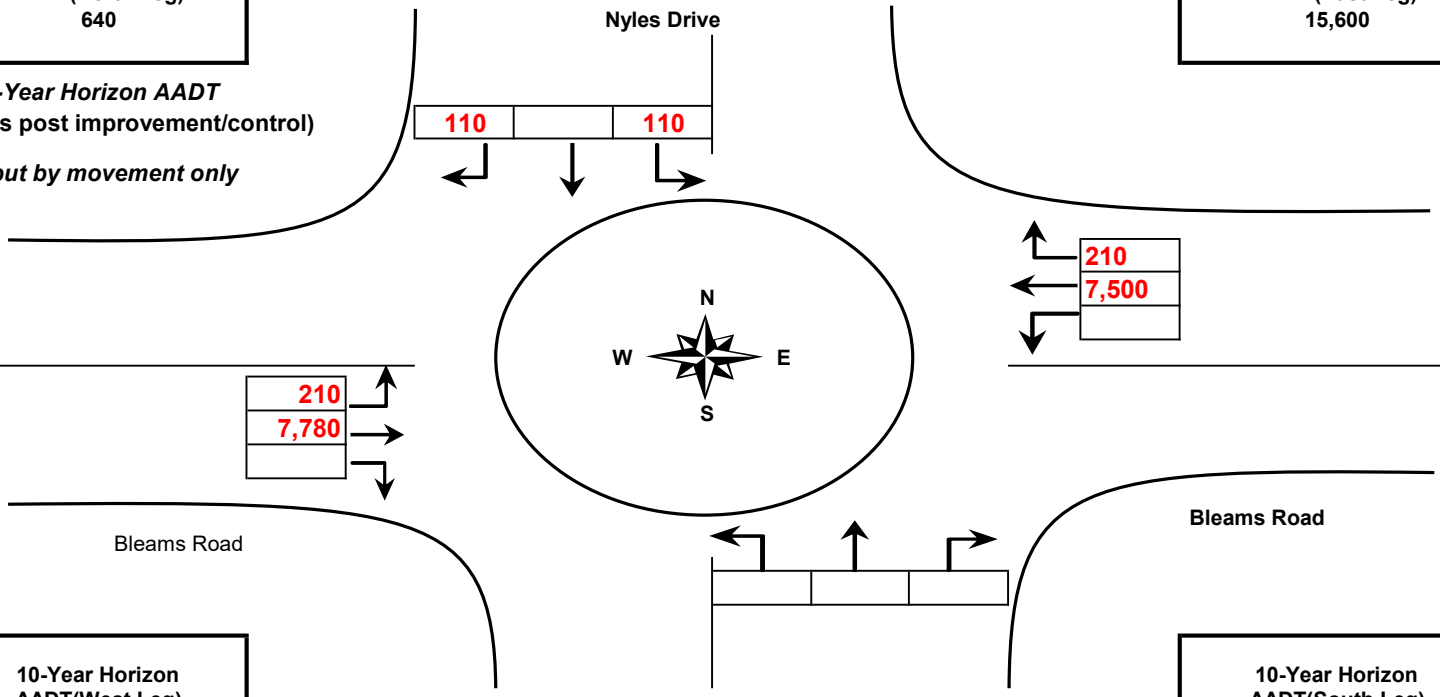
Minor Road (mid-block) 10-Year Horizon AADT: 640

10-Year Horizon AADT(North Leg) 640

10-Year Horizon AADT(East Leg) 15,600

***10-Year Horizon AADT** (10ys post improvement/control)*

Input by movement only



10-Year Horizon AADT(West Leg) 15,600

10-Year Horizon AADT(South Leg) 0

Direct Capital Costs

Fatal =	$1,656,500
Injury =	$60,500
PDO_{SIG} =	$5,000
PDO_{RA} =	$4,500
Discount Rate =	0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	$175,564.35	$17,778.38	$138,786.05	$18,999.92
Roundabout	$98,342.82	$39,434.50	$58,908.32	$0.00

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Nyles Drive - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Nyles Drive**

Major Road Direction: East / West

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: **1090**

5-Year Total Collisions: **2**

5-Year PDO Collisions: **1**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.51**	**0.31**	**0.20**	**0.00**
Roundabout	**0.85**	**0.76**	**0.08**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**0.8**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**0.77**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
			0.61	Total	PDO
				0.914608482	**0.916159758**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Isaiah Drive - 2031 AADT

Major Road: Bleams Road

Minor Road: Isaiah Drive

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	**Major**	2 Approaches
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions:	1
5-Year PDO Collisions:	0

Proposed RA Configuration? MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 17,930

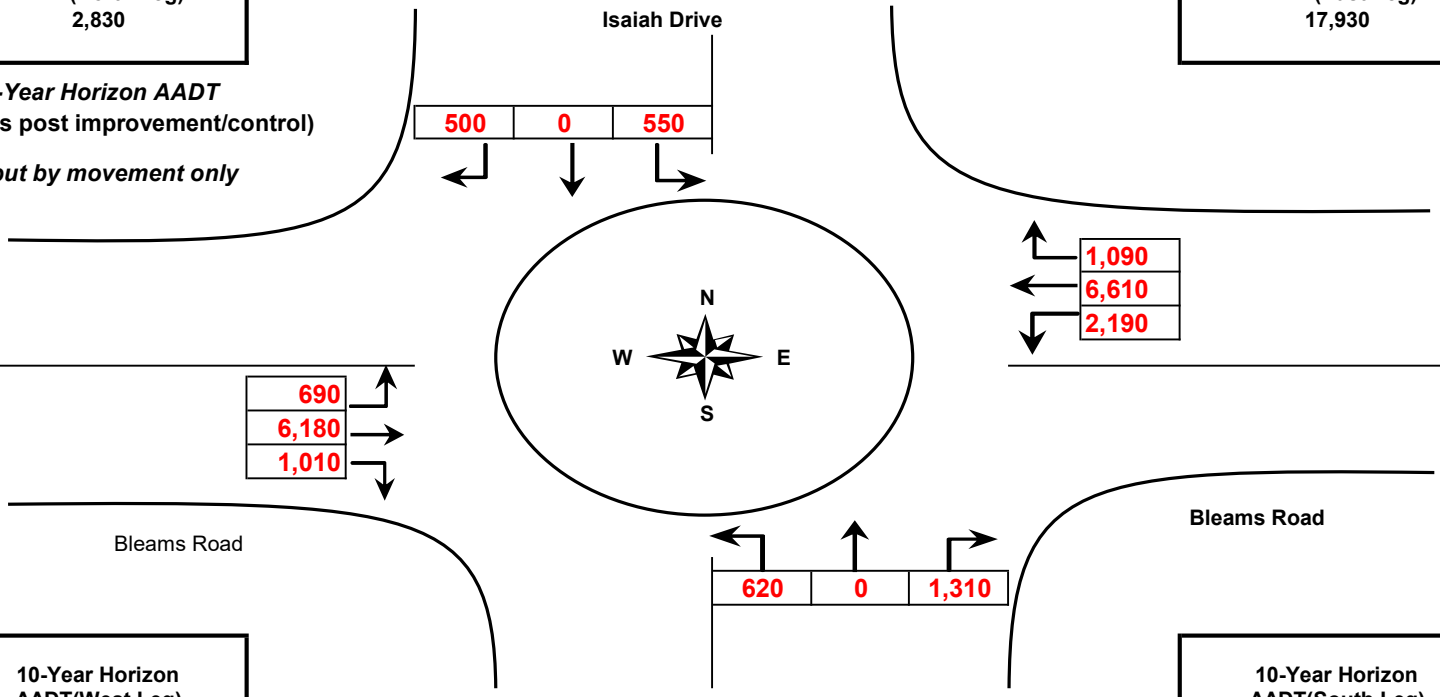
Minor Road (mid-block) 10-Year Horizon AADT: 5,130

10-Year Horizon AADT(North Leg) 2,830

10-Year Horizon AADT(East Leg) 17,930

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 15,610

10-Year Horizon AADT(South Leg) 5,130

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO_{SIG} = $5,000
PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$1,548,393.48	$195,562.16	$1,276,831.63	$75,999.70
Roundabout	$1,634,986.16	$655,613.26	$979,372.90	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Isaiah Drive - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Isaiah Drive**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**18340**
Urban or Rural:	Urban		
Proposed Control:	Signalized	**5-Year Total Collisions:**	**1**
Proposed Config.	4-Leg Intersection	**5-Year PDO Collisions:**	**0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**5.26**	**3.41**	**1.84**	**0.00**
Roundabout	**14.11**	**12.70**	**1.41**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.88**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Street L - 2031 AADT

Major Road: Bleams Road

Minor Road: Street L

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	SELECT
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	SELECT
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 20,620

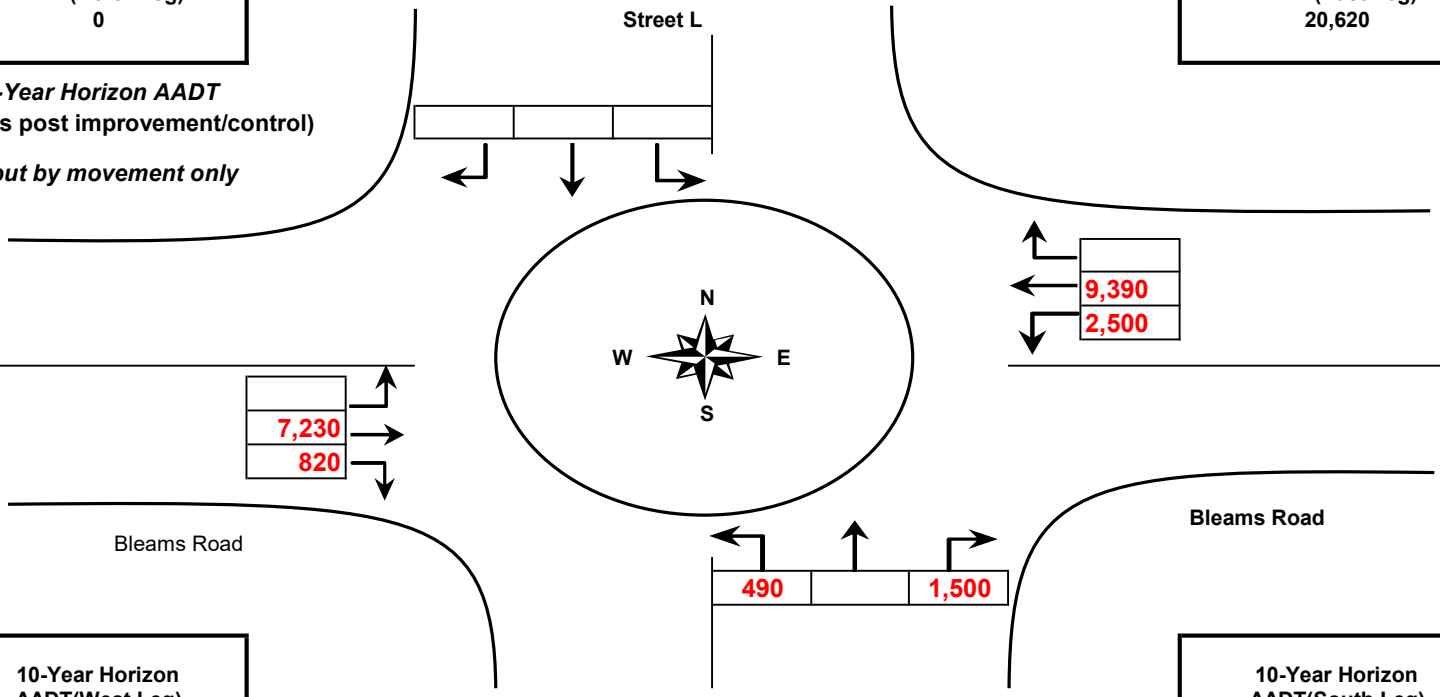
Minor Road (mid-block) 10-Year Horizon AADT: 5,310

10-Year Horizon AADT(North Leg) 0

10-Year Horizon AADT(East Leg) 20,620

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 17,930

10-Year Horizon AADT(South Leg) 5,310

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO_{SIG} = $5,000

PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	$231,422.87	$45,879.68	$166,543.26	$18,999.92
Roundabout	$521,232.37	$209,009.02	$312,223.35	$0.00

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Street L - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Street L**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**8440**
Urban or Rural:	Urban		
Proposed Control:	Stop Control	**5-Year Total Collisions:**	**0**
Proposed Config.	3-Leg Intersection	**5-Year PDO Collisions:**	**0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**1.04**	**0.80**	**0.24**	**0.00**
Roundabout	**4.50**	**4.05**	**0.45**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.67	**0.86**	**0.61**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Donnenwerth/Amand - 2031 AADT

Major Road: Bleams Road

Minor Road: Donnenwerth/Amand

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	**Major**	No RT Lanes
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 9

5-Year PDO Collisions: 4

Proposed RA Configuration? MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 22,820

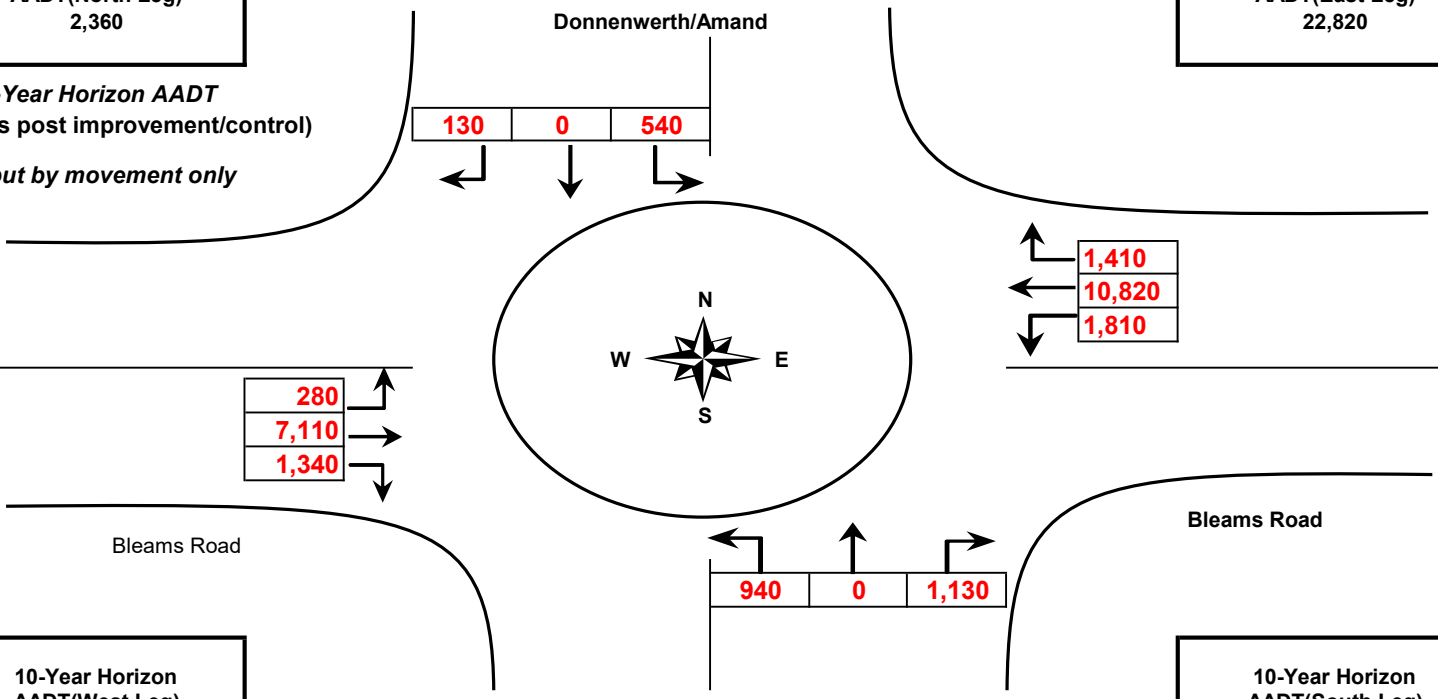
Minor Road (mid-block) 10-Year Horizon AADT: 5,220

10-Year Horizon AADT(North Leg) 2,360

10-Year Horizon AADT(East Leg) 22,820

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 20,620

10-Year Horizon AADT(South Leg) 5,220

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO_{SIG} = $5,000

PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$2,228,290.27	$273,557.62	$1,859,733.03	$94,999.62
Roundabout	$1,481,493.08	$594,064.06	$887,429.02	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Donnenwerth/Amand - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Donnenwerth/Amand**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**16250**
Urban or Rural:	Urban		
Proposed Control:	Signalized	**5-Year Total Collisions:**	**9**
Proposed Config.	4-Leg Intersection	**5-Year PDO Collisions:**	**4**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**7.45**	**4.77**	**2.68**	**0.01**
Roundabout	**12.79**	**11.51**	**1.28**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.96**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Forest Walk - 2031 AADT

Major Road: Bleams Road

Minor Road: Forest Walk

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing?	SELECT
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	SELECT
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 23,020

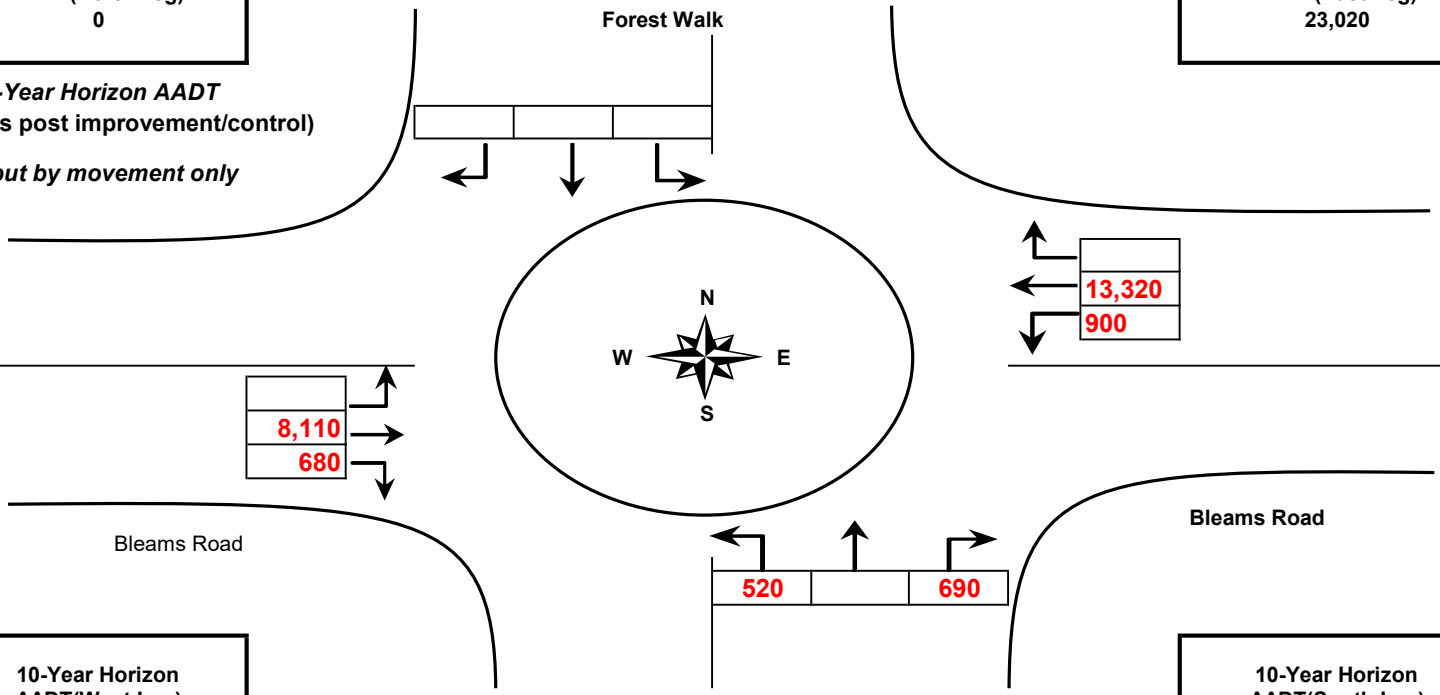
Minor Road (mid-block) 10-Year Horizon AADT: 2,790

10-Year Horizon AADT(North Leg)
0

10-Year Horizon AADT(East Leg)
23,020

10-Year Horizon AADT
(10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg)
22,630

10-Year Horizon AADT(South Leg)
2,790

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDOSIG = $5,000
PDORA = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	**$420,768.32**	**$65,378.55**	**$298,390.00**	**$56,999.77**
Roundabout	**$362,244.66**	**$145,256.52**	**$216,988.14**	**$0.00**

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Forest Walk - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Forest Walk**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**5400**
Urban or Rural:	Urban		
Proposed Control:	Stop Control	**5-Year Total Collisions:**	**0**
Proposed Config.	3-Leg Intersection	**5-Year PDO Collisions:**	**0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**1.57**	**1.14**	**0.43**	**0.00**
Roundabout	**3.13**	**2.81**	**0.31**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
			0.61	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Commonwealth/Abram Clemens - 2031 AADT

Major Road: Bleams Road

Minor Road: Commonwealth/Abram Clemens

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	Major	2 Approaches
Minor	1 Approach	Minor	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 3

5-Year PDO Collisions: 3

Proposed RA Configuration? MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 24,600

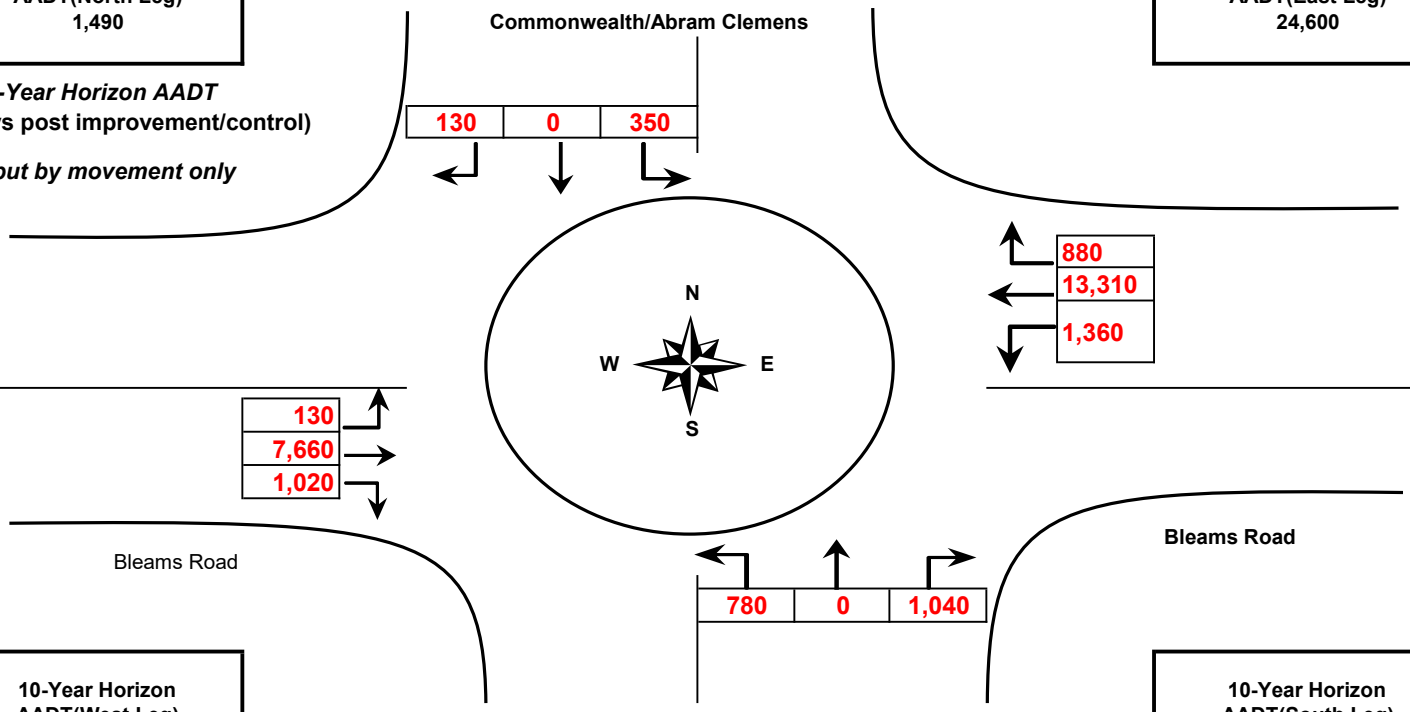
Minor Road (mid-block) 10-Year Horizon AADT: 4,200

10-Year Horizon AADT(North Leg) 1,490

10-Year Horizon AADT(East Leg) 24,600

***10-Year Horizon AADT** (10ys post improvement/control)*

Input by movement only



10-Year Horizon AADT(West Leg) 23,030

10-Year Horizon AADT(South Leg) 4,200

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO_{SIG} = $5,000

PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$2,128,387.26	$256,926.24	$1,776,461.40	$94,999.62
Roundabout	$1,164,279.51	$466,864.56	$697,414.96	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Commonwealth/Abram Clemens - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Commonwealth/Abram Clemens**

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

Roundabout Conflicts:	**12090**
5-Year Total Collisions:	**3**
5-Year PDO Collisions:	**3**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**7.04**	**4.48**	**2.56**	**0.01**
Roundabout	**10.05**	**9.05**	**1.01**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.88**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

December 20, 2019

REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 2.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/Region File No. (completed Screening Tools are to be stored in Docs Public Folder/Roundabout Coordination Committee/Intersection Locations) .:

   Mattamy Bleams Draft Plan of Subdivision TIS

2) Intersection Location
   (Street/Road Names, municipality, distance from major intersection, etc.):

   Bleams Road and George Israel Street, City of Kitchener

3) Brief Description of Existing Intersection
   (Number of Legs, Lanes on each leg, total existing AADT, existing AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

   Planned intersection does not exist.

4) What operational problems are being experienced at this location?

   n/a

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

   New intersection.

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

   Unsignalized intersection at Nyles Drive 485 metres to the east. Unsignalized intersection at Trussler Road 365 metres to the west. No problems with queueing.

7) Would the intersection be located within a coordinated signal system?

   No

8) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

Yes, but project does not include widening.

9) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed? What is the current and past ranking of this intersection as identified in the Region's Annual Collision Report?

n/a

10) What traditional road improvements are warranted for this intersection and what year is it warranted? (eg. traffic signals, all-way stop, auxiliary lanes, etc. based on Region of Waterloo warrants).

Eastbound right turn lane and westbound left turn lane in 2031.

11) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) A Traffic flow worksheets is attached. Traffic flow worksheet provided for 2031 (full build-out of subdivision).

Single lane.

12) 20-Year Life Cycle Cost Estimate
Base Year AADT: 6,690 (existing)
10-Year (post construction) AADT: 12,440 (2031)

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$400,000 (1 RTL, 1 LTL)	$750,000 (single lane roundabout)
Injury Collision Cost (Present Value)	$124,695.25	$307,601.84
Total Life Cycle Cost	**$524,695.25**	**$1,057,601.84**

Notes:

- Completed ROW *HSM 20-year Present Value Collision Costs (rev August 2017) attached.* ***2031 AADT used for analysis.***
- Implementation Cost = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Generally the roundabout is preferred if it is 1.5 times the cost or less than other Traffic Control

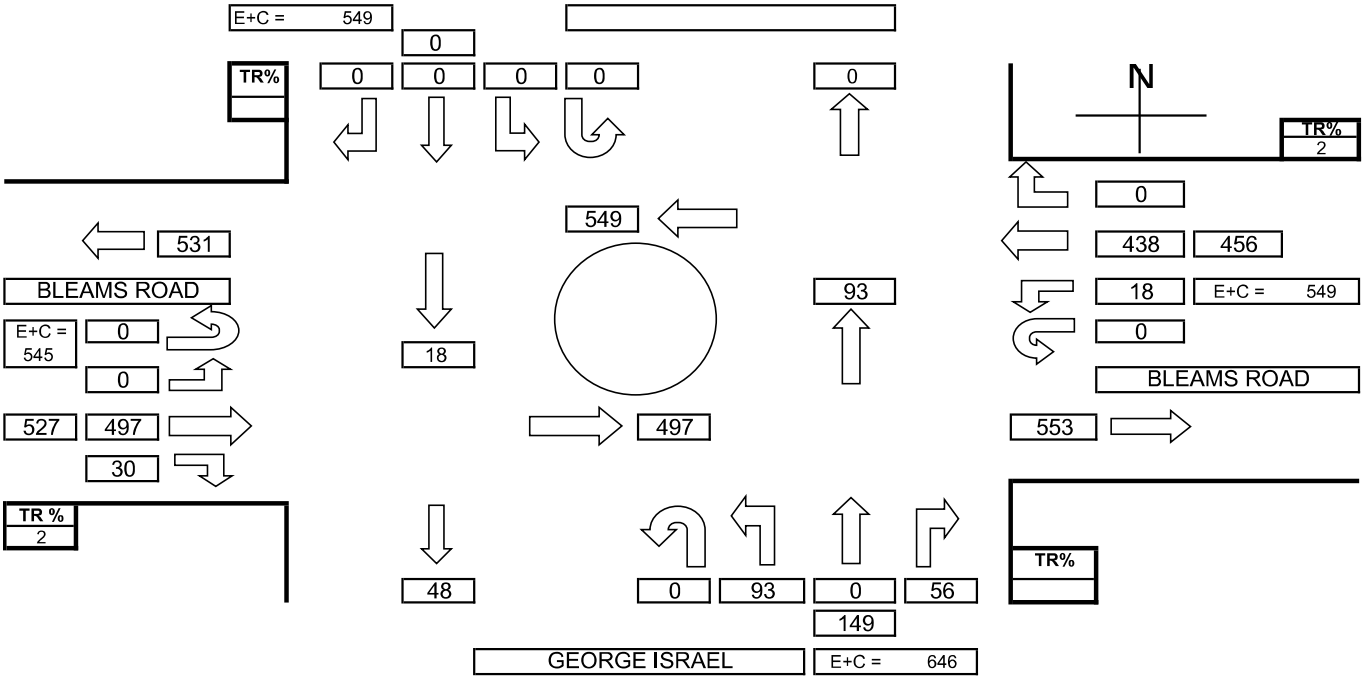
Conclusions and Recommendation

Given that the total cost of the roundabout is more than 1.5 times the cost of a stop controlled intersection in this location, the intersection should not proceed to an Intersection Control Study.

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Mattamy Bleams DP **Drawn By:** J. Salvini
Project No.: **Sheet** 1 **of** 1
Intersection: Bleams Road/George Israel
Time Period: 2031 AM

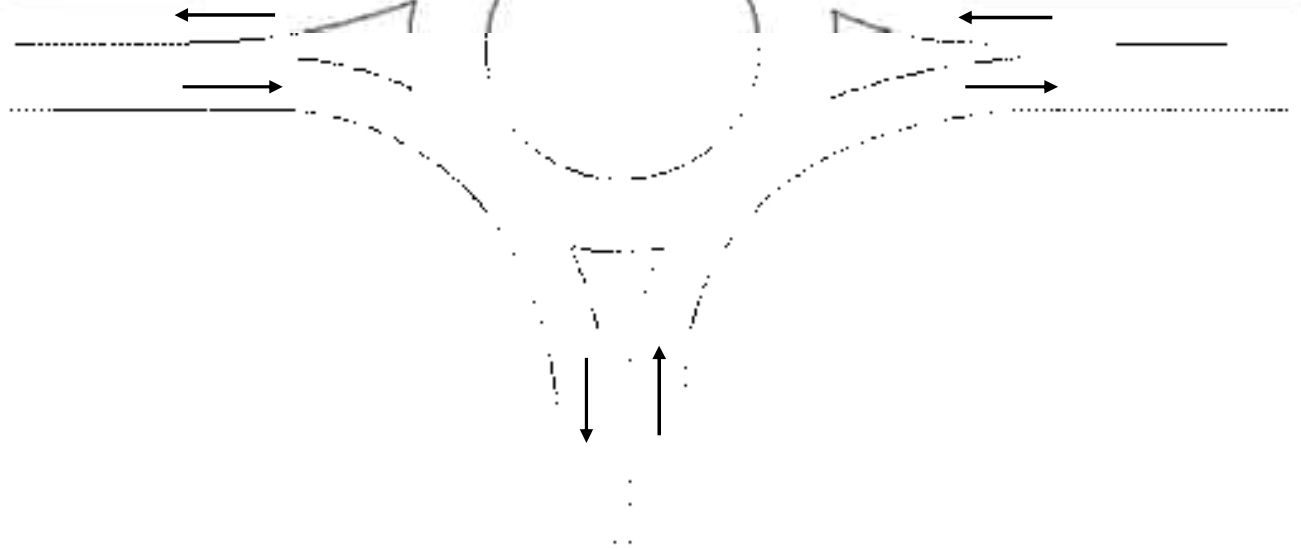


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

ROUEL Inputs

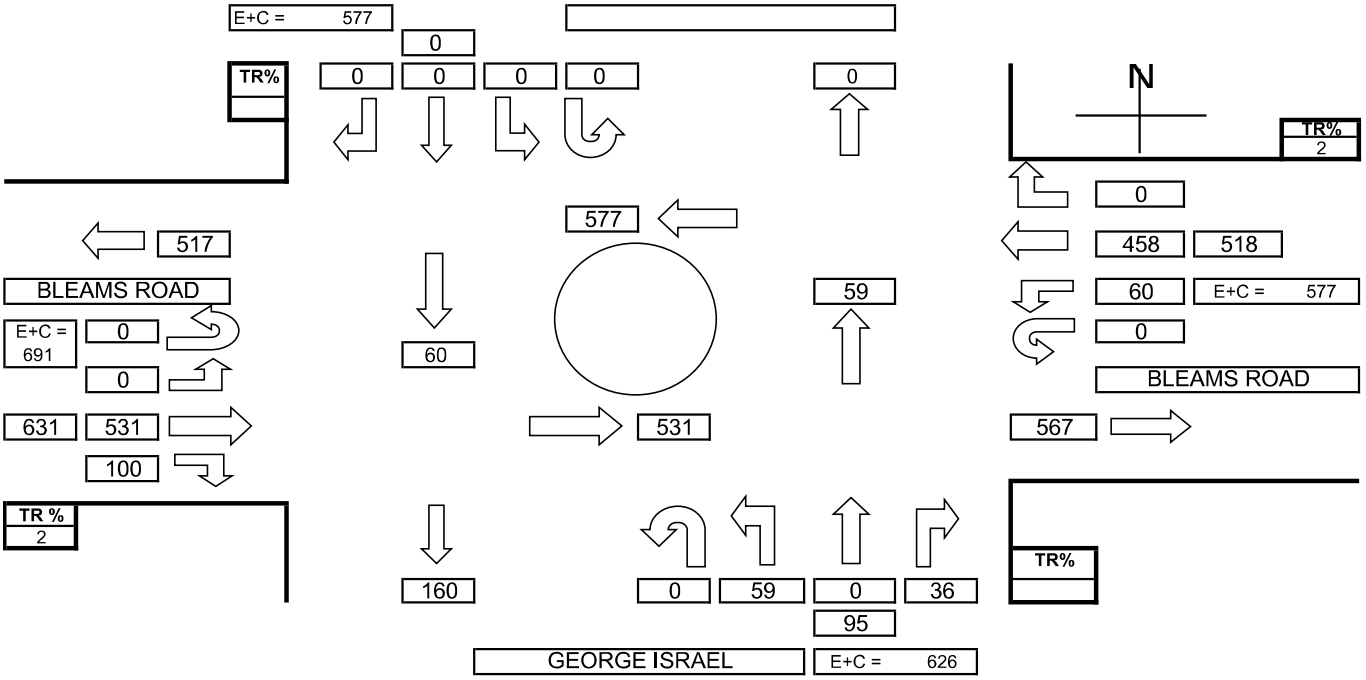
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
0	1	0	0	0	0
BLEAMS ROAD	1.02	30	497	0	0
GEORGE ISRAEL	1	56	0	93	0
BLEAMS ROAD	1.02	0	438	18	0



REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Mattamy Bleams DP **Drawn By:** J. Salvini
Project No.: **Sheet** 1 **of** 1
Intersection: Bleams Road/George Israel
Time Period: 2031 PM

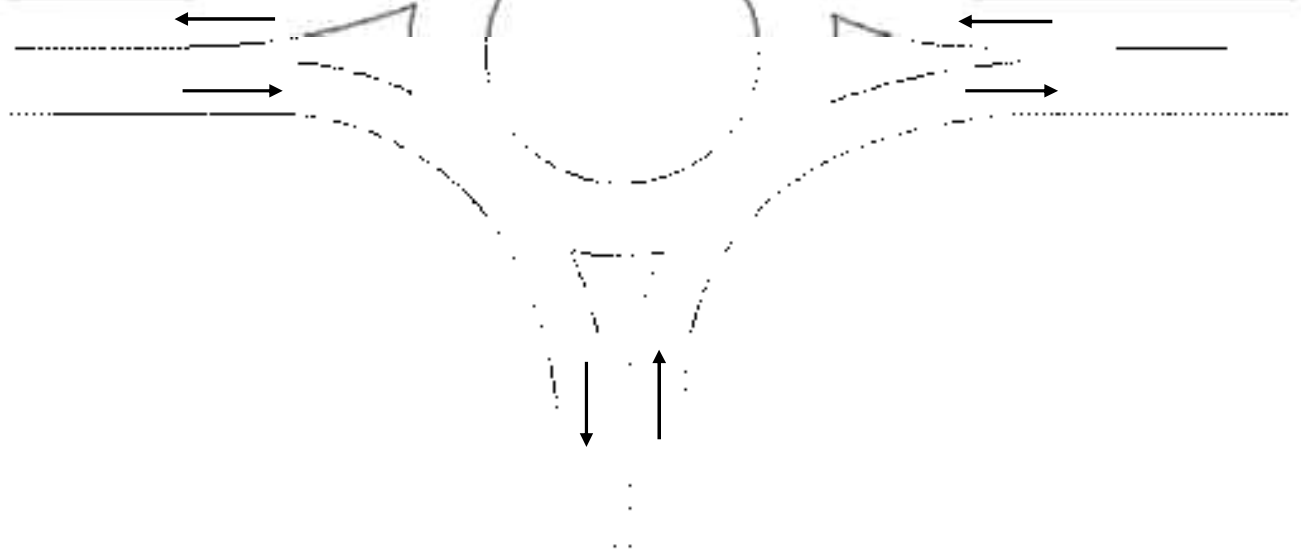


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

ROUEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
0	1	0	0	0	0
BLEAMS ROAD	1.02	100	531	0	0
GEORGE ISRAEL	1	36	0	59	0
BLEAMS ROAD	1.02	0	458	60	0



INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: Bleams Road at George Israel Street - 2031 AADT

Major Road: Bleams Road

Minor Road: George Israel Street

Major Road Direction:

Urban or Rural:

Proposed Control: Improved

Proposed Config.

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major		Major	
Minor		Minor	

Is there going to be any fully protected left-turn phasing?

Number of approaches with FPLTP:

Is the proposed intersection "new" or is it existing:

Does control and number of approaches remain the same:

Will the proposed intersection have illumination:

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed Multi-Lane or Single Lane RA?

Major Road (mid-block) 10-Year Horizon AADT: 11,480

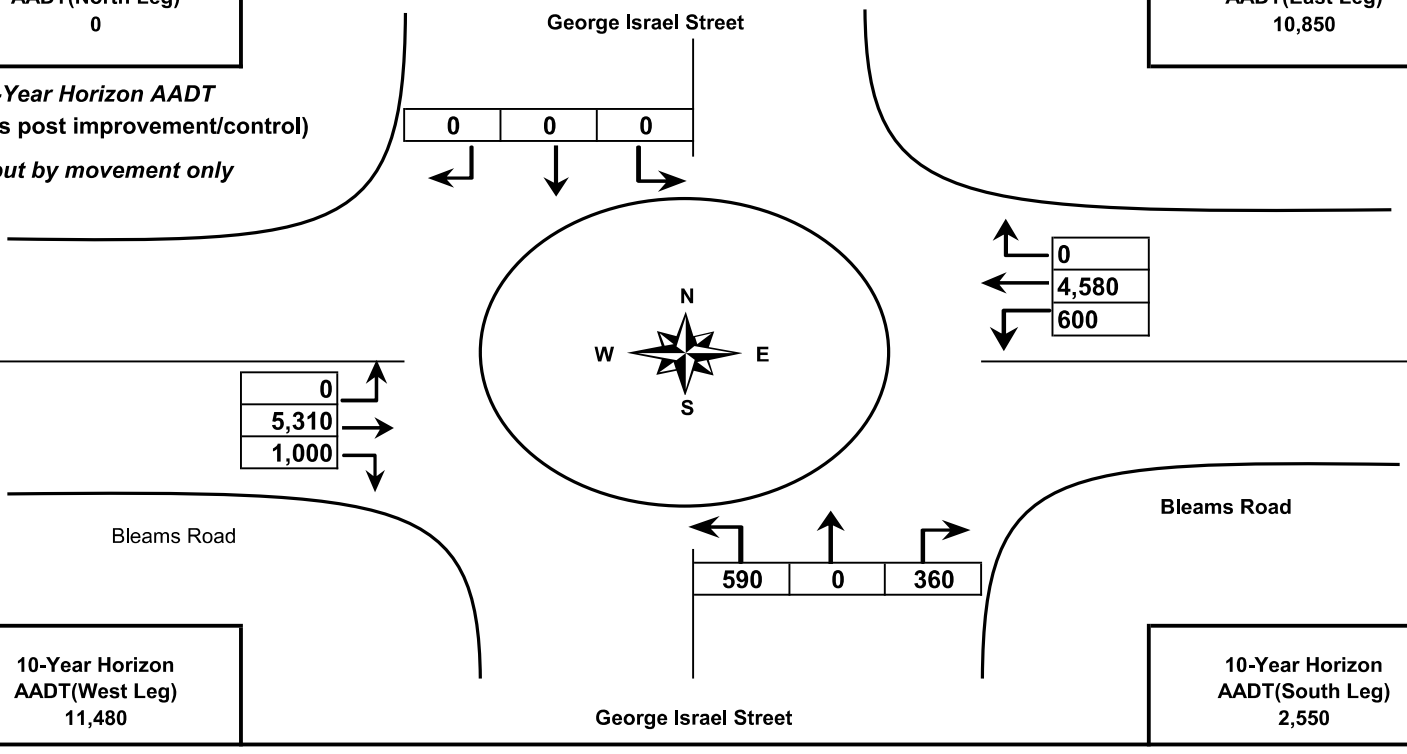
Minor Road (mid-block) 10-Year Horizon AADT: 2,550

10-Year Horizon AADT(North Leg)
0

10-Year Horizon AADT(East Leg)
10,850

** 10-Year Horizon AADT*
(10ys post improvement/control)

** Input by movement only*



10-Year Horizon AADT(West Leg)
11,480

10-Year Horizon AADT(South Leg)
2,550

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO = $5,000

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)				
Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**$124,695.25**	**$15,484.39**	**$90,210.93**	**$18,999.92**
Roundabout	**$307,601.84**	**$131,204.58**	**$176,397.27**	**$0.00**

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: **Bleams Road at George Israel Street - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **George Israel Street**

Major Road Direction: East / West

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: **3680**

5-Year Total Collisions: **0**

5-Year PDO Collisions: **0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.40**	**0.27**	**0.13**	**0.00**
Roundabout	**2.54**	**2.29**	**0.25**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.67	**0.86**	**0.61**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

December 20, 2019

REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 2.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/Region File No. (completed Screening Tools are to be stored in Docs Public Folder/Roundabout Coordination Committee/Intersection Locations) .:

   Mattamy Bleams Draft Plan of Subdivision TIS

2) Intersection Location
   (Street/Road Names, municipality, distance from major intersection, etc.):

   Bleams Road and Isaiah Drive, City of Kitchener

3) Brief Description of Existing Intersection
   (Number of Legs, Lanes on each leg, total existing AADT, existing AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

   Existing three-leg unsignalized intersection. Single travel lane on Bleams Road in each direction with an eastbound slip around lane. One lane inbound and outbound on Isaiah Drive (north leg).

4) What operational problems are being experienced at this location?

   Existing traffic warrants a 25 metre eastbound left turn lane and a westbound right turn lane. 2031 future traffic warrants eastbound and westbound left and right left turn lanes.

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

   Existing unsignalized intersection stop-controlled on the Isaiah Drive approach.

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

   Unsignalized intersection at Nyles Drive 205 metres to the west. Future unsignalized driveway to new subdivision 560 metres to east. No problems with queueing.

7) Would the intersection be located within a coordinated signal system?

   No

8) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

Yes, but project does not include widening.

9) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed? What is the current and past ranking of this intersection as identified in the Region's Annual Collision Report?

Relatively new intersection. No collision problem to be addressed.

10) What traditional road improvements are warranted for this intersection and what year is it warranted? (eg. traffic signals, all-way stop, auxiliary lanes, etc. based on Region of Waterloo warrants) A sample sketch is attached.

Traffic signal along with eastbound and westbound right and left turn lanes in 2031. Eastbound left turn and westbound right turn lanes are currently warranted.

11) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) A Traffic flow worksheets and sample sketch is attached. Traffic flow worksheet provided for 2031 (full build-out of subdivision).

Single lane.

12) 20-Year Life Cycle Cost Estimate
Base Year AADT: 9,830 (existing)
10-Year (post construction) AADT: 17,520 (2031)

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$900,000 (signals, 2 RTL, 2 LTL)	$750,000 (single lane roundabout)
Injury Collision Cost (Present Value)	$1,293,113.18	$811,315.27
Total Life Cycle Cost	**$2,193,113.18**	**$1,561,315.27**

Notes:

- Completed ROW *HSM 20-year Present Value Collision Costs (rev August 2017) attached.* ***2031 AADT used for analysis.***
- Implementation Cost = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Generally the roundabout is preferred if it is 1.5 times the cost or less than other Traffic Control

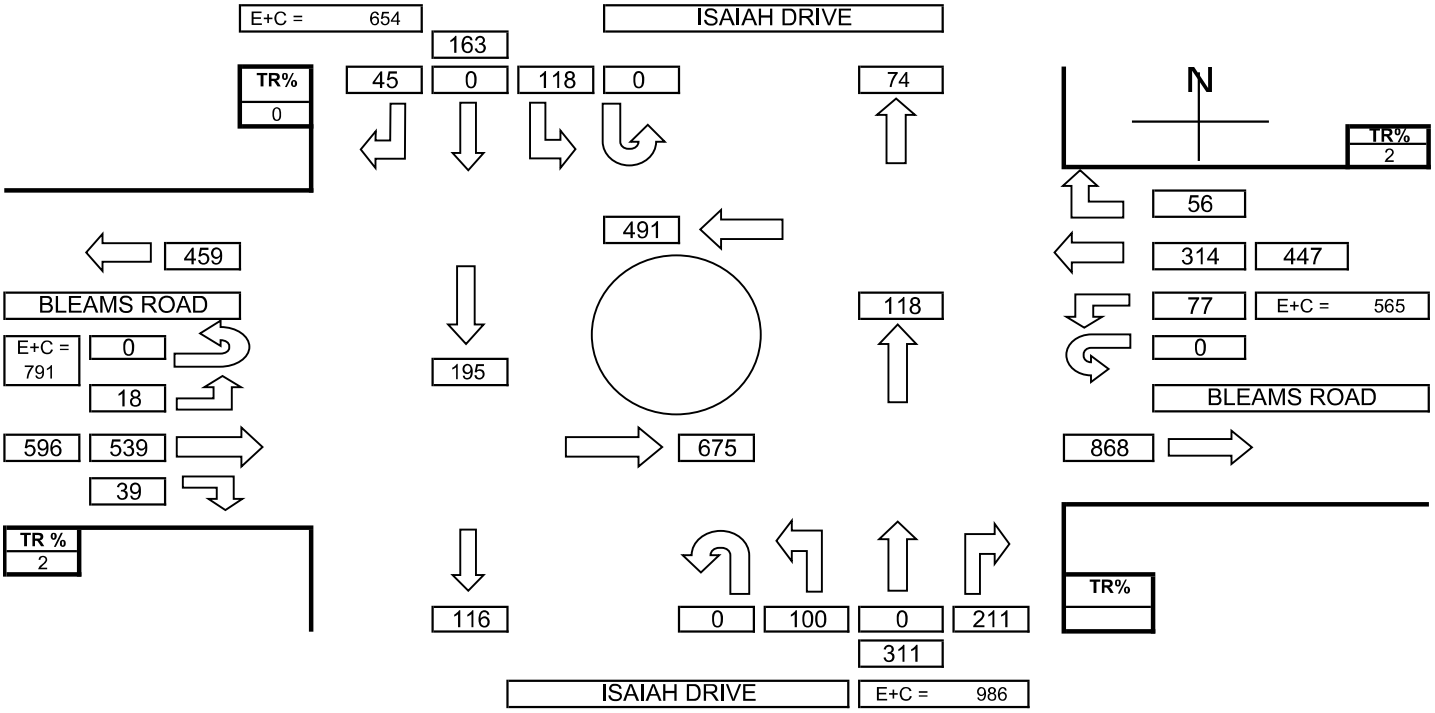
Conclusions and Recommendation

Given that the total cost of the roundabout is less than 1.5 times the cost of a signalized intersection in this location, the intersection should proceed to an Intersection Control Study.

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Mattamy Bleams DP **Drawn By:** J. Salvini
Project No.: **Sheet** 1 **of** 1
Intersection: Bleams Road/Isaiah Drive
Time Period: 2031 AM

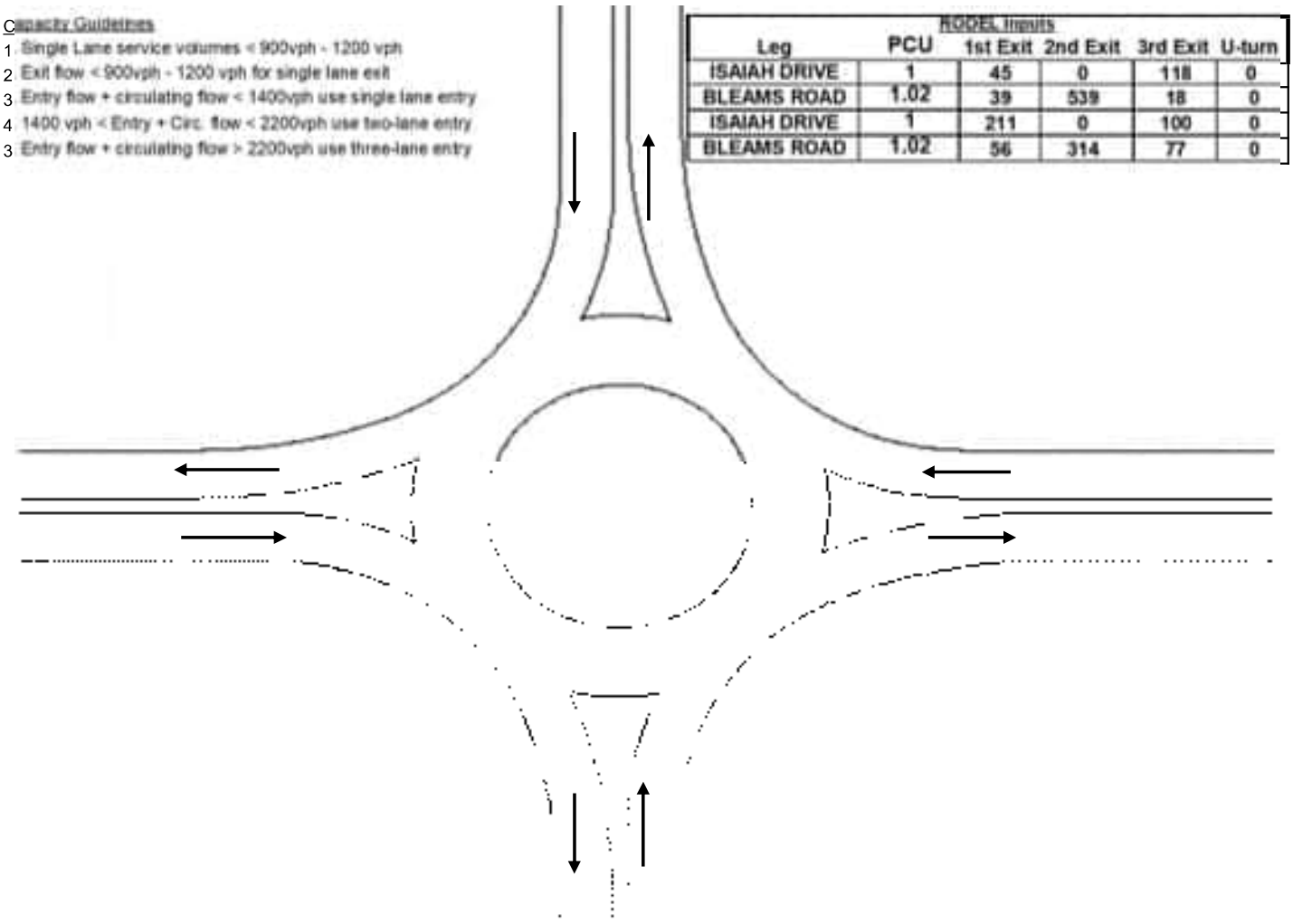


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

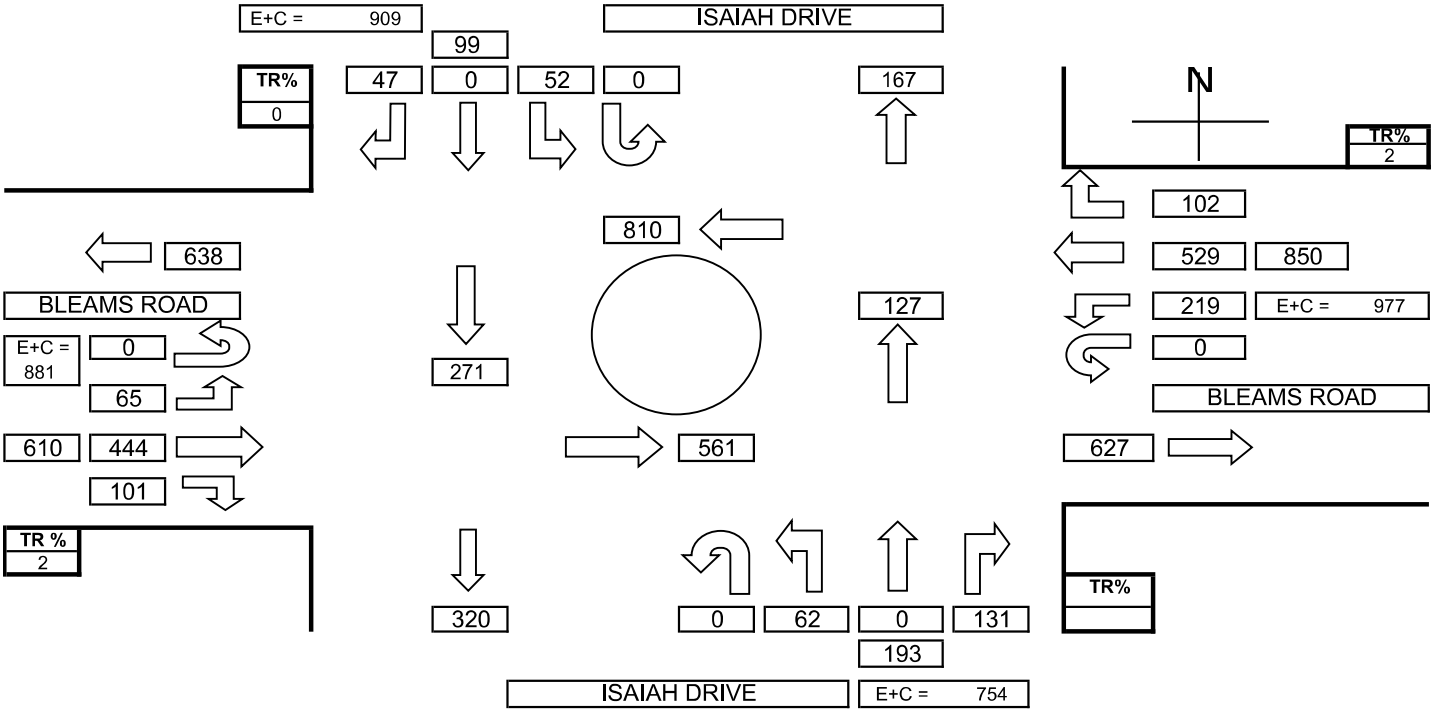
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
ISAIAH DRIVE	1	45	0	118	0
BLEAMS ROAD	1.02	39	539	18	0
ISAIAH DRIVE	1	211	0	100	0
BLEAMS ROAD	1.02	56	314	77	0



REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

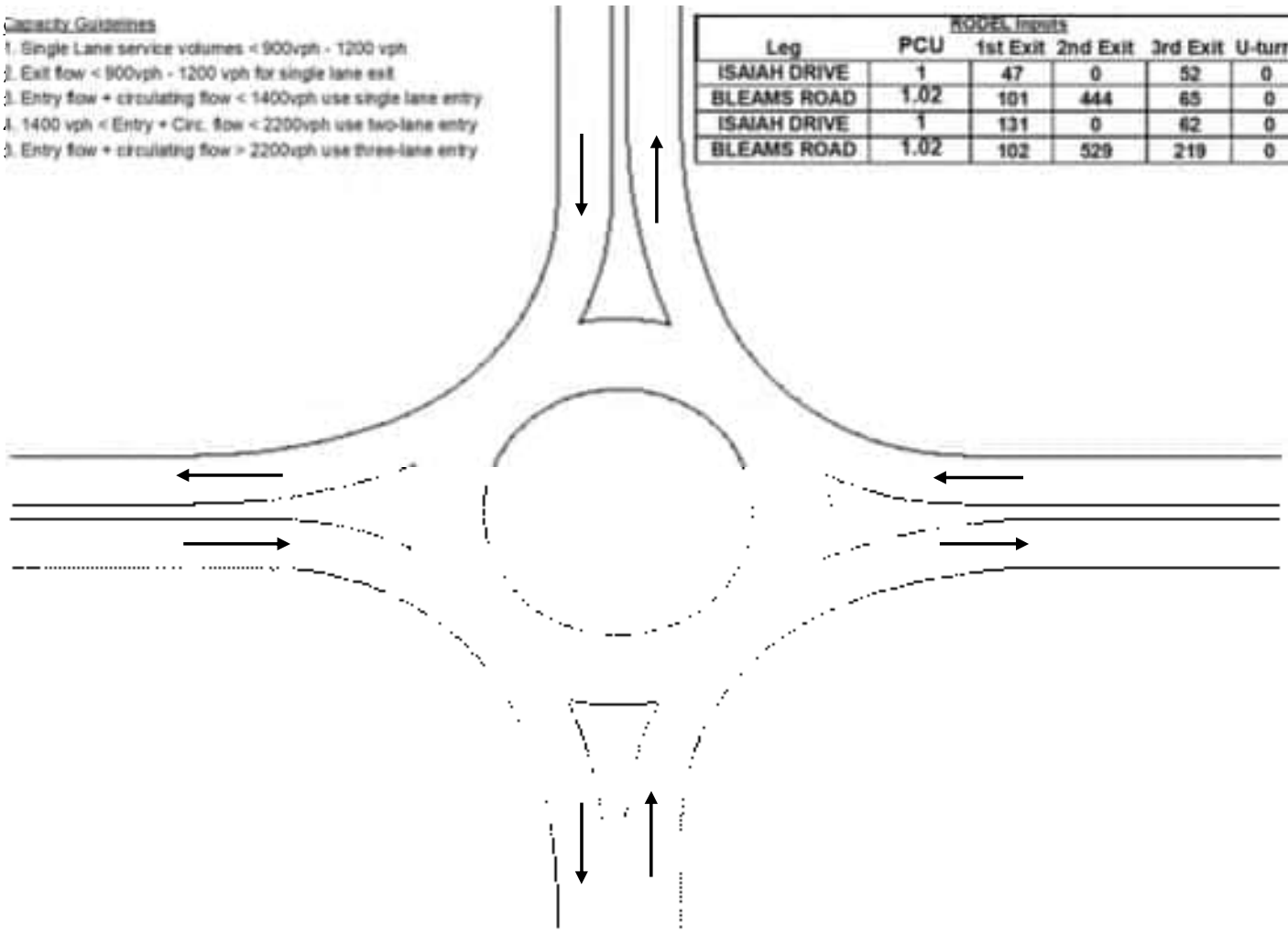
Project: Mattamy Bleams DP **Drawn By:** J. Salvini
Project No.: **Sheet** 1 **of** 1
Intersection: Bleams Road/Isaiah Drive
Time Period: 2031 AM



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

		RODEL Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
ISAIAH DRIVE	1	47	0	52	0
BLEAMS ROAD	1.02	101	444	65	0
ISAIAH DRIVE	1	131	0	62	0
BLEAMS ROAD	1.02	102	529	219	0



INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: Bleams Road at Isaiah Drive - 2031 AADT

Major Road: Bleams Road

Minor Road: Isaiah Drive

Major Road Direction:	
Urban or Rural:	
Proposed Control:	
Proposed Config.	

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major		Major	
Minor		Minor	

Is there going to be any fully protected left-turn phasing?	
Number of approaches with FPLTP:	
Is the proposed intersection "new" or is it existing:	
Does control and number of approaches remain the same:	
Will the proposed intersection have illumination:	
Proposed Multi-Lane or Single Lane RA?	

5-Year Total Collisions:	1
5-Year PDO Collisions:	0

Major Road (mid-block) 10-Year Horizon AADT: 14,770

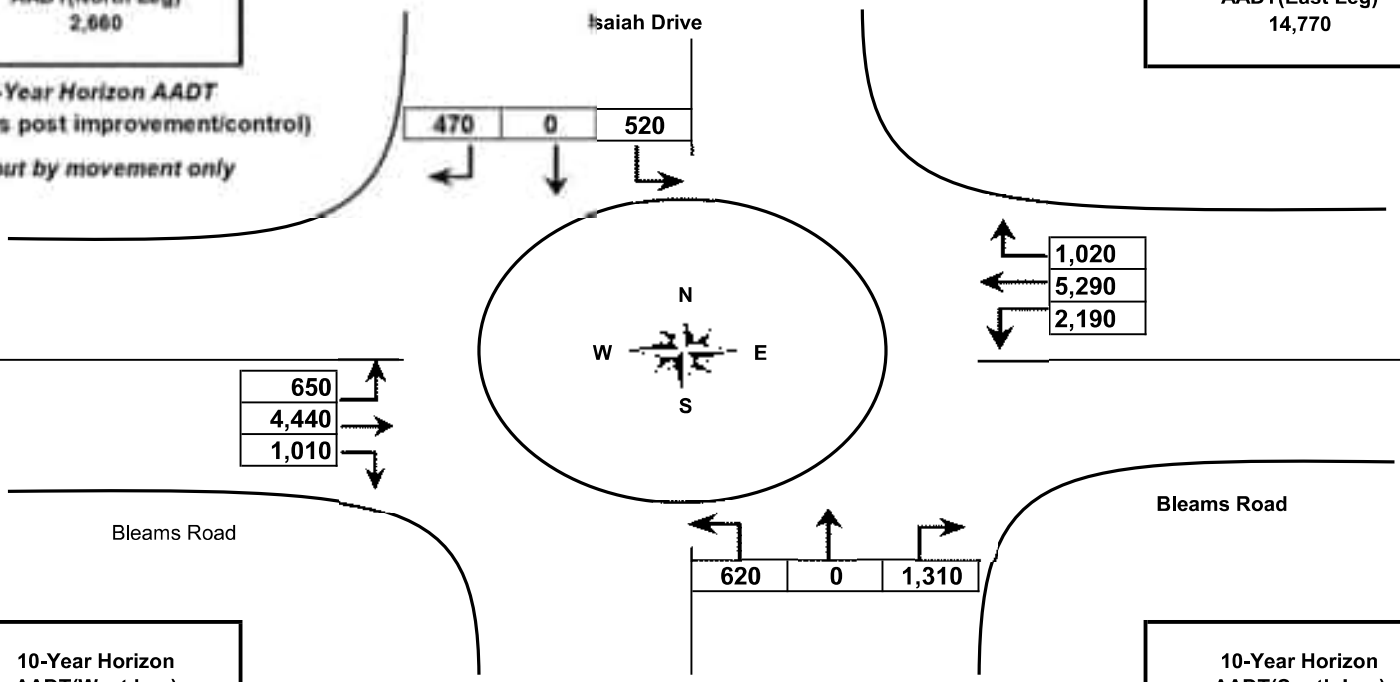
Minor Road (mid-block) 10-Year Horizon AADT: 5,130

10-Year Horizon AADT(North Leg)
2,660

10-Year Horizon AADT(East Leg)
14,770

** 10-Year Horizon AADT (10ys post improvement/control)*

** Input by movement only*



10-Year Horizon AADT(West Leg)
12,480

10-Year Horizon AADT(South Leg)
5,130

Isaiah Drive

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO = $5,000

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$1,293,113.18	$167,460.85	$1,068,652.56	$56,999.77
Roundabout	$811,315.27	$346,058.65	$465,256.63	$0.00

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: **Bleams Road at Isaiah Drive - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Isaiah Drive**

Major Road Direction: East / West

Urban or Rural: Urban

Proposed Control: Signalized

Proposed Config. 4-Leg Intersection

Roundabout Conflicts: **12100**

5-Year Total Collisions: **1**

5-Year PDO Collisions: **0**

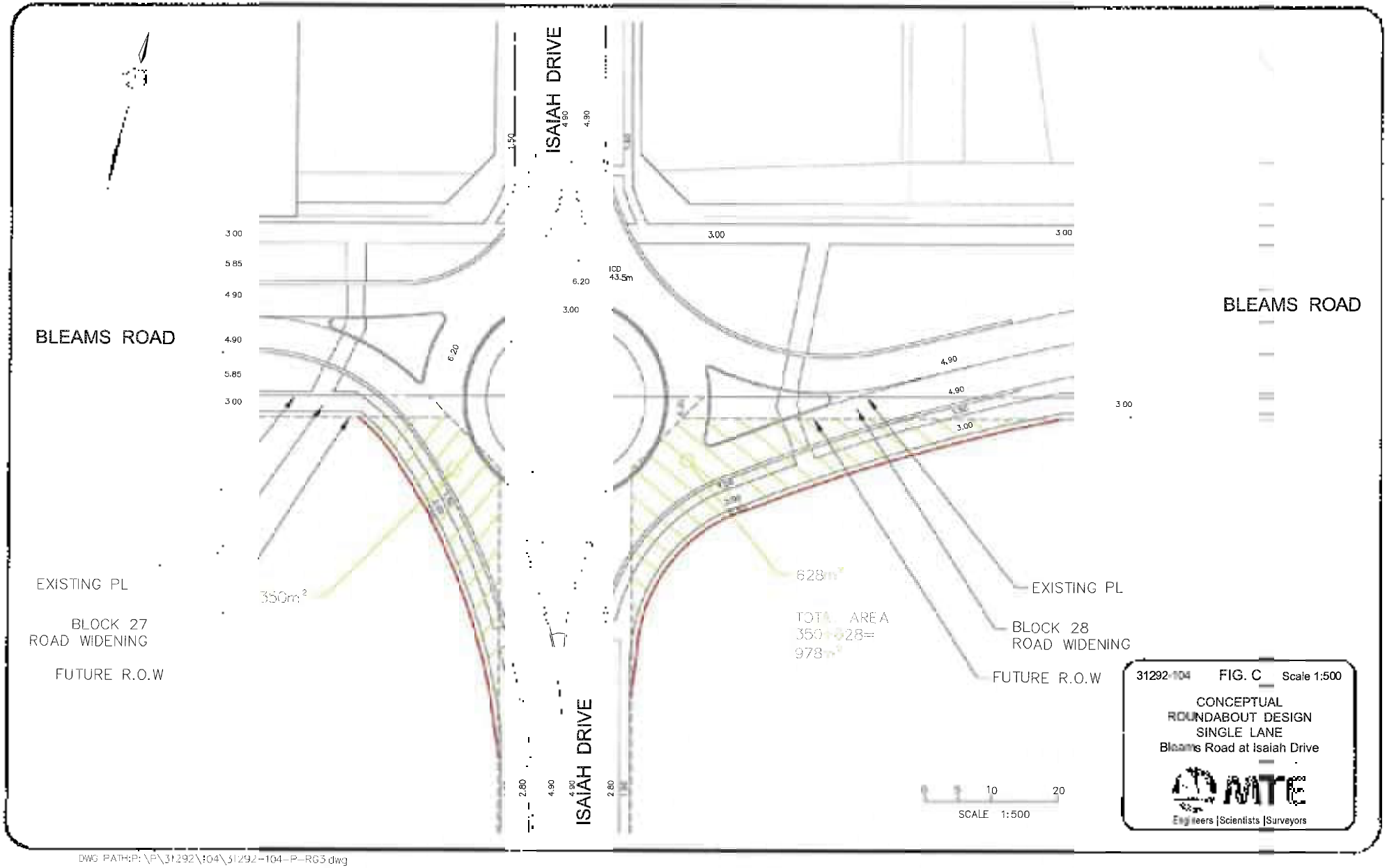
Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**4.47**	**2.92**	**1.54**	**0.00**
Roundabout	**6.70**	**6.03**	**0.67**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.92**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:



31292-104 FIG. C Scale 1:500

CONCEPTUAL
ROUNDABOUT DESIGN
SINGLE LANE
Bleams Road at Isaiah Drive

Engineers | Scientists | Surveyors

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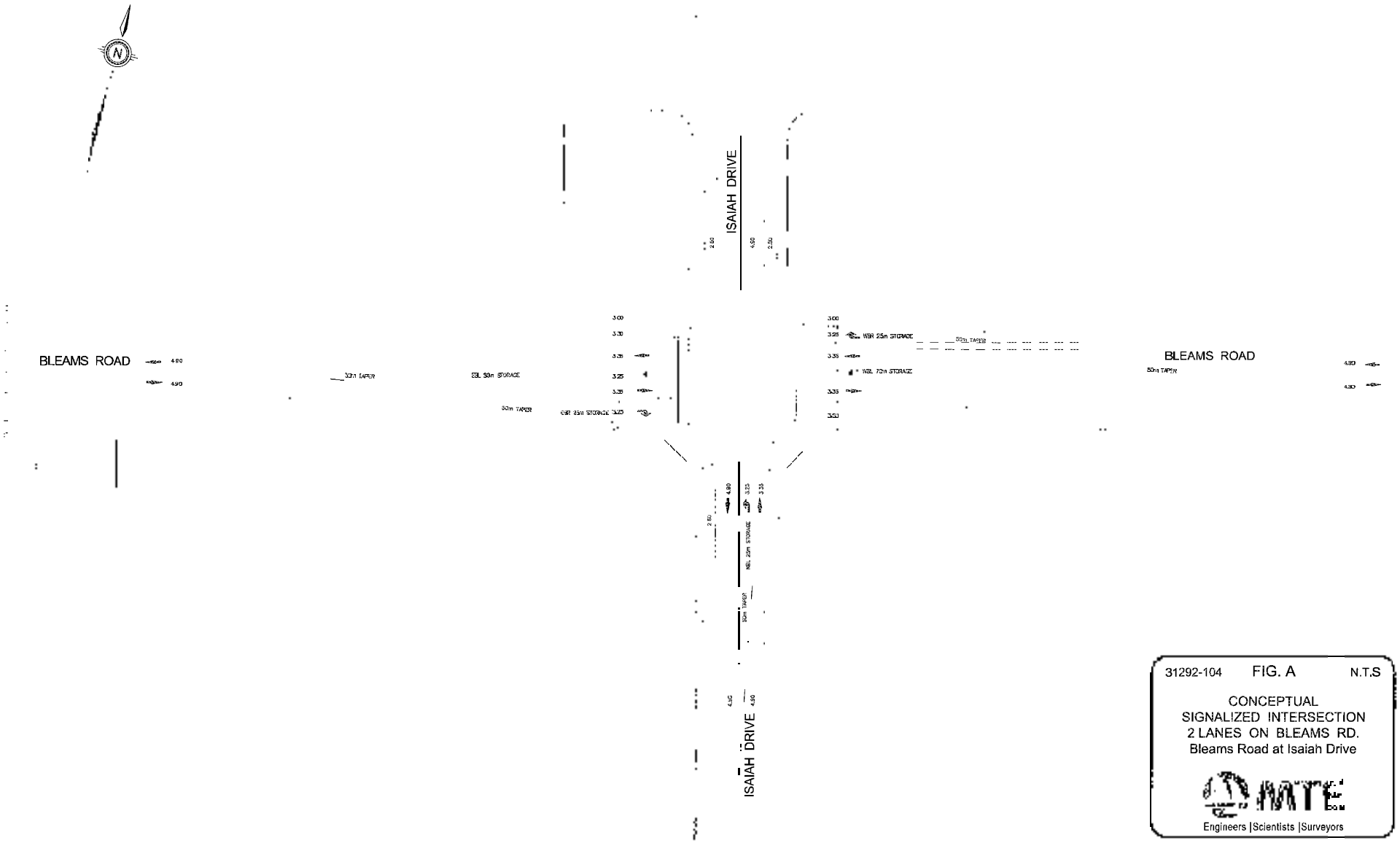
July 17, 2018 10:52 a.m. Plotted By: prainbault



31292-104 FIG. A N.T.S

CONCEPTUAL
SIGNALIZED INTERSECTION
2 LANES ON BLEAMS RD.
Bleams Road at Isaiah Drive

MTE
Engineers | Scientists | Surveyors

DWG PATH: P:\P\31292\104\31292-104-P-RG4.dwg
July 17, 2018 10:48 a.m. Plotted By: proimbault

December 20, 2019

REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 2.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/Region File No. (completed Screening Tools are to be stored in Docs Public Folder/Roundabout Coordination Committee/Intersection Locations) .:

   Mattamy Bleams Draft Plan of Subdivision TIS

2) Intersection Location
   (Street/Road Names, municipality, distance from major intersection, etc.):

   Bleams Road and Street L, City of Kitchener

3) Brief Description of Existing Intersection
   (Number of Legs, Lanes on each leg, total existing AADT, existing AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

   Planned intersection does not exist.

4) What operational problems are being experienced at this location?

   n/a

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

   New intersection.

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

   Existing unsignalized intersection at Isaiah Drive 560 metres to the west. Planned new intersection at Amand Drive 530 metres to the east. No problems with queueing.

7) Would the intersection be located within a coordinated signal system?

   No

8) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

Yes, but project does not include widening.

9) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed? What is the current and past ranking of this intersection as identified in the Region's Annual Collision Report?

n/a

10) What traditional road improvements are warranted for this intersection and what year is it warranted? (eg. traffic signals, all-way stop, auxiliary lanes, etc. based on Region of Waterloo warrants).

Westbound left turn lane in 2031 (warranted in 2028).

11) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) A Traffic flow worksheets is attached. Traffic flow worksheet provided for 2031 (full build-out of subdivision).

Single lane.

12) 20-Year Life Cycle Cost Estimate
Base Year AADT: 8,710 (existing)
10-Year (post construction) AADT: 18,770 (2031)

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$250,000 (1 LTL)	$750,000 (single lane roundabout)
Injury Collision Cost (Present Value)	$208,941.82	$547,071.05
Total Life Cycle Cost	**$458,941.82**	**$1,297,071.05**

Notes:

- Completed ROW *HSM 20-year Present Value Collision Costs (rev August 2017) attached.* ***2031 AADT used for analysis.***
- Implementation Cost = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Generally the roundabout is preferred if it is 1.5 times the cost or less than other Traffic Control

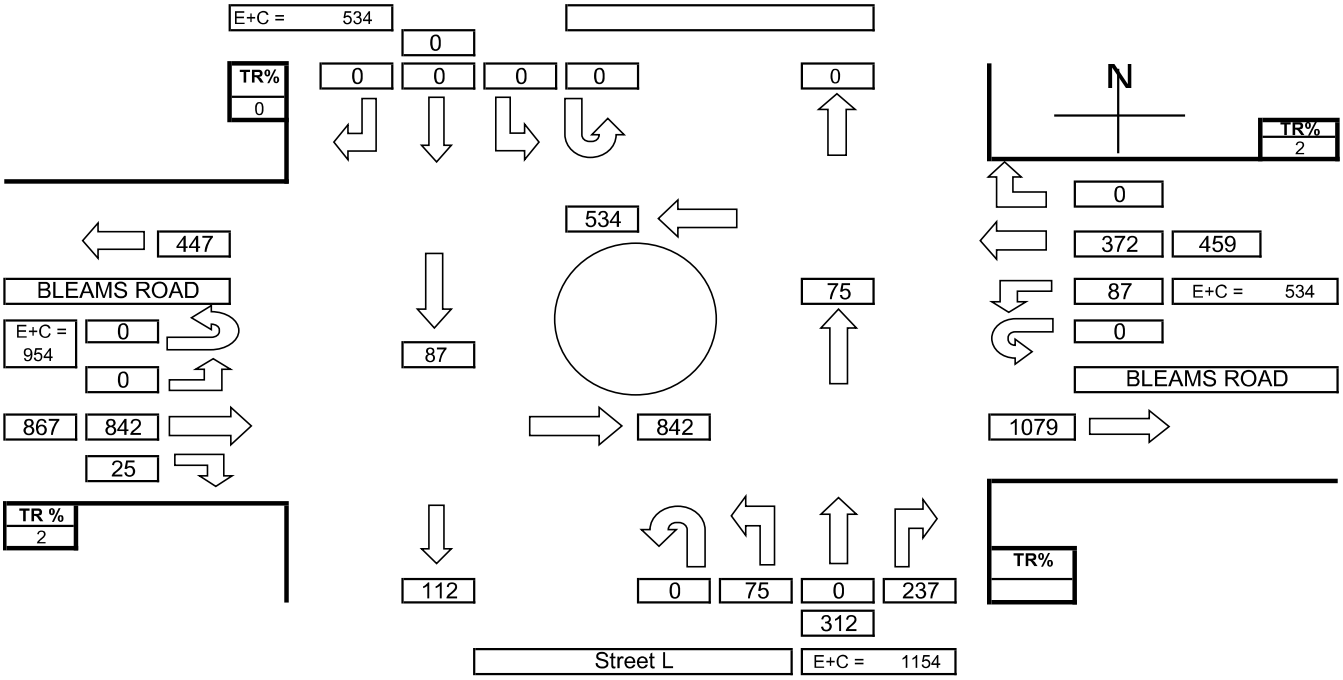
Conclusions and Recommendation

Given that the total cost of the roundabout is more than 1.5 times the cost of a stop controlled intersection in this location, the intersection should not proceed to an Intersection Control Study.

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Mattamy Bleams DP **Drawn By:** J. Salvini
Project No.: **Sheet** 1 **of** 1
Intersection: Bleams Road/Street L
Time Period: 2031 AM

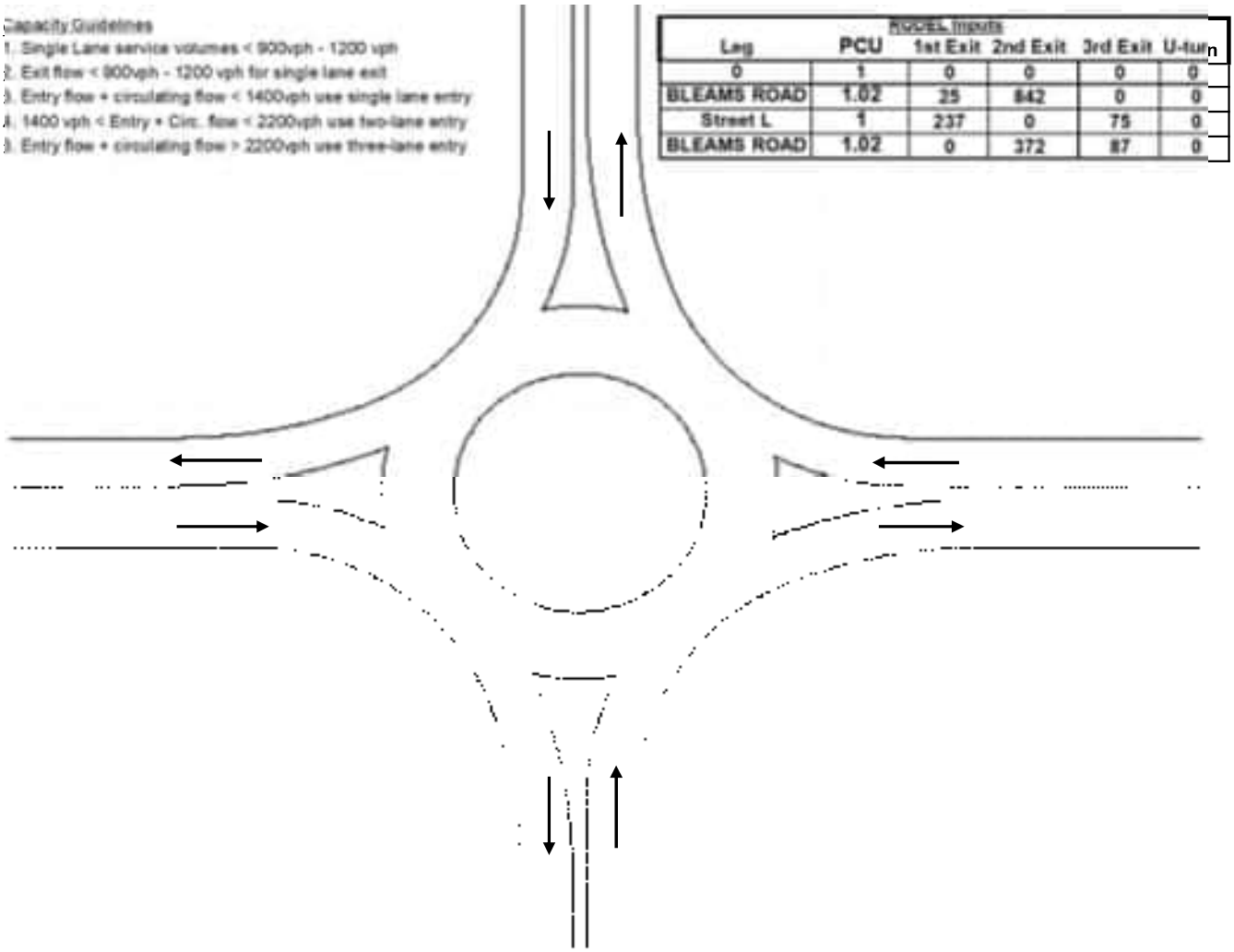


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

MODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
0	1	0	0	0	0
BLEAMS ROAD	1.02	25	842	0	0
Street L	1	237	0	75	0
BLEAMS ROAD	1.02	0	372	87	0

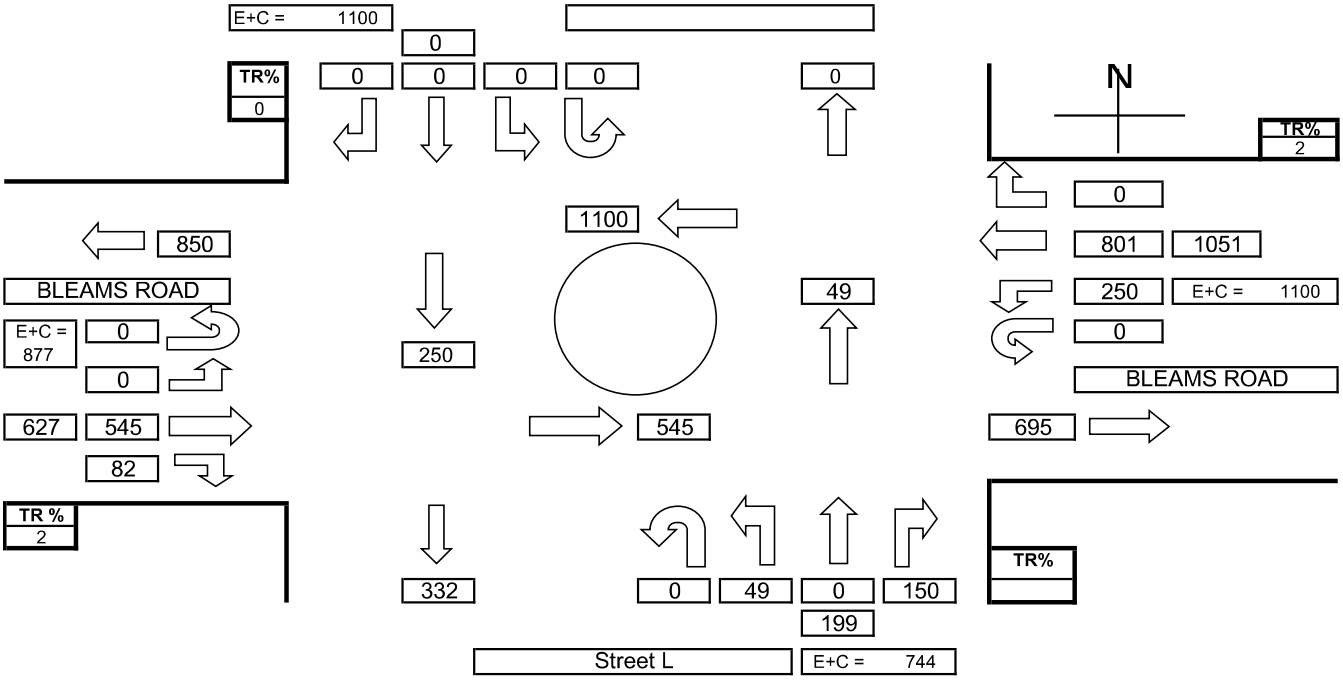


REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Mattamy Bleams DP
Project No.:
Intersection: Bleams Road/Street L
Time Period: 2031 PM

Drawn By: J. Salvini
Sheet 1 **of** 1

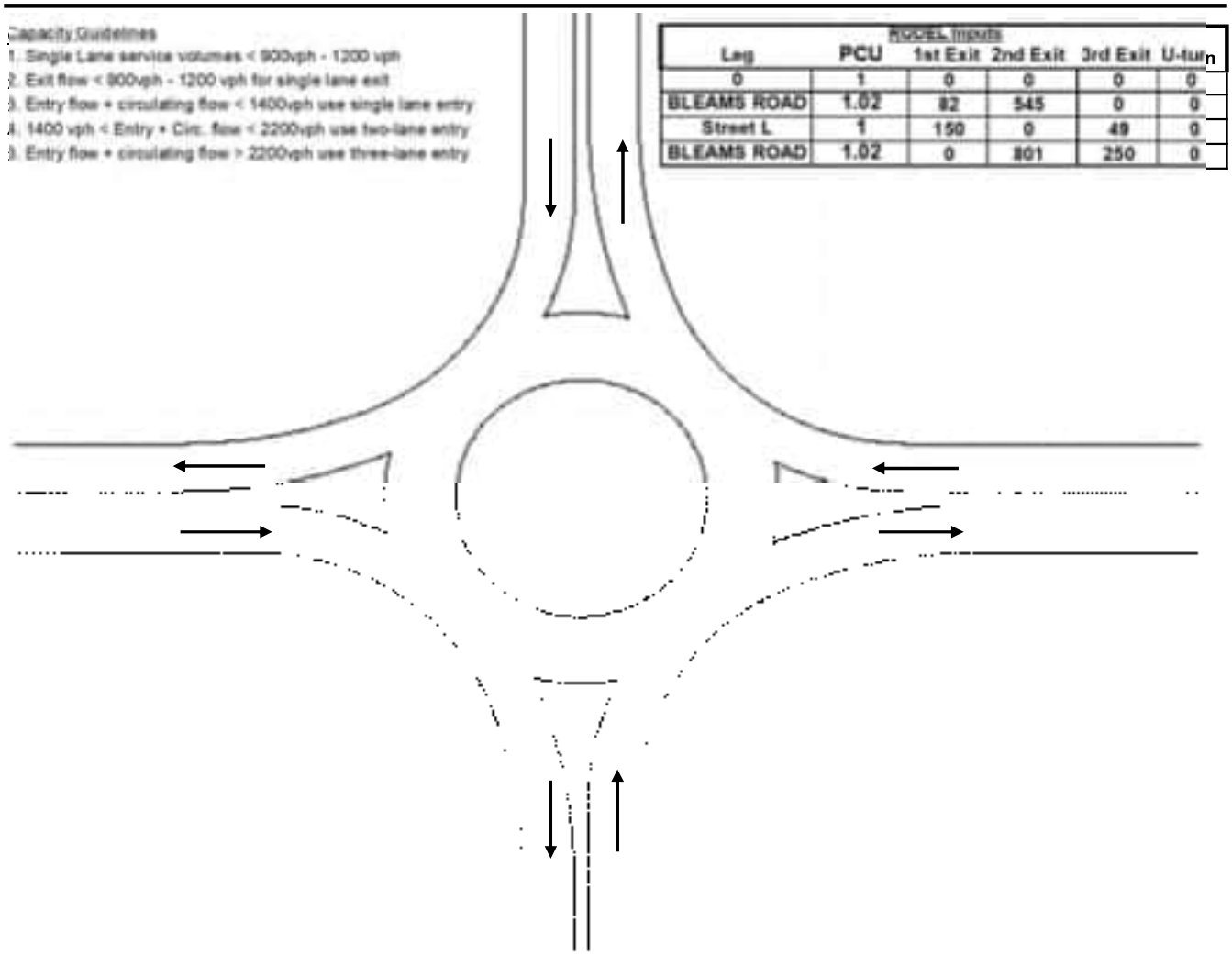


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
5. Entry flow + circulating flow > 2200vph use three-lane entry

MODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
0	1	0	0	0	0
BLEAMS ROAD	1.02	82	545	0	0
Street L	1	150	0	49	0
BLEAMS ROAD	1.02	0	801	250	0



INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: Bleams Road at Street L - 2031 AADT

Major Road: Bleams Road

Minor Road: Street L

Major Road Direction:

Urban or Rural:

Proposed Control: Improved

Proposed Config.

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major		Major	
Minor		Minor	

Is there going to be any fully protected left-turn phasing?

Number of approaches with FPLTP:

Is the proposed intersection "new" or is it existing:

Does control and number of approaches remain the same:

Will the proposed intersection have illumination:

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed Multi-Lane or Single Lane RA?

Major Road (mid-block) 10-Year Horizon AADT: 17,460

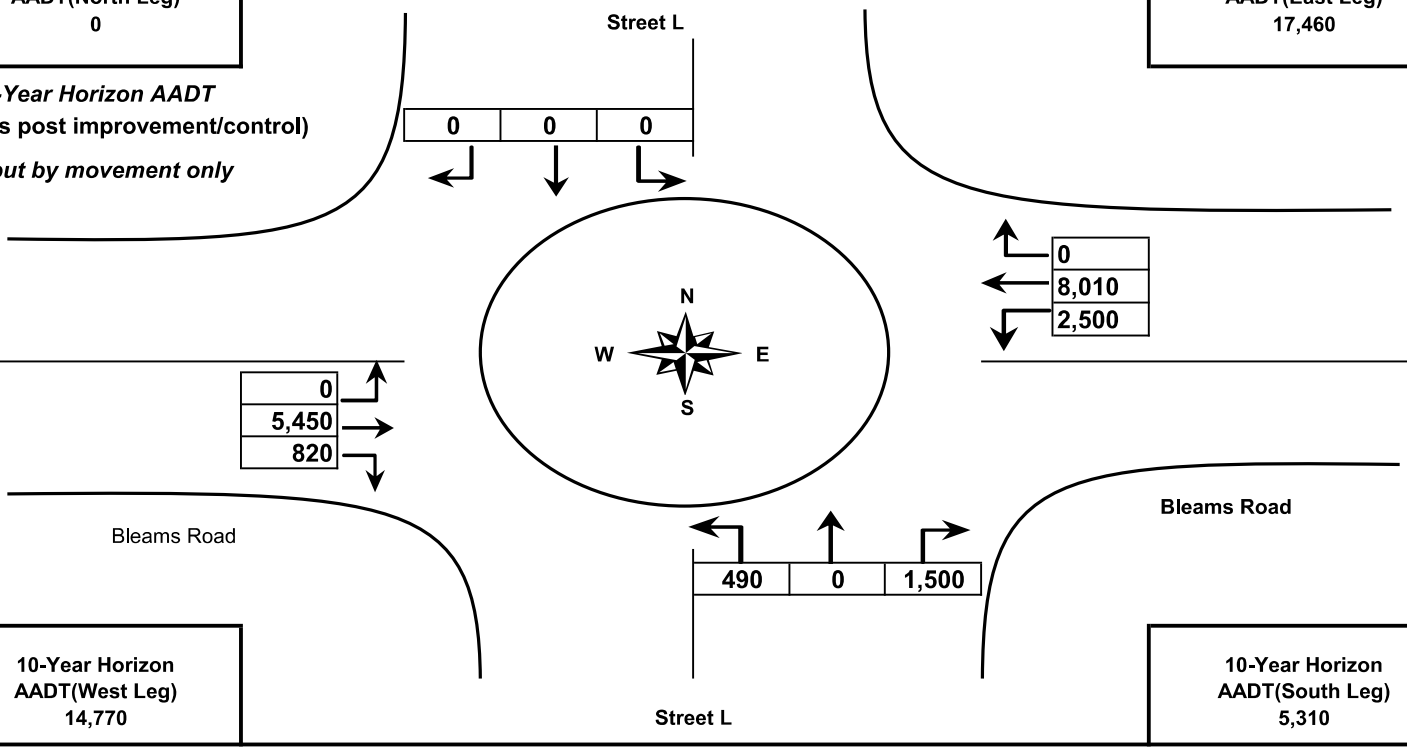
Minor Road (mid-block) 10-Year Horizon AADT: 5,310

10-Year Horizon AADT(North Leg)
0

10-Year Horizon AADT(East Leg)
17,460

** 10-Year Horizon AADT*
(10ys post improvement/control)

** Input by movement only*



10-Year Horizon AADT(West Leg)
14,770

10-Year Horizon AADT(South Leg)
5,310

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO = $5,000

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)				
Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**$208,941.82**	**$37,277.24**	**$152,664.65**	**$18,999.92**
Roundabout	**$547,071.05**	**$233,347.84**	**$313,723.21**	**$0.00**

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev Jan 2019

Scenario: **Bleams Road at Street L - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Street L**

Major Road Direction: East / West

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: **7460**

5-Year Total Collisions: **0**

5-Year PDO Collisions: **0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.87**	**0.65**	**0.22**	**0.00**
Roundabout	**4.52**	**4.07**	**0.45**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
				Total	PDO
Collision Modification Factors (cmf's)	**0.67**	**0.86**	**0.61**	**N/A**	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

May 23, 2012

REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 1.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/File No.:

Bleams Road Residential Development TIS

2) Intersection Location
(Street/Road Names, distance from major intersection, etc.):

Bleams Road & Donnenwerth Drive / Amand Drive

Next major intersection to the west is Trussler Road & Bleams Road (2.1 km) and to the east is Fischer-Hallman Road and Bleams Road (1.0 km).

3) Brief Description of Intersection
(Number of Legs, Lanes on each leg, total AADT, AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

Four legs expected to have single lane approaches each.

Improvements warranted at 2019. Therefore 2029 horizon used.

TIS only forecasts to 5-year horizon, so 15-year horizon forecast obtained by extending background growth rate of 0.5% an additional 10 years.

4) What operational problems are being experienced at this location?

Forecasted to have very high side street delays.

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

Existing stop-controlled intersection.

South leg (Amand Drive) will be new.

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

Closest intersection is Bleams Road and Commonwealth Drive, 570 m to the east, which is unsignalized. Queues are not forecasted to be an issue.

7) Would the intersection be located within a coordinated signal system?

No

8) Would the intersection be located on a Preferred Roundabout Corridor?

Yes

9) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

No.

10) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed?

No collision problems.

11) Are persons with disabilities or horse and buggies frequent users of this intersection?

No

12) What traditional road improvements are proposed for this intersection? (eg. traffic signals, all-way stop, auxiliary lanes, etc.) Please attach a sketch of the traditional road improvements. A sample sketch is attached (DOCS #529440).

Traffic signal control (assumed left-turn lanes installed on Bleams).

13) If traffic control signals are being considered, are the traffic signal warrants met for the horizon year?

Traffic signals are warranted under 2019 total traffic forecasts.

14) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) Please attach a Traffic Flow Worksheet and lane configuration diagram. Please attach a sketch showing how a roundabout would "fit" into the right-of-way. A sample sketch is attached (DOCS #529433).

See traffic flow worksheet.

According to capacity guidelines provided on traffic flow worksheet, double-lane entries on the Bleams Road legs are warranted.

15) 20-Year Life Cycle Cost Estimate

10-Year AADT: 30040

Injury Collision Cost (ICC): $13,600,000 (fatal), $82,000 (injury), $5,000 (non-injury)

Discount Rate: (i): 6%

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$ 600,000 (signals, 2 LT lanes)	$ 1,200,000 (double-lane roundabout)
Injury Collision Cost (Present Value)	$ 3,448,927	$ 1,425,812
Total Life Cycle Cost	**X** 4,048,927	**Y** 2,625,812

Notes:

- Implementation Cost
  = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Present Value of 20 Year Injury Collision Cost
  = expected annual collision frequency x ICC $((1 + i)^{20}-1) / i(1+i)^{20}$

- Monte Carlo Analysis may be required. If so, a range for the implementation cost (i.e. 10%, 50%, 90% probability) is required



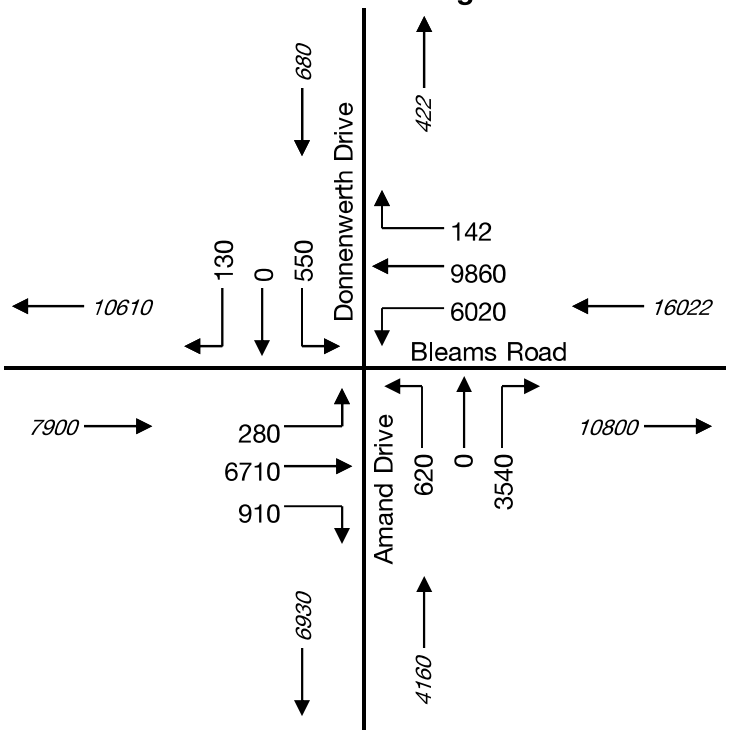
REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 1.0

Conclusions and Recommendation

Life cycle cost of roundabout option is less than signals option.

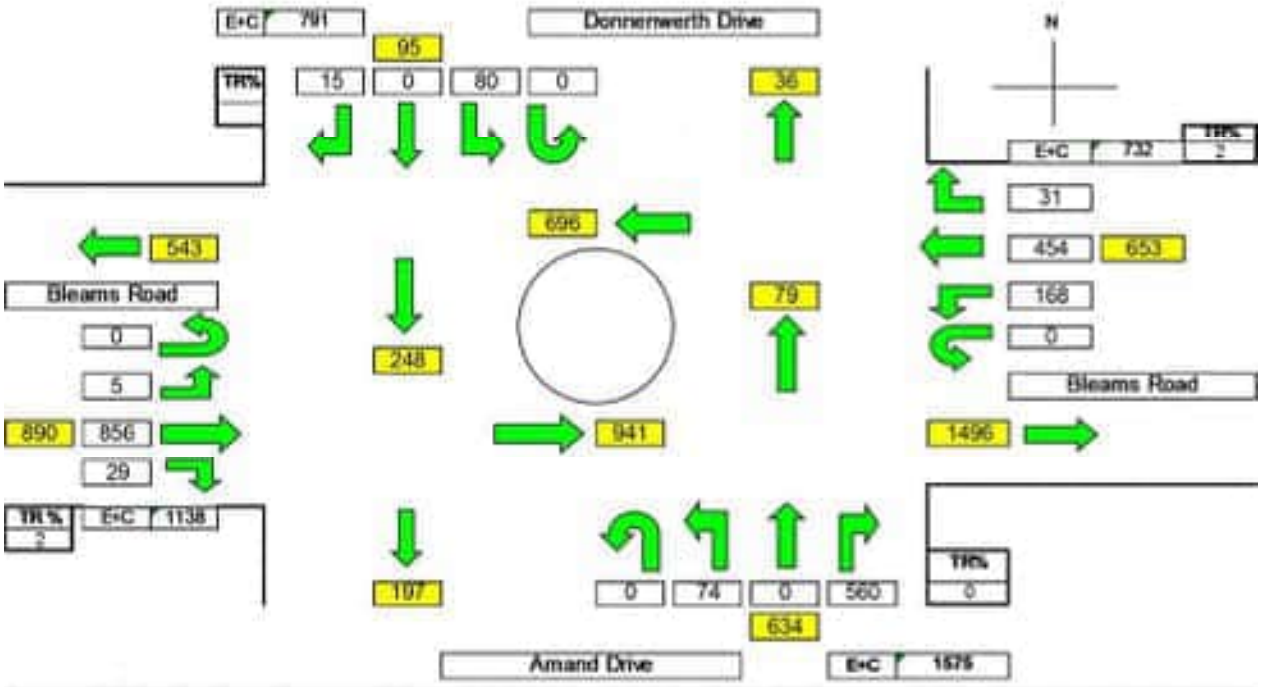
Proceed to Intersection Control Study.

10-Year AADT Diagram



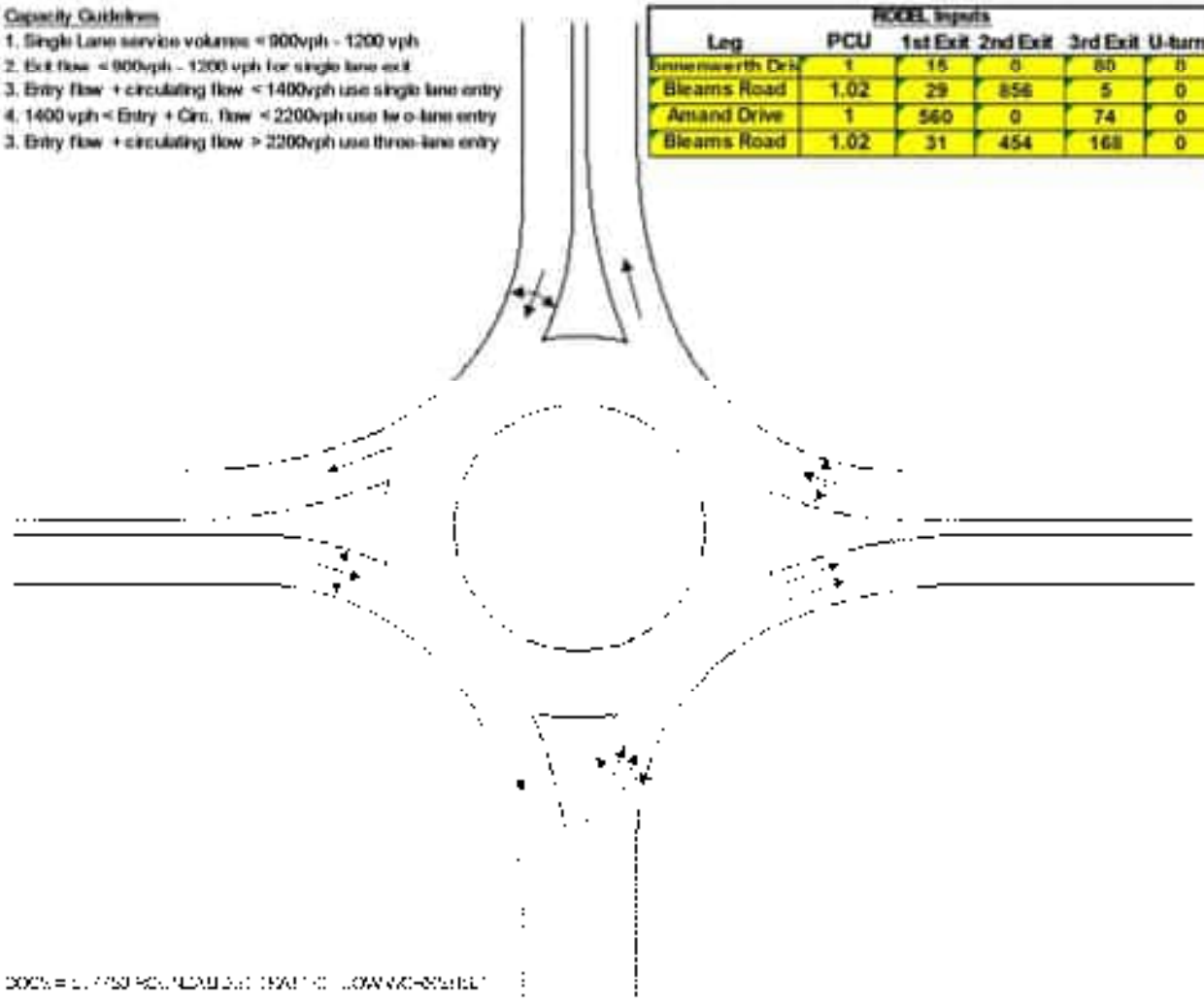
REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET
VERSION 1.0 AUG 22, 2008

Project: Stamm Development Ble **Drawn By:** Matt Brouwer
Project No.: 131060 **Sheet** 1 **of** 2
Intersection: Bleams Road & Donnenwerth Drive / Amand Drive
Time Period: 2029 Total AM (Long Term Development Scenario)



Capacity Guidelines
1. Single Lane service volumes = 900vph - 1200 vph
2. Exit flow = 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

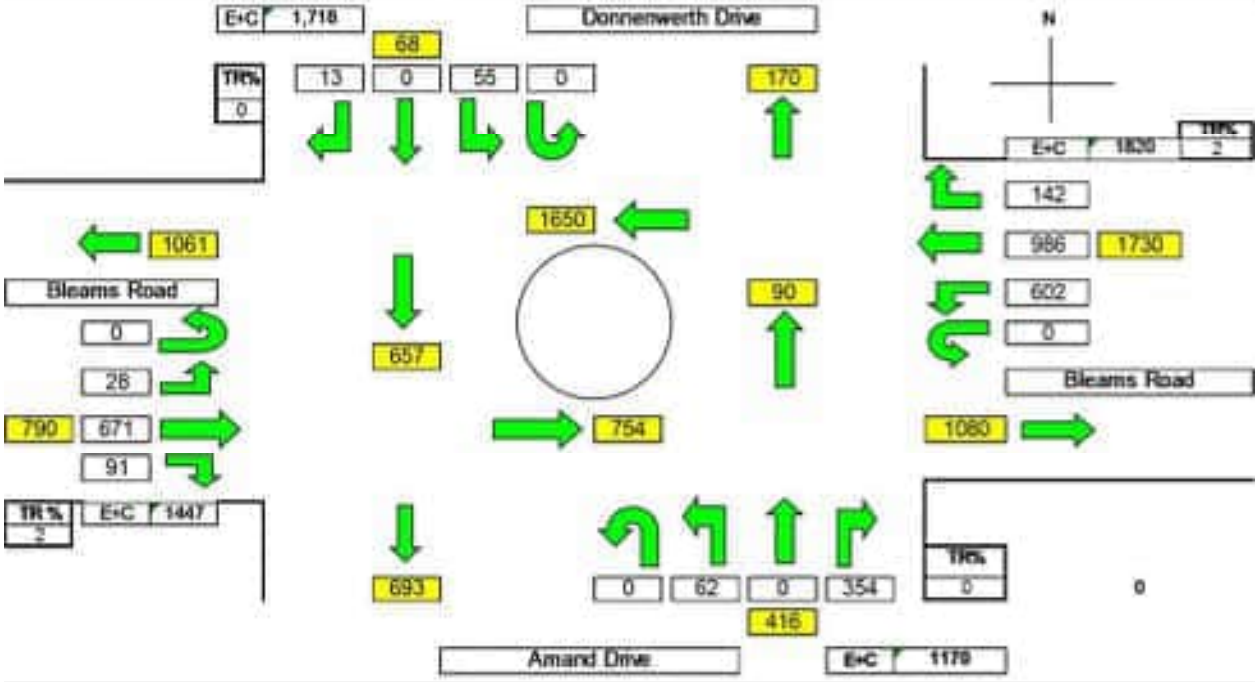
RODEL Inputs					
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Donnenwerth Dri	1	15	0	80	0
Bleams Road	1.02	29	856	5	0
Amand Drive	1	560	0	74	0
Bleams Road	1.02	31	454	168	0



REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.0 AUG 22, 2008

Project: Stamm Development Ble **Drawn By:** Matt Brouwer
Project No.: 131060 **Sheet** 2 **of** 2
Intersection: Bleams Road & Donnenwerth Drive / Amand Drive
Time Period: 2029 Total PM (Long Term Development Scenario)

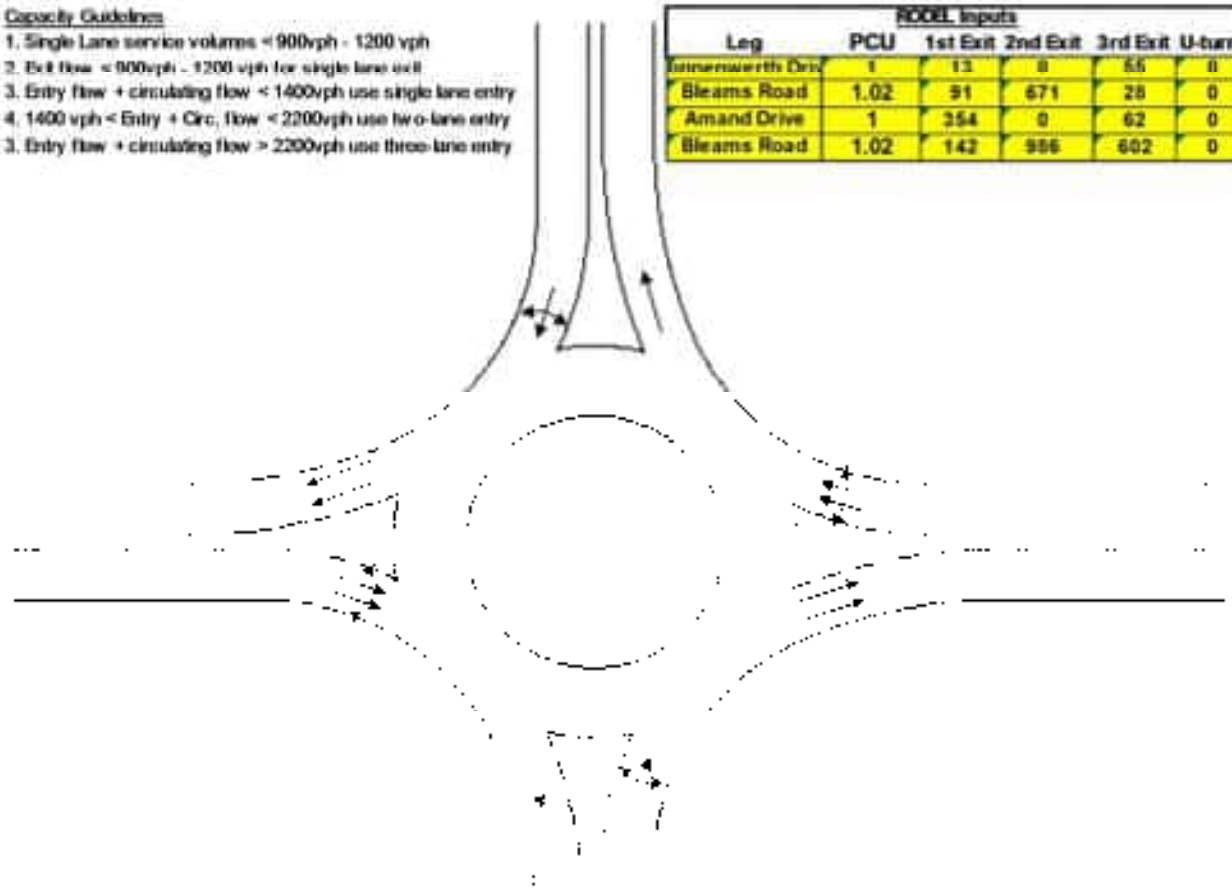


Capacity Guidelines

1. Single Lane service volumes = 900vph - 1200 vph
2. Exit flow = 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

ROBEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Donnenwerth Drive	1	13	0	55	0
Bleams Road	1.02	91	671	26	0
Amand Drive	1	354	0	62	0
Bleams Road	1.02	142	986	602	0



REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 1.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/File No.:

   Williamsburg South & South Estates TIS

2) Intersection Location
   (Street/Road Names, distance from major intersection, etc.):

   Bleams Road & Street A
   Next major intersection to the east is Fischer-Hallman Road & Bleams Road (750 m)
   Next major intersection to the west is Bleams Road & Trussler Road (2.4 km).

3) Brief Description of Intersection
   (Number of Legs, Lanes on each leg, total AADT, AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

   Forecast 2022 Turning Movement volumes attached

   Estimated 2022 AADT on Bleams Road is approximately 11900.
   Street A south leg is approximately 1300.

4) What operational problems are being experienced at this location?

   None. New Intersection.

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

New Intersection

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

Fischer-Hallman intersects with Bleams Road Road approximately 750 m to the east, which is planned to become a roundabout along with an upgrade to Fischer-Hallman to four lanes.
Queues are not forecasted to be a problem.

7) Would the intersection be located within a coordinated signal system?

no

8) Would the intersection be located on a Preferred Roundabout Corridor?

yes

9) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

No.

10) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed?

New Intersection.

11) Are persons with disabilities or horse and buggies frequent users of this intersection?

No

12) What traditional road improvements are proposed for this intersection? (eg. traffic signals, all-way stop, auxiliary lanes, etc.)

Westbound left-turn lane.

13) If traffic control signals are being considered, are the traffic signal warrants met for the horizon year?

Not considered. Warrant not met.

14) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) Please attach a Traffic Flow Worksheet and lane configuration diagram. Please attach a sketch showing how a roundabout would "fit" into the right-of-way.

See - Traffic Flow Worksheet. Two lane entries on north, west and south legs. East leg to be determined when potential future development is planned. Proposed ICD = 55 m.

15) 20-Year Life Cycle Cost Estimate –

Injury Collision Cost (ICC): $30,000
Discount Rate: (i): 6%

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$250,000	$1,200,000
Injury Collision Cost (Present Value)	$168,628	$84,314
Total Life Cycle Cost	**X $418,628**	**Y $1,284,314**

Notes:

- Implementation Cost
  = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Present Value of 20 Year Injury Collision Cost
  = expected annual collision frequency x ICC $((1 + i)^{20}-1) / i(1+i)^{20}$
- Monte Carlo Analysis may be required. If so, a range for the implementation cost (i.e. 10%, 50%, 90% probability) is required

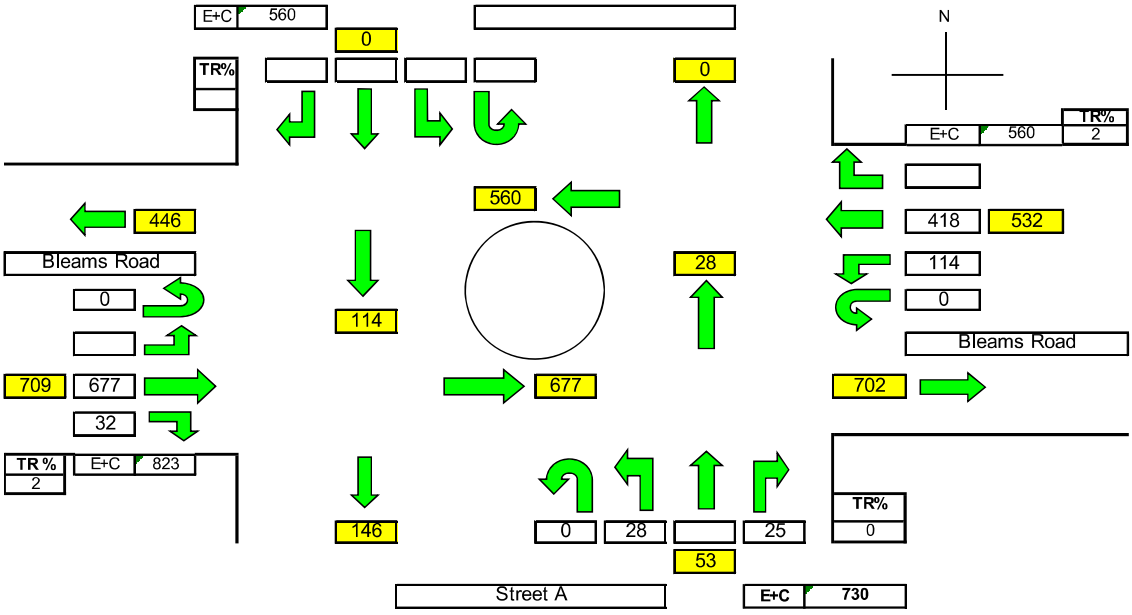
Conclusions and Recommendation

Roundabout not recommended

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.0 AUG 22, 2008

Project: Williamsburg S / S Estate **Drawn By:** Matt Brouwer
Project No.: 121270 **Sheet** 1 **of** 2
Intersection: Bleams Road & Street A
Time Period: 2022 Total AM



Capacity Guidelines

1. Single Lane service
2. Exit flow < 900vph -
3. Entry flow + circulati
4. 1400 vph < Entry + C
3. Entry flow + circulati

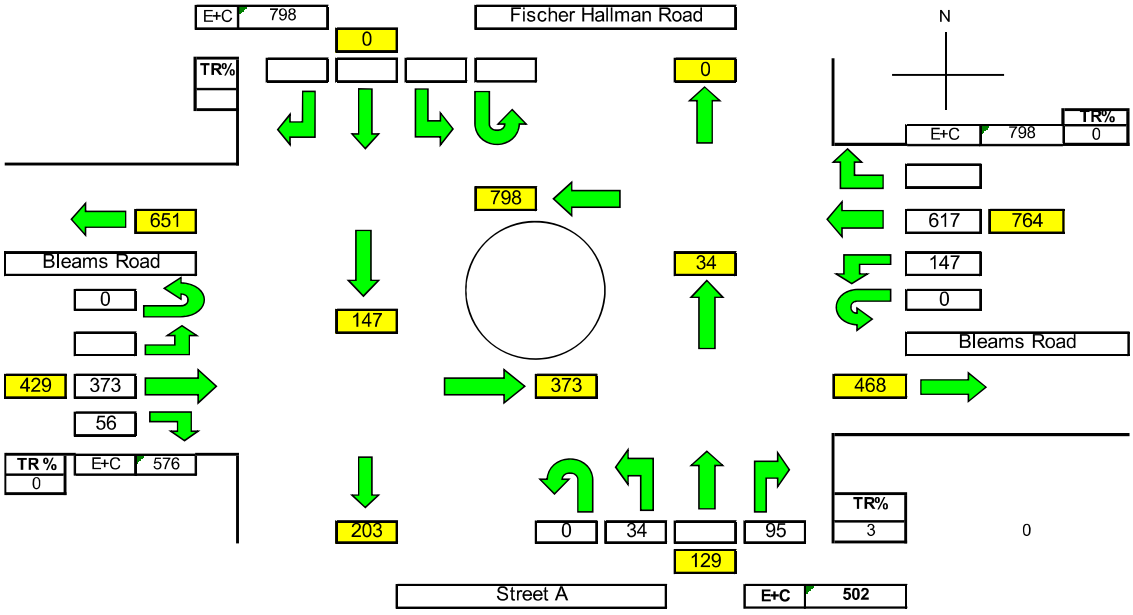
RODEL Inputs				
	1st Exit	2nd Exit	3rd Exit	U-turn
	0	0	0	0
	32	677	0	0
	25	0	28	0
	0	418	114	0

[redacted]

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.0 AUG 22, 2008

Project: Williamsburg S / S Estate **Drawn By:** Matt Brouwer
Project No.: 121270 **Sheet** 2 **of** 2
Intersection: Bleams Road & Street A
Time Period: 2022 Total PM

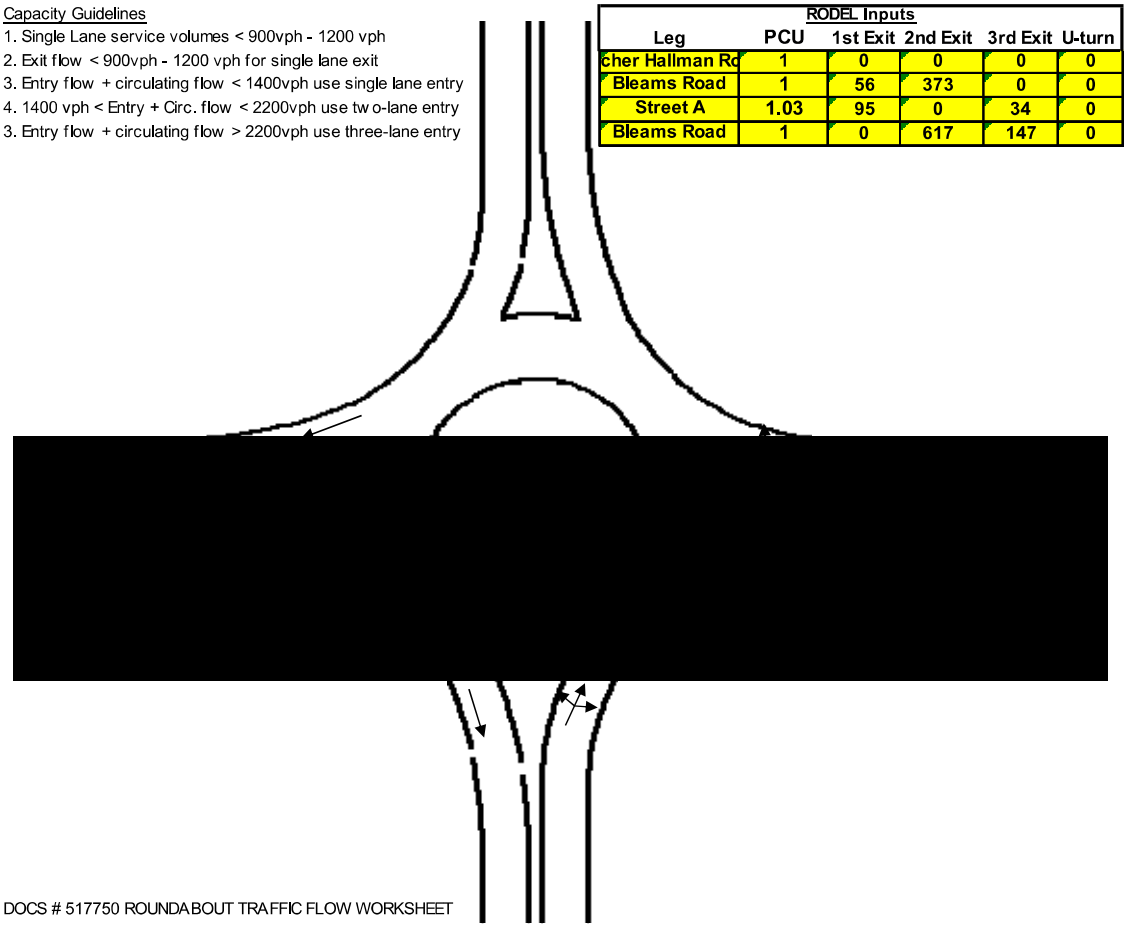


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

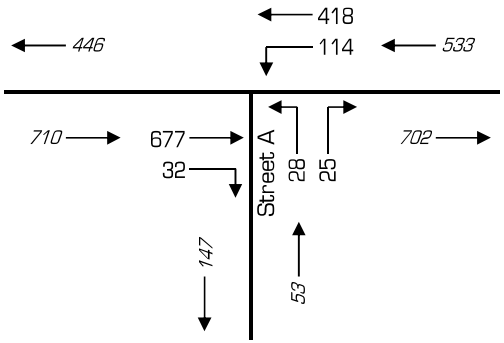
RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
cher Hallman Rd	1	0	0	0	0
Bleams Road	1	56	373	0	0
Street A	1.03	95	0	34	0
Bleams Road	1	0	617	147	0



Project North

AM Peak Hour



PM Peak Hour

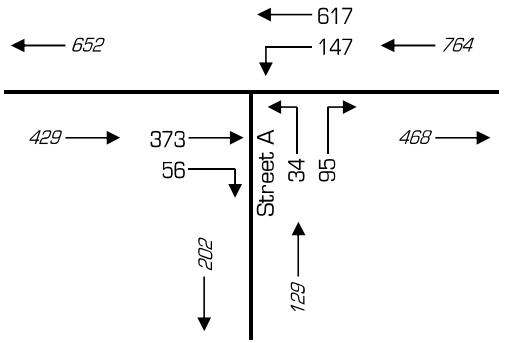


Figure IST4.1

2022 Volumes – Bleams Rd and Street A

REGION OF WATERLOO
ROUNDABOUT FEASIBILITY
INITIAL SCREENING TOOL VERSION 1.0

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a modern roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road improvements including auxiliary lanes, traffic control signals, four-way stop, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed to an Intersection Control Study to further investigate in more detail the feasibility of a roundabout.

1) Project Name/File No.:

   Williamsburg South & South Estates TIS

2) Intersection Location
   (Street/Road Names, distance from major intersection, etc.):

   Bleams Road & Commonwealth Street / Abram Clemens Street
   Next major intersection to the east is Fischer-Hallman Road & Bleams Road (400 m)
   Next major intersection to the west is Bleams Road & Trussler Road (2.7 km).

3) Brief Description of Intersection
   (Number of Legs, Lanes on each leg, total AADT, AADT on each road, etc. Attach or sketch diagram showing existing and horizon-year turning movements.):

   Forecast 2022 Turning Movement volumes attached

   Estimated 2022 AADT on Bleams Road is approximately 14700.
   Abram Clemens south leg is approximately 1200.
   Commonwealth Street is approximate 500.

4) What operational problems are being experienced at this location?

   None.

5) Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

Existing Intersection – Stop Control on Commonwealth. Abram Clemens St is new leg

6) Is the intersection in the vicinity of a railroad crossing *or another intersection?* If so, how close and what type of traffic control exists at the adjacent intersection(s)? Will queues be a problem?

Fischer-Hallman intersects with Bleams Road Road approximately 400 m to the east, which is planned to become a roundabout along with an upgrade to Fischer-Hallman to four lanes.
Queues are not forecasted to be a problem.

7) Would the intersection be located within a coordinated signal system?

no

8) Would the intersection be located on a Preferred Roundabout Corridor?

yes

9) Is the intersection located within a corridor that is scheduled for improvements in the 10 Year Transportation Capital Program? What is the ultimate cross-section of the approach roads?

No.

10) What is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed?

No collision problem.

11) Are persons with disabilities or horse and buggies frequent users of this intersection?

No

12) What traditional road improvements are proposed for this intersection? (eg. traffic signals, all-way stop, auxiliary lanes, etc.)

Westbound left-turn lanes.

13) If traffic control signals are being considered, are the traffic signal warrants met for the horizon year?

Not considered. Warrant not met.

14) What size of roundabout is being considered for this intersection? (eg. Single-lane, two-lane entry or three-lane entry?) Please attach a Traffic Flow Worksheet and lane configuration diagram. Please attach a sketch showing how a roundabout would "fit" into the right-of-way.

See - Traffic Flow Worksheet. Two lane entries on north, west and south legs. East leg to be determined when potential future development is planned. Proposed ICD = 55 m.

15) 20-Year Life Cycle Cost Estimate –

Injury Collision Cost (ICC): $30,000
Discount Rate: (i): 6%

20 YEAR LIFE-CYCLE COST COMPARISON		
Cost Item	**Other Traffic Control**	**Roundabout**
Implementation Cost	$250,000	$1,200,000
Injury Collision Cost (Present Value)	$478,875	$239,438
Total Life Cycle Cost	**X $728,875**	**Y $1,439,438**

Notes:

- Implementation Cost
  = sum of costs for construction, property utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%);
- Present Value of 20 Year Injury Collision Cost
  = expected annual collision frequency x ICC $((1 + i)^{20}-1) / i(1+i)^{20}$
- Monte Carlo Analysis may be required. If so, a range for the implementation cost (i.e. 10%, 50%, 90% probability) is required

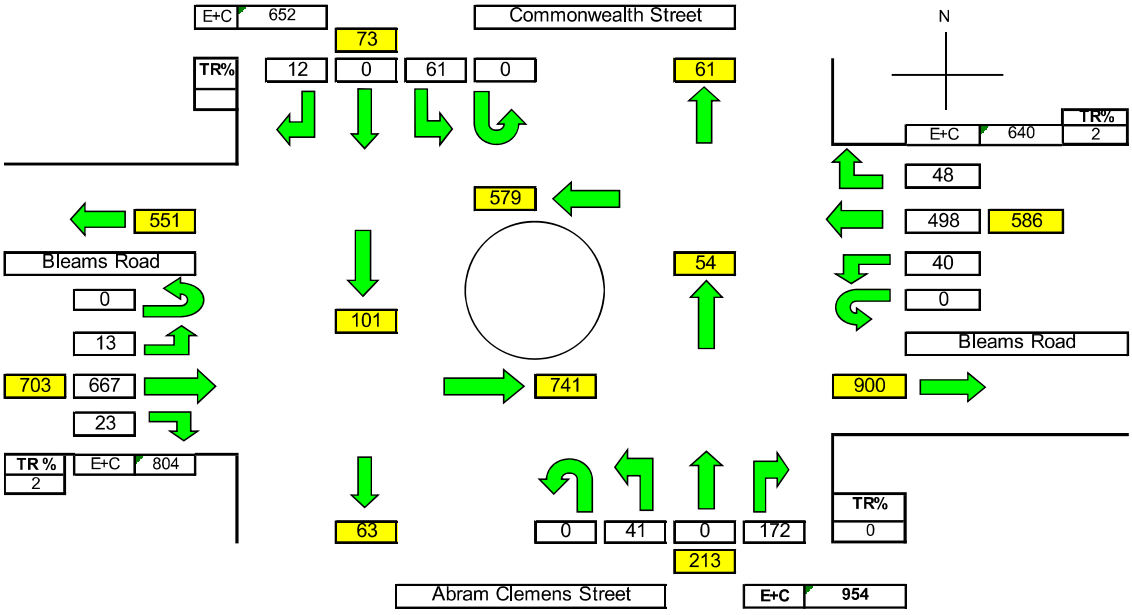
Conclusions and Recommendation

Roundabout not recommended

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.0 AUG 22, 2008

Project: Williamsburg S / S Estate **Drawn By:** Matt Brouwer
Project No.: 121270 **Sheet** 1 **of** 2
Intersection: Bleams Road & Abram Clemens / Commonwealth
Time Period: 2022 Total AM



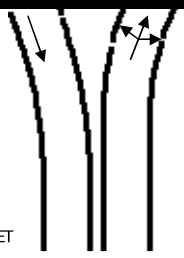
Capacity Guidelines

1. Single Lane service
2. Exit flow < 900vph -
3. Entry flow + circulati
4. 1400 vph < Entry + C
3. Entry flow + circulati

RODEL Inputs

	1st Exit	2nd Exit	3rd Exit	U-turn
	12	0	61	0
	23	667	13	0
	172	0	41	0
	48	498	40	0

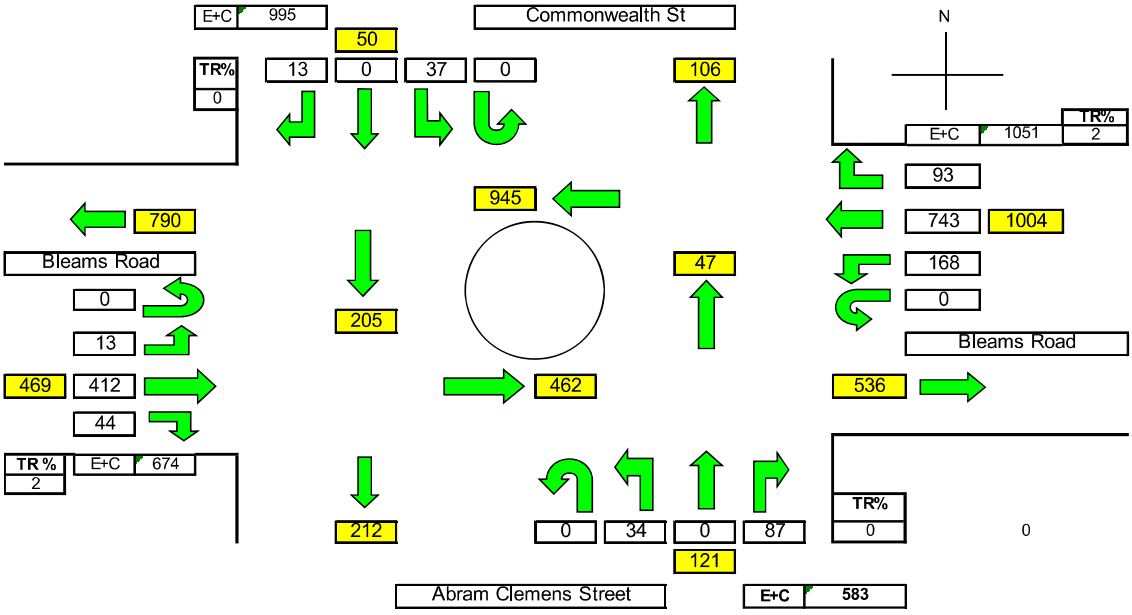
[redacted]



REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.0 AUG 22, 2008

Project: Williamsburg S / S Estate **Drawn By:** Matt Brouwer
Project No.: 121270 **Sheet** 2 **of** 2
Intersection: Bleams Road & Abram Clemens / Commonwealth
Time Period: 2022 Total PM



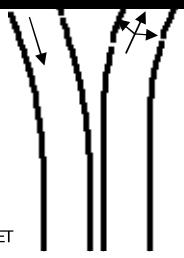
Capacity Guidelines

1. Single Lane service
2. Exit flow < 900vph -
3. Entry flow + circulati
4. 1400 vph < Entry + C
3. Entry flow + circulati

RODEL Inputs

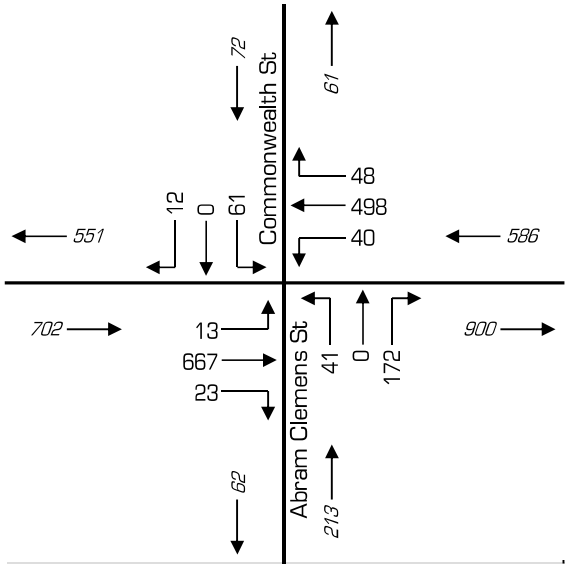
	1st Exit	2nd Exit	3rd Exit	U-turn
	13	0	37	0
	44	412	13	0
	87	0	34	0
	93	743	168	0

[redacted]



Project North

AM Peak Hour



PM Peak Hour

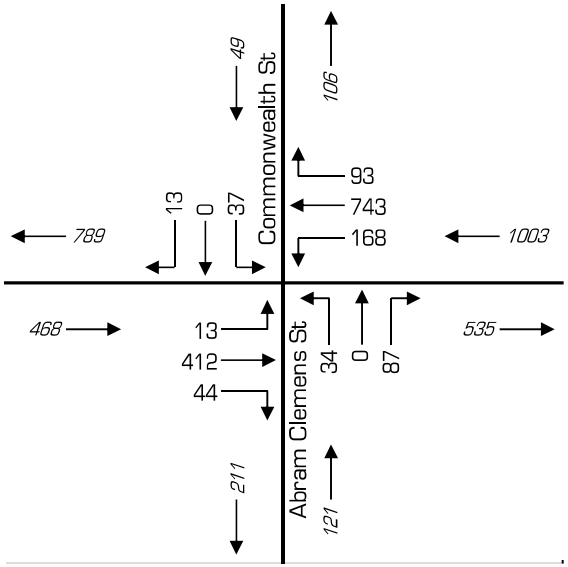


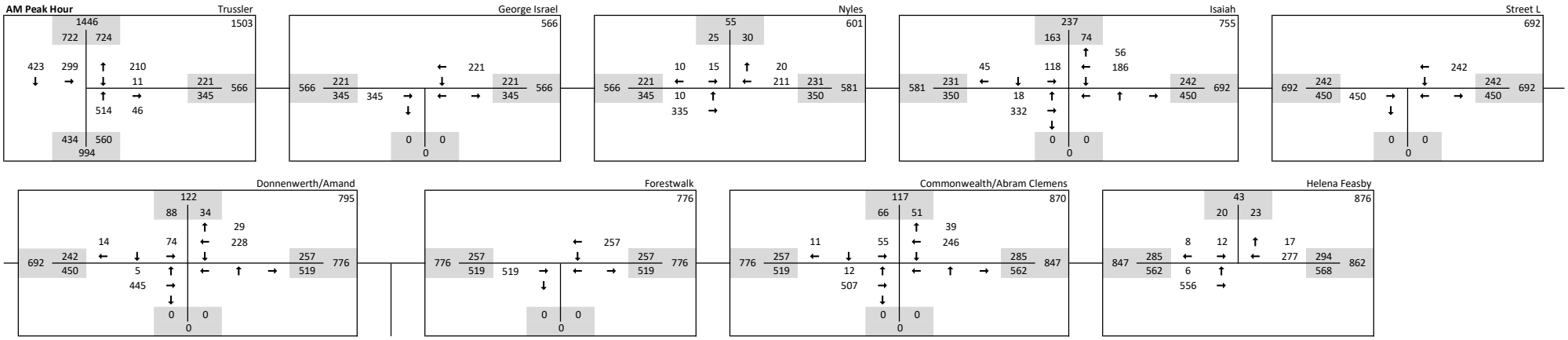
Figure IST3.1

2022 Volumes – Bleams Rd and Commonwealth St / Abram Clemens St

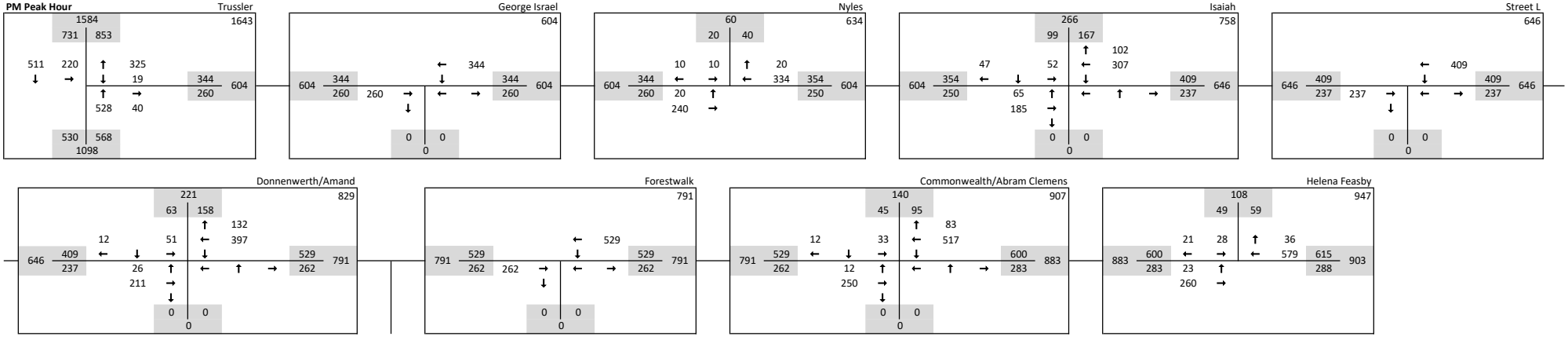
Appendix B: Synchro Traffic Analysis – Future Total

Base Traffic

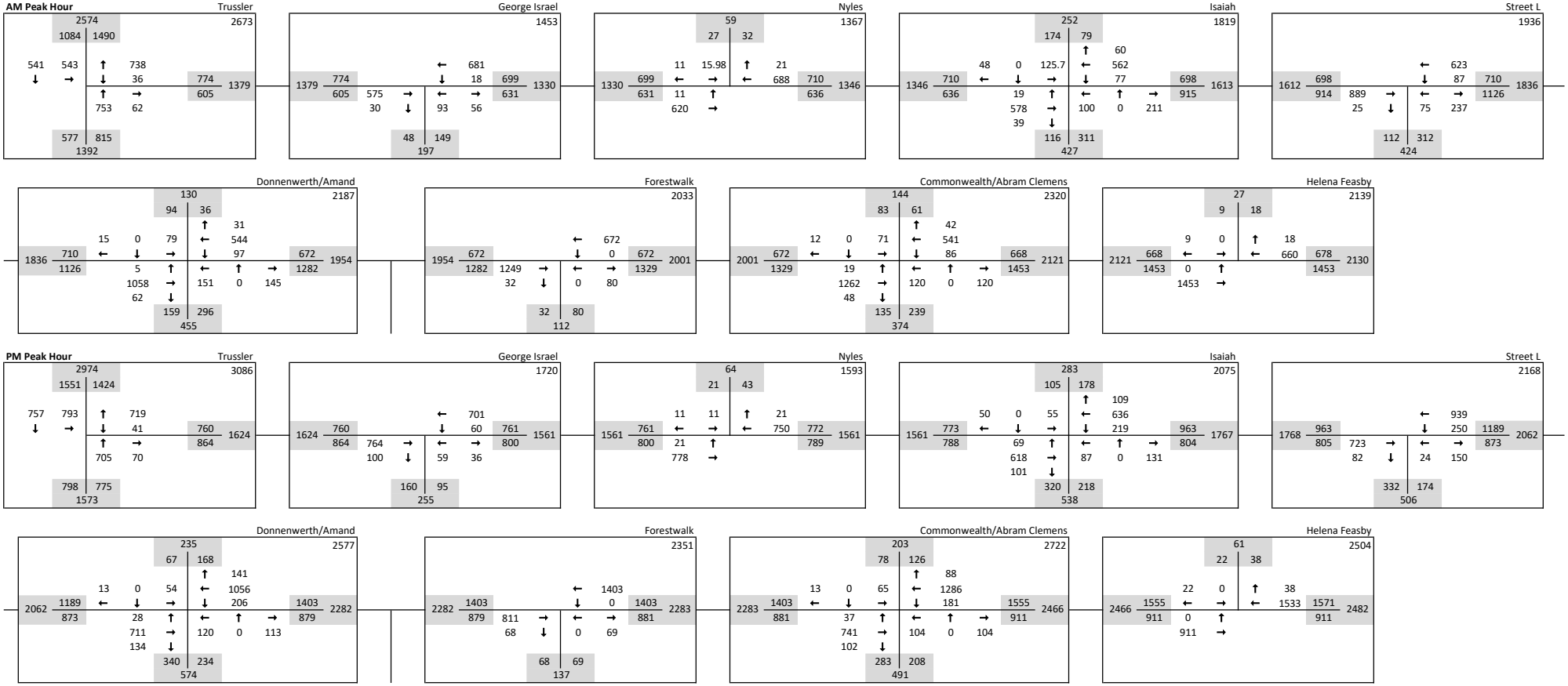
AM Peak Hour



PM Peak Hour



Future Total Traffic 2031





Lane Group	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	36	738	543	541	753	62
Future Volume (vph)	36	738	543	541	753	62
Ideal Flow (vphpl)	1775	1750	1775	1900	1900	1750
Storage Length (m)	30.0	0.0	110.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.6		7.6			
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1672	1475	3243	1883	1883	1475
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1672	1475	3243	1883	1883	1475
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		116				29
Link Speed (k/h)	60			80	80	
Link Distance (m)	337.1			536.2	1410.1	
Travel Time (s)	20.2			24.1	63.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	36	738	543	541	753	62
Shared Lane Traffic (%)						
Lane Group Flow (vph)	36	738	543	541	753	62
Turn Type	Prot	pt+ov	Prot	NA	NA	Perm
Protected Phases	8	8 1	1	6	2	
Permitted Phases						2
Detector Phase	8	8 1	1	6	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0		11.0	24.0	24.0	24.0
Total Split (s)	27.0		19.0	63.0	44.0	44.0
Total Split (%)	30.0%		21.1%	70.0%	48.9%	48.9%
Maximum Green (s)	21.0		13.0	57.0	38.0	38.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0		4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	23.0	42.0	15.0	57.4	38.3	38.3
Actuated g/C Ratio	0.26	0.48	0.17	0.65	0.43	0.43
v/c Ratio	0.08	0.97	0.99	0.44	0.92	0.09
Control Delay	26.2	47.1	73.9	9.0	42.3	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.2	47.1	73.9	9.0	42.3	9.5

Lane Group	WBL	WBR	SEL	SET	NWT	NWR
LOS	C	D	E	A	D	A
Approach Delay	46.2			41.5	39.8	
Approach LOS	D			D	D	
Queue Length 50th (m)	4.8	107.5	~49.2	40.0	116.6	3.1
Queue Length 95th (m)	12.0	#187.3	#81.8	59.5	#187.3	10.1
Internal Link Dist (m)	313.1			512.2	1386.1	
Turn Bay Length (m)	30.0		110.0			30.0
Base Capacity (vph)	435	762	550	1258	852	683
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.97	0.99	0.43	0.88	0.09

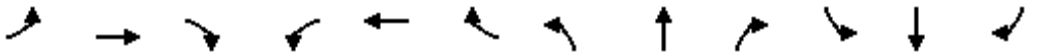
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 88.4			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.99			
Intersection Signal Delay: 42.3		Intersection LOS: D	
Intersection Capacity Utilization 95.9%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Trussler & Bleams



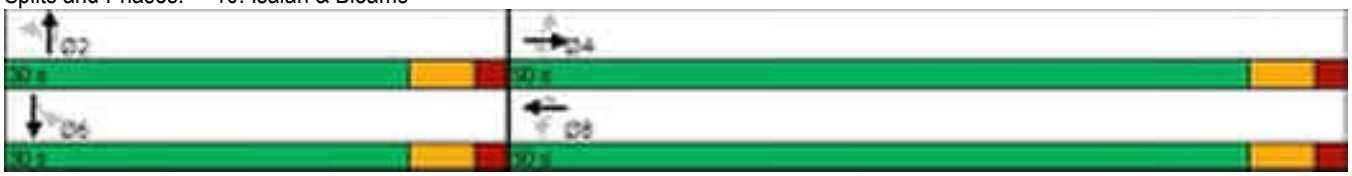


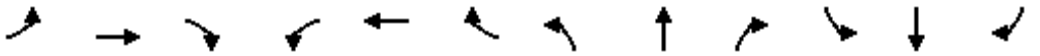
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Future Volume (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.963	
Flt Protected	0.950			0.950				0.950			0.965	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1428	0
Flt Permitted	0.338			0.325				0.698			0.723	
Satd. Flow (perm)	595	1883	1475	572	1883	1475	0	1142	1475	0	1070	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			56			211		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		209.7			579.9			229.9			213.8	
Travel Time (s)		12.6			34.8			16.6			15.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	578	39	77	562	60	0	100	211	0	174	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%	37.5%	
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0	44.0	24.0	24.0	24.0	24.0	24.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	23.4	23.4	23.4	23.4	23.4	23.4		13.9	13.9		13.9	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51	0.51		0.30	0.30		0.30	
v/c Ratio	0.06	0.60	0.05	0.26	0.59	0.08		0.29	0.36		0.49	
Control Delay	7.3	11.6	2.8	10.1	11.3	2.8		16.6	4.7		17.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	7.3	11.6	2.8	10.1	11.3	2.8		16.6	4.7		17.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	B	B	A		B	A		B	
Approach Delay		10.9			10.4			8.5			17.1	
Approach LOS		B			B			A			B	
Queue Length 50th (m)	0.6	26.5	0.0	2.8	25.5	0.2		5.3	0.0		7.4	
Queue Length 95th (m)	3.8	70.2	3.4	12.1	67.6	4.5		20.0	12.5		29.2	
Internal Link Dist (m)		185.7			555.9			205.9			189.8	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	543	1719	1350	522	1719	1351		696	981		668	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.03	0.34	0.03	0.15	0.33	0.04		0.14	0.22		0.26	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 45.9			
Natural Cycle: 50			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 10.9		Intersection LOS: B	
Intersection Capacity Utilization 66.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 10: Isaiah & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1058	62	97	544	31	151	0	145	79	0	15
Future Volume (vph)	5	1058	62	97	544	31	151	0	145	79	0	15
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950				0.950			0.960	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1443	0
Flt Permitted	0.405			0.121				0.732			0.613	
Satd. Flow (perm)	713	1883	1475	213	1883	1475	0	1197	1475	0	921	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			41			122		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		503.6			245.2			346.3			240.1	
Travel Time (s)		30.2			14.7			24.9			17.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1058	62	97	544	31	151	0	145	79	0	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1058	62	97	544	31	0	151	145	0	94	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	55.0	55.0	55.0	55.0	55.0	55.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	68.8%	68.8%	68.8%	68.8%	68.8%	68.8%	31.3%	31.3%	31.3%	31.3%	31.3%	
Maximum Green (s)	49.0	49.0	49.0	49.0	49.0	49.0	19.0	19.0	19.0	19.0	19.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	53.6	53.6	53.6	53.6	53.6	53.6		16.4	16.4		16.4	
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.21	0.21		0.21	
v/c Ratio	0.01	0.82	0.06	0.66	0.42	0.03		0.60	0.36		0.42	
Control Delay	5.2	17.1	2.8	36.9	7.3	1.5		37.4	9.5		21.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	5.2	17.1	2.8	36.9	7.3	1.5		37.4	9.5		21.2	

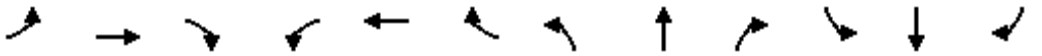
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	D	A	A		D	A		C	
Approach Delay		16.3			11.3			23.7			21.2	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	0.2	95.5	0.9	7.0	30.3	0.0		19.3	2.6		6.3	
Queue Length 95th (m)	1.4	#216.7	4.8	#37.6	56.7	2.1		36.9	15.7		18.9	
Internal Link Dist (m)		479.6			221.2			322.3			216.1	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	489	1293	1025	146	1293	1025		323	487		278	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.01	0.82	0.06	0.66	0.42	0.03		0.47	0.30		0.34	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 78
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 16.0 Intersection LOS: B
Intersection Capacity Utilization 84.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Amand/Donnenwerth & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	1262	48	86	541	42	120	0	120	71	0	12
Future Volume (vph)	19	1262	48	86	541	42	120	0	120	71	0	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	0.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.980	
Flt Protected	0.950			0.950				0.950			0.959	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1444	0
Flt Permitted	0.414			0.073				0.743			0.661	
Satd. Flow (perm)	728	1883	1475	128	1883	1475	0	1215	1475	0	995	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			42			82		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		324.0			232.5			369.9			194.8	
Travel Time (s)		19.4			14.0			26.6			14.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	19	1262	48	86	541	42	120	0	120	71	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	1262	48	86	541	42	0	120	120	0	83	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0	56.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0	50.0	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	54.9	54.9	54.9	54.9	54.9	54.9		14.7	14.7		14.7	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71		0.19	0.19		0.19	
v/c Ratio	0.04	0.95	0.05	0.96	0.41	0.04		0.52	0.35		0.38	
Control Delay	4.8	28.6	2.1	106.7	6.4	1.8		35.6	12.9		19.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	4.8	28.6	2.1	106.7	6.4	1.8		35.6	12.9		19.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	C	A	F	A	A		D	B		B	
Approach Delay		27.3			19.0			24.3			19.8	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	0.7	134.4	0.3	9.2	26.7	0.0		15.2	4.5		5.0	
Queue Length 95th (m)	3.1	#281.6	3.5	#28.6	53.9	3.0		30.1	16.9		16.5	
Internal Link Dist (m)		300.0			208.5			345.9			170.8	
Turn Bay Length (m)	30.0		30.0			30.0			30.0			
Base Capacity (vph)	515	1331	1055	90	1331	1055		313	441		287	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.04	0.95	0.05	0.96	0.41	0.04		0.38	0.27		0.29	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 77.6			
Natural Cycle: 110			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 24.3		Intersection LOS: C	
Intersection Capacity Utilization 93.9%		ICU Level of Service F	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 16: Abram Clemens/Commonwealth & Bleams





Lane Group	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	41	719	793	757	705	70
Future Volume (vph)	41	719	793	757	705	70
Ideal Flow (vphpl)	1775	1750	1775	1900	1900	1750
Storage Length (m)	30.0	0.0	110.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.6		7.6			
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1672	1475	3243	1883	1883	1475
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1672	1475	3243	1883	1883	1475
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		98				32
Link Speed (k/h)	60			80	80	
Link Distance (m)	337.1			536.2	1410.1	
Travel Time (s)	20.2			24.1	63.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	719	793	757	705	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	719	793	757	705	70
Turn Type	Prot	pt+ov	Prot	NA	NA	Perm
Protected Phases	8	8 1	1	6	2	
Permitted Phases						2
Detector Phase	8	8 1	1	6	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0		11.0	24.0	24.0	24.0
Total Split (s)	25.0		26.0	65.0	39.0	39.0
Total Split (%)	27.8%		28.9%	72.2%	43.3%	43.3%
Maximum Green (s)	19.0		20.0	59.0	33.0	33.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0		4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	21.0	47.0	22.0	61.0	35.0	35.0
Actuated g/C Ratio	0.23	0.52	0.24	0.68	0.39	0.39
v/c Ratio	0.11	0.88	1.00	0.59	0.96	0.12
Control Delay	28.1	30.8	67.7	10.2	53.9	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	30.8	67.7	10.2	53.9	11.6

Lane Group	WBL	WBR	SEL	SET	NWT	NWR
LOS	C	C	E	B	D	B
Approach Delay	30.7			39.6	50.1	
Approach LOS	C			D	D	
Queue Length 50th (m)	5.6	92.3	~70.9	61.5	116.6	4.0
Queue Length 95th (m)	13.7	#169.6	#108.7	91.1	#187.8	12.2
Internal Link Dist (m)	313.1			512.2	1386.1	
Turn Bay Length (m)	30.0		110.0			30.0
Base Capacity (vph)	390	817	792	1276	732	593
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.88	1.00	0.59	0.96	0.12

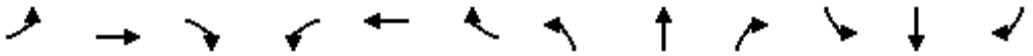
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 40.1		Intersection LOS: D	
Intersection Capacity Utilization 92.1%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Trussler & Bleams



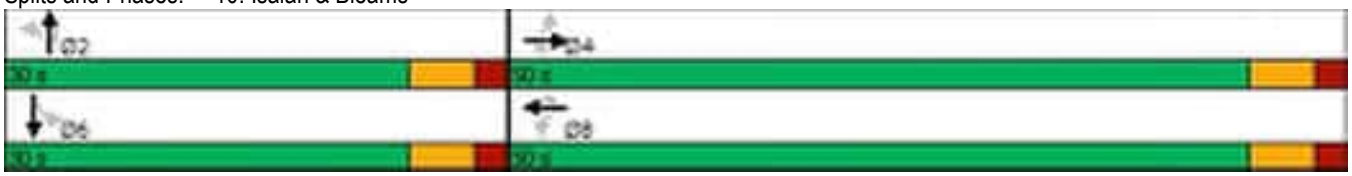


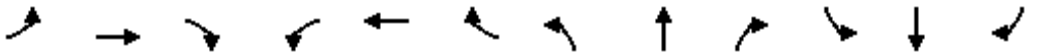
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Future Volume (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.936	
Flt Protected	0.950			0.950				0.950			0.974	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1401	0
Flt Permitted	0.351			0.362				0.771			0.790	
Satd. Flow (perm)	618	1883	1475	637	1883	1475	0	1261	1475	0	1136	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			90			131		50	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		209.7			579.9			229.9			213.8	
Travel Time (s)		12.6			34.8			16.6			15.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	618	101	219	636	109	0	87	131	0	105	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%	37.5%	
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0	44.0	24.0	24.0	24.0	24.0	24.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	35.8	35.8	35.8	35.8	35.8	35.8		12.2	12.2		12.1	
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.24	0.24		0.23	
v/c Ratio	0.16	0.47	0.10	0.50	0.49	0.10		0.29	0.29		0.35	
Control Delay	5.8	7.0	1.8	11.1	7.2	1.9		23.0	6.9		16.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	5.8	7.0	1.8	11.1	7.2	1.9		23.0	6.9		16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	A	A		C	A		B	
Approach Delay		6.3			7.5			13.3			16.0	
Approach LOS		A			A			B			B	
Queue Length 50th (m)	2.3	26.7	0.5	9.7	27.9	0.6		6.4	0.0		4.0	
Queue Length 95th (m)	8.0	59.0	4.8	32.3	61.5	5.2		20.7	11.8		18.1	
Internal Link Dist (m)		185.7			555.9			205.9			189.8	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	527	1606	1270	543	1606	1271		697	874		650	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.13	0.38	0.08	0.40	0.40	0.09		0.12	0.15		0.16	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 51.6			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 8.1		Intersection LOS: A	
Intersection Capacity Utilization 69.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 10: Isaiah & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	711	134	206	1056	141	120	0	113	54	0	13
Future Volume (vph)	28	711	134	206	1056	141	120	0	113	54	0	13
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.974	
Flt Protected	0.950			0.950				0.950			0.961	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1438	0
Flt Permitted	0.120			0.307				0.769			0.711	
Satd. Flow (perm)	211	1883	1475	540	1883	1475	0	1258	1475	0	1064	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			116			82			113		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		503.6			245.2			346.3			240.1	
Travel Time (s)		30.2			14.7			24.9			17.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	711	134	206	1056	141	120	0	113	54	0	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	711	134	206	1056	141	0	120	113	0	67	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	55.0	55.0	55.0	55.0	55.0	55.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	68.8%	68.8%	68.8%	68.8%	68.8%	68.8%	31.3%	31.3%	31.3%	31.3%	31.3%	
Maximum Green (s)	49.0	49.0	49.0	49.0	49.0	49.0	19.0	19.0	19.0	19.0	19.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	47.3	47.3	47.3	47.3	47.3	47.3		14.3	14.3		14.3	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68		0.21	0.21		0.21	
v/c Ratio	0.20	0.56	0.13	0.56	0.83	0.14		0.47	0.29		0.27	
Control Delay	9.3	8.5	1.8	14.5	16.7	2.7		31.4	7.4		15.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	9.3	8.5	1.8	14.5	16.7	2.7		31.4	7.4		15.4	

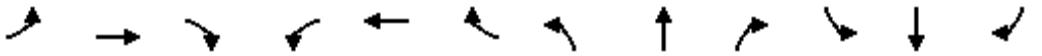
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A		C	A		B	
Approach Delay		7.5			15.0			19.7			15.4	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	1.1	39.4	0.6	11.5	82.8	2.1		14.9	0.0		3.0	
Queue Length 95th (m)	5.9	84.4	6.3	40.4	#215.8	8.9		29.3	11.2		12.3	
Internal Link Dist (m)		479.6			221.2			322.3			216.1	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	156	1397	1124	400	1397	1116		384	529		353	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.18	0.51	0.12	0.52	0.76	0.13		0.31	0.21		0.19	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 69.7			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 12.9		Intersection LOS: B	
Intersection Capacity Utilization 81.1%		ICU Level of Service D	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Amand/Donnenwerth & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	741	102	181	1286	88	104	0	104	65	0	13
Future Volume (vph)	37	741	102	181	1286	88	104	0	104	65	0	13
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	0.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.977	
Flt Protected	0.950			0.950				0.950			0.960	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1441	0
Flt Permitted	0.072			0.313				0.754			0.691	
Satd. Flow (perm)	127	1883	1475	551	1883	1475	0	1233	1475	0	1037	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			88			44			104		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		324.0			232.5			369.9			194.8	
Travel Time (s)		19.4			14.0			26.6			14.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	37	741	102	181	1286	88	104	0	104	65	0	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	37	741	102	181	1286	88	0	104	104	0	78	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0	56.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0	50.0	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	56.1	56.1	56.1	56.1	56.1	56.1		13.6	13.6		13.4	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76	0.76		0.18	0.18		0.18	
v/c Ratio	0.39	0.52	0.09	0.44	0.90	0.08		0.46	0.29		0.35	
Control Delay	22.3	7.3	1.7	9.9	22.7	2.8		33.4	8.0		19.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	22.3	7.3	1.7	9.9	22.7	2.8		33.4	8.0		19.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A	A	A	C	A		C	A		B	
Approach Delay		7.3			20.1			20.7			19.1	
Approach LOS		A			C			C			B	
Queue Length 50th (m)	1.7	40.1	0.5	8.8	133.4	1.5		13.0	0.0		4.4	
Queue Length 95th (m)	#16.8	85.7	5.2	29.6	#287.8	6.5		26.4	11.1		15.1	
Internal Link Dist (m)		300.0			208.5			345.9			170.8	
Turn Bay Length (m)	30.0		30.0			30.0			30.0			
Base Capacity (vph)	95	1421	1135	415	1421	1124		332	474		309	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.39	0.52	0.09	0.44	0.90	0.08		0.31	0.22		0.25	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 74.3			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 15.9		Intersection LOS: B	
Intersection Capacity Utilization 93.9%		ICU Level of Service F	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 16: Abram Clemens/Commonwealth & Bleams

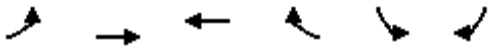




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	575	30	18	681	93	56
Future Volume (Veh/h)	575	30	18	681	93	56
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	575	30	18	681	93	56
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	337					
pX, platoon unblocked						
vC, conflicting volume			605		1292	575
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			605		1292	575
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		47	89
cM capacity (veh/h)			973		177	518

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	575	30	18	681	93	56
Volume Left	0	0	18	0	93	0
Volume Right	0	30	0	0	0	56
cSH	1700	1700	973	1700	177	518
Volume to Capacity	0.34	0.02	0.02	0.40	0.53	0.11
Queue Length 95th (m)	0.0	0.0	0.4	0.0	20.2	2.7
Control Delay (s)	0.0	0.0	8.8	0.0	46.1	12.8
Lane LOS			A		E	B
Approach Delay (s)	0.0		0.2		33.6	
Approach LOS					D	

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	48.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	620	688	21	16	11
Future Volume (Veh/h)	11	620	688	21	16	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	11	620	688	21	16	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			210			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	709				1340	698
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	482				1295	469
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				88	98
cM capacity (veh/h)	840				137	462

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	11	620	709	27
Volume Left	11	0	0	16
Volume Right	0	0	21	11
cSH	840	1700	1700	193
Volume to Capacity	0.01	0.36	0.42	0.14
Queue Length 95th (m)	0.3	0.0	0.0	3.6
Control Delay (s)	9.3	0.0	0.0	26.7
Lane LOS	A			D
Approach Delay (s)	0.2		0.0	26.7
Approach LOS				D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	889	25	87	623	75	237
Future Volume (Veh/h)	889	25	87	623	75	237
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	889	25	87	623	75	237
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			914		1698	902
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			914		1698	902
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		16	30
cM capacity (veh/h)			746		90	336

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	914	87	623	75	237
Volume Left	0	87	0	75	0
Volume Right	25	0	0	0	237
cSH	1700	746	1700	90	336
Volume to Capacity	0.54	0.12	0.37	0.84	0.70
Queue Length 95th (m)	0.0	3.0	0.0	34.0	38.6
Control Delay (s)	0.0	10.5	0.0	136.9	37.6
Lane LOS		B		F	E
Approach Delay (s)	0.0	1.3		61.5	
Approach LOS				F	

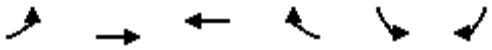
Intersection Summary			
Average Delay	10.4		
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1249	32	0	672	0	80
Future Volume (Veh/h)	1249	32	0	672	0	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1249	32	0	672	0	80
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	245			324		
pX, platoon unblocked			0.35		0.41	0.35
vC, conflicting volume			1281		1937	1265
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			882		1941	837
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	38
cM capacity (veh/h)			272		29	130

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1281	672	80
Volume Left	0	0	0
Volume Right	32	0	80
cSH	1700	1700	130
Volume to Capacity	0.75	0.40	0.62
Queue Length 95th (m)	0.0	0.0	24.2
Control Delay (s)	0.0	0.0	69.3
Lane LOS			F
Approach Delay (s)	0.0	0.0	69.3
Approach LOS			F

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1453	660	18	0	9
Future Volume (Veh/h)	0	1453	660	18	0	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1453	660	18	0	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		233				
pX, platoon unblocked						
vC, conflicting volume	678				1396	339
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	678				1396	339
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	910				132	657

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	726	726	440	238	9
Volume Left	0	0	0	0	0
Volume Right	0	0	0	18	9
cSH	1700	1700	1700	1700	657
Volume to Capacity	0.43	0.43	0.26	0.14	0.01
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	0.0	0.0	10.6
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.6
Approach LOS					B

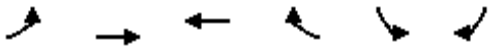
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	764	100	60	701	59	36
Future Volume (Veh/h)	764	100	60	701	59	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	764	100	60	701	59	36
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	337					
pX, platoon unblocked						
vC, conflicting volume			864		1585	764
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			864		1585	764
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		46	91
cM capacity (veh/h)			779		110	404

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	764	100	60	701	59	36
Volume Left	0	0	60	0	59	0
Volume Right	0	100	0	0	0	36
cSH	1700	1700	779	1700	110	404
Volume to Capacity	0.45	0.06	0.08	0.41	0.54	0.09
Queue Length 95th (m)	0.0	0.0	1.9	0.0	19.0	2.2
Control Delay (s)	0.0	0.0	10.0	0.0	70.5	14.8
Lane LOS			B		F	B
Approach Delay (s)	0.0		0.8		49.4	
Approach LOS					E	

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	778	750	21	11	11
Future Volume (Veh/h)	21	778	750	21	11	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	21	778	750	21	11	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			210			
pX, platoon unblocked	0.80				0.80	0.80
vC, conflicting volume	771				1580	760
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	590				1600	577
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				88	97
cM capacity (veh/h)	789				91	414

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	21	778	771	22
Volume Left	21	0	0	11
Volume Right	0	0	21	11
cSH	789	1700	1700	149
Volume to Capacity	0.03	0.46	0.45	0.15
Queue Length 95th (m)	0.6	0.0	0.0	3.8
Control Delay (s)	9.7	0.0	0.0	33.3
Lane LOS	A			D
Approach Delay (s)	0.3		0.0	33.3
Approach LOS				D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	723	82	250	939	24	150
Future Volume (Veh/h)	723	82	250	939	24	150
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	723	82	250	939	24	150
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			805		2203	764
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			805		2203	764
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			69		30	63
cM capacity (veh/h)			819		34	404

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	805	250	939	24	150
Volume Left	0	250	0	24	0
Volume Right	82	0	0	0	150
cSH	1700	819	1700	34	404
Volume to Capacity	0.47	0.31	0.55	0.70	0.37
Queue Length 95th (m)	0.0	9.8	0.0	18.5	12.8
Control Delay (s)	0.0	11.3	0.0	238.9	19.1
Lane LOS		B		F	C
Approach Delay (s)	0.0	2.4		49.4	
Approach LOS				E	

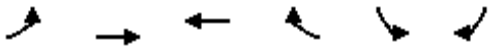
Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	811	68	0	1403	0	69
Future Volume (Veh/h)	811	68	0	1403	0	69
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	811	68	0	1403	0	69
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	245			324		
pX, platoon unblocked			0.77		0.42	0.77
vC, conflicting volume			879		2248	845
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			693		2046	649
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	81
cM capacity (veh/h)			694		26	362

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	879	1403	69
Volume Left	0	0	0
Volume Right	68	0	69
cSH	1700	1700	362
Volume to Capacity	0.52	0.83	0.19
Queue Length 95th (m)	0.0	0.0	5.3
Control Delay (s)	0.0	0.0	17.3
Lane LOS			C
Approach Delay (s)	0.0	0.0	17.3
Approach LOS			C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	911	1533	38	0	22
Future Volume (Veh/h)	0	911	1533	38	0	22
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	911	1533	38	0	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		233				
pX, platoon unblocked						
vC, conflicting volume	1571				2008	786
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1571				2008	786
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	416				52	335

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	456	456	1022	549	22
Volume Left	0	0	0	0	0
Volume Right	0	0	0	38	22
cSH	1700	1700	1700	1700	335
Volume to Capacity	0.27	0.27	0.60	0.32	0.07
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.6
Control Delay (s)	0.0	0.0	0.0	0.0	16.5
Lane LOS					C
Approach Delay (s)	0.0		0.0		16.5
Approach LOS					C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

Appendix C: Arcady Analysis – Future Total

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Trussler Rd.
Date: November 2021
Description: Single Lane

Drawn By: NPD
Sheet: 1 of 4

	Trussler		Trussler	Bleams
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	115		117	245
Level of Service (LOS)	F		F	F
Queue Length (m)	721		588	756
V/C Ratio	1.04		1.04	1.14
Overall Average Delay (s)	69			
Overall LOS	F			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	1355		87	174
Level of Service (LOS)	F		F	F
Queue Length (m)	N/A*		497	651
V/C Ratio	1.49		1.00	1.09
Overall Average Delay (s)	312			
Overall LOS	F			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	184		163	347
Level of Service (LOS)	F		F	F
Queue Length (m)	889		679	868
V/C Ratio	1.10		1.08	1.18
Overall Average Delay (s)	111			
Overall LOS	F			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	1689		119	252
Level of Service (LOS)	F		F	F
Queue Length (m)	N/A*		574	756
V/C Ratio	1.58		1.03	1.14
Overall Average Delay (s)	377			
Overall LOS	F			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

* unable to calculate queue

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Isaiah Dr.
Date: November 2021
Description: Single Lane

Drawn By: NPD
Sheet: 2 of 4

	Isaiah Dr.	Bleams Rd.	Isaiah Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	8	7	8
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.23	0.60	0.40	0.63
Overall Average Delay (s)	6			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	15	6	27
Level of Service (LOS)	A	B	A	D
Queue Length (m)	<14	63	<14	182
V/C Ratio	0.16	0.77	0.29	0.89
Overall Average Delay (s)	11			
Overall LOS	B			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	9	8	10
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	21
V/C Ratio	0.24	0.63	0.42	0.67
Overall Average Delay (s)	7			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	19	7	42
Level of Service (LOS)	A	C	A	E
Queue Length (m)	<14	105	<14	329
V/C Ratio	0.17	0.81	0.30	0.94
Overall Average Delay (s)	15			
Overall LOS	B			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 3 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Donnenwerth/Amand Dr.
Date: February 2023

	Donnenwrth	Bleams Rd.	Amand Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	118	12	8
Level of Service (LOS)	A	F	B	A
Queue Length (m)	<14	749	<14	14
V/C Ratio	0.13	1.05	0.52	0.62
Overall Average Delay (s)	29			
Overall LOS	D			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	19	7	607
Level of Service (LOS)	A	C	A	F
Queue Length (m)	<14	112	<14	>1400
V/C Ratio	0.12	0.83	0.32	1.29
Overall Average Delay (s)	167			
Overall LOS	F			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	187	13	10
Level of Service (LOS)	A	F	B	A
Queue Length (m)	<14	924	<14	14
V/C Ratio	0.13	1.11	0.52	0.65
Overall Average Delay (s)	51			
Overall LOS	F			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	25	7	804
Level of Service (LOS)	A	D	A	F
Queue Length (m)	<14	161	<14	>1400
V/C Ratio	0.12	0.87	0.33	1.36
Overall Average Delay (s)	216			
Overall LOS	F			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 4 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Commonwealth/Abram Clemens
Date: February 2023
Description: Single Lane

	Commonwlth	Bleams Rd	Abram Clemens	Bleams Rd
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	448	11	8
Level of Service (LOS)	A	F	B	A
Queue Length (m)	<14	>1400	<14	14
V/C Ratio	0.11	1.22	0.43	0.61
Overall Average Delay (s)	131			
Overall LOS	F			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	18	7	1025
Level of Service (LOS)	A	C	A	F
Queue Length (m)	<14	112	<14	>1400
V/C Ratio	0.14	0.83	0.29	1.42
Overall Average Delay (s)	268			
Overall LOS	F			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	622	11	9
Level of Service (LOS)	A	F	B	A
Queue Length (m)	<14	>1400	<14	14
V/C Ratio	0.12	1.29	0.43	0.64
Overall Average Delay (s)	178			
Overall LOS	F			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	25	7	1319
Level of Service (LOS)	A	C	A	F
Queue Length (m)	<14	154	<14	>1400
V/C Ratio	0.14	0.87	0.31	1.50
Overall Average Delay (s)	323			
Overall LOS	F			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Trussler Rd.
Date: November 2021
Description: Dual Lane North/South - Single Lane East/West

Drawn By: NPD
Sheet: 1 of 4

	Trussler		Trussler	Bleams
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	3		4	4
Level of Service (LOS)	A		A	A
Queue Length (m)	<14		<14	<14
V/C Ratio	0.52		0.47	0.49
Overall Average Delay (s)	3			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7		4	4
Level of Service (LOS)	A		A	A
Queue Length (m)	35		<14	<14
V/C Ratio	0.75		0.50	0.47
Overall Average Delay (s)	4			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	4		4	5
Level of Service (LOS)	A		A	A
Queue Length (m)	<14		<14	<14
V/C Ratio	0.55		0.50	0.52
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8		5	4
Level of Service (LOS)	A		A	A
Queue Length (m)	49		<14	<14
V/C Ratio	0.79		0.53	0.50
Overall Average Delay (s)	5			
Overall LOS	A			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Isaiah Dr.
Date: November 2021
Description: Dual Lane East/West - Single Lane North/South

Drawn By: NPD
Sheet: 2 of 4

	Isaiah Dr.	Bleams Rd.	Isaiah Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	3	9	3
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.26	0.32	0.46	0.35
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8	3	8	3
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.19	0.41	0.33	0.48
Overall Average Delay (s)	3			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	3	10	3
Level of Service (LOS)	A	A	B	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.27	0.34	0.48	0.37
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8	3	8	4
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.20	0.43	0.34	0.51
Overall Average Delay (s)	4			
Overall LOS	A			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 3 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Donnenwerth/Amand Dr.
Date: February 2023

	Donnenwrth	Bleams Rd.	Amand Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	4	14	3
Level of Service (LOS)	A	A	B	A
Queue Length (m)	<14	<14	14	<14
V/C Ratio	0.13	0.57	0.54	0.34
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	10	3	7	6
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	28
V/C Ratio	0.16	0.45	0.32	0.68
Overall Average Delay (s)	4			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	5	16	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	14	14	<14
V/C Ratio	0.13	0.60	0.58	0.36
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	11	4	7	7
Level of Service (LOS)	B	A	A	A
Queue Length (m)	<14	<14	<14	28
V/C Ratio	0.17	0.48	0.33	0.74
Overall Average Delay (s)	5			
Overall LOS	A			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 4 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Commonsealth/Abram Clemens
Date: February 2023

	Commonwlth	Bleams Rd	Abram Clemens	Bleams Rd
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	5	18	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	21	14	<14
V/C Ratio	0.11	0.67	0.56	0.33
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	15	3	7	8
Level of Service (LOS)	B	A	A	A
Queue Length (m)	<14	<14	<14	35
V/C Ratio	0.25	0.46	0.29	0.78
Overall Average Delay (s)	5			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	6	21	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	28	21	<14
V/C Ratio	0.12	0.70	0.59	0.35
Overall Average Delay (s)	5			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	16	4	7	10
Level of Service (LOS)	C	A	A	A
Queue Length (m)	<14	<14	<14	84
V/C Ratio	0.27	0.48	0.31	0.82
Overall Average Delay (s)	6			
Overall LOS	A			

Notes:
- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

Trussler Road & Bleams Road Roundabout Capacity Analysis

Version: 7.1.1.245 [9th June 2011]
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File: Q:\47727\100\ICS\Arcady\Bleams & Trussler.arc7
Report generation date: 5/12/2022 8:53:50 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
	95% - 2031							
Trussler SB	1.14	3.45	0.52	A	3.06	6.55	0.75	A
Trussler NB	0.93	3.75	0.47	A	1.03	4.39	0.50	A
Bleams WB	1.00	4.23	0.49	A	0.93	4.00	0.47	A
	90% - 2031							
Trussler SB	1.28	3.88	0.55	A	3.84	8.26	0.79	A
Trussler NB	1.03	4.17	0.50	A	1.15	4.90	0.53	A
Bleams WB	1.11	4.72	0.52	A	1.03	4.44	0.50	A
	95% - Single Lane - 2031							
Trussler SB	40.15	114.66	1.04	F	432.72	1355.32	1.49	F
Trussler NB	30.27	117.14	1.04	F	20.15	86.63	1.00	F
Bleams WB	58.25	245.10	1.14	F	43.39	173.51	1.09	F
	90% - Single Lane - 2031							
Trussler SB	65.86	184.06	1.10	F	517.23	1689.08	1.58	F
Trussler NB	43.26	162.87	1.08	F	28.99	119.33	1.03	F
Bleams WB	72.73	347.16	1.18	F	58.44	252.38	1.14	F

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	MTEDOMAIN\NDuimering
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCU	PCU	perHour	s	-Min	perMin

A2 - 95% - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95%		Yes		(D1)		100.000	95.000	10 Year Horizon - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)

Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	816.09	816.09	N/A	N/A
1	**Trussler NB**	613.57	613.57	N/A	N/A

1	Bleams WB	582.71	582.71	N/A	N/A
2	Trussler SB	974.49	974.49	N/A	N/A
2	Trussler NB	732.67	732.67	N/A	N/A
2	Bleams WB	695.81	695.81	N/A	N/A
3	Trussler SB	1193.51	1193.51	N/A	N/A
3	Trussler NB	897.33	897.33	N/A	N/A
3	Bleams WB	852.19	852.19	N/A	N/A
4	Trussler SB	1193.51	1193.51	N/A	N/A
4	Trussler NB	897.33	897.33	N/A	N/A
4	Bleams WB	852.19	852.19	N/A	N/A
5	Trussler SB	974.49	974.49	N/A	N/A
5	Trussler NB	732.67	732.67	N/A	N/A
5	Bleams WB	695.81	695.81	N/A	N/A
6	Trussler SB	816.09	816.09	N/A	N/A
6	Trussler NB	613.57	613.57	N/A	N/A
6	Bleams WB	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	0.52	3.45	1.14	A	994.70	1492.05	74.43	2.99	0.83	74.44	2.99	0.723	2436.345
Trussler NB	0.47	3.75	0.93	A	747.86	1121.79	59.70	3.19	0.66	59.71	3.19	0.723	2436.345
Bleams WB	0.49	4.23	1.00	A	710.24	1065.35	62.12	3.50	0.69	62.12	3.50	0.723	2436.345
						3679.19	196.25	3.2004					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	813.79	1119.11	27.02	0.00	2295.97	2271.67	0.355	0.00	0.58
Trussler NB	613.57	153.39	611.77	433.16	407.64	0.00	2034.56	1532.99	0.302	0.00	0.45
Bleams WB	582.71	145.68	580.89	454.18	565.23	0.00	1926.33	1341.76	0.303	0.00	0.45

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	973.71	1339.11	32.33	0.00	2292.32	2271.67	0.425	0.58	0.77
Trussler NB	732.67	183.17	732.02	518.29	487.75	0.00	1979.54	1532.99	0.370	0.45	0.61
Bleams WB	695.81	173.95	695.11	543.44	676.33	0.00	1850.02	1341.76	0.376	0.45	0.63

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1192.05	1639.07	39.57	0.00	2287.35	2271.67	0.522	0.77	1.14
Trussler NB	897.33	224.33	896.07	634.49	597.12	0.00	1904.42	1532.99	0.471	0.61	0.93
Bleams WB	852.19	213.05	850.74	665.29	827.91	0.00	1745.92	1341.76	0.488	0.63	0.99

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1193.49	1641.59	39.64	0.00	2287.31	2271.67	0.522	1.14	1.14
Trussler NB	897.33	224.33	897.32	635.28	597.85	0.00	1903.93	1532.99	0.471	0.93	0.93
Bleams WB	852.19	213.05	852.17	666.11	829.05	0.00	1745.13	1341.76	0.488	0.99	1.00

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	975.94	1342.90	32.43	0.00	2292.25	2271.67	0.425	1.14	0.78
Trussler NB	732.67	183.17	733.91	519.50	488.87	0.00	1978.77	1532.99	0.370	0.93	0.62
Bleams WB	695.81	173.95	697.25	544.70	678.08	0.00	1848.82	1341.76	0.376	1.00	0.64

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	816.89	1123.80	27.14	0.00	2295.89	2271.67	0.355	0.78	0.58

Trussler NB	613.57	153.39	614.23	434.83	409.20	0.00	2033.49	1532.99	0.302	0.62	0.46
Bleams WB	582.71	145.68	583.43	455.92	567.51	0.00	1924.76	1341.76	0.303	0.64	0.46

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	8.48	0.57	2.547	A	A
Trussler NB	6.65	0.44	2.653	A	A
Bleams WB	6.67	0.44	2.806	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	11.40	0.76	2.865	A	A
Trussler NB	9.06	0.60	3.028	A	A
Bleams WB	9.28	0.62	3.271	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	16.67	1.11	3.446	A	A
Trussler NB	13.62	0.91	3.743	A	A
Bleams WB	14.51	0.97	4.215	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	17.09	1.14	3.454	A	A
Trussler NB	13.96	0.93	3.754	A	A
Bleams WB	14.93	1.00	4.232	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	11.93	0.80	2.876	A	A
Trussler NB	9.48	0.63	3.038	A	A
Bleams WB	9.76	0.65	3.285	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	8.85	0.59	2.558	A	A
Trussler NB	6.93	0.46	2.664	A	A
Bleams WB	6.98	0.47	2.821	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Trussler NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.77	0.00	0.00	0.00	1.05			N/A	N/A
Trussler NB	0.61	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.99	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.00	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	816.09	2295.97	0.355	0.00	0.00	0.58	8.48	(0.00)	2.547
1	Trussler NB	613.57	2034.56	0.302	0.00	0.00	0.45	6.65	(0.00)	2.653
1	Bleams WB	582.71	1926.33	0.303	0.00	0.00	0.45	6.67	(0.00)	2.806
2	Trussler SB	974.49	2292.32	0.425	0.00	0.58	0.77	11.40	(0.00)	2.865
2	Trussler NB	732.67	1979.54	0.370	0.00	0.45	0.61	9.06	(0.00)	3.028
2	Bleams WB	695.81	1850.02	0.376	0.00	0.45	0.63	9.28	(0.00)	3.271
3	Trussler SB	1193.51	2287.35	0.522	0.00	0.77	1.14	16.67	(0.00)	3.446
3	Trussler NB	897.33	1904.42	0.471	0.00	0.61	0.93	13.62	(0.00)	3.743
3	Bleams WB	852.19	1745.92	0.488	0.00	0.63	0.99	14.51	(0.00)	4.215
4	Trussler SB	1193.51	2287.31	0.522	0.00	1.14	1.14	17.09	(0.00)	3.454
4	Trussler NB	897.33	1903.93	0.471	0.00	0.93	0.93	13.96	(0.00)	3.754
4	Bleams WB	852.19	1745.13	0.488	0.00	0.99	1.00	14.93	(0.00)	4.232
5	Trussler SB	974.49	2292.25	0.425	0.00	1.14	0.78	11.93	(0.00)	2.876
5	Trussler NB	732.67	1978.77	0.370	0.00	0.93	0.62	9.48	(0.00)	3.038
5	Bleams WB	695.81	1848.82	0.376	0.00	1.00	0.64	9.76	(0.00)	3.285
6	Trussler SB	816.09	2295.89	0.355	0.00	0.78	0.58	8.85	(0.00)	2.558
6	Trussler NB	613.57	2033.49	0.302	0.00	0.62	0.46	6.93	(0.00)	2.664
6	Bleams WB	582.71	1924.76	0.303	0.00	0.64	0.46	6.98	(0.00)	2.821

A2 - 95% - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95%		Yes		(D1)		100.000	95.000	10 Year Horizon - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	1166.92	1166.92	N/A	N/A
1	Trussler NB	583.46	583.46	N/A	N/A
1	Bleams WB	572.17	572.17	N/A	N/A
2	Trussler SB	1393.42	1393.42	N/A	N/A
2	Trussler NB	696.71	696.71	N/A	N/A
2	Bleams WB	683.22	683.22	N/A	N/A
3	Trussler SB	1706.58	1706.58	N/A	N/A
3	Trussler NB	853.29	853.29	N/A	N/A
3	Bleams WB	836.78	836.78	N/A	N/A
4	Trussler SB	1706.58	1706.58	N/A	N/A
4	Trussler NB	853.29	853.29	N/A	N/A
4	Bleams WB	836.78	836.78	N/A	N/A
5	Trussler SB	1393.42	1393.42	N/A	N/A
5	Trussler NB	696.71	696.71	N/A	N/A
5	Bleams WB	683.22	683.22	N/A	N/A
6	Trussler SB	1166.92	1166.92	N/A	N/A
6	Trussler NB	583.46	583.46	N/A	N/A
6	Bleams WB	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	0.75	6.55	3.06	A	1422.31	2133.46	170.32	4.79	1.89	170.34	4.79	0.723	2436.345
Trussler NB	0.50	4.39	1.03	A	711.15	1066.73	63.88	3.59	0.71	63.88	3.59	0.723	2436.345
Bleams WB	0.47	4.00	0.93	A	697.39	1046.08	58.45	3.35	0.65	58.45	3.35	0.723	2436.345
						4246.27	292.65	4.1352					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1162.60	1068.74	30.77	0.00	2293.39	2263.94	0.509	0.00	1.08
Trussler NB	583.46	145.87	581.62	598.57	594.80	0.00	1906.02	1519.03	0.306	0.00	0.46
Bleams WB	572.17	143.04	570.43	647.34	529.08	0.00	1951.15	1365.48	0.293	0.00	0.43

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1391.28	1278.87	36.82	0.00	2289.24	2263.94	0.609	1.08	1.61
Trussler NB	696.71	174.18	695.98	716.31	711.80	0.00	1825.66	1519.03	0.382	0.46	0.64
Bleams WB	683.22	170.81	682.57	774.66	633.11	0.00	1879.70	1365.48	0.363	0.43	0.60

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1700.95	1565.23	45.07	0.00	2283.57	2263.93	0.747	1.61	3.02
Trussler NB	853.29	213.32	851.76	875.79	870.23	0.00	1716.85	1519.03	0.497	0.64	1.03
Bleams WB	836.78	209.19	835.47	947.16	774.82	0.00	1782.38	1365.48	0.469	0.60	0.92

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1706.42	1567.81	45.14	0.00	2283.52	2263.93	0.747	3.02	3.06
Trussler NB	853.29	213.32	853.26	878.53	873.03	0.00	1714.93	1519.03	0.498	1.03	1.03
Bleams WB	836.78	209.19	836.76	950.10	776.20	0.00	1781.43	1365.48	0.470	0.92	0.93

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1399.06	1282.75	36.93	0.00	2289.17	2263.94	0.609	3.06	1.65
Trussler NB	696.71	174.18	698.23	720.21	715.78	0.00	1822.93	1519.03	0.382	1.03	0.65
Bleams WB	683.22	170.81	684.51	778.84	635.17	0.00	1878.29	1365.48	0.364	0.93	0.60

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1169.15	1073.37	30.90	0.00	2293.30	2263.94	0.509	1.65	1.10
Trussler NB	583.46	145.87	584.21	601.90	598.15	0.00	1903.72	1519.03	0.306	0.65	0.47
Bleams WB	572.17	143.04	572.83	650.92	531.44	0.00	1949.53	1365.48	0.293	0.60	0.44

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	15.74	1.05	3.331	A	A
Trussler NB	6.78	0.45	2.850	A	A
Bleams WB	6.39	0.43	2.734	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	23.52	1.57	4.199	A	A
Trussler NB	9.49	0.63	3.344	A	A
Bleams WB	8.80	0.59	3.156	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	42.83	2.86	6.425	A	A
Trussler NB	15.01	1.00	4.361	A	A
Bleams WB	13.50	0.90	3.986	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	45.70	3.05	6.545	A	A
Trussler NB	15.48	1.03	4.386	A	A
Bleams WB	13.86	0.92	4.001	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	25.70	1.71	4.272	A	A
Trussler NB	10.01	0.67	3.364	A	A
Bleams WB	9.23	0.62	3.169	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	16.83	1.12	3.371	A	A
Trussler NB	7.10	0.47	2.867	A	A
Bleams WB	6.67	0.44	2.746	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.61	0.00	0.00	3.15	5.25			N/A	N/A
Trussler NB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.02	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.65	0.00	0.00	3.15	4.20			N/A	N/A
Trussler NB	0.65	0.00	0.00	0.00	>199			N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.10	0.00	0.00	2.10	3.15			N/A	N/A
Trussler NB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	1166.92	2293.39	0.509	0.00	0.00	1.08	15.74	(0.00)	3.331
1	Trussler NB	583.46	1906.02	0.306	0.00	0.00	0.46	6.78	(0.00)	2.850
1	Bleams WB	572.17	1951.15	0.293	0.00	0.00	0.43	6.39	(0.00)	2.734
2	Trussler SB	1393.42	2289.24	0.609	0.00	1.08	1.61	23.52	(0.00)	4.199
2	Trussler NB	696.71	1825.66	0.382	0.00	0.46	0.64	9.49	(0.00)	3.344
2	Bleams WB	683.22	1879.70	0.363	0.00	0.43	0.60	8.80	(0.00)	3.156
3	Trussler SB	1706.58	2283.57	0.747	0.00	1.61	3.02	42.83	(0.00)	6.425
3	Trussler NB	853.29	1716.85	0.497	0.00	0.64	1.03	15.01	(0.00)	4.361
3	Bleams WB	836.78	1782.38	0.469	0.00	0.60	0.92	13.50	(0.00)	3.986
4	Trussler SB	1706.58	2283.52	0.747	0.00	3.02	3.06	45.70	(0.00)	6.545
4	Trussler NB	853.29	1714.93	0.498	0.00	1.03	1.03	15.48	(0.00)	4.386
4	Bleams WB	836.78	1781.43	0.470	0.00	0.92	0.93	13.86	(0.00)	4.001
5	Trussler SB	1393.42	2289.17	0.609	0.00	3.06	1.65	25.70	(0.00)	4.272
5	Trussler NB	696.71	1822.93	0.382	0.00	1.03	0.65	10.01	(0.00)	3.364
5	Bleams WB	683.22	1878.29	0.364	0.00	0.93	0.60	9.23	(0.00)	3.169
6	Trussler SB	1166.92	2293.30	0.509	0.00	1.65	1.10	16.83	(0.00)	3.371
6	Trussler NB	583.46	1903.72	0.306	0.00	0.65	0.47	7.10	(0.00)	2.867
6	Bleams WB	572.17	1949.53	0.293	0.00	0.60	0.44	6.67	(0.00)	2.746

A3 - 90% - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90%		Yes		(D1)		100.000	90.000	Opening Day - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	816.09	816.09	N/A	N/A
1	**Trussler NB**	613.57	613.57	N/A	N/A
1	**Bleams WB**	582.71	582.71	N/A	N/A
2	**Trussler SB**	974.49	974.49	N/A	N/A
2	**Trussler NB**	732.67	732.67	N/A	N/A
2	**Bleams WB**	695.81	695.81	N/A	N/A
3	**Trussler SB**	1193.51	1193.51	N/A	N/A
3	**Trussler NB**	897.33	897.33	N/A	N/A
3	**Bleams WB**	852.19	852.19	N/A	N/A
4	**Trussler SB**	1193.51	1193.51	N/A	N/A
4	**Trussler NB**	897.33	897.33	N/A	N/A
4	**Bleams WB**	852.19	852.19	N/A	N/A
5	**Trussler SB**	974.49	974.49	N/A	N/A
5	**Trussler NB**	732.67	732.67	N/A	N/A
5	**Bleams WB**	695.81	695.81	N/A	N/A
6	**Trussler SB**	816.09	816.09	N/A	N/A
6	**Trussler NB**	613.57	613.57	N/A	N/A
6	**Bleams WB**	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
From		**1**	**2**	**3**

	1	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	0.55	3.88	1.28	A	994.70	1492.05	82.40	3.31	0.92	82.40	3.31	0.723	2436.345
Trussler NB	0.50	4.17	1.03	A	747.86	1121.79	65.48	3.50	0.73	65.48	3.50	0.723	2436.345
Bleams WB	0.52	4.72	1.11	A	710.24	1065.35	68.27	3.84	0.76	68.27	3.85	0.723	2436.345
						3679.19	216.15	3.525					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	813.58	1118.83	27.01	0.00	2175.14	2153.48	0.375	0.00	0.63
Trussler NB	613.57	153.39	611.62	433.05	407.54	0.00	1927.54	1490.83	0.318	0.00	0.49
Bleams WB	582.71	145.68	580.75	454.07	565.09	0.00	1825.03	1296.49	0.319	0.00	0.49

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	973.61	1338.96	32.33	0.00	2171.68	2153.48	0.449	0.63	0.85
Trussler NB	732.67	183.17	731.94	518.23	487.70	0.00	1875.39	1490.83	0.391	0.49	0.67
Bleams WB	695.81	173.95	695.02	543.38	676.26	0.00	1752.70	1296.49	0.397	0.49	0.69

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1191.80	1638.70	39.56	0.00	2166.97	2153.48	0.551	0.85	1.28
Trussler NB	897.33	224.33	895.89	634.36	597.00	0.00	1804.27	1490.83	0.497	0.67	1.03
Bleams WB	852.19	213.05	850.52	665.15	827.74	0.00	1654.14	1296.49	0.515	0.69	1.10

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1193.48	1641.58	39.64	0.00	2166.92	2153.48	0.551	1.28	1.28
Trussler NB	897.33	224.33	897.31	635.28	597.84	0.00	1803.72	1490.83	0.497	1.03	1.03
Bleams WB	852.19	213.05	852.16	666.10	829.05	0.00	1653.29	1296.49	0.515	1.10	1.11

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	976.18	1343.28	32.44	0.00	2171.60	2153.48	0.449	1.28	0.86
Trussler NB	732.67	183.17	734.10	519.63	488.99	0.00	1874.55	1490.83	0.391	1.03	0.68
Bleams WB	695.81	173.95	697.47	544.84	678.25	0.00	1751.40	1296.49	0.397	1.11	0.70

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	817.00	1123.95	27.14	0.00	2175.05	2153.48	0.375	0.86	0.63
Trussler NB	613.57	153.39	614.31	434.89	409.25	0.00	1926.43	1490.83	0.319	0.68	0.49
Bleams WB	582.71	145.68	583.51	455.99	567.58	0.00	1823.41	1296.49	0.320	0.70	0.50

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	9.22	0.61	2.772	A	A
Trussler NB	7.18	0.48	2.869	A	A
Bleams WB	7.20	0.48	3.028	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	12.52	0.83	3.154	A	A
Trussler NB	9.87	0.66	3.304	A	A
Bleams WB	10.11	0.67	3.572	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	18.65	1.24	3.869	A	A
Trussler NB	15.06	1.00	4.154	A	A
Bleams WB	16.09	1.07	4.694	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

Trussler SB	19.18	1.28	3.882	A	A
Trussler NB	15.49	1.03	4.170	A	A
Bleams WB	16.62	1.11	4.718	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	13.17	0.88	3.165	A	A
Trussler NB	10.38	0.69	3.320	A	A
Bleams WB	10.69	0.71	3.591	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	9.66	0.64	2.786	A	A
Trussler NB	7.51	0.50	2.884	A	A
Bleams WB	7.56	0.50	3.052	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.85	0.00	0.00	1.05	1.05			N/A	N/A
Trussler NB	0.67	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.69	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.86	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.68	0.00	0.00	0.00	>199			N/A	N/A
Bleams WB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	**Trussler SB**	816.09	2175.14	0.375	0.00	0.00	0.63	9.22	(0.00)	2.772
1	**Trussler NB**	613.57	1927.54	0.318	0.00	0.00	0.49	7.18	(0.00)	2.869
1	**Bleams WB**	582.71	1825.03	0.319	0.00	0.00	0.49	7.20	(0.00)	3.028
2	**Trussler SB**	974.49	2171.68	0.449	0.00	0.63	0.85	12.52	(0.00)	3.154
2	**Trussler NB**	732.67	1875.39	0.391	0.00	0.49	0.67	9.87	(0.00)	3.304
2	**Bleams WB**	695.81	1752.70	0.397	0.00	0.49	0.69	10.11	(0.00)	3.572

3	Trussler SB	1193.51	2166.97	0.551	0.00	0.85	1.28	18.65	(0.00)	3.869
3	Trussler NB	897.33	1804.27	0.497	0.00	0.67	1.03	15.06	(0.00)	4.154
3	Bleams WB	852.19	1654.14	0.515	0.00	0.69	1.10	16.09	(0.00)	4.694
4	Trussler SB	1193.51	2166.92	0.551	0.00	1.28	1.28	19.18	(0.00)	3.882
4	Trussler NB	897.33	1803.72	0.497	0.00	1.03	1.03	15.49	(0.00)	4.170
4	Bleams WB	852.19	1653.29	0.515	0.00	1.10	1.11	16.62	(0.00)	4.718
5	Trussler SB	974.49	2171.60	0.449	0.00	1.28	0.86	13.17	(0.00)	3.165
5	Trussler NB	732.67	1874.55	0.391	0.00	1.03	0.68	10.38	(0.00)	3.320
5	Bleams WB	695.81	1751.40	0.397	0.00	1.11	0.70	10.69	(0.00)	3.591
6	Trussler SB	816.09	2175.05	0.375	0.00	0.86	0.63	9.66	(0.00)	2.786
6	Trussler NB	613.57	1926.43	0.319	0.00	0.68	0.49	7.51	(0.00)	2.884
6	Bleams WB	582.71	1823.41	0.320	0.00	0.70	0.50	7.56	(0.00)	3.052

A3 - 90% - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90%		Yes		(D1)		100.000	90.000	Opening Day - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	1166.92	1166.92	N/A	N/A
1	Trussler NB	583.46	583.46	N/A	N/A
1	Bleams WB	572.17	572.17	N/A	N/A
2	Trussler SB	1393.42	1393.42	N/A	N/A
2	Trussler NB	696.71	696.71	N/A	N/A
2	Bleams WB	683.22	683.22	N/A	N/A
3	Trussler SB	1706.58	1706.58	N/A	N/A
3	Trussler NB	853.29	853.29	N/A	N/A
3	Bleams WB	836.78	836.78	N/A	N/A
4	Trussler SB	1706.58	1706.58	N/A	N/A
4	Trussler NB	853.29	853.29	N/A	N/A
4	Bleams WB	836.78	836.78	N/A	N/A
5	Trussler SB	1393.42	1393.42	N/A	N/A
5	Trussler NB	696.71	696.71	N/A	N/A
5	Bleams WB	683.22	683.22	N/A	N/A
6	Trussler SB	1166.92	1166.92	N/A	N/A
6	Trussler NB	583.46	583.46	N/A	N/A
6	Bleams WB	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	0.79	8.26	3.84	A	1422.31	2133.46	203.11	5.71	2.26	203.13	5.71	0.723	2436.345
Trussler NB	0.53	4.90	1.15	A	711.15	1066.73	70.28	3.95	0.78	70.29	3.95	0.723	2436.345
Bleams WB	0.50	4.44	1.03	A	697.39	1046.08	64.06	3.67	0.71	64.07	3.67	0.723	2436.345
						4246.27	337.45	4.7682					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1162.09	1068.47	30.77	0.00	2172.69	2146.46	0.537	0.00	1.21
Trussler NB	583.46	145.87	581.47	598.32	594.54	0.00	1805.87	1478.19	0.323	0.00	0.50
Bleams WB	572.17	143.04	570.29	647.06	528.95	0.00	1848.55	1317.79	0.310	0.00	0.47

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1390.81	1278.72	36.82	0.00	2168.75	2146.45	0.643	1.21	1.86
Trussler NB	696.71	174.18	695.89	716.07	711.56	0.00	1729.73	1478.19	0.403	0.50	0.70
Bleams WB	683.22	170.81	682.50	774.41	633.04	0.00	1780.82	1317.79	0.384	0.47	0.65

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1698.95	1564.84	45.06	0.00	2163.39	2146.45	0.789	1.86	3.77
Trussler NB	853.29	213.32	851.52	874.81	869.21	0.00	1627.16	1478.19	0.524	0.70	1.14
Bleams WB	836.78	209.19	835.29	946.12	774.61	0.00	1688.70	1317.79	0.496	0.65	1.02

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1706.28	1567.80	45.14	0.00	2163.34	2146.45	0.789	3.77	3.84
Trussler NB	853.29	213.32	853.25	878.47	872.96	0.00	1624.72	1478.19	0.525	1.14	1.15
Bleams WB	836.78	209.19	836.75	950.03	776.19	0.00	1687.68	1317.79	0.496	1.02	1.03

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1401.12	1283.14	36.94	0.00	2168.68	2146.45	0.643	3.84	1.92
Trussler NB	696.71	174.18	698.46	721.23	716.83	0.00	1726.30	1478.19	0.404	1.15	0.72
Bleams WB	683.22	170.81	684.70	779.92	635.38	0.00	1779.30	1317.79	0.384	1.03	0.66

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1169.67	1073.53	30.91	0.00	2172.60	2146.46	0.537	1.92	1.23
Trussler NB	583.46	145.87	584.30	602.16	598.42	0.00	1803.35	1478.19	0.324	0.72	0.50
Bleams WB	572.17	143.04	572.91	651.19	531.53	0.00	1846.87	1317.79	0.310	0.66	0.47

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	17.54	1.17	3.722	A	A
Trussler NB	7.32	0.49	3.081	A	A
Bleams WB	6.89	0.46	2.953	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	26.95	1.80	4.842	A	A
Trussler NB	10.35	0.69	3.652	A	A
Bleams WB	9.57	0.64	3.440	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	52.49	3.50	8.007	A	A
Trussler NB	16.67	1.11	4.863	A	A
Bleams WB	14.92	0.99	4.422	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	57.19	3.81	8.256	A	A
Trussler NB	17.26	1.15	4.899	A	A
Bleams WB	15.38	1.03	4.441	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	30.00	2.00	4.974	A	A
Trussler NB	10.98	0.73	3.682	A	A
Bleams WB	10.09	0.67	3.457	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	18.95	1.26	3.781	A	A
Trussler NB	7.70	0.51	3.104	A	A

Bleams WB	7.22	0.48	2.970	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.86	0.00	0.00	3.15	6.30			N/A	N/A
Trussler NB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.77	0.00	0.00	0.00	7.35			N/A	N/A
Trussler NB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.02	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.92	0.00	0.00	4.20	6.30			N/A	N/A
Trussler NB	0.72	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.66	0.00	0.00	0.00	>199			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.23	0.00	0.00	2.10	3.15			N/A	N/A

Trussler NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	**Trussler SB**	1166.92	2172.69	0.537	0.00	0.00	1.21	17.54	(0.00)	3.722
1	**Trussler NB**	583.46	1805.87	0.323	0.00	0.00	0.50	7.32	(0.00)	3.081
1	**Bleams WB**	572.17	1848.55	0.310	0.00	0.00	0.47	6.89	(0.00)	2.953
2	**Trussler SB**	1393.42	2168.75	0.643	0.00	1.21	1.86	26.95	(0.00)	4.842
2	**Trussler NB**	696.71	1729.73	0.403	0.00	0.50	0.70	10.35	(0.00)	3.652
2	**Bleams WB**	683.22	1780.82	0.384	0.00	0.47	0.65	9.57	(0.00)	3.440
3	**Trussler SB**	1706.58	2163.39	0.789	0.00	1.86	3.77	52.49	(0.00)	8.007
3	**Trussler NB**	853.29	1627.16	0.524	0.00	0.70	1.14	16.67	(0.00)	4.863
3	**Bleams WB**	836.78	1688.70	0.496	0.00	0.65	1.02	14.92	(0.00)	4.422
4	**Trussler SB**	1706.58	2163.34	0.789	0.00	3.77	3.84	57.19	(0.00)	8.256
4	**Trussler NB**	853.29	1624.72	0.525	0.00	1.14	1.15	17.26	(0.00)	4.899
4	**Bleams WB**	836.78	1687.68	0.496	0.00	1.02	1.03	15.38	(0.00)	4.441
5	**Trussler SB**	1393.42	2168.68	0.643	0.00	3.84	1.92	30.00	(0.00)	4.974
5	**Trussler NB**	696.71	1726.30	0.404	0.00	1.15	0.72	10.98	(0.00)	3.682
5	**Bleams WB**	683.22	1779.30	0.384	0.00	1.03	0.66	10.09	(0.00)	3.457
6	**Trussler SB**	1166.92	2172.60	0.537	0.00	1.92	1.23	18.95	(0.00)	3.781
6	**Trussler NB**	583.46	1803.35	0.324	0.00	0.72	0.50	7.70	(0.00)	3.104

6	**Bleams WB**	572.17	1846.87	0.310	0.00	0.66	0.47	7.22	(0.00)	2.970

A4 - 95% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00	
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.552	1225.224
Trussler NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.552	1225.224

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	816.09	816.09	N/A	N/A
1	**Trussler NB**	613.57	613.57	N/A	N/A
1	**Bleams WB**	582.71	582.71	N/A	N/A
2	**Trussler SB**	974.49	974.49	N/A	N/A
2	**Trussler NB**	732.67	732.67	N/A	N/A
2	**Bleams WB**	695.81	695.81	N/A	N/A
3	**Trussler SB**	1193.51	1193.51	N/A	N/A
3	**Trussler NB**	897.33	897.33	N/A	N/A
3	**Bleams WB**	852.19	852.19	N/A	N/A
4	**Trussler SB**	1193.51	1193.51	N/A	N/A
4	**Trussler NB**	897.33	897.33	N/A	N/A
4	**Bleams WB**	852.19	852.19	N/A	N/A
5	**Trussler SB**	974.49	974.49	N/A	N/A

5	Trussler NB	732.67	732.67	N/A	N/A
5	Bleams WB	695.81	695.81	N/A	N/A
6	Trussler SB	816.09	816.09	N/A	N/A
6	Trussler NB	613.57	613.57	N/A	N/A
6	Bleams WB	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	1.04	114.66	40.15	F	994.70	1492.05	1227.49	49.36	13.64	1227.69	49.37	0.552	1225.224
Trussler NB	1.04	117.14	30.27	F	747.86	1121.79	925.74	49.51	10.29	925.87	49.52	0.552	1225.224
Bleams WB	1.14	245.10	58.25	F	710.24	1065.35	2082.99	117.31	23.14	2083.20	117.32	0.552	1225.224
						3679.19	4236.22	69.084					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	806.24	1107.91	26.72	0.00	1149.94	1145.76	0.710	0.00	2.46
Trussler NB	613.57	153.39	606.21	429.10	403.86	0.00	952.04	862.79	0.644	0.00	1.84
Bleams WB	582.71	145.68	574.54	449.98	560.10	0.00	870.06	745.66	0.670	0.00	2.04

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	963.51	1320.73	31.78	0.00	1147.29	1145.76	0.849	2.46	5.21
Trussler NB	732.67	183.17	724.41	512.64	482.65	0.00	910.70	862.79	0.805	1.84	3.91
Bleams WB	695.81	173.95	683.20	537.75	669.30	0.00	812.75	745.66	0.856	2.04	5.19

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1112.95	1482.39	34.61	0.00	1145.80	1145.76	1.042	5.21	25.35
Trussler NB	897.33	224.33	836.42	590.07	557.50	0.00	871.42	862.79	1.030	3.91	19.13
Bleams WB	852.19	213.05	744.21	621.13	772.79	0.00	758.45	745.66	1.124	5.19	32.19

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1134.29	1501.05	34.79	0.00	1145.71	1145.76	1.042	25.35	40.15
Trussler NB	897.33	224.33	852.79	600.89	568.19	0.00	865.81	862.79	1.036	19.13	30.27
Bleams WB	852.19	213.05	747.92	633.07	787.92	0.00	750.51	745.66	1.135	32.19	58.25

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	1102.64	1477.94	34.90	0.00	1145.65	1145.76	0.851	40.15	8.11
Trussler NB	732.67	183.17	825.32	585.20	552.33	0.00	874.13	862.79	0.838	30.27	7.11
Bleams WB	695.81	173.95	750.30	615.12	762.54	0.00	763.83	745.66	0.911	58.25	44.63

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	837.70	1302.07	34.95	0.00	1145.63	1145.76	0.712	8.11	2.71
Trussler NB	613.57	153.39	633.91	453.02	419.62	0.00	943.77	862.79	0.650	7.11	2.02
Bleams WB	582.71	145.68	751.33	467.84	585.68	0.00	856.63	745.66	0.680	44.63	2.47

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	33.74	2.25	10.713	B	B
Trussler NB	25.47	1.70	10.715	B	B

Bleams WB	27.91	1.86	12.473	B	B

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	68.18	4.55	19.454	C	B
Trussler NB	51.84	3.46	19.456	C	B
Bleams WB	65.61	4.37	26.860	D	C

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	246.16	16.41	62.249	F	E
Trussler NB	189.23	12.62	64.268	F	E
Bleams WB	290.65	19.38	106.483	F	F

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	493.45	32.90	114.664	F	F
Trussler NB	372.87	24.86	117.139	F	F
Bleams WB	679.12	45.27	229.759	F	F

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	338.58	22.57	80.648	F	F
Trussler NB	250.60	16.71	80.181	F	F
Bleams WB	771.64	51.44	245.103	F	F

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	47.38	3.16	13.060	B	B
Trussler NB	35.72	2.38	12.940	B	B
Bleams WB	248.07	16.54	73.120	F	E

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	2.46	0.00	1.05	4.20	5.25			N/A	N/A
Trussler NB	1.84	0.00	0.00	3.15	3.15			N/A	N/A
Bleams WB	2.04	0.00	0.00	4.20	5.25			N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	5.21	0.00	1.05	12.60	18.90			N/A	N/A
Trussler NB	3.91	0.00	0.00	9.45	13.65			N/A	N/A
Bleams WB	5.19	0.00	1.05	12.60	18.90			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Trussler SB	25.35	2.10	18.90	52.50	66.15			N/A	N/A
Trussler NB	19.13	0.00	12.60	42.00	53.55			N/A	N/A
Bleams WB	32.19	7.35	27.30	55.65	66.15			N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	40.15	4.20	30.45	82.95	102.90			N/A	N/A
Trussler NB	30.27	1.05	21.00	66.15	84.00			N/A	N/A
Bleams WB	58.25	21.00	52.50	93.45	108.15			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	8.11	0.00	0.00	18.90	31.50			N/A	N/A
Trussler NB	7.11	0.00	0.00	16.80	27.30			N/A	N/A
Bleams WB	44.63	16.80	40.95	69.30	79.80			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	2.71	0.00	0.00	1.05	7.35			N/A	N/A
Trussler NB	2.02	0.00	0.00	0.00	4.20			N/A	N/A
Bleams WB	2.47	0.00	0.00	0.00	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	**Trussler SB**	816.09	1149.94	0.710	0.00	0.00	2.46	33.74	(0.00)	10.713
1	**Trussler NB**	613.57	952.04	0.644	0.00	0.00	1.84	25.47	(0.00)	10.715
1	**Bleams WB**	582.71	870.06	0.670	0.00	0.00	2.04	27.91	(0.00)	12.473
2	**Trussler SB**	974.49	1147.29	0.849	0.00	2.46	5.21	68.18	(0.00)	19.454
2	**Trussler NB**	732.67	910.70	0.805	0.00	1.84	3.91	51.84	(0.00)	19.456
2	**Bleams WB**	695.81	812.75	0.856	0.00	2.04	5.19	65.61	(0.00)	26.860

3	Trussler SB	1193.51	1145.80	1.042	0.00	5.21	25.35	246.16	(0.00)	62.249
3	Trussler NB	897.33	871.42	1.030	0.00	3.91	19.13	189.23	(0.00)	64.268
3	Bleams WB	852.19	758.45	1.124	0.00	5.19	32.19	290.65	(0.00)	106.483
4	Trussler SB	1193.51	1145.71	1.042	0.00	25.35	40.15	493.45	(0.00)	114.664
4	Trussler NB	897.33	865.81	1.036	0.00	19.13	30.27	372.87	(0.00)	117.139
4	Bleams WB	852.19	750.51	1.135	0.00	32.19	58.25	679.12	(0.00)	229.759
5	Trussler SB	974.49	1145.65	0.851	0.00	40.15	8.11	338.58	(0.00)	80.648
5	Trussler NB	732.67	874.13	0.838	0.00	30.27	7.11	250.60	(0.00)	80.181
5	Bleams WB	695.81	763.83	0.911	0.00	58.25	44.63	771.64	(0.00)	245.103
6	Trussler SB	816.09	1145.63	0.712	0.00	8.11	2.71	47.38	(0.00)	13.060
6	Trussler NB	613.57	943.77	0.650	0.00	7.11	2.02	35.72	(0.00)	12.940
6	Bleams WB	582.71	856.63	0.680	0.00	44.63	2.47	248.07	(0.00)	73.120

A4 - 95% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00	
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.552	1225.224
Trussler NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.552	1225.224

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A

Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	1166.92	1166.92	N/A	N/A
1	**Trussler NB**	583.46	583.46	N/A	N/A
1	**Bleams WB**	572.17	572.17	N/A	N/A
2	**Trussler SB**	1393.42	1393.42	N/A	N/A
2	**Trussler NB**	696.71	696.71	N/A	N/A
2	**Bleams WB**	683.22	683.22	N/A	N/A
3	**Trussler SB**	1706.58	1706.58	N/A	N/A
3	**Trussler NB**	853.29	853.29	N/A	N/A
3	**Bleams WB**	836.78	836.78	N/A	N/A
4	**Trussler SB**	1706.58	1706.58	N/A	N/A
4	**Trussler NB**	853.29	853.29	N/A	N/A
4	**Bleams WB**	836.78	836.78	N/A	N/A
5	**Trussler SB**	1393.42	1393.42	N/A	N/A
5	**Trussler NB**	696.71	696.71	N/A	N/A
5	**Bleams WB**	683.22	683.22	N/A	N/A
6	**Trussler SB**	1166.92	1166.92	N/A	N/A
6	**Trussler NB**	583.46	583.46	N/A	N/A
6	**Bleams WB**	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	1.050	1.050	1.050
	2	1.050	1.050	1.050

	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	1.49	1355.32	432.72	F	1422.31	2133.46	20044.42	563.72	222.72	24946.52	701.58	0.552	1225.224
Trussler NB	1.00	86.63	20.15	F	711.15	1066.73	677.41	38.10	7.53	677.60	38.11	0.552	1225.224
Bleams WB	1.09	173.51	43.39	F	697.39	1046.08	1345.94	77.20	14.95	1346.08	77.21	0.552	1225.224
						4246.27	22067.77	311.8187					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1089.15	1057.73	30.47	0.00	1147.97	1142.60	1.017	0.00	19.44
Trussler NB	583.46	145.87	575.30	562.40	557.22	0.00	871.56	857.22	0.669	0.00	2.04
Bleams WB	572.17	143.04	564.86	609.19	523.34	0.00	889.34	754.77	0.643	0.00	1.83

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1141.68	1263.91	36.35	0.00	1144.89	1142.59	1.217	19.44	82.38
Trussler NB	696.71	174.18	688.61	593.93	584.10	0.00	857.46	857.22	0.813	2.04	4.06
Bleams WB	683.22	170.81	673.85	646.30	626.41	0.00	835.26	754.77	0.818	1.83	4.17

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1142.40	1451.80	40.72	0.00	1142.60	1142.59	1.494	82.38	223.42
Trussler NB	853.29	213.32	811.05	598.65	584.47	0.00	857.27	857.22	0.995	4.06	14.62
Bleams WB	836.78	209.19	754.73	657.72	737.79	0.00	776.81	754.77	1.077	4.17	24.68

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1142.35	1476.98	41.11	0.00	1142.39	1142.59	1.494	223.42	364.48
Trussler NB	853.29	213.32	831.20	599.01	584.44	0.00	857.28	857.22	0.995	14.62	20.15
Bleams WB	836.78	209.19	761.96	659.52	756.12	0.00	767.19	754.77	1.091	24.68	43.39

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1141.72	1429.60	42.30	0.00	1141.77	1142.59	1.220	364.48	427.40
Trussler NB	696.71	174.18	756.15	599.90	584.12	0.00	857.45	857.22	0.813	20.15	5.29
Bleams WB	683.22	170.81	784.04	652.42	687.85	0.00	803.02	754.77	0.851	43.39	18.18

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1145.64	1143.84	34.35	0.00	1145.94	1142.60	1.018	427.40	432.72
Trussler NB	583.46	145.87	595.22	593.87	586.12	0.00	856.40	857.22	0.681	5.29	2.35
Bleams WB	572.17	143.04	636.72	639.89	541.46	0.00	879.84	754.77	0.650	18.18	2.04

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	185.39	12.36	44.230	E	D
Trussler NB	27.88	1.86	12.442	B	B
Bleams WB	25.22	1.68	11.409	B	B

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	766.05	51.07	170.948	F	F
Trussler NB	53.78	3.59	21.382	C	C
Bleams WB	54.48	3.63	22.205	C	C

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	2293.60	152.91	488.093	F	F
Trussler NB	155.17	10.34	55.282	F	E
Bleams WB	230.09	15.34	84.850	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	4409.28	293.95	931.398	F	F
Trussler NB	263.20	17.55	86.631	F	F
Bleams WB	511.95	34.13	173.513	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	5939.14	395.94	1252.759	F	F
Trussler NB	138.27	9.22	46.918	E	D
Bleams WB	461.77	30.78	145.089	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	6450.96	430.06	1355.324	F	F

Trussler NB	39.10	2.61	15.064	C	B
Bleams WB	62.43	4.16	19.350	C	B

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	19.44	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	2.04	0.00	1.05	3.15	3.15			N/A	N/A
Bleams WB	1.83	0.00	0.00	3.15	4.20			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	82.38	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	4.06	0.00	0.00	9.45	13.65			N/A	N/A
Bleams WB	4.17	0.00	0.00	9.45	14.70			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	223.42	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	14.62	0.00	7.35	35.70	48.30			N/A	N/A
Bleams WB	24.68	3.15	19.95	47.25	58.80			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	364.48	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	20.15	0.00	9.45	51.45	71.40			N/A	N/A
Bleams WB	43.39	9.45	36.75	78.75	93.45			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	427.40	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	5.29	0.00	0.00	10.50	19.95			N/A	N/A
Bleams WB	18.18	0.00	12.60	38.85	49.35			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Trussler SB	432.72	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	2.35	0.00	0.00	1.05	6.30			N/A	N/A
Bleams WB	2.04	0.00	0.00	0.00	3.15			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	**Trussler SB**	1166.92	1147.97	1.017	0.00	0.00	19.44	185.39	(0.00)	44.230
1	**Trussler NB**	583.46	871.56	0.669	0.00	0.00	2.04	27.88	(0.00)	12.442
1	**Bleams WB**	572.17	889.34	0.643	0.00	0.00	1.83	25.22	(0.00)	11.409
2	**Trussler SB**	1393.42	1144.89	1.217	0.00	19.44	82.38	766.05	(0.00)	170.948
2	**Trussler NB**	696.71	857.46	0.813	0.00	2.04	4.06	53.78	(0.00)	21.382
2	**Bleams WB**	683.22	835.26	0.818	0.00	1.83	4.17	54.48	(0.00)	22.205
3	**Trussler SB**	1706.58	1142.60	1.494	0.00	82.38	223.42	2293.60	(0.00)	488.093
3	**Trussler NB**	853.29	857.27	0.995	0.00	4.06	14.62	155.17	(0.00)	55.282
3	**Bleams WB**	836.78	776.81	1.077	0.00	4.17	24.68	230.09	(0.00)	84.850
4	**Trussler SB**	1706.58	1142.39	1.494	0.00	223.42	364.48	4409.28	(0.00)	931.398
4	**Trussler NB**	853.29	857.28	0.995	0.00	14.62	20.15	263.20	(0.00)	86.631
4	**Bleams WB**	836.78	767.19	1.091	0.00	24.68	43.39	511.95	(0.00)	173.513
5	**Trussler SB**	1393.42	1141.77	1.220	0.00	364.48	427.40	5939.14	(0.00)	1252.759
5	**Trussler NB**	696.71	857.45	0.813	0.00	20.15	5.29	138.27	(0.00)	46.918
5	**Bleams WB**	683.22	803.02	0.851	0.00	43.39	18.18	461.77	(0.00)	145.089
6	**Trussler SB**	1166.92	1145.94	1.018	0.00	427.40	432.72	6450.96	(0.00)	1355.324

6	**Trussler NB**	583.46	856.40	0.681	0.00	5.29	2.35	39.10	(0.00)	15.064
6	**Bleams WB**	572.17	879.84	0.650	0.00	18.18	2.04	62.43	(0.00)	19.350

A5 - 90% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00	

Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.552	1225.224
Trussler NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.552	1225.224

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	816.09	816.09	N/A	N/A
1	**Trussler NB**	613.57	613.57	N/A	N/A
1	**Bleams WB**	582.71	582.71	N/A	N/A
2	**Trussler SB**	974.49	974.49	N/A	N/A
2	**Trussler NB**	732.67	732.67	N/A	N/A
2	**Bleams WB**	695.81	695.81	N/A	N/A
3	**Trussler SB**	1193.51	1193.51	N/A	N/A
3	**Trussler NB**	897.33	897.33	N/A	N/A
3	**Bleams WB**	852.19	852.19	N/A	N/A
4	**Trussler SB**	1193.51	1193.51	N/A	N/A

4	Trussler NB	897.33	897.33	N/A	N/A
4	Bleams WB	852.19	852.19	N/A	N/A
5	Trussler SB	974.49	974.49	N/A	N/A
5	Trussler NB	732.67	732.67	N/A	N/A
5	Bleams WB	695.81	695.81	N/A	N/A
6	Trussler SB	816.09	816.09	N/A	N/A
6	Trussler NB	613.57	613.57	N/A	N/A
6	Bleams WB	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	1.10	184.06	65.86	F	994.70	1492.05	2310.85	92.93	25.68	2311.20	92.94	0.552	1225.224
Trussler NB	1.08	162.87	43.26	F	747.86	1121.79	1445.18	77.30	16.06	1445.46	77.31	0.552	1225.224

Bleams WB	1.18	347.16	72.73	F	710.24	1065.35	3024.30	170.33	33.60	3039.24	171.17	0.552	1225.224
						3679.19	6780.33	110.5732					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	804.25	1105.49	26.66	0.00	1089.45	1086.04	0.749	0.00	2.96
Trussler NB	613.57	153.39	605.03	428.04	402.87	0.00	902.43	832.25	0.680	0.00	2.14
Bleams WB	582.71	145.68	573.14	448.89	559.00	0.00	824.81	720.44	0.706	0.00	2.39

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	957.76	1312.61	31.52	0.00	1087.03	1086.04	0.896	2.96	7.15
Trussler NB	732.67	183.17	721.28	509.52	479.76	0.00	864.20	832.25	0.848	2.14	4.98
Bleams WB	695.81	173.95	677.72	534.63	666.41	0.00	771.41	720.44	0.902	2.39	6.91

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1069.68	1438.73	33.48	0.00	1086.06	1086.04	1.099	7.15	38.10
Trussler NB	897.33	224.33	814.40	567.33	535.83	0.00	836.33	832.25	1.073	4.98	25.72
Bleams WB	852.19	213.05	719.77	597.78	752.45	0.00	728.64	720.44	1.170	6.91	40.02

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1193.51	298.38	1082.46	1452.04	33.55	0.00	1086.02	1086.04	1.099	38.10	65.86
Trussler NB	897.33	224.33	827.15	573.78	542.23	0.00	833.15	832.25	1.077	25.72	43.26
Bleams WB	852.19	213.05	721.37	605.15	764.22	0.00	722.79	720.44	1.179	40.02	72.73

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	974.49	243.62	1069.07	1438.42	33.36	0.00	1086.12	1086.04	0.897	65.86	42.22
Trussler NB	732.67	183.17	816.66	566.91	535.52	0.00	836.48	832.25	0.876	43.26	22.26
Bleams WB	695.81	173.95	717.25	597.65	754.53	0.00	727.61	720.44	0.956	72.73	67.37

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	816.09	204.02	970.64	1375.94	35.96	0.00	1084.83	1086.04	0.752	42.22	3.58
Trussler NB	613.57	153.39	691.42	520.38	486.21	0.00	860.99	832.25	0.713	22.26	2.80
Bleams WB	582.71	145.68	773.08	538.81	638.82	0.00	785.13	720.44	0.742	67.37	19.77

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	39.77	2.65	12.776	B	B
Trussler NB	29.16	1.94	12.382	B	B
Bleams WB	32.15	2.14	14.518	B	B

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	89.00	5.93	26.268	D	C
Trussler NB	63.91	4.26	24.645	C	C
Bleams WB	83.01	5.53	34.985	D	C

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	350.47	23.36	89.237	F	F
Trussler NB	243.08	16.21	83.259	F	F
Bleams WB	358.85	23.92	133.350	F	F

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	780.73	52.05	182.879	F	F
Trussler NB	518.81	34.59	162.868	F	F
Bleams WB	846.06	56.40	292.896	F	F

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	810.59	54.04	184.057	F	F
Trussler NB	491.45	32.76	148.283	F	F
Bleams WB	1050.68	70.05	347.164	F	F

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	240.29	16.02	58.798	F	E
Trussler NB	98.77	6.58	31.089	D	C
Bleams WB	653.54	43.57	207.119	F	F

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	2.96	0.00	1.05	5.25	7.35			N/A	N/A
Trussler NB	2.14	0.00	0.00	3.15	5.25			N/A	N/A
Bleams WB	2.39	0.00	0.00	5.25	7.35			N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	7.15	0.00	2.10	17.85	25.20			N/A	N/A
Trussler NB	4.98	0.00	1.05	11.55	17.85			N/A	N/A
Bleams WB	6.91	0.00	2.10	16.80	24.15			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	38.10	9.45	32.55	67.20	79.80			N/A	N/A
Trussler NB	25.72	3.15	19.95	49.35	60.90			N/A	N/A
Bleams WB	40.02	12.60	35.70	65.10	75.60			N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	65.86	21.00	59.85	109.20	127.05			N/A	N/A
Trussler NB	43.26	8.40	36.75	79.80	96.60			N/A	N/A
Bleams WB	72.73	32.55	68.25	109.20	123.90			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	42.22	10.50	36.75	73.50	86.10			N/A	N/A
Trussler NB	22.26	1.05	15.75	46.20	58.80			N/A	N/A
Bleams WB	67.37	27.30	61.95	105.00	119.70			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.58	0.00	0.00	2.10	10.50			N/A	N/A
Trussler NB	2.80	0.00	0.00	1.05	7.35			N/A	N/A
Bleams WB	19.77	1.05	13.65	42.00	53.55			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	816.09	1089.45	0.749	0.00	0.00	2.96	39.77	(0.00)	12.776
1	Trussler NB	613.57	902.43	0.680	0.00	0.00	2.14	29.16	(0.00)	12.382
1	Bleams WB	582.71	824.81	0.706	0.00	0.00	2.39	32.15	(0.00)	14.518
2	Trussler SB	974.49	1087.03	0.896	0.00	2.96	7.15	89.00	(0.00)	26.268

2	**Trussler NB**	732.67	864.20	0.848	0.00	2.14	4.98	63.91	(0.00)	24.645
2	**Bleams WB**	695.81	771.41	0.902	0.00	2.39	6.91	83.01	(0.00)	34.985
3	**Trussler SB**	1193.51	1086.06	1.099	0.00	7.15	38.10	350.47	(0.00)	89.237
3	**Trussler NB**	897.33	836.33	1.073	0.00	4.98	25.72	243.08	(0.00)	83.259
3	**Bleams WB**	852.19	728.64	1.170	0.00	6.91	40.02	358.85	(0.00)	133.350
4	**Trussler SB**	1193.51	1086.02	1.099	0.00	38.10	65.86	780.73	(0.00)	182.879
4	**Trussler NB**	897.33	833.15	1.077	0.00	25.72	43.26	518.81	(0.00)	162.868
4	**Bleams WB**	852.19	722.79	1.179	0.00	40.02	72.73	846.06	(0.00)	292.896
5	**Trussler SB**	974.49	1086.12	0.897	0.00	65.86	42.22	810.59	(0.00)	184.057
5	**Trussler NB**	732.67	836.48	0.876	0.00	43.26	22.26	491.45	(0.00)	148.283
5	**Bleams WB**	695.81	727.61	0.956	0.00	72.73	67.37	1050.68	(0.00)	347.164
6	**Trussler SB**	816.09	1084.83	0.752	0.00	42.22	3.58	240.29	(0.00)	58.798
6	**Trussler NB**	613.57	860.99	0.713	0.00	22.26	2.80	98.77	(0.00)	31.089
6	**Bleams WB**	582.71	785.13	0.742	0.00	67.37	19.77	653.54	(0.00)	207.119

A5 - 90% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London

Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCU/hr)	Maximum Capacity (PCU/hr)	Assume Flat Start Profile	Initial Queue (PCU)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00	
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCU/hr)	Final Slope	Final Intercept (PCU/hr)
Trussler SB		((calculated))	((calculated))	0.552	1225.224
Trussler NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.552	1225.224

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCU Factor for a HV (PCU)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	HV Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCU/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCU/hr)	DirectDemandEntryFlowInPCU (PCU/hr)	Direct Demand Exit Flow (PCU/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Trussler SB**	1166.92	1166.92	N/A	N/A
1	**Trussler NB**	583.46	583.46	N/A	N/A
1	**Bleams WB**	572.17	572.17	N/A	N/A
2	**Trussler SB**	1393.42	1393.42	N/A	N/A
2	**Trussler NB**	696.71	696.71	N/A	N/A
2	**Bleams WB**	683.22	683.22	N/A	N/A
3	**Trussler SB**	1706.58	1706.58	N/A	N/A
3	**Trussler NB**	853.29	853.29	N/A	N/A
3	**Bleams WB**	836.78	836.78	N/A	N/A
4	**Trussler SB**	1706.58	1706.58	N/A	N/A
4	**Trussler NB**	853.29	853.29	N/A	N/A
4	**Bleams WB**	836.78	836.78	N/A	N/A
5	**Trussler SB**	1393.42	1393.42	N/A	N/A
5	**Trussler NB**	696.71	696.71	N/A	N/A
5	**Bleams WB**	683.22	683.22	N/A	N/A
6	**Trussler SB**	1166.92	1166.92	N/A	N/A
6	**Trussler NB**	583.46	583.46	N/A	N/A
6	**Bleams WB**	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCU/hr) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCU) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCU Per Vehicle - Bleams & Trussler (for whole period)

	To			
From		**1**	**2**	**3**

	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Heavy Vehicle Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Total Demand (PCU/hr)	Total Arrivals (PCU)	Total Queueing Delay (PCU-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCU-min/min)	Inclusive Queueing Total Delay (PCU-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCU/hr)
Trussler SB	1.58	1689.08	517.23	F	1422.31	2133.46	23617.53	664.20	262.42	31029.73	872.66	0.552	1225.224
Trussler NB	1.03	119.33	28.99	F	711.15	1066.73	945.61	53.19	10.51	945.86	53.20	0.552	1225.224
Bleams WB	1.14	252.38	58.44	F	697.39	1046.08	2118.36	121.50	23.54	2118.61	121.52	0.552	1225.224
						4246.27	26681.5	377.011					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1049.90	1055.65	30.41	0.00	1087.58	1083.16	1.073	0.00	29.25
Trussler NB	583.46	145.87	574.24	543.17	537.14	0.00	835.67	827.22	0.698	0.00	2.31
Bleams WB	572.17	143.04	563.69	589.01	522.37	0.00	843.02	728.62	0.679	0.00	2.12

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1083.30	1258.72	36.15	0.00	1084.73	1083.16	1.285	29.25	106.78
Trussler NB	696.71	174.18	686.72	565.22	554.23	0.00	827.18	827.22	0.842	2.31	4.80
Bleams WB	683.22	170.81	670.17	616.26	624.70	0.00	792.15	728.62	0.862	2.12	5.38

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1083.03	1413.83	39.34	0.00	1083.15	1083.16	1.576	106.78	262.67
Trussler NB	853.29	213.32	795.87	568.28	554.09	0.00	827.25	827.22	1.031	4.80	19.16
Bleams WB	836.78	209.19	729.18	625.98	723.99	0.00	742.79	728.62	1.127	5.38	32.28

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1706.58	426.65	1083.04	1433.07	39.50	0.00	1083.07	1083.16	1.576	262.67	418.56

Trussler NB	853.29	213.32	813.95	568.44	554.10	0.00	827.25	827.22	1.031	19.16	28.99
Bleams WB	836.78	209.19	732.13	627.61	740.44	0.00	734.61	728.62	1.139	32.28	58.44

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1393.42	348.35	1082.95	1407.95	39.68	0.00	1082.98	1083.16	1.287	418.56	496.17
Trussler NB	696.71	174.18	782.88	568.58	554.05	0.00	827.27	827.22	0.842	28.99	7.45
Bleams WB	683.22	170.81	735.45	624.76	712.17	0.00	748.66	728.62	0.913	58.44	45.38

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCU/hr)	Arrivals (PCU)	Entry Flow (PCU/hr)	Exit Flow (PCU/hr)	Circulating Flow (PCU/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCU/hr)	Saturation Capacity (PCU/hr)	RFC	Start Queue (PCU)	End Queue (PCU)
Trussler SB	1166.92	291.73	1082.71	1251.29	40.09	0.00	1082.77	1083.16	1.078	496.17	517.23
Trussler NB	583.46	145.87	602.63	568.87	553.93	0.00	827.33	827.22	0.705	7.45	2.65
Bleams WB	572.17	143.04	743.18	608.36	548.20	0.00	830.18	728.62	0.689	45.38	2.63

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	254.99	17.00	61.678	F	E
Trussler NB	31.13	2.08	14.008	B	B
Bleams WB	28.83	1.92	13.163	B	B

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	1021.32	68.09	235.442	F	F
Trussler NB	62.22	4.15	25.207	D	C
Bleams WB	67.58	4.51	28.327	D	C

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	2770.99	184.73	619.993	F	F
Trussler NB	193.15	12.88	69.307	F	E
Bleams WB	292.24	19.48	109.255	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	5109.23	340.62	1137.102	F	F
Trussler NB	363.23	24.22	119.334	F	F
Bleams WB	681.20	45.41	235.180	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	6860.49	457.37	1524.877	F	F
Trussler NB	248.83	16.59	84.147	F	F
Bleams WB	778.70	51.91	252.382	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCU-min)	Queueing Rate Of Delay (PCU-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	7600.51	506.70	1689.077	F	F
Trussler NB	47.05	3.14	18.075	C	B
Bleams WB	269.83	17.99	84.018	F	F

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	29.25	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	2.31	0.00	1.05	3.15	4.20			N/A	N/A
Bleams WB	2.12	0.00	0.00	4.20	5.25			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	106.78	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	4.80	0.00	1.05	11.55	16.80			N/A	N/A
Bleams WB	5.38	0.00	1.05	12.60	18.90			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	262.67	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	19.16	0.00	12.60	40.95	53.55			N/A	N/A
Bleams WB	32.28	8.40	28.35	55.65	66.15			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	418.56	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	28.99	1.05	19.95	63.00	81.90			N/A	N/A
Bleams WB	58.44	21.00	53.55	93.45	108.15			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	496.17	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	7.45	0.00	0.00	17.85	29.40			N/A	N/A
Bleams WB	45.38	17.85	42.00	70.35	80.85			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCU)	Q05 (PCU)	Q50 (PCU)	Q90 (PCU)	Q95 (PCU)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	517.23	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A
Trussler NB	2.65	0.00	0.00	1.05	7.35			N/A	N/A
Bleams WB	2.63	0.00	0.00	0.00	5.25			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCU/hr)
Trussler SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Trussler NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCU)	End Queue (PCU)	Queueing Total Delay (PCU-min)	Geometric Total Delay (PCU-min)	Average Delay Per Arriving Vehicle (s)
1	**Trussler SB**	1166.92	1087.58	1.073	0.00	0.00	29.25	254.99	(0.00)	61.678
1	**Trussler NB**	583.46	835.67	0.698	0.00	0.00	2.31	31.13	(0.00)	14.008
1	**Bleams WB**	572.17	843.02	0.679	0.00	0.00	2.12	28.83	(0.00)	13.163
2	**Trussler SB**	1393.42	1084.73	1.285	0.00	29.25	106.78	1021.32	(0.00)	235.442
2	**Trussler NB**	696.71	827.18	0.842	0.00	2.31	4.80	62.22	(0.00)	25.207
2	**Bleams WB**	683.22	792.15	0.862	0.00	2.12	5.38	67.58	(0.00)	28.327
3	**Trussler SB**	1706.58	1083.15	1.576	0.00	106.78	262.67	2770.99	(0.00)	619.993
3	**Trussler NB**	853.29	827.25	1.031	0.00	4.80	19.16	193.15	(0.00)	69.307
3	**Bleams WB**	836.78	742.79	1.127	0.00	5.38	32.28	292.24	(0.00)	109.255
4	**Trussler SB**	1706.58	1083.07	1.576	0.00	262.67	418.56	5109.23	(0.00)	1137.102
4	**Trussler NB**	853.29	827.25	1.031	0.00	19.16	28.99	363.23	(0.00)	119.334
4	**Bleams WB**	836.78	734.61	1.139	0.00	32.28	58.44	681.20	(0.00)	235.180
5	**Trussler SB**	1393.42	1082.98	1.287	0.00	418.56	496.17	6860.49	(0.00)	1524.877
5	**Trussler NB**	696.71	827.27	0.842	0.00	28.99	7.45	248.83	(0.00)	84.147

5	**Bleams WB**	683.22	748.66	0.913	0.00	58.44	45.38	778.70	(0.00)	252.382
6	**Trussler SB**	1166.92	1082.77	1.078	0.00	496.17	517.23	7600.51	(0.00)	1689.077
6	**Trussler NB**	583.46	827.33	0.705	0.00	7.45	2.65	47.05	(0.00)	18.075
6	**Bleams WB**	572.17	830.18	0.689	0.00	45.38	2.63	269.83	(0.00)	84.018

Bleams Road & Isaiah Drive

Version: 7.1.1.245 [9th June 2011]
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File: C:_Work\47727-100\Arcady\Bleams & Isaiah.arc7
Report generation date: 11/2/2021 9:52:06 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - Single Lane - 2031							
Isaiah SB	0.31	5.81	0.23	A	0.20	6.25	0.16	A
Bleams EB	1.56	8.10	0.60	A	3.43	14.65	0.77	B
Isaiah NB	0.70	7.42	0.40	A	0.42	6.29	0.29	A
Bleams WB	1.78	8.43	0.63	A	7.41	26.65	0.89	D
	90% - Single Lane - 2031							
Isaiah SB	0.33	6.23	0.24	A	0.21	6.64	0.17	A
Bleams EB	1.79	9.32	0.63	A	4.36	18.82	0.81	C
Isaiah NB	0.77	8.13	0.42	A	0.45	6.79	0.30	A
Bleams WB	2.07	9.84	0.67	A	11.64	42.19	0.94	E
	95% - Dual E-W Single N-S - 2031							
Isaiah SB	0.37	6.93	0.26	A	0.24	7.50	0.19	A
Bleams EB	0.50	2.59	0.32	A	0.73	3.05	0.41	A
Isaiah NB	0.88	9.36	0.46	A	0.51	7.63	0.33	A
Bleams WB	0.55	2.60	0.35	A	0.98	3.33	0.48	A
	90% - Dual E-W Single N-S - 2031							
Isaiah SB	0.39	7.46	0.27	A	0.26	8.02	0.20	A
Bleams EB	0.54	2.81	0.34	A	0.80	3.35	0.43	A
Isaiah NB	0.98	10.36	0.48	B	0.55	8.28	0.34	A
Bleams WB	0.60	2.82	0.37	A	1.09	3.71	0.51	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.
2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

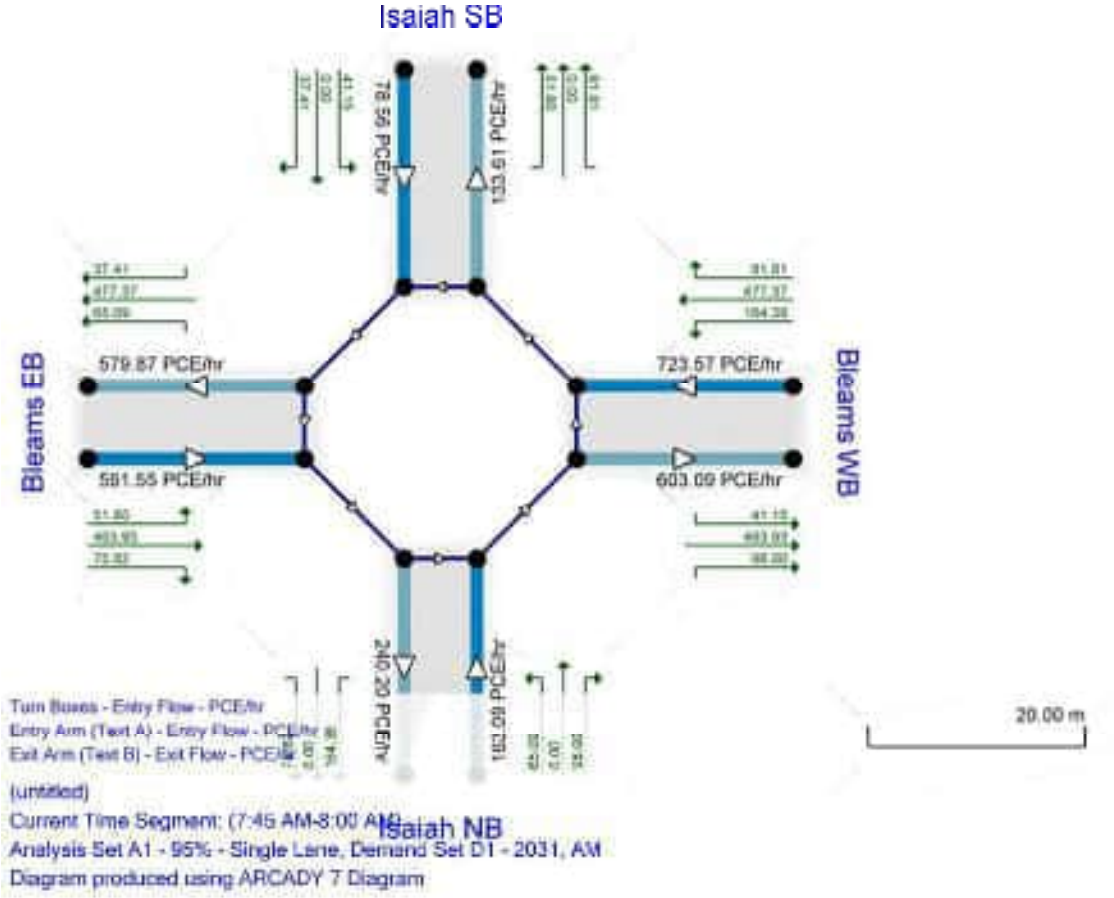
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin



The intersection diagram reflects the last run of ARCADY.

A1 - 95% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.23	5.81	0.31	A	159.67	239.50	20.35	5.10	0.23	20.35	5.10	0.579	1357.445
Bleams EB	0.60	8.10	1.56	A	583.60	875.41	95.36	6.54	1.06	95.37	6.54	0.579	1357.445
Isaiah NB	0.40	7.42	0.70	A	285.38	428.07	43.81	6.14	0.49	43.82	6.14	0.579	1357.445
Bleams WB	0.63	8.43	1.78	A	641.41	962.12	107.89	6.73	1.20	107.90	6.73	0.579	1357.445
						2505.1	267.41	6.405					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.36	59.13	553.14	0.00	985.44	601.56	0.133	0.00	0.16
Bleams EB	478.81	119.70	476.07	531.47	152.03	0.00	1205.98	978.77	0.397	0.00	0.68
Isaiah NB	234.14	58.53	232.85	86.83	541.28	0.00	991.97	544.92	0.236	0.00	0.32
Bleams WB	526.24	131.56	523.18	685.03	89.09	0.00	1240.59	1177.16	0.424	0.00	0.77

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.21	70.88	663.04	0.00	925.02	601.56	0.169	0.16	0.21
Bleams EB	571.75	142.94	570.65	637.05	182.20	0.00	1189.39	978.77	0.481	0.68	0.96
Isaiah NB	279.58	69.90	279.09	104.08	648.78	0.00	932.86	544.92	0.300	0.32	0.45
Bleams WB	628.39	157.10	627.13	821.08	106.79	0.00	1230.86	1177.16	0.511	0.77	1.08

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.20	86.68	810.85	0.00	843.75	601.56	0.227	0.21	0.31
Bleams EB	700.25	175.06	697.92	779.11	222.94	0.00	1167.00	978.77	0.600	0.96	1.54
Isaiah NB	342.42	85.60	341.42	127.28	793.58	0.00	853.24	544.92	0.401	0.45	0.69
Bleams WB	769.61	192.40	766.89	1004.37	130.63	0.00	1217.75	1177.16	0.632	1.08	1.76

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.97	813.57	0.00	842.26	601.56	0.227	0.31	0.31
Bleams EB	700.25	175.06	700.18	781.65	223.49	0.00	1166.69	978.77	0.600	1.54	1.56
Isaiah NB	342.42	85.60	342.39	127.70	795.97	0.00	851.93	544.92	0.402	0.69	0.70
Bleams WB	769.61	192.40	769.53	1007.35	131.01	0.00	1217.54	1177.16	0.632	1.76	1.78

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.79	71.32	667.11	0.00	922.78	601.56	0.170	0.31	0.22
Bleams EB	571.75	142.94	574.05	640.85	183.05	0.00	1188.93	978.77	0.481	1.56	0.99
Isaiah NB	279.58	69.90	280.57	104.72	652.38	0.00	930.88	544.92	0.300	0.70	0.45
Bleams WB	628.39	157.10	631.07	825.58	107.36	0.00	1230.54	1177.16	0.511	1.78	1.11

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.21	59.62	557.73	0.00	982.92	601.56	0.133	0.22	0.16
Bleams EB	478.81	119.70	479.96	535.81	153.13	0.00	1205.38	978.77	0.397	0.99	0.70
Isaiah NB	234.14	58.53	234.65	87.55	545.54	0.00	989.62	544.92	0.237	0.45	0.33
Bleams WB	526.24	131.56	527.56	690.40	89.79	0.00	1240.21	1177.16	0.424	1.11	0.78

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.34	0.16	4.418	A	A
Bleams EB	9.93	0.66	5.161	A	A
Isaiah NB	4.70	0.31	4.971	A	A
Bleams WB	11.08	0.74	5.247	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.13	0.21	4.915	A	A
Bleams EB	13.98	0.93	6.097	A	A
Isaiah NB	6.53	0.44	5.778	A	A
Bleams WB	15.71	1.05	6.248	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.49	0.30	5.790	A	A
Bleams EB	22.10	1.47	8.017	A	A
Isaiah NB	10.08	0.67	7.369	A	A
Bleams WB	25.14	1.68	8.332	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.61	0.31	5.808	A	A
Bleams EB	23.28	1.55	8.100	A	A
Isaiah NB	10.47	0.70	7.417	A	A
Bleams WB	26.60	1.77	8.433	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.30	0.22	4.936	A	A
Bleams EB	15.31	1.02	6.172	A	A
Isaiah NB	7.01	0.47	5.822	A	A
Bleams WB	17.31	1.15	6.332	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.48	0.17	4.440	A	A
Bleams EB	10.76	0.72	5.220	A	A
Isaiah NB	5.02	0.33	5.009	A	A
Bleams WB	12.05	0.80	5.315	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.68	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.77	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.96	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.08	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.69	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.76	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.70	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.99	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.11	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.70	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.78	0.00	0.00	1.05	1.05			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	985.44	0.133	0.00	0.00	0.16	2.34	(0.00)	4.418
1	Bleams EB	478.81	1205.98	0.397	0.00	0.00	0.68	9.93	(0.00)	5.161
1	Isaiah NB	234.14	991.97	0.236	0.00	0.00	0.32	4.70	(0.00)	4.971
1	Bleams WB	526.24	1240.59	0.424	0.00	0.00	0.77	11.08	(0.00)	5.247
2	Isaiah SB	156.42	925.02	0.169	0.00	0.16	0.21	3.13	(0.00)	4.915
2	Bleams EB	571.75	1189.39	0.481	0.00	0.68	0.96	13.98	(0.00)	6.097
2	Isaiah NB	279.58	932.86	0.300	0.00	0.32	0.45	6.53	(0.00)	5.778
2	Bleams WB	628.39	1230.86	0.511	0.00	0.77	1.08	15.71	(0.00)	6.248
3	Isaiah SB	191.58	843.75	0.227	0.00	0.21	0.31	4.49	(0.00)	5.790
3	Bleams EB	700.25	1167.00	0.600	0.00	0.96	1.54	22.10	(0.00)	8.017
3	Isaiah NB	342.42	853.24	0.401	0.00	0.45	0.69	10.08	(0.00)	7.369
3	Bleams WB	769.61	1217.75	0.632	0.00	1.08	1.76	25.14	(0.00)	8.332
4	Isaiah SB	191.58	842.26	0.227	0.00	0.31	0.31	4.61	(0.00)	5.808
4	Bleams EB	700.25	1166.69	0.600	0.00	1.54	1.56	23.28	(0.00)	8.100
4	Isaiah NB	342.42	851.93	0.402	0.00	0.69	0.70	10.47	(0.00)	7.417
4	Bleams WB	769.61	1217.54	0.632	0.00	1.76	1.78	26.60	(0.00)	8.433
5	Isaiah SB	156.42	922.78	0.170	0.00	0.31	0.22	3.30	(0.00)	4.936
5	Bleams EB	571.75	1188.93	0.481	0.00	1.56	0.99	15.31	(0.00)	6.172
5	Isaiah NB	279.58	930.88	0.300	0.00	0.70	0.45	7.01	(0.00)	5.822
5	Bleams WB	628.39	1230.54	0.511	0.00	1.78	1.11	17.31	(0.00)	6.332
6	Isaiah SB	131.00	982.92	0.133	0.00	0.22	0.16	2.48	(0.00)	4.440
6	Bleams EB	478.81	1205.38	0.397	0.00	0.99	0.70	10.76	(0.00)	5.220
6	Isaiah NB	234.14	989.62	0.237	0.00	0.45	0.33	5.02	(0.00)	5.009
6	Bleams WB	526.24	1240.21	0.424	0.00	1.11	0.78	12.05	(0.00)	5.315

A1 - 95% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.16	6.25	0.20	A	96.35	144.52	12.99	5.39	0.14	12.99	5.39	0.579	1357.445
Bleams EB	0.77	14.65	3.43	B	723.08	1084.62	178.55	9.88	1.98	178.58	9.88	0.579	1357.445
Isaiah NB	0.29	6.29	0.42	A	200.04	300.06	27.11	5.42	0.30	27.11	5.42	0.579	1357.445
Bleams WB	0.89	26.65	7.41	D	884.58	1326.87	320.28	14.48	3.56	320.34	14.49	0.579	1357.445
						2856.07	538.93	11.3218					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.65	132.96	703.55	0.00	902.75	611.03	0.088	0.00	0.10
Bleams EB	593.25	148.31	589.04	577.49	204.71	0.00	1177.02	976.09	0.504	0.00	1.05
Isaiah NB	164.12	41.03	163.29	239.02	554.74	0.00	984.57	645.71	0.167	0.00	0.21
Bleams WB	725.75	181.44	719.77	601.28	116.74	0.00	1225.38	1100.90	0.592	0.00	1.49

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.26	159.35	843.05	0.00	826.04	611.03	0.114	0.10	0.13
Bleams EB	708.40	177.10	706.09	692.00	245.31	0.00	1154.70	976.09	0.613	1.05	1.63
Isaiah NB	195.98	48.99	195.69	286.44	664.96	0.00	923.96	645.71	0.212	0.21	0.28
Bleams WB	866.62	216.65	862.48	720.73	139.92	0.00	1212.64	1100.90	0.715	1.49	2.53

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.36	193.47	1021.84	0.00	727.75	611.03	0.159	0.13	0.20
Bleams EB	867.60	216.90	860.88	839.52	297.68	0.00	1125.90	976.08	0.771	1.63	3.31
Isaiah NB	240.02	60.01	239.49	347.59	810.96	0.00	843.69	645.71	0.284	0.28	0.41
Bleams WB	1061.38	265.35	1044.34	879.49	170.96	0.00	1195.58	1100.90	0.888	2.53	6.79

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.66	1034.96	0.00	720.53	611.03	0.160	0.20	0.20
Bleams EB	867.60	216.90	867.13	849.44	301.11	0.00	1124.02	976.08	0.772	3.31	3.43
Isaiah NB	240.02	60.01	240.01	351.70	816.54	0.00	840.62	645.71	0.286	0.41	0.42
Bleams WB	1061.38	265.35	1058.91	884.84	171.71	0.00	1195.16	1100.90	0.888	6.79	7.41

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.64	162.73	863.60	0.00	814.75	611.03	0.116	0.20	0.14
Bleams EB	708.40	177.10	715.24	707.55	250.69	0.00	1151.74	976.09	0.615	3.43	1.72
Isaiah NB	195.98	48.99	196.50	292.79	673.14	0.00	919.47	645.71	0.213	0.42	0.29
Bleams WB	866.62	216.65	885.28	728.59	141.05	0.00	1212.02	1100.90	0.715	7.41	2.74

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.20	134.77	713.51	0.00	897.27	611.03	0.088	0.14	0.10
Bleams EB	593.25	148.31	595.78	585.27	207.44	0.00	1175.52	976.09	0.505	1.72	1.08
Isaiah NB	164.12	41.03	164.42	242.32	560.90	0.00	981.18	645.71	0.167	0.29	0.21
Bleams WB	725.75	181.44	730.50	607.53	117.79	0.00	1224.81	1100.90	0.593	2.74	1.56

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.47	0.10	4.585	A	A
Bleams EB	15.08	1.01	6.385	A	A
Isaiah NB	3.05	0.20	4.597	A	A
Bleams WB	21.17	1.41	7.393	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.98	0.13	5.165	A	A
Bleams EB	23.33	1.56	8.381	A	A
Isaiah NB	4.13	0.28	5.187	A	A
Bleams WB	35.49	2.37	10.665	B	B

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.88	0.19	6.169	A	A
Bleams EB	45.17	3.01	13.913	B	B
Isaiah NB	6.05	0.40	6.251	A	A
Bleams WB	85.04	5.67	22.764	C	C

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.98	0.20	6.248	A	A
Bleams EB	50.74	3.38	14.645	B	B
Isaiah NB	6.24	0.42	6.292	A	A
Bleams WB	107.29	7.15	26.648	D	C

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.12	0.14	5.252	A	A
Bleams EB	27.34	1.82	8.790	A	A
Isaiah NB	4.40	0.29	5.231	A	A
Bleams WB	46.72	3.11	12.174	B	B

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.56	0.10	4.621	A	A
Bleams EB	16.90	1.13	6.550	A	A
Isaiah NB	3.24	0.22	4.629	A	A
Bleams WB	24.56	1.64	7.718	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.05	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.63	0.00	0.00	3.15	5.25			N/A	N/A
Isaiah NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.53	0.00	0.00	5.25	8.40			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	3.31	0.00	0.00	2.10	9.45			N/A	N/A
Isaiah NB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	6.79	0.00	0.00	14.70	26.25			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	3.43	0.00	0.00	0.00	4.20			N/A	N/A
Isaiah NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	7.41	0.00	0.00	9.45	26.25			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.72	0.00	0.00	3.15	5.25			N/A	N/A
Isaiah NB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.74	0.00	0.00	5.25	9.45			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.08	0.00	0.00	1.05	3.15			N/A	N/A
Isaiah NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.56	0.00	0.00	1.05	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	902.75	0.088	0.00	0.00	0.10	1.47	(0.00)	4.585
1	Bleams EB	593.25	1177.02	0.504	0.00	0.00	1.05	15.08	(0.00)	6.385
1	Isaiah NB	164.12	984.57	0.167	0.00	0.00	0.21	3.05	(0.00)	4.597
1	Bleams WB	725.75	1225.38	0.592	0.00	0.00	1.49	21.17	(0.00)	7.393
2	Isaiah SB	94.39	826.04	0.114	0.00	0.10	0.13	1.98	(0.00)	5.165
2	Bleams EB	708.40	1154.70	0.613	0.00	1.05	1.63	23.33	(0.00)	8.381
2	Isaiah NB	195.98	923.96	0.212	0.00	0.21	0.28	4.13	(0.00)	5.187
2	Bleams WB	866.62	1212.64	0.715	0.00	1.49	2.53	35.49	(0.00)	10.665
3	Isaiah SB	115.61	727.75	0.159	0.00	0.13	0.20	2.88	(0.00)	6.169
3	Bleams EB	867.60	1125.90	0.771	0.00	1.63	3.31	45.17	(0.00)	13.913
3	Isaiah NB	240.02	843.69	0.284	0.00	0.28	0.41	6.05	(0.00)	6.251
3	Bleams WB	1061.38	1195.58	0.888	0.00	2.53	6.79	85.04	(0.00)	22.764
4	Isaiah SB	115.61	720.53	0.160	0.00	0.20	0.20	2.98	(0.00)	6.248
4	Bleams EB	867.60	1124.02	0.772	0.00	3.31	3.43	50.74	(0.00)	14.645
4	Isaiah NB	240.02	840.62	0.286	0.00	0.41	0.42	6.24	(0.00)	6.292
4	Bleams WB	1061.38	1195.16	0.888	0.00	6.79	7.41	107.29	(0.00)	26.648
5	Isaiah SB	94.39	814.75	0.116	0.00	0.20	0.14	2.12	(0.00)	5.252
5	Bleams EB	708.40	1151.74	0.615	0.00	3.43	1.72	27.34	(0.00)	8.790
5	Isaiah NB	195.98	919.47	0.213	0.00	0.42	0.29	4.40	(0.00)	5.231
5	Bleams WB	866.62	1212.02	0.715	0.00	7.41	2.74	46.72	(0.00)	12.174
6	Isaiah SB	79.05	897.27	0.088	0.00	0.14	0.10	1.56	(0.00)	4.621
6	Bleams EB	593.25	1175.52	0.505	0.00	1.72	1.08	16.90	(0.00)	6.550
6	Isaiah NB	164.12	981.18	0.167	0.00	0.29	0.21	3.24	(0.00)	4.629
6	Bleams WB	725.75	1224.81	0.593	0.00	2.74	1.56	24.56	(0.00)	7.718

A2 - 90% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.24	6.23	0.33	A	159.67	239.50	21.74	5.45	0.24	21.74	5.45	0.579	1357.445
Bleams EB	0.63	9.32	1.79	A	583.60	875.41	107.13	7.34	1.19	107.14	7.34	0.579	1357.445
Isaiah NB	0.42	8.13	0.77	A	285.38	428.07	47.54	6.66	0.53	47.55	6.66	0.579	1357.445
Bleams WB	0.67	9.84	2.07	A	641.41	962.12	122.26	7.62	1.36	122.28	7.63	0.579	1357.445
						2505.1	298.67	7.153					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.32	59.10	552.84	0.00	933.74	599.47	0.140	0.00	0.17
Bleams EB	478.81	119.70	475.82	531.19	151.96	0.00	1142.54	931.51	0.419	0.00	0.75
Isaiah NB	234.14	58.53	232.75	86.78	541.01	0.00	939.90	540.13	0.249	0.00	0.35
Bleams WB	526.24	131.56	522.88	684.70	89.06	0.00	1175.31	1116.74	0.448	0.00	0.84

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.20	70.86	662.83	0.00	876.44	599.47	0.178	0.17	0.23
Bleams EB	571.75	142.94	570.49	636.86	182.17	0.00	1126.81	931.51	0.507	0.75	1.07
Isaiah NB	279.58	69.90	279.04	104.04	648.61	0.00	883.85	540.13	0.316	0.35	0.48
Bleams WB	628.39	157.10	626.92	820.89	106.77	0.00	1166.09	1116.74	0.539	0.84	1.21

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.17	86.61	810.25	0.00	799.65	599.47	0.240	0.23	0.33
Bleams EB	700.25	175.06	697.45	778.58	222.85	0.00	1105.62	931.51	0.633	1.07	1.77
Isaiah NB	342.42	85.60	341.30	127.18	793.11	0.00	808.58	540.13	0.423	0.48	0.76
Bleams WB	769.61	192.40	766.28	1003.84	130.58	0.00	1153.68	1116.74	0.667	1.21	2.04

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.97	813.53	0.00	797.95	599.47	0.240	0.33	0.33
Bleams EB	700.25	175.06	700.15	781.61	223.49	0.00	1105.29	931.51	0.634	1.77	1.79
Isaiah NB	342.42	85.60	342.39	127.70	795.94	0.00	807.11	540.13	0.424	0.76	0.77
Bleams WB	769.61	192.40	769.49	1007.32	131.01	0.00	1153.46	1116.74	0.667	2.04	2.07

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.82	71.38	667.71	0.00	873.90	599.47	0.179	0.33	0.23
Bleams EB	571.75	142.94	574.52	641.39	183.14	0.00	1126.30	931.51	0.508	1.79	1.10
Isaiah NB	279.58	69.90	280.68	104.81	652.85	0.00	881.64	540.13	0.317	0.77	0.49
Bleams WB	628.39	157.10	631.68	826.11	107.41	0.00	1165.75	1116.74	0.539	2.07	1.25

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.23	59.65	557.95	0.00	931.07	599.47	0.141	0.23	0.17
Bleams EB	478.81	119.70	480.14	536.01	153.17	0.00	1141.92	931.51	0.419	1.10	0.77
Isaiah NB	234.14	58.53	234.70	87.58	545.73	0.00	937.44	540.13	0.250	0.49	0.35
Bleams WB	526.24	131.56	527.79	690.62	89.81	0.00	1174.92	1116.74	0.448	1.25	0.86

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.49	0.17	4.701	A	A
Bleams EB	10.83	0.72	5.645	A	A
Isaiah NB	5.03	0.34	5.336	A	A
Bleams WB	12.14	0.81	5.767	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.33	0.22	5.247	A	A
Bleams EB	15.47	1.03	6.779	A	A
Isaiah NB	7.04	0.47	6.245	A	A
Bleams WB	17.49	1.17	6.990	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.80	0.32	6.208	A	A
Bleams EB	25.13	1.68	9.196	A	A
Isaiah NB	10.99	0.73	8.070	A	A
Bleams WB	28.88	1.93	9.672	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.94	0.33	6.233	A	A
Bleams EB	26.71	1.78	9.324	A	A
Isaiah NB	11.47	0.76	8.132	A	A
Bleams WB	30.89	2.06	9.835	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.53	0.24	5.273	A	A
Bleams EB	17.15	1.14	6.883	A	A
Isaiah NB	7.61	0.51	6.300	A	A
Bleams WB	19.54	1.30	7.119	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.64	0.18	4.726	A	A
Bleams EB	11.83	0.79	5.725	A	A
Isaiah NB	5.41	0.36	5.382	A	A
Bleams WB	13.33	0.89	5.854	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.75	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.07	0.00	0.00	1.05	2.10			N/A	N/A
Isaiah NB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.21	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.77	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.76	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.04	0.00	0.00	0.00	2.10			N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.79	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.77	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.10	0.00	0.00	1.05	2.10			N/A	N/A
Isaiah NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.25	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.77	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.86	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	933.74	0.140	0.00	0.00	0.17	2.49	(0.00)	4.701
1	Bleams EB	478.81	1142.54	0.419	0.00	0.00	0.75	10.83	(0.00)	5.645
1	Isaiah NB	234.14	939.90	0.249	0.00	0.00	0.35	5.03	(0.00)	5.336
1	Bleams WB	526.24	1175.31	0.448	0.00	0.00	0.84	12.14	(0.00)	5.767
2	Isaiah SB	156.42	876.44	0.178	0.00	0.17	0.23	3.33	(0.00)	5.247
2	Bleams EB	571.75	1126.81	0.507	0.00	0.75	1.07	15.47	(0.00)	6.779
2	Isaiah NB	279.58	883.85	0.316	0.00	0.35	0.48	7.04	(0.00)	6.245
2	Bleams WB	628.39	1166.09	0.539	0.00	0.84	1.21	17.49	(0.00)	6.990
3	Isaiah SB	191.58	799.65	0.240	0.00	0.23	0.33	4.80	(0.00)	6.208
3	Bleams EB	700.25	1105.62	0.633	0.00	1.07	1.77	25.13	(0.00)	9.196
3	Isaiah NB	342.42	808.58	0.423	0.00	0.48	0.76	10.99	(0.00)	8.070
3	Bleams WB	769.61	1153.68	0.667	0.00	1.21	2.04	28.88	(0.00)	9.672
4	Isaiah SB	191.58	797.95	0.240	0.00	0.33	0.33	4.94	(0.00)	6.233
4	Bleams EB	700.25	1105.29	0.634	0.00	1.77	1.79	26.71	(0.00)	9.324
4	Isaiah NB	342.42	807.11	0.424	0.00	0.76	0.77	11.47	(0.00)	8.132
4	Bleams WB	769.61	1153.46	0.667	0.00	2.04	2.07	30.89	(0.00)	9.835
5	Isaiah SB	156.42	873.90	0.179	0.00	0.33	0.23	3.53	(0.00)	5.273
5	Bleams EB	571.75	1126.30	0.508	0.00	1.79	1.10	17.15	(0.00)	6.883
5	Isaiah NB	279.58	881.64	0.317	0.00	0.77	0.49	7.61	(0.00)	6.300
5	Bleams WB	628.39	1165.75	0.539	0.00	2.07	1.25	19.54	(0.00)	7.119
6	Isaiah SB	131.00	931.07	0.141	0.00	0.23	0.17	2.64	(0.00)	4.726
6	Bleams EB	478.81	1141.92	0.419	0.00	1.10	0.77	11.83	(0.00)	5.725
6	Isaiah NB	234.14	937.44	0.250	0.00	0.49	0.35	5.41	(0.00)	5.382
6	Bleams WB	526.24	1174.92	0.448	0.00	1.25	0.86	13.33	(0.00)	5.854

A2 - 90% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.17	6.64	0.21	A	96.35	144.52	13.81	5.73	0.15	13.81	5.73	0.579	1357.445
Bleams EB	0.81	18.82	4.36	C	723.08	1084.62	214.05	11.84	2.38	214.09	11.84	0.579	1357.445
Isaiah NB	0.30	6.79	0.45	A	200.04	300.06	29.09	5.82	0.32	29.09	5.82	0.579	1357.445
Bleams WB	0.94	42.19	11.64	E	884.58	1326.87	438.36	19.82	4.87	438.44	19.83	0.579	1357.445
						2856.07	695.31	14.607					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.62	132.82	702.77	0.00	855.64	606.15	0.092	0.00	0.11
Bleams EB	593.25	148.31	588.55	576.89	204.51	0.00	1115.18	932.35	0.532	0.00	1.17
Isaiah NB	164.12	41.03	163.23	238.76	554.30	0.00	932.97	632.92	0.176	0.00	0.22
Bleams WB	725.75	181.44	718.92	600.85	116.68	0.00	1160.92	1047.61	0.625	0.00	1.71

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.25	159.16	841.94	0.00	783.15	606.15	0.121	0.11	0.14
Bleams EB	708.40	177.10	705.59	691.16	245.02	0.00	1094.07	932.35	0.647	1.17	1.87
Isaiah NB	195.98	48.99	195.67	286.09	664.52	0.00	875.56	632.92	0.224	0.22	0.30
Bleams WB	866.62	216.65	861.23	720.32	139.87	0.00	1148.84	1047.61	0.754	1.71	3.05

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.35	192.10	1012.71	0.00	694.20	606.15	0.167	0.14	0.21
Bleams EB	867.60	216.90	858.55	832.72	295.34	0.00	1067.86	932.35	0.812	1.87	4.14
Isaiah NB	240.02	60.01	239.44	344.96	808.93	0.00	800.34	632.92	0.300	0.30	0.45
Bleams WB	1061.38	265.35	1034.08	877.64	170.74	0.00	1132.77	1047.61	0.937	3.05	9.88

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.59	195.11	1030.91	0.00	684.72	606.15	0.169	0.21	0.21
Bleams EB	867.60	216.90	866.72	846.43	300.07	0.00	1065.40	932.35	0.814	4.14	4.36
Isaiah NB	240.02	60.01	240.00	350.61	816.18	0.00	796.57	632.92	0.301	0.45	0.45
Bleams WB	1061.38	265.35	1054.34	884.51	171.67	0.00	1132.28	1047.61	0.937	9.88	11.64

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.65	164.55	876.19	0.00	765.31	606.15	0.123	0.21	0.15
Bleams EB	708.40	177.10	717.78	716.93	253.91	0.00	1089.44	932.35	0.650	4.36	2.01
Isaiah NB	195.98	48.99	196.55	296.34	675.36	0.00	869.92	632.92	0.225	0.45	0.31
Bleams WB	866.62	216.65	899.46	730.62	141.29	0.00	1148.11	1047.61	0.755	11.64	3.43

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.21	135.02	715.11	0.00	849.21	606.15	0.093	0.15	0.11
Bleams EB	593.25	148.31	596.42	586.47	207.85	0.00	1113.43	932.35	0.533	2.01	1.22
Isaiah NB	164.12	41.03	164.45	242.80	561.47	0.00	929.24	632.92	0.177	0.31	0.23
Bleams WB	725.75	181.44	732.28	608.06	117.85	0.00	1160.31	1047.61	0.625	3.43	1.80

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.55	0.10	4.863	A	A
Bleams EB	16.73	1.12	7.116	A	A
Isaiah NB	3.25	0.22	4.906	A	A
Bleams WB	23.98	1.60	8.427	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.10	0.14	5.485	A	A
Bleams EB	26.63	1.78	9.658	A	A
Isaiah NB	4.41	0.29	5.557	A	A
Bleams WB	42.20	2.81	12.898	B	B

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.05	0.20	6.527	A	A
Bleams EB	55.00	3.67	17.339	C	B
Isaiah NB	6.50	0.43	6.732	A	A
Bleams WB	115.15	7.68	31.843	D	C

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.16	0.21	6.641	A	A
Bleams EB	64.07	4.27	18.821	C	B
Isaiah NB	6.72	0.45	6.791	A	A
Bleams WB	163.14	10.88	42.187	E	D

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.28	0.15	5.639	A	A
Bleams EB	32.56	2.17	10.412	B	B
Isaiah NB	4.73	0.32	5.617	A	A
Bleams WB	65.31	4.35	16.938	C	B

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.66	0.11	4.909	A	A
Bleams EB	19.07	1.27	7.357	A	A
Isaiah NB	3.47	0.23	4.944	A	A
Bleams WB	28.59	1.91	8.960	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.71	0.00	1.05	2.10	2.10			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.87	0.00	0.00	4.20	5.25			N/A	N/A
Isaiah NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.05	0.00	0.00	6.30	10.50			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.14	0.00	0.00	5.25	14.70			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	9.88	0.00	1.05	25.20	38.85			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.36	0.00	0.00	1.05	9.45			N/A	N/A
Isaiah NB	0.45	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	11.64	0.00	0.00	26.25	47.25			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.01	0.00	0.00	4.20	6.30			N/A	N/A
Isaiah NB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.43	0.00	0.00	6.30	12.60			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.22	0.00	0.00	1.05	3.15			N/A	N/A
Isaiah NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.80	0.00	0.00	1.05	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	855.64	0.092	0.00	0.00	0.11	1.55	(0.00)	4.863
1	Bleams EB	593.25	1115.18	0.532	0.00	0.00	1.17	16.73	(0.00)	7.116
1	Isaiah NB	164.12	932.97	0.176	0.00	0.00	0.22	3.25	(0.00)	4.906
1	Bleams WB	725.75	1160.92	0.625	0.00	0.00	1.71	23.98	(0.00)	8.427
2	Isaiah SB	94.39	783.15	0.121	0.00	0.11	0.14	2.10	(0.00)	5.485
2	Bleams EB	708.40	1094.07	0.647	0.00	1.17	1.87	26.63	(0.00)	9.658
2	Isaiah NB	195.98	875.56	0.224	0.00	0.22	0.30	4.41	(0.00)	5.557
2	Bleams WB	866.62	1148.84	0.754	0.00	1.71	3.05	42.20	(0.00)	12.898
3	Isaiah SB	115.61	694.20	0.167	0.00	0.14	0.21	3.05	(0.00)	6.527
3	Bleams EB	867.60	1067.86	0.812	0.00	1.87	4.14	55.00	(0.00)	17.339
3	Isaiah NB	240.02	800.34	0.300	0.00	0.30	0.45	6.50	(0.00)	6.732
3	Bleams WB	1061.38	1132.77	0.937	0.00	3.05	9.88	115.15	(0.00)	31.843
4	Isaiah SB	115.61	684.72	0.169	0.00	0.21	0.21	3.16	(0.00)	6.641
4	Bleams EB	867.60	1065.40	0.814	0.00	4.14	4.36	64.07	(0.00)	18.821
4	Isaiah NB	240.02	796.57	0.301	0.00	0.45	0.45	6.72	(0.00)	6.791
4	Bleams WB	1061.38	1132.28	0.937	0.00	9.88	11.64	163.14	(0.00)	42.187
5	Isaiah SB	94.39	765.31	0.123	0.00	0.21	0.15	2.28	(0.00)	5.639
5	Bleams EB	708.40	1089.44	0.650	0.00	4.36	2.01	32.56	(0.00)	10.412
5	Isaiah NB	195.98	869.92	0.225	0.00	0.45	0.31	4.73	(0.00)	5.617
5	Bleams WB	866.62	1148.11	0.755	0.00	11.64	3.43	65.31	(0.00)	16.938
6	Isaiah SB	79.05	849.21	0.093	0.00	0.15	0.11	1.66	(0.00)	4.909
6	Bleams EB	593.25	1113.43	0.533	0.00	2.01	1.22	19.07	(0.00)	7.357
6	Isaiah NB	164.12	929.24	0.177	0.00	0.31	0.23	3.47	(0.00)	4.944
6	Bleams WB	725.75	1160.31	0.625	0.00	3.43	1.80	28.59	(0.00)	8.960

A3 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.26	6.93	0.37	A	159.67	239.50	23.86	5.98	0.27	23.86	5.98	0.552	1225.224
Bleams EB	0.32	2.59	0.50	A	583.60	875.41	34.79	2.38	0.39	34.79	2.38	0.723	2436.345
Isaiah NB	0.46	9.36	0.88	A	285.38	428.07	53.42	7.49	0.59	53.43	7.49	0.552	1225.224
Bleams WB	0.35	2.60	0.55	A	641.41	962.12	38.35	2.39	0.43	38.35	2.39	0.723	2436.345
						2505.1	150.42	3.603					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.26	59.33	554.71	0.00	872.89	68.27	0.150	0.00	0.18
Bleams EB	478.81	119.70	477.66	532.81	152.16	0.00	2210.03	2110.39	0.217	0.00	0.29
Isaiah NB	234.14	58.53	232.63	87.12	542.69	0.00	879.19	98.52	0.266	0.00	0.38
Bleams WB	526.24	131.56	524.97	686.25	89.07	0.00	2253.35	2249.47	0.234	0.00	0.32

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.17	70.98	663.82	0.00	815.63	68.27	0.192	0.18	0.25
Bleams EB	571.75	142.94	571.43	637.72	182.27	0.00	2189.34	2110.39	0.261	0.29	0.37
Isaiah NB	279.58	69.90	278.96	104.22	649.48	0.00	823.15	98.52	0.340	0.38	0.53
Bleams WB	628.39	157.10	628.03	821.67	106.77	0.00	2241.20	2249.47	0.280	0.32	0.41

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.11	86.92	812.69	0.00	737.51	68.27	0.260	0.25	0.36
Bleams EB	700.25	175.06	699.72	780.69	223.10	0.00	2161.30	2110.39	0.324	0.37	0.50
Isaiah NB	342.42	85.60	341.06	127.62	795.20	0.00	746.69	98.52	0.459	0.53	0.87
Bleams WB	769.61	192.40	769.03	1005.70	130.57	0.00	2224.85	2249.47	0.346	0.41	0.55

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.98	813.64	0.00	737.01	68.27	0.260	0.36	0.37
Bleams EB	700.25	175.06	700.24	781.71	223.50	0.00	2161.03	2110.39	0.324	0.50	0.50
Isaiah NB	342.42	85.60	342.38	127.72	796.03	0.00	746.25	98.52	0.459	0.87	0.88
Bleams WB	769.61	192.40	769.61	1007.40	131.01	0.00	2224.55	2249.47	0.346	0.55	0.55

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.88	71.08	665.30	0.00	814.85	68.27	0.192	0.37	0.25
Bleams EB	571.75	142.94	572.27	639.29	182.89	0.00	2188.92	2110.39	0.261	0.50	0.37
Isaiah NB	279.58	69.90	280.92	104.38	650.78	0.00	822.47	98.52	0.340	0.88	0.55
Bleams WB	628.39	157.10	628.96	824.28	107.42	0.00	2240.75	2249.47	0.280	0.55	0.41

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.25	59.52	556.89	0.00	871.74	68.27	0.150	0.25	0.19
Bleams EB	478.81	119.70	479.14	535.09	153.06	0.00	2209.41	2110.39	0.217	0.37	0.29
Isaiah NB	234.14	58.53	234.78	87.39	544.80	0.00	878.08	98.52	0.267	0.55	0.39
Bleams WB	526.24	131.56	526.60	689.78	89.81	0.00	2252.85	2249.47	0.234	0.41	0.32

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.69	0.18	5.084	A	A
Bleams EB	4.28	0.29	2.181	A	A
Isaiah NB	5.48	0.37	5.834	A	A
Bleams WB	4.71	0.31	2.186	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.63	0.24	5.732	A	A
Bleams EB	5.49	0.37	2.336	A	A
Isaiah NB	7.79	0.52	6.939	A	A
Bleams WB	6.05	0.40	2.343	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.33	0.36	6.912	A	A
Bleams EB	7.42	0.49	2.586	A	A
Isaiah NB	12.56	0.84	9.287	A	A
Bleams WB	8.18	0.55	2.594	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.49	0.37	6.929	A	A
Bleams EB	7.53	0.50	2.587	A	A
Isaiah NB	13.18	0.88	9.357	A	A
Bleams WB	8.31	0.55	2.597	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.86	0.26	5.750	A	A
Bleams EB	5.66	0.38	2.338	A	A
Isaiah NB	8.49	0.57	6.996	A	A
Bleams WB	6.24	0.42	2.345	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.86	0.19	5.106	A	A
Bleams EB	4.42	0.29	2.184	A	A
Isaiah NB	5.92	0.39	5.883	A	A
Bleams WB	4.87	0.32	2.191	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.18	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.38	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.53	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.50	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.88	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.55	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	872.89	0.150	0.00	0.00	0.18	2.69	(0.00)	5.084
1	Bleams EB	478.81	2210.03	0.217	0.00	0.00	0.29	4.28	(0.00)	2.181
1	Isaiah NB	234.14	879.19	0.266	0.00	0.00	0.38	5.48	(0.00)	5.834
1	Bleams WB	526.24	2253.35	0.234	0.00	0.00	0.32	4.71	(0.00)	2.186
2	Isaiah SB	156.42	815.63	0.192	0.00	0.18	0.25	3.63	(0.00)	5.732
2	Bleams EB	571.75	2189.34	0.261	0.00	0.29	0.37	5.49	(0.00)	2.336
2	Isaiah NB	279.58	823.15	0.340	0.00	0.38	0.53	7.79	(0.00)	6.939
2	Bleams WB	628.39	2241.20	0.280	0.00	0.32	0.41	6.05	(0.00)	2.343
3	Isaiah SB	191.58	737.51	0.260	0.00	0.25	0.36	5.33	(0.00)	6.912
3	Bleams EB	700.25	2161.30	0.324	0.00	0.37	0.50	7.42	(0.00)	2.586
3	Isaiah NB	342.42	746.69	0.459	0.00	0.53	0.87	12.56	(0.00)	9.287
3	Bleams WB	769.61	2224.85	0.346	0.00	0.41	0.55	8.18	(0.00)	2.594
4	Isaiah SB	191.58	737.01	0.260	0.00	0.36	0.37	5.49	(0.00)	6.929
4	Bleams EB	700.25	2161.03	0.324	0.00	0.50	0.50	7.53	(0.00)	2.587
4	Isaiah NB	342.42	746.25	0.459	0.00	0.87	0.88	13.18	(0.00)	9.357
4	Bleams WB	769.61	2224.55	0.346	0.00	0.55	0.55	8.31	(0.00)	2.597
5	Isaiah SB	156.42	814.85	0.192	0.00	0.37	0.25	3.86	(0.00)	5.750
5	Bleams EB	571.75	2188.92	0.261	0.00	0.50	0.37	5.66	(0.00)	2.338
5	Isaiah NB	279.58	822.47	0.340	0.00	0.88	0.55	8.49	(0.00)	6.996
5	Bleams WB	628.39	2240.75	0.280	0.00	0.55	0.41	6.24	(0.00)	2.345
6	Isaiah SB	131.00	871.74	0.150	0.00	0.25	0.19	2.86	(0.00)	5.106
6	Bleams EB	478.81	2209.41	0.217	0.00	0.37	0.29	4.42	(0.00)	2.184
6	Isaiah NB	234.14	878.08	0.267	0.00	0.55	0.39	5.92	(0.00)	5.883
6	Bleams WB	526.24	2252.85	0.234	0.00	0.41	0.32	4.87	(0.00)	2.191

A3 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.19	7.50	0.24	A	96.35	144.52	15.31	6.36	0.17	15.31	6.36	0.552	1225.224
Bleams EB	0.41	3.05	0.73	A	723.08	1084.62	49.10	2.72	0.55	49.10	2.72	0.723	2436.345
Isaiah NB	0.33	7.63	0.51	A	200.04	300.06	32.18	6.43	0.36	32.18	6.43	0.552	1225.224
Bleams WB	0.48	3.33	0.98	A	884.58	1326.87	64.33	2.91	0.71	64.33	2.91	0.723	2436.345
						2856.07	160.92	3.3806					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.59	133.64	707.02	0.00	792.96	121.06	0.100	0.00	0.12
Bleams EB	593.25	148.31	591.68	580.02	205.58	0.00	2173.33	1938.47	0.273	0.00	0.39
Isaiah NB	164.12	41.03	163.15	240.25	557.00	0.00	871.68	243.87	0.188	0.00	0.24
Bleams WB	725.75	181.44	723.74	603.24	116.92	0.00	2234.23	2131.11	0.325	0.00	0.50

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.23	159.90	846.11	0.00	719.98	121.06	0.131	0.12	0.16
Bleams EB	708.40	177.10	707.91	694.25	246.08	0.00	2145.52	1938.47	0.330	0.39	0.52
Isaiah NB	195.98	48.99	195.62	287.46	666.53	0.00	814.21	243.87	0.241	0.24	0.33
Bleams WB	866.62	216.65	865.95	722.10	140.06	0.00	2218.34	2131.11	0.391	0.50	0.67

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.28	195.77	1035.80	0.00	620.43	121.06	0.186	0.16	0.24
Bleams EB	867.60	216.90	866.74	849.86	301.23	0.00	2107.64	1938.47	0.412	0.52	0.73
Isaiah NB	240.02	60.01	239.33	351.94	816.04	0.00	735.75	243.87	0.326	0.33	0.50
Bleams WB	1061.38	265.35	1060.16	883.96	171.41	0.00	2196.80	2131.11	0.483	0.67	0.97

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.98	1037.14	0.00	619.73	121.06	0.187	0.24	0.24
Bleams EB	867.60	216.90	867.60	851.07	301.67	0.00	2107.34	1938.47	0.412	0.73	0.73
Isaiah NB	240.02	60.01	240.01	352.32	816.95	0.00	735.28	243.87	0.326	0.50	0.51
Bleams WB	1061.38	265.35	1061.37	885.20	171.75	0.00	2196.57	2131.11	0.483	0.97	0.98

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.71	160.23	848.18	0.00	718.89	121.06	0.131	0.24	0.16
Bleams EB	708.40	177.10	709.25	696.13	246.76	0.00	2145.05	1938.47	0.330	0.73	0.52
Isaiah NB	195.98	48.99	196.66	288.06	667.95	0.00	813.46	243.87	0.241	0.51	0.34
Bleams WB	866.62	216.65	867.82	724.02	140.59	0.00	2217.97	2131.11	0.391	0.98	0.68

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.22	134.13	709.93	0.00	791.43	121.06	0.100	0.16	0.12
Bleams EB	593.25	148.31	593.74	582.63	206.52	0.00	2172.69	1938.47	0.273	0.52	0.40
Isaiah NB	164.12	41.03	164.48	241.13	559.14	0.00	870.56	243.87	0.189	0.34	0.25
Bleams WB	725.75	181.44	726.43	605.99	117.63	0.00	2233.74	2131.11	0.325	0.68	0.51

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.69	0.11	5.288	A	A
Bleams EB	5.79	0.39	2.388	A	A
Isaiah NB	3.52	0.23	5.329	A	A
Bleams WB	7.41	0.49	2.499	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.31	0.15	6.039	A	A
Bleams EB	7.63	0.51	2.629	A	A
Isaiah NB	4.84	0.32	6.108	A	A
Bleams WB	9.90	0.66	2.793	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.48	0.23	7.478	A	A
Bleams EB	10.77	0.72	3.045	A	A
Isaiah NB	7.31	0.49	7.603	A	A
Bleams WB	14.32	0.95	3.323	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.58	0.24	7.497	A	A
Bleams EB	10.98	0.73	3.048	A	A
Isaiah NB	7.56	0.50	7.631	A	A
Bleams WB	14.65	0.98	3.329	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.46	0.16	6.060	A	A
Bleams EB	7.92	0.53	2.635	A	A
Isaiah NB	5.18	0.35	6.134	A	A
Bleams WB	10.33	0.69	2.803	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.79	0.12	5.308	A	A
Bleams EB	6.01	0.40	2.396	A	A
Isaiah NB	3.76	0.25	5.355	A	A
Bleams WB	7.72	0.51	2.508	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.67	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.73	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.97	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.73	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.51	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.98	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.68	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.51	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

WB									

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	792.96	0.100	0.00	0.00	0.12	1.69	(0.00)	5.288
1	Bleams EB	593.25	2173.33	0.273	0.00	0.00	0.39	5.79	(0.00)	2.388
1	Isaiah NB	164.12	871.68	0.188	0.00	0.00	0.24	3.52	(0.00)	5.329
1	Bleams WB	725.75	2234.23	0.325	0.00	0.00	0.50	7.41	(0.00)	2.499
2	Isaiah SB	94.39	719.98	0.131	0.00	0.12	0.16	2.31	(0.00)	6.039
2	Bleams EB	708.40	2145.52	0.330	0.00	0.39	0.52	7.63	(0.00)	2.629
2	Isaiah NB	195.98	814.21	0.241	0.00	0.24	0.33	4.84	(0.00)	6.108
2	Bleams WB	866.62	2218.34	0.391	0.00	0.50	0.67	9.90	(0.00)	2.793
3	Isaiah SB	115.61	620.43	0.186	0.00	0.16	0.24	3.48	(0.00)	7.478
3	Bleams EB	867.60	2107.64	0.412	0.00	0.52	0.73	10.77	(0.00)	3.045
3	Isaiah NB	240.02	735.75	0.326	0.00	0.33	0.50	7.31	(0.00)	7.603
3	Bleams WB	1061.38	2196.80	0.483	0.00	0.67	0.97	14.32	(0.00)	3.323
4	Isaiah SB	115.61	619.73	0.187	0.00	0.24	0.24	3.58	(0.00)	7.497
4	Bleams EB	867.60	2107.34	0.412	0.00	0.73	0.73	10.98	(0.00)	3.048
4	Isaiah NB	240.02	735.28	0.326	0.00	0.50	0.51	7.56	(0.00)	7.631
4	Bleams WB	1061.38	2196.57	0.483	0.00	0.97	0.98	14.65	(0.00)	3.329
5	Isaiah SB	94.39	718.89	0.131	0.00	0.24	0.16	2.46	(0.00)	6.060
5	Bleams EB	708.40	2145.05	0.330	0.00	0.73	0.52	7.92	(0.00)	2.635
5	Isaiah NB	195.98	813.46	0.241	0.00	0.51	0.34	5.18	(0.00)	6.134
5	Bleams WB	866.62	2217.97	0.391	0.00	0.98	0.68	10.33	(0.00)	2.803
6	Isaiah SB	79.05	791.43	0.100	0.00	0.16	0.12	1.79	(0.00)	5.308
6	Bleams EB	593.25	2172.69	0.273	0.00	0.52	0.40	6.01	(0.00)	2.396
6	Isaiah NB	164.12	870.56	0.189	0.00	0.34	0.25	3.76	(0.00)	5.355
6	Bleams WB	725.75	2233.74	0.325	0.00	0.68	0.51	7.72	(0.00)	2.508

A4 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.27	7.46	0.39	A	159.67	239.50	25.56	6.40	0.28	25.56	6.40	0.552	1225.224
Bleams EB	0.34	2.81	0.54	A	583.60	875.41	37.51	2.57	0.42	37.51	2.57	0.723	2436.345
Isaiah NB	0.48	10.36	0.98	B	285.38	428.07	58.36	8.18	0.65	58.36	8.18	0.552	1225.224
Bleams WB	0.37	2.82	0.60	A	641.41	962.12	41.45	2.58	0.46	41.45	2.59	0.723	2436.345
						2505.1	162.88	3.901					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.21	59.32	554.58	0.00	827.01	115.05	0.158	0.00	0.20
Bleams EB	478.81	119.70	477.57	532.68	152.11	0.00	2093.74	1986.12	0.229	0.00	0.31
Isaiah NB	234.14	58.53	232.51	87.10	542.58	0.00	832.97	134.48	0.281	0.00	0.41
Bleams WB	526.24	131.56	524.87	686.06	89.03	0.00	2134.78	2125.97	0.247	0.00	0.34

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.15	70.98	663.77	0.00	772.73	115.05	0.202	0.20	0.26
Bleams EB	571.75	142.94	571.40	637.66	182.25	0.00	2074.13	1986.12	0.276	0.31	0.40
Isaiah NB	279.58	69.90	278.89	104.22	649.44	0.00	779.85	134.48	0.359	0.41	0.58
Bleams WB	628.39	157.10	628.00	821.58	106.75	0.00	2123.26	2125.97	0.296	0.34	0.44

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.07	86.91	812.57	0.00	698.75	115.05	0.274	0.26	0.39
Bleams EB	700.25	175.06	699.67	780.57	223.07	0.00	2047.57	1986.12	0.342	0.40	0.54
Isaiah NB	342.42	85.60	340.88	127.61	795.12	0.00	707.43	134.48	0.484	0.58	0.96
Bleams WB	769.61	192.40	768.97	1005.49	130.51	0.00	2107.79	2125.97	0.365	0.44	0.60

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.98	813.63	0.00	698.22	115.05	0.274	0.39	0.39
Bleams EB	700.25	175.06	700.24	781.70	223.50	0.00	2047.29	1986.12	0.342	0.54	0.54
Isaiah NB	342.42	85.60	342.37	127.72	796.03	0.00	706.98	134.48	0.484	0.96	0.98
Bleams WB	769.61	192.40	769.61	1007.39	131.01	0.00	2107.47	2125.97	0.365	0.60	0.60

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.92	71.09	665.42	0.00	771.91	115.05	0.203	0.39	0.27
Bleams EB	571.75	142.94	572.32	639.41	182.93	0.00	2073.69	1986.12	0.276	0.54	0.40
Isaiah NB	279.58	69.90	281.10	104.39	650.86	0.00	779.14	134.48	0.359	0.98	0.60
Bleams WB	628.39	157.10	629.02	824.48	107.48	0.00	2122.78	2125.97	0.296	0.60	0.44

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.28	59.52	556.95	0.00	825.83	115.05	0.159	0.27	0.20
Bleams EB	478.81	119.70	479.17	535.15	153.07	0.00	2093.11	1986.12	0.229	0.40	0.31
Isaiah NB	234.14	58.53	234.86	87.40	544.85	0.00	831.84	134.48	0.281	0.60	0.42
Bleams WB	526.24	131.56	526.64	689.87	89.83	0.00	2134.26	2125.97	0.247	0.44	0.34

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.86	0.19	5.419	A	A
Bleams EB	4.58	0.31	2.338	A	A
Isaiah NB	5.89	0.39	6.279	A	A
Bleams WB	5.05	0.34	2.345	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.88	0.26	6.127	A	A
Bleams EB	5.90	0.39	2.515	A	A
Isaiah NB	8.44	0.56	7.534	A	A
Bleams WB	6.51	0.43	2.528	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.72	0.38	7.437	A	A
Bleams EB	8.03	0.54	2.802	A	A
Isaiah NB	13.81	0.92	10.268	B	B
Bleams WB	8.88	0.59	2.821	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.91	0.39	7.459	A	A
Bleams EB	8.16	0.54	2.805	A	A
Isaiah NB	14.56	0.97	10.364	B	B
Bleams WB	9.03	0.60	2.824	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.14	0.28	6.153	A	A
Bleams EB	6.10	0.41	2.518	A	A
Isaiah NB	9.26	0.62	7.614	A	A
Bleams WB	6.74	0.45	2.531	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.05	0.20	5.446	A	A
Bleams EB	4.74	0.32	2.342	A	A
Isaiah NB	6.40	0.43	6.341	A	A
Bleams WB	5.23	0.35	2.351	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.96	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.54	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.98	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.60	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.27	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	827.01	0.158	0.00	0.00	0.20	2.86	(0.00)	5.419
1	Bleams EB	478.81	2093.74	0.229	0.00	0.00	0.31	4.58	(0.00)	2.338
1	Isaiah NB	234.14	832.97	0.281	0.00	0.00	0.41	5.89	(0.00)	6.279
1	Bleams WB	526.24	2134.78	0.247	0.00	0.00	0.34	5.05	(0.00)	2.345
2	Isaiah SB	156.42	772.73	0.202	0.00	0.20	0.26	3.88	(0.00)	6.127
2	Bleams EB	571.75	2074.13	0.276	0.00	0.31	0.40	5.90	(0.00)	2.515
2	Isaiah NB	279.58	779.85	0.359	0.00	0.41	0.58	8.44	(0.00)	7.534
2	Bleams WB	628.39	2123.26	0.296	0.00	0.34	0.44	6.51	(0.00)	2.528
3	Isaiah SB	191.58	698.75	0.274	0.00	0.26	0.39	5.72	(0.00)	7.437
3	Bleams EB	700.25	2047.57	0.342	0.00	0.40	0.54	8.03	(0.00)	2.802
3	Isaiah NB	342.42	707.43	0.484	0.00	0.58	0.96	13.81	(0.00)	10.268
3	Bleams WB	769.61	2107.79	0.365	0.00	0.44	0.60	8.88	(0.00)	2.821
4	Isaiah SB	191.58	698.22	0.274	0.00	0.39	0.39	5.91	(0.00)	7.459
4	Bleams EB	700.25	2047.29	0.342	0.00	0.54	0.54	8.16	(0.00)	2.805
4	Isaiah NB	342.42	706.98	0.484	0.00	0.96	0.98	14.56	(0.00)	10.364
4	Bleams WB	769.61	2107.47	0.365	0.00	0.60	0.60	9.03	(0.00)	2.824
5	Isaiah SB	156.42	771.91	0.203	0.00	0.39	0.27	4.14	(0.00)	6.153
5	Bleams EB	571.75	2073.69	0.276	0.00	0.54	0.40	6.10	(0.00)	2.518
5	Isaiah NB	279.58	779.14	0.359	0.00	0.98	0.60	9.26	(0.00)	7.614
5	Bleams WB	628.39	2122.78	0.296	0.00	0.60	0.44	6.74	(0.00)	2.531
6	Isaiah SB	131.00	825.83	0.159	0.00	0.27	0.20	3.05	(0.00)	5.446
6	Bleams EB	478.81	2093.11	0.229	0.00	0.40	0.31	4.74	(0.00)	2.342
6	Isaiah NB	234.14	831.84	0.281	0.00	0.60	0.42	6.40	(0.00)	6.341
6	Bleams WB	526.24	2134.26	0.247	0.00	0.44	0.34	5.23	(0.00)	2.351

A4 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.20	8.02	0.26	A	96.35	144.52	16.31	6.77	0.18	16.31	6.77	0.552	1225.224
Bleams EB	0.43	3.35	0.80	A	723.08	1084.62	53.45	2.96	0.59	53.45	2.96	0.723	2436.345
Isaiah NB	0.34	8.28	0.55	A	200.04	300.06	34.65	6.93	0.39	34.65	6.93	0.552	1225.224
Bleams WB	0.51	3.71	1.09	A	884.58	1326.87	70.74	3.20	0.79	70.74	3.20	0.723	2436.345
						2856.07	175.15	3.6795					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.56	133.61	706.84	0.00	751.31	159.99	0.105	0.00	0.12
Bleams EB	593.25	148.31	591.55	579.87	205.53	0.00	2058.98	1839.68	0.288	0.00	0.42
Isaiah NB	164.12	41.03	163.09	240.20	556.88	0.00	825.86	263.71	0.199	0.00	0.26
Bleams WB	725.75	181.44	723.57	603.09	116.88	0.00	2116.66	2019.42	0.343	0.00	0.55

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.21	159.89	846.02	0.00	682.12	159.99	0.138	0.12	0.17
Bleams EB	708.40	177.10	707.85	694.18	246.06	0.00	2032.61	1839.68	0.349	0.42	0.56
Isaiah NB	195.98	48.99	195.59	287.43	666.48	0.00	771.38	263.71	0.254	0.26	0.35
Bleams WB	866.62	216.65	865.87	722.03	140.04	0.00	2101.59	2019.42	0.412	0.55	0.73

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.26	195.74	1035.61	0.00	587.87	159.99	0.197	0.17	0.25
Bleams EB	867.60	216.90	866.63	849.69	301.18	0.00	1996.75	1839.68	0.435	0.56	0.80
Isaiah NB	240.02	60.01	239.26	351.88	815.93	0.00	697.08	263.71	0.344	0.35	0.54
Bleams WB	1061.38	265.35	1059.98	883.82	171.37	0.00	2081.21	2019.42	0.510	0.73	1.08

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.98	1037.14	0.00	587.12	159.99	0.197	0.25	0.26
Bleams EB	867.60	216.90	867.59	851.07	301.67	0.00	1996.43	1839.68	0.435	0.80	0.80
Isaiah NB	240.02	60.01	240.01	352.32	816.94	0.00	696.58	263.71	0.345	0.54	0.55
Bleams WB	1061.38	265.35	1061.37	885.20	171.75	0.00	2080.96	2019.42	0.510	1.08	1.09

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.74	160.26	848.37	0.00	680.96	159.99	0.139	0.26	0.17
Bleams EB	708.40	177.10	709.35	696.29	246.82	0.00	2032.12	1839.68	0.349	0.80	0.56
Isaiah NB	195.98	48.99	196.72	288.11	668.06	0.00	770.59	263.71	0.254	0.55	0.36
Bleams WB	866.62	216.65	868.01	724.16	140.62	0.00	2101.21	2019.42	0.412	1.09	0.74

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.23	134.14	710.02	0.00	749.73	159.99	0.105	0.17	0.12
Bleams EB	593.25	148.31	593.80	582.70	206.55	0.00	2058.32	1839.68	0.288	0.56	0.43
Isaiah NB	164.12	41.03	164.52	241.16	559.19	0.00	824.71	263.71	0.199	0.36	0.26
Bleams WB	725.75	181.44	726.51	606.06	117.65	0.00	2116.16	2019.42	0.343	0.74	0.55

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.79	0.12	5.615	A	A
Bleams EB	6.24	0.42	2.574	A	A
Isaiah NB	3.76	0.25	5.695	A	A
Bleams WB	8.02	0.53	2.713	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.46	0.16	6.428	A	A
Bleams EB	8.26	0.55	2.851	A	A
Isaiah NB	5.19	0.35	6.560	A	A
Bleams WB	10.81	0.72	3.057	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.71	0.25	7.992	A	A
Bleams EB	11.80	0.79	3.341	A	A
Isaiah NB	7.89	0.53	8.242	A	A
Bleams WB	15.89	1.06	3.696	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.83	0.26	8.016	A	A
Bleams EB	12.05	0.80	3.347	A	A
Isaiah NB	8.20	0.55	8.279	A	A
Bleams WB	16.30	1.09	3.706	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.62	0.17	6.453	A	A
Bleams EB	8.61	0.57	2.861	A	A
Isaiah NB	5.58	0.37	6.597	A	A
Bleams WB	11.34	0.76	3.070	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.91	0.13	5.638	A	A
Bleams EB	6.49	0.43	2.581	A	A
Isaiah NB	4.03	0.27	5.728	A	A
Bleams WB	8.38	0.56	2.721	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.73	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.80	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.80	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.55	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.74	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	751.31	0.105	0.00	0.00	0.12	1.79	(0.00)	5.615
1	Bleams EB	593.25	2058.98	0.288	0.00	0.00	0.42	6.24	(0.00)	2.574
1	Isaiah NB	164.12	825.86	0.199	0.00	0.00	0.26	3.76	(0.00)	5.695
1	Bleams WB	725.75	2116.66	0.343	0.00	0.00	0.55	8.02	(0.00)	2.713
2	Isaiah SB	94.39	682.12	0.138	0.00	0.12	0.17	2.46	(0.00)	6.428
2	Bleams EB	708.40	2032.61	0.349	0.00	0.42	0.56	8.26	(0.00)	2.851
2	Isaiah NB	195.98	771.38	0.254	0.00	0.26	0.35	5.19	(0.00)	6.560
2	Bleams WB	866.62	2101.59	0.412	0.00	0.55	0.73	10.81	(0.00)	3.057
3	Isaiah SB	115.61	587.87	0.197	0.00	0.17	0.25	3.71	(0.00)	7.992
3	Bleams EB	867.60	1996.75	0.435	0.00	0.56	0.80	11.80	(0.00)	3.341
3	Isaiah NB	240.02	697.08	0.344	0.00	0.35	0.54	7.89	(0.00)	8.242
3	Bleams WB	1061.38	2081.21	0.510	0.00	0.73	1.08	15.89	(0.00)	3.696
4	Isaiah SB	115.61	587.12	0.197	0.00	0.25	0.26	3.83	(0.00)	8.016
4	Bleams EB	867.60	1996.43	0.435	0.00	0.80	0.80	12.05	(0.00)	3.347
4	Isaiah NB	240.02	696.58	0.345	0.00	0.54	0.55	8.20	(0.00)	8.279
4	Bleams WB	1061.38	2080.96	0.510	0.00	1.08	1.09	16.30	(0.00)	3.706
5	Isaiah SB	94.39	680.96	0.139	0.00	0.26	0.17	2.62	(0.00)	6.453
5	Bleams EB	708.40	2032.12	0.349	0.00	0.80	0.56	8.61	(0.00)	2.861
5	Isaiah NB	195.98	770.59	0.254	0.00	0.55	0.36	5.58	(0.00)	6.597
5	Bleams WB	866.62	2101.21	0.412	0.00	1.09	0.74	11.34	(0.00)	3.070
6	Isaiah SB	79.05	749.73	0.105	0.00	0.17	0.12	1.91	(0.00)	5.638
6	Bleams EB	593.25	2058.32	0.288	0.00	0.56	0.43	6.49	(0.00)	2.581
6	Isaiah NB	164.12	824.71	0.199	0.00	0.36	0.26	4.03	(0.00)	5.728
6	Bleams WB	725.75	2116.16	0.343	0.00	0.74	0.55	8.38	(0.00)	2.721

Bleams Road & Donnenwerth/Amand Drive

Roundabout Capacity Analysis

Version: 7.1.1.245 [9th June 2011]
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File: Q:\47727\100\ICS\Arcady\Bleams & Donnenwerth-Amand.arc7
Report generation date: 2/8/2023 11:31:34 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
95% - Dual E-W Single N-S - 2031								
Donnenwerth SB	0.15	5.35	0.13	A	0.20	9.97	0.16	A
Bleams EB	1.37	4.01	0.57	A	0.87	3.27	0.45	A
Amand NB	1.23	13.86	0.54	B	0.48	6.83	0.32	A
Bleams WB	0.53	2.59	0.34	A	2.44	5.74	0.70	A
90% - Dual E-W Single N-S - 2031								
Donnenwerth SB	0.16	5.69	0.13	A	0.22	10.63	0.17	B
Bleams EB	1.56	4.56	0.60	A	0.96	3.61	0.48	A
Amand NB	1.39	15.66	0.58	C	0.52	7.40	0.33	A
Bleams WB	0.58	2.82	0.36	A	2.95	6.97	0.74	A
95% - Single Lane - 2031								
Donnenwerth SB	0.15	5.35	0.13	A	0.14	6.87	0.12	A
Bleams EB	43.32	118.06	1.05	F	4.80	18.71	0.83	C
Amand NB	1.09	12.31	0.52	B	0.48	6.83	0.32	A
Bleams WB	1.69	8.29	0.62	A	209.67	606.64	1.29	F
90% - Single Lane - 2031								
Donnenwerth SB	0.16	5.69	0.13	A	0.14	6.92	0.12	A
Bleams EB	70.46	187.44	1.11	F	6.42	25.40	0.87	D
Amand NB	1.12	12.57	0.52	B	0.52	7.39	0.33	A
Bleams WB	1.95	9.62	0.65	A	270.53	803.97	1.36	F

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A5 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies	Vehicle Mix Varies Over Turn	Vehicle Mix Varies	Vehicle Mix Source	PCE Factor for a	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry

	Over Time		Over Entry		Truck (PCE)					
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	672.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	70.77	70.77	N/A	N/A
1	**Bleams EB**	846.96	846.96	N/A	N/A
1	**Amand NB**	222.84	222.84	N/A	N/A
1	**Bleams WB**	505.92	505.92	N/A	N/A
2	**Donnenwerth SB**	84.50	84.50	N/A	N/A
2	**Bleams EB**	1011.35	1011.35	N/A	N/A
2	**Amand NB**	266.10	266.10	N/A	N/A
2	**Bleams WB**	604.11	604.11	N/A	N/A
3	**Donnenwerth SB**	103.50	103.50	N/A	N/A
3	**Bleams EB**	1238.65	1238.65	N/A	N/A
3	**Amand NB**	325.90	325.90	N/A	N/A
3	**Bleams WB**	739.89	739.89	N/A	N/A
4	**Donnenwerth SB**	103.50	103.50	N/A	N/A
4	**Bleams EB**	1238.65	1238.65	N/A	N/A
4	**Amand NB**	325.90	325.90	N/A	N/A
4	**Bleams WB**	739.89	739.89	N/A	N/A
5	**Donnenwerth SB**	84.50	84.50	N/A	N/A
5	**Bleams EB**	1011.35	1011.35	N/A	N/A
5	**Amand NB**	266.10	266.10	N/A	N/A
5	**Bleams WB**	604.11	604.11	N/A	N/A
6	**Donnenwerth SB**	70.77	70.77	N/A	N/A
6	**Bleams EB**	846.96	846.96	N/A	N/A
6	**Amand NB**	222.84	222.84	N/A	N/A
6	**Bleams WB**	505.92	505.92	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000

	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	97.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.81	0.14	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.35	0.15	A	86.26	129.38	10.31	4.78	0.11	10.31	4.78	0.579	1357.445
Bleams EB	0.57	4.01	1.37	A	1032.32	1548.48	86.55	3.35	0.96	86.55	3.35	0.723	2436.345
Amand NB	0.54	13.86	1.23	B	271.61	407.42	65.61	9.66	0.73	65.61	9.66	0.579	1357.445
Bleams WB	0.34	2.59	0.53	A	616.64	924.96	36.83	2.39	0.41	36.83	2.39	0.723	2436.345
						3010.24	199.3	3.972					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.44	27.03	594.30	0.00	962.82	60.35	0.074	0.00	0.08
Bleams EB	846.96	211.74	844.39	532.69	132.05	0.00	2223.84	2057.56	0.381	0.00	0.64
Amand NB	222.84	55.71	221.29	119.38	857.05	0.00	818.35	192.74	0.272	0.00	0.39

Bleams WB	505.92	126.48	504.69	961.70	116.64	0.00	2234.42	2240.72	0.226	0.00	0.31

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.34	711.24	0.00	898.52	60.35	0.094	0.08	0.11
Bleams EB	1011.35	252.84	1010.39	637.55	158.09	0.00	2205.95	2057.56	0.458	0.64	0.88
Amand NB	266.10	66.52	265.26	142.84	1025.64	0.00	725.65	192.74	0.367	0.39	0.60
Bleams WB	604.11	151.03	603.77	1151.09	139.81	0.00	2218.51	2240.72	0.272	0.31	0.39

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.32	39.60	870.23	0.00	811.10	60.35	0.128	0.11	0.15
Bleams EB	1238.65	309.66	1236.72	780.00	193.55	0.00	2181.60	2057.56	0.568	0.88	1.37
Amand NB	325.90	81.48	323.45	174.88	1255.39	0.00	599.33	192.74	0.544	0.60	1.21
Bleams WB	739.89	184.97	739.33	1408.35	170.50	0.00	2197.43	2240.72	0.337	0.39	0.53

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.64	871.96	0.00	810.15	60.35	0.128	0.15	0.15
Bleams EB	1238.65	309.66	1238.62	781.67	193.78	0.00	2181.44	2057.56	0.568	1.37	1.37
Amand NB	325.90	81.48	325.81	175.06	1257.34	0.00	598.26	192.74	0.545	1.21	1.23
Bleams WB	739.89	184.97	739.88	1411.44	171.71	0.00	2196.59	2240.72	0.337	0.53	0.53

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.68	32.40	713.77	0.00	897.12	60.35	0.094	0.15	0.11
Bleams EB	1011.35	252.84	1013.26	640.01	158.45	0.00	2205.71	2057.56	0.459	1.37	0.89
Amand NB	266.10	66.52	268.56	143.12	1028.59	0.00	724.03	192.74	0.368	1.23	0.62
Bleams WB	604.11	151.03	604.66	1155.64	141.51	0.00	2217.34	2240.72	0.272	0.53	0.39

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.87	27.12	597.04	0.00	961.31	60.35	0.074	0.11	0.08
Bleams EB	846.96	211.74	847.94	535.27	132.64	0.00	2223.43	2057.56	0.381	0.89	0.65
Amand NB	222.84	55.71	223.73	119.81	860.77	0.00	816.30	192.74	0.273	0.62	0.40
Bleams WB	505.92	126.48	506.26	966.60	117.90	0.00	2233.55	2240.72	0.227	0.39	0.31

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.22	0.08	4.235	A	A
Bleams EB	9.44	0.63	2.736	A	A
Amand NB	5.64	0.38	6.314	A	A
Bleams WB	4.53	0.30	2.184	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.60	0.11	4.643	A	A
Bleams EB	13.01	0.87	3.158	A	A
Amand NB	8.69	0.58	8.196	A	A
Bleams WB	5.81	0.39	2.341	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.24	0.15	5.339	A	A
Bleams EB	19.93	1.33	3.992	A	A
Amand NB	17.04	1.14	13.584	B	B
Bleams WB	7.85	0.52	2.592	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.29	0.15	5.348	A	A
Bleams EB	20.55	1.37	4.009	A	A
Amand NB	18.39	1.23	13.861	B	B
Bleams WB	7.97	0.53	2.594	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.68	0.11	4.655	A	A
Bleams EB	13.72	0.91	3.176	A	A
Amand NB	9.70	0.65	8.344	A	A
Bleams WB	5.99	0.40	2.344	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.28	0.09	4.246	A	A
Bleams EB	9.90	0.66	2.751	A	A
Amand NB	6.15	0.41	6.387	A	A
Bleams WB	4.68	0.31	2.190	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.88	0.00	0.00	1.05	1.05			N/A	N/A
Amand NB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.53	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.23	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.53	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.89	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth SB	70.77	962.82	0.074	0.00	0.00	0.08	1.22	(0.00)	4.235
1	Bleams EB	846.96	2223.84	0.381	0.00	0.00	0.64	9.44	(0.00)	2.736
1	Amand NB	222.84	818.35	0.272	0.00	0.00	0.39	5.64	(0.00)	6.314
1	Bleams WB	505.92	2234.42	0.226	0.00	0.00	0.31	4.53	(0.00)	2.184
2	Donnenwerth SB	84.50	898.52	0.094	0.00	0.08	0.11	1.60	(0.00)	4.643
2	Bleams EB	1011.35	2205.95	0.458	0.00	0.64	0.88	13.01	(0.00)	3.158
2	Amand NB	266.10	725.65	0.367	0.00	0.39	0.60	8.69	(0.00)	8.196
2	Bleams WB	604.11	2218.51	0.272	0.00	0.31	0.39	5.81	(0.00)	2.341
3	Donnenwerth SB	103.50	811.10	0.128	0.00	0.11	0.15	2.24	(0.00)	5.339
3	Bleams EB	1238.65	2181.60	0.568	0.00	0.88	1.37	19.93	(0.00)	3.992
3	Amand NB	325.90	599.33	0.544	0.00	0.60	1.21	17.04	(0.00)	13.584
3	Bleams WB	739.89	2197.43	0.337	0.00	0.39	0.53	7.85	(0.00)	2.592
4	Donnenwerth SB	103.50	810.15	0.128	0.00	0.15	0.15	2.29	(0.00)	5.348
4	Bleams EB	1238.65	2181.44	0.568	0.00	1.37	1.37	20.55	(0.00)	4.009
4	Amand NB	325.90	598.26	0.545	0.00	1.21	1.23	18.39	(0.00)	13.861
4	Bleams WB	739.89	2196.59	0.337	0.00	0.53	0.53	7.97	(0.00)	2.594
5	Donnenwerth SB	84.50	897.12	0.094	0.00	0.15	0.11	1.68	(0.00)	4.655
5	Bleams EB	1011.35	2205.71	0.459	0.00	1.37	0.89	13.72	(0.00)	3.176
5	Amand NB	266.10	724.03	0.368	0.00	1.23	0.62	9.70	(0.00)	8.344
5	Bleams WB	604.11	2217.34	0.272	0.00	0.53	0.39	5.99	(0.00)	2.344
6	Donnenwerth SB	70.77	961.31	0.074	0.00	0.11	0.08	1.28	(0.00)	4.246
6	Bleams EB	846.96	2223.43	0.381	0.00	0.89	0.65	9.90	(0.00)	2.751
6	Amand NB	222.84	816.30	0.273	0.00	0.62	0.40	6.15	(0.00)	6.387
6	Bleams WB	505.92	2233.55	0.227	0.00	0.39	0.31	4.68	(0.00)	2.190

A5 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None

Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1403.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	50.44	50.44	N/A	N/A
1	**Bleams EB**	657.24	657.24	N/A	N/A
1	**Amand NB**	175.41	175.41	N/A	N/A
1	**Bleams WB**	1056.25	1056.25	N/A	N/A
2	**Donnenwerth SB**	60.23	60.23	N/A	N/A
2	**Bleams EB**	784.81	784.81	N/A	N/A
2	**Amand NB**	209.46	209.46	N/A	N/A
2	**Bleams WB**	1261.27	1261.27	N/A	N/A
3	**Donnenwerth SB**	73.77	73.77	N/A	N/A
3	**Bleams EB**	961.19	961.19	N/A	N/A
3	**Amand NB**	256.54	256.54	N/A	N/A
3	**Bleams WB**	1544.73	1544.73	N/A	N/A
4	**Donnenwerth SB**	73.77	73.77	N/A	N/A
4	**Bleams EB**	961.19	961.19	N/A	N/A
4	**Amand NB**	256.54	256.54	N/A	N/A

4	Bleams WB	1544.73	1544.73	N/A	N/A
5	Donnenwerth SB	60.23	60.23	N/A	N/A
5	Bleams EB	784.81	784.81	N/A	N/A
5	Amand NB	209.46	209.46	N/A	N/A
5	Bleams WB	1261.27	1261.27	N/A	N/A
6	Donnenwerth SB	50.44	50.44	N/A	N/A
6	Bleams EB	657.24	657.24	N/A	N/A
6	Amand NB	175.41	175.41	N/A	N/A
6	Bleams WB	1056.25	1056.25	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000
	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	206.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.75	0.15	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.16	9.97	0.20	A	61.48	92.22	11.80	7.68	0.13	11.80	7.68	0.579	1357.445
Bleams EB	0.45	3.27	0.87	A	801.08	1201.62	57.42	2.87	0.64	57.42	2.87	0.723	2436.345
Amand NB	0.32	6.83	0.48	A	213.80	320.71	30.89	5.78	0.34	30.89	5.78	0.579	1357.445
Bleams WB	0.70	5.74	2.44	A	1287.42	1931.13	140.58	4.37	1.56	140.60	4.37	0.723	2436.345
						3545.68	240.69	4.073					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.13	126.80	1036.61	0.00	719.62	135.63	0.070	0.00	0.08
Bleams EB	657.24	164.31	655.44	891.80	194.94	0.00	2180.64	2020.84	0.301	0.00	0.45
Amand NB	175.41	43.85	174.48	255.15	595.23	0.00	962.30	288.91	0.182	0.00	0.23
Bleams WB	1056.25	264.06	1052.52	658.83	110.89	0.00	2238.37	2167.82	0.472	0.00	0.93

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.09	151.74	1240.66	0.00	607.43	135.63	0.099	0.08	0.11
Bleams EB	784.81	196.20	784.22	1067.39	233.37	0.00	2154.25	2020.84	0.364	0.45	0.60
Amand NB	209.46	52.37	209.12	305.31	712.27	0.00	897.95	288.91	0.233	0.23	0.32
Bleams WB	1261.27	315.32	1259.54	788.54	132.86	0.00	2223.28	2167.82	0.567	0.93	1.36

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.42	185.62	1517.49	0.00	455.22	135.63	0.162	0.11	0.20
Bleams EB	961.19	240.30	960.12	1305.54	285.37	0.00	2118.53	2020.84	0.454	0.60	0.87
Amand NB	256.54	64.13	255.88	373.57	871.93	0.00	810.17	288.91	0.317	0.32	0.48
Bleams WB	1544.73	386.18	1540.53	965.23	162.58	0.00	2202.87	2167.82	0.701	1.36	2.41

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.76	186.06	1521.51	0.00	453.01	135.63	0.163	0.20	0.20
Bleams EB	961.19	240.30	961.18	1309.03	286.24	0.00	2117.93	2020.84	0.454	0.87	0.87
Amand NB	256.54	64.13	256.53	374.33	873.09	0.00	809.53	288.91	0.317	0.48	0.48
Bleams WB	1544.73	386.18	1544.63	966.67	162.94	0.00	2202.62	2167.82	0.701	2.41	2.44

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.57	152.38	1246.50	0.00	604.22	135.63	0.100	0.20	0.12
Bleams EB	784.81	196.20	785.87	1072.44	234.63	0.00	2153.39	2020.84	0.364	0.87	0.61
Amand NB	209.46	52.37	210.11	306.43	714.06	0.00	896.97	288.91	0.234	0.48	0.32
Bleams WB	1261.27	315.32	1265.46	790.76	133.42	0.00	2222.90	2167.82	0.567	2.44	1.39

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.59	127.43	1042.22	0.00	716.53	135.63	0.070	0.12	0.08
Bleams EB	657.24	164.31	657.84	896.69	196.12	0.00	2179.83	2020.84	0.302	0.61	0.46
Amand NB	175.41	43.85	175.76	256.32	597.64	0.00	960.98	288.91	0.183	0.32	0.24
Bleams WB	1056.25	264.06	1058.04	661.78	111.62	0.00	2237.87	2167.82	0.472	1.39	0.94

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.15	0.08	5.643	A	A
Bleams EB	6.65	0.44	2.475	A	A
Amand NB	3.40	0.23	4.794	A	A
Bleams WB	13.62	0.91	3.179	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.68	0.11	6.904	A	A
Bleams EB	8.85	0.59	2.757	A	A
Amand NB	4.66	0.31	5.485	A	A
Bleams WB	19.93	1.33	3.915	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.91	0.19	9.891	A	A
Bleams EB	12.75	0.85	3.260	A	A
Amand NB	7.02	0.47	6.810	A	A
Bleams WB	34.58	2.31	5.671	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	3.03	0.20	9.966	A	A
Bleams EB	13.02	0.87	3.267	A	A
Amand NB	7.25	0.48	6.834	A	A
Bleams WB	36.45	2.43	5.742	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.81	0.12	6.956	A	A
Bleams EB	9.23	0.62	2.767	A	A
Amand NB	4.96	0.33	5.507	A	A
Bleams WB	21.53	1.44	3.964	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.23	0.08	5.676	A	A
Bleams EB	6.92	0.46	2.486	A	A

Amand NB	3.61	0.24	4.817	A	A
Bleams WB	14.48	0.97	3.210	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.36	0.00	0.00	2.10	4.20			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.48	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.61	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.39	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.94	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	50.44	719.62	0.070	0.00	0.00	0.08	1.15	(0.00)	5.643
1	**Bleams EB**	657.24	2180.64	0.301	0.00	0.00	0.45	6.65	(0.00)	2.475
1	**Amand NB**	175.41	962.30	0.182	0.00	0.00	0.23	3.40	(0.00)	4.794
1	**Bleams WB**	1056.25	2238.37	0.472	0.00	0.00	0.93	13.62	(0.00)	3.179
2	**Donnenwerth SB**	60.23	607.43	0.099	0.00	0.08	0.11	1.68	(0.00)	6.904
2	**Bleams EB**	784.81	2154.25	0.364	0.00	0.45	0.60	8.85	(0.00)	2.757
2	**Amand NB**	209.46	897.95	0.233	0.00	0.23	0.32	4.66	(0.00)	5.485
2	**Bleams WB**	1261.27	2223.28	0.567	0.00	0.93	1.36	19.93	(0.00)	3.915
3	**Donnenwerth SB**	73.77	455.22	0.162	0.00	0.11	0.20	2.91	(0.00)	9.891
3	**Bleams EB**	961.19	2118.53	0.454	0.00	0.60	0.87	12.75	(0.00)	3.260
3	**Amand NB**	256.54	810.17	0.317	0.00	0.32	0.48	7.02	(0.00)	6.810
3	**Bleams WB**	1544.73	2202.87	0.701	0.00	1.36	2.41	34.58	(0.00)	5.671
4	**Donnenwerth SB**	73.77	453.01	0.163	0.00	0.20	0.20	3.03	(0.00)	9.966
4	**Bleams EB**	961.19	2117.93	0.454	0.00	0.87	0.87	13.02	(0.00)	3.267

4	**Amand NB**	256.54	809.53	0.317	0.00	0.48	0.48	7.25	(0.00)	6.834
4	**Bleams WB**	1544.73	2202.62	0.701	0.00	2.41	2.44	36.45	(0.00)	5.742
5	**Donnenwerth SB**	60.23	604.22	0.100	0.00	0.20	0.12	1.81	(0.00)	6.956
5	**Bleams EB**	784.81	2153.39	0.364	0.00	0.87	0.61	9.23	(0.00)	2.767
5	**Amand NB**	209.46	896.97	0.234	0.00	0.48	0.32	4.96	(0.00)	5.507
5	**Bleams WB**	1261.27	2222.90	0.567	0.00	2.44	1.39	21.53	(0.00)	3.964
6	**Donnenwerth SB**	50.44	716.53	0.070	0.00	0.12	0.08	1.23	(0.00)	5.676
6	**Bleams EB**	657.24	2179.83	0.302	0.00	0.61	0.46	6.92	(0.00)	2.486
6	**Amand NB**	175.41	960.98	0.183	0.00	0.32	0.24	3.61	(0.00)	4.817
6	**Bleams WB**	1056.25	2237.87	0.472	0.00	1.39	0.94	14.48	(0.00)	3.210

A6 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	672.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Donnenwerth SB	70.77	70.77	N/A	N/A
1	Bleams EB	846.96	846.96	N/A	N/A
1	Amand NB	222.84	222.84	N/A	N/A
1	Bleams WB	505.92	505.92	N/A	N/A
2	Donnenwerth SB	84.50	84.50	N/A	N/A
2	Bleams EB	1011.35	1011.35	N/A	N/A
2	Amand NB	266.10	266.10	N/A	N/A
2	Bleams WB	604.11	604.11	N/A	N/A
3	Donnenwerth SB	103.50	103.50	N/A	N/A
3	Bleams EB	1238.65	1238.65	N/A	N/A
3	Amand NB	325.90	325.90	N/A	N/A
3	Bleams WB	739.89	739.89	N/A	N/A
4	Donnenwerth SB	103.50	103.50	N/A	N/A
4	Bleams EB	1238.65	1238.65	N/A	N/A
4	Amand NB	325.90	325.90	N/A	N/A
4	Bleams WB	739.89	739.89	N/A	N/A
5	Donnenwerth SB	84.50	84.50	N/A	N/A
5	Bleams EB	1011.35	1011.35	N/A	N/A
5	Amand NB	266.10	266.10	N/A	N/A
5	Bleams WB	604.11	604.11	N/A	N/A
6	Donnenwerth SB	70.77	70.77	N/A	N/A
6	Bleams EB	846.96	846.96	N/A	N/A
6	Amand NB	222.84	222.84	N/A	N/A
6	Bleams WB	505.92	505.92	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000
	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	97.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.81	0.14	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

	To				
From		1	2	3	4

	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.69	0.16	A	86.26	129.38	10.95	5.08	0.12	10.95	5.08	0.579	1357.445
Bleams EB	0.60	4.56	1.56	A	1032.32	1548.48	96.66	3.75	1.07	96.66	3.75	0.723	2436.345
Amand NB	0.58	15.66	1.39	C	271.61	407.42	72.46	10.67	0.81	72.46	10.67	0.579	1357.445
Bleams WB	0.36	2.82	0.58	A	616.64	924.96	39.77	2.58	0.44	39.77	2.58	0.723	2436.345
						3010.24	219.84	4.3818					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.42	27.03	594.15	0.00	912.22	112.72	0.078	0.00	0.09
Bleams EB	846.96	211.74	844.15	532.55	132.02	0.00	2106.81	1932.56	0.402	0.00	0.70
Amand NB	222.84	55.71	221.17	119.36	856.81	0.00	775.40	221.20	0.287	0.00	0.42
Bleams WB	505.92	126.48	504.60	961.40	116.58	0.00	2116.86	2113.70	0.239	0.00	0.33

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.34	711.16	0.00	851.27	112.72	0.099	0.09	0.12
Bleams EB	1011.35	252.84	1010.25	637.48	158.08	0.00	2089.86	1932.56	0.484	0.70	0.98
Amand NB	266.10	66.52	265.16	142.82	1025.50	0.00	687.53	221.20	0.387	0.42	0.65
Bleams WB	604.11	151.03	603.74	1150.91	139.76	0.00	2101.78	2113.70	0.287	0.33	0.42

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.31	39.60	869.98	0.00	768.54	112.72	0.135	0.12	0.16
Bleams EB	1238.65	309.66	1236.35	779.75	193.53	0.00	2066.79	1932.56	0.599	0.98	1.55
Amand NB	325.90	81.48	323.07	174.85	1255.04	0.00	567.97	221.20	0.574	0.65	1.36
Bleams WB	739.89	184.97	739.27	1407.80	170.30	0.00	2081.90	2113.70	0.355	0.42	0.58

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.64	871.94	0.00	767.52	112.72	0.135	0.16	0.16
Bleams EB	1238.65	309.66	1238.61	781.66	193.78	0.00	2066.63	1932.56	0.599	1.55	1.56
Amand NB	325.90	81.48	325.78	175.06	1257.33	0.00	566.78	221.20	0.575	1.36	1.39
Bleams WB	739.89	184.97	739.88	1411.41	171.70	0.00	2080.99	2113.70	0.356	0.58	0.58

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.69	32.40	714.03	0.00	849.77	112.72	0.099	0.16	0.12
Bleams EB	1011.35	252.84	1013.63	640.26	158.46	0.00	2089.60	1932.56	0.484	1.56	0.99
Amand NB	266.10	66.52	268.96	143.15	1028.94	0.00	685.74	221.20	0.388	1.39	0.68
Bleams WB	604.11	151.03	604.72	1156.19	141.71	0.00	2100.51	2113.70	0.288	0.58	0.43

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.88	27.13	597.12	0.00	910.67	112.72	0.078	0.12	0.09
Bleams EB	846.96	211.74	848.09	535.35	132.65	0.00	2106.40	1932.56	0.402	0.99	0.71
Amand NB	222.84	55.71	223.83	119.82	860.92	0.00	773.26	221.20	0.288	0.68	0.43
Bleams WB	505.92	126.48	506.29	966.80	117.95	0.00	2115.96	2113.70	0.239	0.43	0.33

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.29	0.09	4.488	A	A
Bleams EB	10.29	0.69	2.987	A	A
Amand NB	6.05	0.40	6.799	A	A
Bleams WB	4.85	0.32	2.342	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.70	0.11	4.929	A	A
Bleams EB	14.36	0.96	3.498	A	A
Amand NB	9.44	0.63	8.930	A	A
Bleams WB	6.25	0.42	2.523	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.38	0.16	5.680	A	A
Bleams EB	22.55	1.50	4.539	A	A
Amand NB	18.97	1.26	15.259	C	B
Bleams WB	8.51	0.57	2.813	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.44	0.16	5.691	A	A

Bleams EB	23.36	1.56	4.564	A	A
Amand NB	20.69	1.38	15.664	C	B
Bleams WB	8.66	0.58	2.817	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.78	0.12	4.941	A	A
Bleams EB	15.25	1.02	3.522	A	A
Amand NB	10.65	0.71	9.129	A	A
Bleams WB	6.47	0.43	2.529	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.36	0.09	4.501	A	A
Bleams EB	10.84	0.72	3.008	A	A
Amand NB	6.65	0.44	6.891	A	A
Bleams WB	5.02	0.33	2.348	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.98	0.00	0.00	1.05	2.10			N/A	N/A
Amand NB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.39	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.58	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.99	0.00	0.00	1.05	1.05			N/A	N/A
Amand NB	0.68	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.71	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth SB	70.77	912.22	0.078	0.00	0.00	0.09	1.29	(0.00)	4.488
1	Bleams EB	846.96	2106.81	0.402	0.00	0.00	0.70	10.29	(0.00)	2.987
1	Amand NB	222.84	775.40	0.287	0.00	0.00	0.42	6.05	(0.00)	6.799

1	Bleams WB	505.92	2116.86	0.239	0.00	0.00	0.33	4.85	(0.00)	2.342
2	Donnenwerth SB	84.50	851.27	0.099	0.00	0.09	0.12	1.70	(0.00)	4.929
2	Bleams EB	1011.35	2089.86	0.484	0.00	0.70	0.98	14.36	(0.00)	3.498
2	Amand NB	266.10	687.53	0.387	0.00	0.42	0.65	9.44	(0.00)	8.930
2	Bleams WB	604.11	2101.78	0.287	0.00	0.33	0.42	6.25	(0.00)	2.523
3	Donnenwerth SB	103.50	768.54	0.135	0.00	0.12	0.16	2.38	(0.00)	5.680
3	Bleams EB	1238.65	2066.79	0.599	0.00	0.98	1.55	22.55	(0.00)	4.539
3	Amand NB	325.90	567.97	0.574	0.00	0.65	1.36	18.97	(0.00)	15.259
3	Bleams WB	739.89	2081.90	0.355	0.00	0.42	0.58	8.51	(0.00)	2.813
4	Donnenwerth SB	103.50	767.52	0.135	0.00	0.16	0.16	2.44	(0.00)	5.691
4	Bleams EB	1238.65	2066.63	0.599	0.00	1.55	1.56	23.36	(0.00)	4.564
4	Amand NB	325.90	566.78	0.575	0.00	1.36	1.39	20.69	(0.00)	15.664
4	Bleams WB	739.89	2080.99	0.356	0.00	0.58	0.58	8.66	(0.00)	2.817
5	Donnenwerth SB	84.50	849.77	0.099	0.00	0.16	0.12	1.78	(0.00)	4.941
5	Bleams EB	1011.35	2089.60	0.484	0.00	1.56	0.99	15.25	(0.00)	3.522
5	Amand NB	266.10	685.74	0.388	0.00	1.39	0.68	10.65	(0.00)	9.129
5	Bleams WB	604.11	2100.51	0.288	0.00	0.58	0.43	6.47	(0.00)	2.529
6	Donnenwerth SB	70.77	910.67	0.078	0.00	0.12	0.09	1.36	(0.00)	4.501
6	Bleams EB	846.96	2106.40	0.402	0.00	0.99	0.71	10.84	(0.00)	3.008
6	Amand NB	222.84	773.26	0.288	0.00	0.68	0.43	6.65	(0.00)	6.891
6	Bleams WB	505.92	2115.96	0.239	0.00	0.43	0.33	5.02	(0.00)	2.348

A6 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London

Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1403.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	50.44	50.44	N/A	N/A
1	**Bleams EB**	657.24	657.24	N/A	N/A
1	**Amand NB**	175.41	175.41	N/A	N/A
1	**Bleams WB**	1056.25	1056.25	N/A	N/A
2	**Donnenwerth SB**	60.23	60.23	N/A	N/A
2	**Bleams EB**	784.81	784.81	N/A	N/A
2	**Amand NB**	209.46	209.46	N/A	N/A
2	**Bleams WB**	1261.27	1261.27	N/A	N/A
3	**Donnenwerth SB**	73.77	73.77	N/A	N/A
3	**Bleams EB**	961.19	961.19	N/A	N/A
3	**Amand NB**	256.54	256.54	N/A	N/A
3	**Bleams WB**	1544.73	1544.73	N/A	N/A
4	**Donnenwerth SB**	73.77	73.77	N/A	N/A
4	**Bleams EB**	961.19	961.19	N/A	N/A
4	**Amand NB**	256.54	256.54	N/A	N/A
4	**Bleams WB**	1544.73	1544.73	N/A	N/A
5	**Donnenwerth SB**	60.23	60.23	N/A	N/A
5	**Bleams EB**	784.81	784.81	N/A	N/A
5	**Amand NB**	209.46	209.46	N/A	N/A
5	**Bleams WB**	1261.27	1261.27	N/A	N/A
6	**Donnenwerth SB**	50.44	50.44	N/A	N/A
6	**Bleams EB**	657.24	657.24	N/A	N/A
6	**Amand NB**	175.41	175.41	N/A	N/A
6	**Bleams WB**	1056.25	1056.25	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000
	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	206.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

	To

		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.75	0.15	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.17	10.63	0.22	B	61.48	92.22	12.54	8.16	0.14	12.54	8.16	0.579	1357.445
Bleams EB	0.48	3.61	0.96	A	801.08	1201.62	62.85	3.14	0.70	62.85	3.14	0.723	2436.345
Amand NB	0.33	7.40	0.52	A	213.80	320.71	33.24	6.22	0.37	33.24	6.22	0.579	1357.445
Bleams WB	0.74	6.97	2.95	A	1287.42	1931.13	163.62	5.08	1.82	163.64	5.08	0.723	2436.345
						3545.68	272.25	4.607					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.11	126.75	1036.21	0.00	681.96	178.73	0.074	0.00	0.08
Bleams EB	657.24	164.31	655.29	891.45	194.87	0.00	2065.92	1903.14	0.318	0.00	0.49
Amand NB	175.41	43.85	174.42	255.06	595.09	0.00	911.73	307.51	0.192	0.00	0.25
Bleams WB	1056.25	264.06	1052.12	658.67	110.85	0.00	2120.59	2049.95	0.498	0.00	1.03

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)

Donnenwerth SB	60.23	15.06	60.08	151.70	1240.35	0.00	575.62	178.73	0.105	0.08	0.12
Bleams EB	784.81	196.20	784.15	1067.12	233.31	0.00	2040.91	1903.14	0.385	0.49	0.65
Amand NB	209.46	52.37	209.10	305.25	712.21	0.00	850.72	307.51	0.246	0.25	0.34
Bleams WB	1261.27	315.32	1259.21	788.47	132.84	0.00	2106.28	2049.95	0.599	1.03	1.55

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.40	185.49	1516.35	0.00	431.86	178.73	0.171	0.12	0.21
Bleams EB	961.19	240.30	959.97	1304.58	285.17	0.00	2007.16	1903.14	0.479	0.65	0.96
Amand NB	256.54	64.13	255.81	373.36	871.78	0.00	767.60	307.51	0.334	0.34	0.52
Bleams WB	1544.73	386.18	1539.29	965.06	162.54	0.00	2086.95	2049.95	0.740	1.55	2.91

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.76	186.06	1521.45	0.00	429.20	178.73	0.172	0.21	0.22
Bleams EB	961.19	240.30	961.17	1308.98	286.23	0.00	2006.47	1903.14	0.479	0.96	0.96
Amand NB	256.54	64.13	256.52	374.32	873.09	0.00	766.92	307.51	0.335	0.52	0.52
Bleams WB	1544.73	386.18	1544.57	966.67	162.94	0.00	2086.69	2049.95	0.740	2.91	2.95

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.60	152.51	1247.66	0.00	571.82	178.73	0.105	0.22	0.12
Bleams EB	784.81	196.20	786.02	1073.43	234.83	0.00	2039.92	1903.14	0.385	0.96	0.66
Amand NB	209.46	52.37	210.17	306.64	714.21	0.00	849.68	307.51	0.247	0.52	0.35
Bleams WB	1261.27	315.32	1266.72	790.93	133.45	0.00	2105.88	2049.95	0.599	2.95	1.59

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.60	127.47	1042.57	0.00	678.64	178.73	0.074	0.12	0.08
Bleams EB	657.24	164.31	657.91	896.98	196.19	0.00	2065.06	1903.14	0.318	0.66	0.49
Amand NB	175.41	43.85	175.79	256.39	597.71	0.00	910.36	307.51	0.193	0.35	0.25
Bleams WB	1056.25	264.06	1058.40	661.86	111.64	0.00	2120.07	2049.95	0.498	1.59	1.05

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.21	0.08	5.980	A	A
Bleams EB	7.18	0.48	2.676	A	A
Amand NB	3.62	0.24	5.121	A	A
Bleams WB	15.06	1.00	3.525	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.78	0.12	7.330	A	A
Bleams EB	9.63	0.64	3.006	A	A
Amand NB	4.99	0.33	5.889	A	A

Bleams WB	22.54	1.50	4.451	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	3.09	0.21	10.534	B	B
Bleams EB	14.06	0.94	3.604	A	A
Amand NB	7.58	0.51	7.375	A	A
Bleams WB	41.17	2.74	6.834	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	3.23	0.22	10.634	B	B
Bleams EB	14.40	0.96	3.615	A	A
Amand NB	7.85	0.52	7.405	A	A
Bleams WB	44.00	2.93	6.965	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.93	0.13	7.398	A	A
Bleams EB	10.09	0.67	3.016	A	A
Amand NB	5.34	0.36	5.919	A	A
Bleams WB	24.70	1.65	4.532	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.30	0.09	6.019	A	A
Bleams EB	7.49	0.50	2.687	A	A
Amand NB	3.87	0.26	5.150	A	A
Bleams WB	16.15	1.08	3.566	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Amand NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.55	0.00	0.00	3.15	4.20			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.96	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.91	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.96	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.52	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.95	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.66	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.59	0.00	0.00	3.15	4.20			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.05	0.00	0.00	1.05	3.15			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)

Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	50.44	681.96	0.074	0.00	0.00	0.08	1.21	(0.00)	5.980
1	**Bleams EB**	657.24	2065.92	0.318	0.00	0.00	0.49	7.18	(0.00)	2.676
1	**Amand NB**	175.41	911.73	0.192	0.00	0.00	0.25	3.62	(0.00)	5.121
1	**Bleams WB**	1056.25	2120.59	0.498	0.00	0.00	1.03	15.06	(0.00)	3.525
2	**Donnenwerth SB**	60.23	575.62	0.105	0.00	0.08	0.12	1.78	(0.00)	7.330
2	**Bleams EB**	784.81	2040.91	0.385	0.00	0.49	0.65	9.63	(0.00)	3.006
2	**Amand NB**	209.46	850.72	0.246	0.00	0.25	0.34	4.99	(0.00)	5.889
2	**Bleams WB**	1261.27	2106.28	0.599	0.00	1.03	1.55	22.54	(0.00)	4.451
3	**Donnenwerth SB**	73.77	431.86	0.171	0.00	0.12	0.21	3.09	(0.00)	10.534
3	**Bleams EB**	961.19	2007.16	0.479	0.00	0.65	0.96	14.06	(0.00)	3.604
3	**Amand NB**	256.54	767.60	0.334	0.00	0.34	0.52	7.58	(0.00)	7.375
3	**Bleams WB**	1544.73	2086.95	0.740	0.00	1.55	2.91	41.17	(0.00)	6.834
4	**Donnenwerth SB**	73.77	429.20	0.172	0.00	0.21	0.22	3.23	(0.00)	10.634
4	**Bleams EB**	961.19	2006.47	0.479	0.00	0.96	0.96	14.40	(0.00)	3.615
4	**Amand NB**	256.54	766.92	0.335	0.00	0.52	0.52	7.85	(0.00)	7.405
4	**Bleams WB**	1544.73	2086.69	0.740	0.00	2.91	2.95	44.00	(0.00)	6.965
5	**Donnenwerth SB**	60.23	571.82	0.105	0.00	0.22	0.12	1.93	(0.00)	7.398
5	**Bleams EB**	784.81	2039.92	0.385	0.00	0.96	0.66	10.09	(0.00)	3.016
5	**Amand NB**	209.46	849.68	0.247	0.00	0.52	0.35	5.34	(0.00)	5.919
5	**Bleams WB**	1261.27	2105.88	0.599	0.00	2.95	1.59	24.70	(0.00)	4.532
6	**Donnenwerth SB**	50.44	678.64	0.074	0.00	0.12	0.08	1.30	(0.00)	6.019
6	**Bleams EB**	657.24	2065.06	0.318	0.00	0.66	0.49	7.49	(0.00)	2.687
6	**Amand NB**	175.41	910.36	0.193	0.00	0.35	0.25	3.87	(0.00)	5.150
6	**Bleams WB**	1056.25	2120.07	0.498	0.00	1.59	1.05	16.15	(0.00)	3.566

A7 - 95% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	672.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Donnenwerth SB	70.77	70.77	N/A	N/A
1	Bleams EB	846.96	846.96	N/A	N/A
1	Amand NB	222.84	222.84	N/A	N/A
1	Bleams WB	505.92	505.92	N/A	N/A
2	Donnenwerth SB	84.50	84.50	N/A	N/A
2	Bleams EB	1011.35	1011.35	N/A	N/A
2	Amand NB	266.10	266.10	N/A	N/A
2	Bleams WB	604.11	604.11	N/A	N/A
3	Donnenwerth SB	103.50	103.50	N/A	N/A
3	Bleams EB	1238.65	1238.65	N/A	N/A
3	Amand NB	325.90	325.90	N/A	N/A
3	Bleams WB	739.89	739.89	N/A	N/A
4	Donnenwerth SB	103.50	103.50	N/A	N/A
4	Bleams EB	1238.65	1238.65	N/A	N/A
4	Amand NB	325.90	325.90	N/A	N/A
4	Bleams WB	739.89	739.89	N/A	N/A
5	Donnenwerth SB	84.50	84.50	N/A	N/A
5	Bleams EB	1011.35	1011.35	N/A	N/A
5	Amand NB	266.10	266.10	N/A	N/A
5	Bleams WB	604.11	604.11	N/A	N/A

6	Donnenwerth SB	70.77	70.77	N/A	N/A
6	Bleams EB	846.96	846.96	N/A	N/A
6	Amand NB	222.84	222.84	N/A	N/A
6	Bleams WB	505.92	505.92	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000
	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	97.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.81	0.14	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.35	0.15	A	86.26	129.38	10.31	4.78	0.11	10.31	4.78	0.579	1357.445

Bleams EB	1.05	118.06	43.32	F	1032.32	1548.48	1274.66	49.39	14.16	1274.82	49.40	0.579	1357.445
Amand NB	0.52	12.31	1.09	B	271.61	407.42	63.18	9.30	0.70	63.19	9.31	0.579	1357.445
Bleams WB	0.62	8.29	1.69	A	616.64	924.96	102.50	6.65	1.14	102.52	6.65	0.579	1357.445
						3010.24	1450.65	28.9143					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.44	26.93	592.68	0.00	963.70	541.62	0.073	0.00	0.08
Bleams EB	846.96	211.74	837.69	531.32	131.80	0.00	1217.11	949.30	0.696	0.00	2.32
Amand NB	222.84	55.71	221.30	118.77	850.72	0.00	821.83	546.12	0.271	0.00	0.39
Bleams WB	505.92	126.48	502.99	955.40	116.61	0.00	1225.46	1134.08	0.413	0.00	0.73

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.26	710.44	0.00	898.96	541.61	0.094	0.08	0.11
Bleams EB	1011.35	252.84	1000.80	636.87	157.96	0.00	1202.72	949.30	0.841	2.32	4.96
Amand NB	266.10	66.52	265.27	142.18	1016.58	0.00	730.64	546.12	0.364	0.39	0.59
Bleams WB	604.11	151.03	602.92	1142.08	139.77	0.00	1212.72	1134.07	0.498	0.73	1.03

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.32	39.13	868.65	0.00	811.97	541.62	0.127	0.11	0.15
Bleams EB	1238.65	309.66	1151.06	778.70	193.26	0.00	1183.31	949.30	1.047	4.96	26.85
Amand NB	325.90	81.48	324.08	169.87	1174.46	0.00	643.83	546.12	0.506	0.59	1.05
Bleams WB	739.89	184.97	737.34	1328.09	170.44	0.00	1195.86	1134.08	0.619	1.03	1.67

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.34	871.84	0.00	810.22	541.62	0.128	0.15	0.15
Bleams EB	1238.65	309.66	1172.77	781.57	193.77	0.00	1183.04	949.30	1.047	26.85	43.32
Amand NB	325.90	81.48	325.72	171.42	1195.11	0.00	632.47	546.12	0.515	1.05	1.09
Bleams WB	739.89	184.97	739.81	1349.46	171.37	0.00	1195.35	1134.08	0.619	1.67	1.69

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.68	33.12	715.11	0.00	896.39	541.61	0.094	0.15	0.11
Bleams EB	1011.35	252.84	1155.14	641.06	158.73	0.00	1202.30	949.30	0.841	43.32	7.38
Amand NB	266.10	66.52	267.52	151.22	1162.64	0.00	650.33	546.12	0.409	1.09	0.74
Bleams WB	604.11	151.03	606.62	1288.56	141.60	0.00	1211.72	1134.07	0.499	1.69	1.06

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.87	27.25	598.13	0.00	960.71	541.62	0.074	0.11	0.08

Bleams EB	846.96	211.74	866.49	536.24	132.77	0.00	1216.57	949.30	0.696	7.38	2.49
Amand NB	222.84	55.71	224.19	120.96	878.30	0.00	806.67	546.12	0.276	0.74	0.40
Bleams WB	505.92	126.48	507.16	984.27	118.22	0.00	1224.58	1134.08	0.413	1.06	0.75

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.21	0.08	4.231	A	A
Bleams EB	32.00	2.13	9.740	A	A
Amand NB	5.60	0.37	6.277	A	A
Bleams WB	10.59	0.71	5.211	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.60	0.11	4.640	A	A
Bleams EB	65.34	4.36	17.824	C	B
Amand NB	8.61	0.57	8.108	A	A
Bleams WB	14.97	1.00	6.185	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.24	0.15	5.332	A	A
Bleams EB	256.59	17.11	62.367	F	E
Amand NB	14.92	0.99	11.754	B	B
Bleams WB	23.82	1.59	8.197	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.29	0.15	5.348	A	A
Bleams EB	528.48	35.23	118.061	F	F
Amand NB	16.20	1.08	12.309	B	B
Bleams WB	25.16	1.68	8.294	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.68	0.11	4.657	A	A
Bleams EB	349.57	23.30	78.886	F	E
Amand NB	11.57	0.77	9.910	A	A
Bleams WB	16.46	1.10	6.271	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.28	0.09	4.248	A	A
Bleams EB	42.68	2.85	11.351	B	B
Amand NB	6.27	0.42	6.503	A	A
Bleams WB	11.50	0.77	5.279	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.32	0.00	1.05	4.20	5.25			N/A	N/A
Amand NB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.73	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.96	0.00	0.00	11.55	17.85			N/A	N/A
Amand NB	0.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.03	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	26.85	2.10	19.95	54.60	69.30			N/A	N/A
Amand NB	1.05	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.67	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	43.32	5.25	33.60	87.15	107.10			N/A	N/A
Amand NB	1.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.69	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	7.38	0.00	0.00	16.80	29.40			N/A	N/A
Amand NB	0.74	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.06	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.49	0.00	0.00	0.00	5.25			N/A	N/A
Amand NB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.75	0.00	0.00	1.05	1.05			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	70.77	963.70	0.073	0.00	0.00	0.08	1.21	(0.00)	4.231
1	**Bleams EB**	846.96	1217.11	0.696	0.00	0.00	2.32	32.00	(0.00)	9.740
1	**Amand NB**	222.84	821.83	0.271	0.00	0.00	0.39	5.60	(0.00)	6.277
1	**Bleams WB**	505.92	1225.46	0.413	0.00	0.00	0.73	10.59	(0.00)	5.211
2	**Donnenwerth SB**	84.50	898.96	0.094	0.00	0.08	0.11	1.60	(0.00)	4.640
2	**Bleams EB**	1011.35	1202.72	0.841	0.00	2.32	4.96	65.34	(0.00)	17.824
2	**Amand NB**	266.10	730.64	0.364	0.00	0.39	0.59	8.61	(0.00)	8.108
2	**Bleams WB**	604.11	1212.72	0.498	0.00	0.73	1.03	14.97	(0.00)	6.185
3	**Donnenwerth SB**	103.50	811.97	0.127	0.00	0.11	0.15	2.24	(0.00)	5.332
3	**Bleams EB**	1238.65	1183.31	1.047	0.00	4.96	26.85	256.59	(0.00)	62.367
3	**Amand NB**	325.90	643.83	0.506	0.00	0.59	1.05	14.92	(0.00)	11.754
3	**Bleams WB**	739.89	1195.86	0.619	0.00	1.03	1.67	23.82	(0.00)	8.197
4	**Donnenwerth SB**	103.50	810.22	0.128	0.00	0.15	0.15	2.29	(0.00)	5.348
4	**Bleams EB**	1238.65	1183.04	1.047	0.00	26.85	43.32	528.48	(0.00)	118.061
4	**Amand NB**	325.90	632.47	0.515	0.00	1.05	1.09	16.20	(0.00)	12.309
4	**Bleams WB**	739.89	1195.35	0.619	0.00	1.67	1.69	25.16	(0.00)	8.294
5	**Donnenwerth SB**	84.50	896.39	0.094	0.00	0.15	0.11	1.68	(0.00)	4.657
5	**Bleams EB**	1011.35	1202.30	0.841	0.00	43.32	7.38	349.57	(0.00)	78.886
5	**Amand NB**	266.10	650.33	0.409	0.00	1.09	0.74	11.57	(0.00)	9.910
5	**Bleams WB**	604.11	1211.72	0.499	0.00	1.69	1.06	16.46	(0.00)	6.271
6	**Donnenwerth SB**	70.77	960.71	0.074	0.00	0.11	0.08	1.28	(0.00)	4.248

6	**Bleams EB**	846.96	1216.57	0.696	0.00	7.38	2.49	42.68	(0.00)	11.351
6	**Amand NB**	222.84	806.67	0.276	0.00	0.74	0.40	6.27	(0.00)	6.503
6	**Bleams WB**	505.92	1224.58	0.413	0.00	1.06	0.75	11.50	(0.00)	5.279

A7 - 95% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1403.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	50.44	50.44	N/A	N/A
1	**Bleams EB**	657.24	657.24	N/A	N/A
1	**Amand NB**	175.41	175.41	N/A	N/A
1	**Bleams WB**	1056.25	1056.25	N/A	N/A
2	**Donnenwerth SB**	60.23	60.23	N/A	N/A

2	Bleams EB	784.81	784.81	N/A	N/A
2	Amand NB	209.46	209.46	N/A	N/A
2	Bleams WB	1261.27	1261.27	N/A	N/A
3	Donnenwerth SB	73.77	73.77	N/A	N/A
3	Bleams EB	961.19	961.19	N/A	N/A
3	Amand NB	256.54	256.54	N/A	N/A
3	Bleams WB	1544.73	1544.73	N/A	N/A
4	Donnenwerth SB	73.77	73.77	N/A	N/A
4	Bleams EB	961.19	961.19	N/A	N/A
4	Amand NB	256.54	256.54	N/A	N/A
4	Bleams WB	1544.73	1544.73	N/A	N/A
5	Donnenwerth SB	60.23	60.23	N/A	N/A
5	Bleams EB	784.81	784.81	N/A	N/A
5	Amand NB	209.46	209.46	N/A	N/A
5	Bleams WB	1261.27	1261.27	N/A	N/A
6	Donnenwerth SB	50.44	50.44	N/A	N/A
6	Bleams EB	657.24	657.24	N/A	N/A
6	Amand NB	175.41	175.41	N/A	N/A
6	Bleams WB	1056.25	1056.25	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000
	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	206.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.75	0.15	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

	To				
From		1	2	3	4

	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.12	6.87	0.14	A	61.48	92.22	9.96	6.48	0.11	9.97	6.48	0.579	1357.445
Bleams EB	0.83	18.71	4.80	C	801.08	1201.62	237.01	11.83	2.63	237.06	11.84	0.579	1357.445
Amand NB	0.32	6.83	0.48	A	213.80	320.71	30.84	5.77	0.34	30.84	5.77	0.579	1357.445
Bleams WB	1.29	606.64	209.67	F	1287.42	1931.13	9570.13	297.34	106.33	10261.38	318.82	0.579	1357.445
						3545.68	9847.94	166.6468					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.13	124.83	1019.90	0.00	728.81	574.92	0.069	0.00	0.08
Bleams EB	657.24	164.31	652.09	877.82	192.22	0.00	1183.89	945.64	0.555	0.00	1.29
Amand NB	175.41	43.85	174.49	251.90	592.40	0.00	963.86	594.68	0.182	0.00	0.23
Bleams WB	1056.25	264.06	1033.95	656.11	110.78	0.00	1228.66	1104.50	0.860	0.00	5.58

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.11	143.85	1170.81	0.00	645.83	574.93	0.093	0.08	0.11
Bleams EB	784.81	196.20	781.61	1008.94	221.98	0.00	1167.52	945.63	0.672	1.29	2.09
Amand NB	209.46	52.37	209.12	293.51	710.09	0.00	899.15	594.68	0.233	0.23	0.32
Bleams WB	1261.27	315.32	1181.89	786.44	132.77	0.00	1216.57	1104.50	1.037	5.58	25.42

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.64	150.97	1209.97	0.00	624.31	574.93	0.118	0.11	0.14
Bleams EB	961.19	240.30	951.23	1048.26	235.35	0.00	1160.18	945.63	0.828	2.09	4.58
Amand NB	256.54	64.13	255.89	322.00	864.58	0.00	814.21	594.67	0.315	0.32	0.48
Bleams WB	1544.73	386.18	1198.64	958.17	162.30	0.00	1200.34	1104.50	1.287	25.42	111.94

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.77	151.37	1211.29	0.00	623.58	574.93	0.118	0.14	0.14
Bleams EB	961.19	240.30	960.30	1049.44	235.61	0.00	1160.03	945.63	0.829	4.58	4.80
Amand NB	256.54	64.13	256.52	323.56	872.35	0.00	809.93	594.67	0.317	0.48	0.48
Bleams WB	1544.73	386.18	1199.75	965.96	162.91	0.00	1200.00	1104.50	1.287	111.94	198.19

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.34	147.64	1201.42	0.00	629.00	574.93	0.096	0.14	0.11
Bleams EB	784.81	196.20	795.05	1034.68	227.08	0.00	1164.72	945.63	0.674	4.80	2.24
Amand NB	209.46	52.37	210.10	300.48	721.65	0.00	892.80	594.68	0.235	0.48	0.32
Bleams WB	1261.27	315.32	1215.36	798.04	133.70	0.00	1216.06	1104.50	1.037	198.19	209.67

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.52	144.00	1189.74	0.00	635.43	574.92	0.079	0.11	0.09
Bleams EB	657.24	164.31	660.70	1020.12	220.15	0.00	1168.53	945.64	0.562	2.24	1.37
Amand NB	175.41	43.85	175.77	280.84	600.01	0.00	959.67	594.68	0.183	0.32	0.24
Bleams WB	1056.25	264.06	1222.03	664.06	111.71	0.00	1228.15	1104.50	0.860	209.67	168.22

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.13	0.08	5.567	A	A
Bleams EB	18.33	1.22	7.041	A	A
Amand NB	3.39	0.23	4.785	A	A
Bleams WB	69.80	4.65	17.782	C	B

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.57	0.10	6.451	A	A
Bleams EB	29.57	1.97	9.712	A	A
Amand NB	4.65	0.31	5.475	A	A
Bleams WB	249.57	16.64	59.647	F	E

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.05	0.14	6.862	A	A
Bleams EB	60.58	4.04	17.300	C	B
Amand NB	6.97	0.46	6.765	A	A
Bleams WB	1031.59	68.77	215.393	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.10	0.14	6.874	A	A
Bleams EB	70.64	4.71	18.709	C	B
Amand NB	7.22	0.48	6.829	A	A
Bleams WB	2326.08	155.07	469.236	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.72	0.11	6.647	A	A
Bleams EB	36.33	2.42	10.493	B	B

Amand NB	4.99	0.33	5.541	A	A
Bleams WB	3058.93	203.93	606.644	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.39	0.09	6.465	A	A
Bleams EB	21.57	1.44	7.495	A	A
Amand NB	3.62	0.24	4.823	A	A
Bleams WB	2834.16	188.94	557.108	F	F

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	5.58	0.00	0.00	6.30	18.90			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.09	0.00	0.00	4.20	6.30			N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	25.42	0.00	13.65	63.00	86.10			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.58	0.00	0.00	6.30	15.75			N/A	N/A
Amand NB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	111.94	54.60	106.05	163.80	183.75			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.80	0.00	0.00	1.05	11.55			N/A	N/A
Amand NB	0.48	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	198.19	124.95	193.20	>199	>199			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.24	0.00	0.00	4.20	7.35			N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	209.67	127.05	>199	>199	>199			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.37	0.00	0.00	1.05	4.20			N/A	N/A
Amand NB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	168.22	84.00	160.65	>199	>199			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	50.44	728.81	0.069	0.00	0.00	0.08	1.13	(0.00)	5.567
1	**Bleams EB**	657.24	1183.89	0.555	0.00	0.00	1.29	18.33	(0.00)	7.041
1	**Amand NB**	175.41	963.86	0.182	0.00	0.00	0.23	3.39	(0.00)	4.785
1	**Bleams WB**	1056.25	1228.66	0.860	0.00	0.00	5.58	69.80	(0.00)	17.782
2	**Donnenwerth SB**	60.23	645.83	0.093	0.00	0.08	0.11	1.57	(0.00)	6.451
2	**Bleams EB**	784.81	1167.52	0.672	0.00	1.29	2.09	29.57	(0.00)	9.712
2	**Amand NB**	209.46	899.15	0.233	0.00	0.23	0.32	4.65	(0.00)	5.475
2	**Bleams WB**	1261.27	1216.57	1.037	0.00	5.58	25.42	249.57	(0.00)	59.647
3	**Donnenwerth SB**	73.77	624.31	0.118	0.00	0.11	0.14	2.05	(0.00)	6.862
3	**Bleams EB**	961.19	1160.18	0.828	0.00	2.09	4.58	60.58	(0.00)	17.300
3	**Amand NB**	256.54	814.21	0.315	0.00	0.32	0.48	6.97	(0.00)	6.765
3	**Bleams WB**	1544.73	1200.34	1.287	0.00	25.42	111.94	1031.59	(0.00)	215.393
4	**Donnenwerth SB**	73.77	623.58	0.118	0.00	0.14	0.14	2.10	(0.00)	6.874

4	**Bleams EB**	961.19	1160.03	0.829	0.00	4.58	4.80	70.64	(0.00)	18.709
4	**Amand NB**	256.54	809.93	0.317	0.00	0.48	0.48	7.22	(0.00)	6.829
4	**Bleams WB**	1544.73	1200.00	1.287	0.00	111.94	198.19	2326.08	(0.00)	469.236
5	**Donnenwerth SB**	60.23	629.00	0.096	0.00	0.14	0.11	1.72	(0.00)	6.647
5	**Bleams EB**	784.81	1164.72	0.674	0.00	4.80	2.24	36.33	(0.00)	10.493
5	**Amand NB**	209.46	892.80	0.235	0.00	0.48	0.32	4.99	(0.00)	5.541
5	**Bleams WB**	1261.27	1216.06	1.037	0.00	198.19	209.67	3058.93	(0.00)	606.644
6	**Donnenwerth SB**	50.44	635.43	0.079	0.00	0.11	0.09	1.39	(0.00)	6.465
6	**Bleams EB**	657.24	1168.53	0.562	0.00	2.24	1.37	21.57	(0.00)	7.495
6	**Amand NB**	175.41	959.67	0.183	0.00	0.32	0.24	3.62	(0.00)	4.823
6	**Bleams WB**	1056.25	1228.15	0.860	0.00	209.67	168.22	2834.16	(0.00)	557.108

A8 - 90% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	672.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Donnenwerth SB	70.77	70.77	N/A	N/A
1	Bleams EB	846.96	846.96	N/A	N/A
1	Amand NB	222.84	222.84	N/A	N/A
1	Bleams WB	505.92	505.92	N/A	N/A
2	Donnenwerth SB	84.50	84.50	N/A	N/A
2	Bleams EB	1011.35	1011.35	N/A	N/A
2	Amand NB	266.10	266.10	N/A	N/A
2	Bleams WB	604.11	604.11	N/A	N/A
3	Donnenwerth SB	103.50	103.50	N/A	N/A
3	Bleams EB	1238.65	1238.65	N/A	N/A
3	Amand NB	325.90	325.90	N/A	N/A
3	Bleams WB	739.89	739.89	N/A	N/A
4	Donnenwerth SB	103.50	103.50	N/A	N/A
4	Bleams EB	1238.65	1238.65	N/A	N/A
4	Amand NB	325.90	325.90	N/A	N/A
4	Bleams WB	739.89	739.89	N/A	N/A
5	Donnenwerth SB	84.50	84.50	N/A	N/A
5	Bleams EB	1011.35	1011.35	N/A	N/A
5	Amand NB	266.10	266.10	N/A	N/A
5	Bleams WB	604.11	604.11	N/A	N/A
6	Donnenwerth SB	70.77	70.77	N/A	N/A
6	Bleams EB	846.96	846.96	N/A	N/A
6	Amand NB	222.84	222.84	N/A	N/A
6	Bleams WB	505.92	505.92	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000
	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	97.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.81	0.14	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.69	0.16	A	86.26	129.38	10.95	5.08	0.12	10.95	5.08	0.579	1357.445
Bleams EB	1.11	187.44	70.46	F	1032.32	1548.48	2384.50	92.39	26.49	2384.76	92.40	0.579	1357.445
Amand NB	0.52	12.57	1.12	B	271.61	407.42	67.29	9.91	0.75	67.30	9.91	0.579	1357.445
Bleams WB	0.65	9.62	1.95	A	616.64	924.96	115.71	7.51	1.29	115.73	7.51	0.579	1357.445
						3010.24	2578.45	51.3936					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.42	26.91	592.35	0.00	913.15	543.61	0.078	0.00	0.09
Bleams EB	846.96	211.74	835.89	531.02	131.74	0.00	1153.08	902.81	0.735	0.00	2.77
Amand NB	222.84	55.71	221.18	118.63	849.00	0.00	779.47	539.39	0.286	0.00	0.42
Bleams WB	505.92	126.48	502.71	953.64	116.55	0.00	1160.99	1076.28	0.436	0.00	0.80

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.23	710.22	0.00	851.76	543.61	0.099	0.09	0.11
Bleams EB	1011.35	252.84	995.45	636.68	157.93	0.00	1139.44	902.80	0.888	2.77	6.74
Amand NB	266.10	66.52	265.19	141.86	1011.52	0.00	694.82	539.39	0.383	0.42	0.64
Bleams WB	604.11	151.03	602.74	1137.00	139.71	0.00	1148.93	1076.28	0.526	0.80	1.15

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.31	38.90	868.15	0.00	769.49	543.61	0.135	0.11	0.16

Bleams EB	1238.65	309.66	1104.84	778.28	193.17	0.00	1121.08	902.80	1.105	6.74	40.19
Amand NB	325.90	81.48	324.13	167.24	1130.77	0.00	632.70	539.39	0.515	0.64	1.09
Bleams WB	739.89	184.97	736.79	1284.64	170.26	0.00	1133.02	1076.28	0.653	1.15	1.92

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.09	871.83	0.00	767.58	543.61	0.135	0.16	0.16
Bleams EB	1238.65	309.66	1117.58	781.56	193.76	0.00	1120.77	902.80	1.105	40.19	70.46
Amand NB	325.90	81.48	325.77	168.37	1142.97	0.00	626.35	539.39	0.520	1.09	1.12
Bleams WB	739.89	184.97	739.77	1297.58	171.15	0.00	1132.55	1076.28	0.653	1.92	1.95

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.69	33.00	715.60	0.00	848.95	543.61	0.100	0.16	0.12
Bleams EB	1011.35	252.84	1122.25	641.47	158.82	0.00	1138.98	902.80	0.888	70.46	42.74
Amand NB	266.10	66.52	267.46	149.49	1131.58	0.00	632.28	539.39	0.421	1.12	0.78
Bleams WB	604.11	151.03	607.17	1257.61	141.43	0.00	1148.03	1076.28	0.526	1.95	1.18

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.88	27.87	598.21	0.00	910.10	543.61	0.078	0.12	0.09
Bleams EB	846.96	211.74	1005.18	536.28	132.81	0.00	1152.52	902.81	0.735	42.74	3.18
Amand NB	222.84	55.71	223.95	128.63	1009.35	0.00	695.95	539.39	0.320	0.78	0.50
Bleams WB	505.92	126.48	507.37	1114.59	118.71	0.00	1159.87	1076.28	0.436	1.18	0.82

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.29	0.09	4.483	A	A
Bleams EB	37.54	2.50	11.549	B	B
Amand NB	6.01	0.40	6.750	A	A
Bleams WB	11.57	0.77	5.715	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.70	0.11	4.926	A	A
Bleams EB	84.81	5.65	23.910	C	C
Amand NB	9.29	0.62	8.780	A	A
Bleams WB	16.62	1.11	6.902	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.38	0.16	5.672	A	A
Bleams EB	363.80	24.25	89.224	F	F
Amand NB	15.44	1.03	12.178	B	B
Bleams WB	27.24	1.82	9.464	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.44	0.16	5.691	A	A
Bleams EB	830.87	55.39	187.444	F	F
Amand NB	16.61	1.11	12.565	B	B
Bleams WB	29.06	1.94	9.616	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.79	0.12	4.946	A	A
Bleams EB	848.99	56.60	183.229	F	F
Amand NB	12.16	0.81	10.399	B	B
Bleams WB	18.53	1.24	7.027	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.36	0.09	4.504	A	A
Bleams EB	218.49	14.57	47.961	E	D
Amand NB	7.78	0.52	8.026	A	A
Bleams WB	12.69	0.85	5.807	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.77	0.00	1.05	5.25	7.35			N/A	N/A
Amand NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.80	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	6.74	0.00	2.10	16.80	24.15			N/A	N/A
Amand NB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.15	0.00	0.00	2.10	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	40.19	10.50	34.65	69.30	82.95			N/A	N/A
Amand NB	1.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Bleams WB	1.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	70.46	24.15	64.05	114.45	132.30			N/A	N/A
Amand NB	1.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.95	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	42.74	12.60	37.80	72.45	85.05			N/A	N/A
Amand NB	0.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.18	0.00	0.00	2.10	2.10			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	3.18	0.00	0.00	1.05	7.35			N/A	N/A
Amand NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.82	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	70.77	913.15	0.078	0.00	0.00	0.09	1.29	(0.00)	4.483

1	Bleams EB	846.96	1153.08	0.735	0.00	0.00	2.77	37.54	(0.00)	11.549
1	Amand NB	222.84	779.47	0.286	0.00	0.00	0.42	6.01	(0.00)	6.750
1	Bleams WB	505.92	1160.99	0.436	0.00	0.00	0.80	11.57	(0.00)	5.715
2	Donnenwerth SB	84.50	851.76	0.099	0.00	0.09	0.11	1.70	(0.00)	4.926
2	Bleams EB	1011.35	1139.44	0.888	0.00	2.77	6.74	84.81	(0.00)	23.910
2	Amand NB	266.10	694.82	0.383	0.00	0.42	0.64	9.29	(0.00)	8.780
2	Bleams WB	604.11	1148.93	0.526	0.00	0.80	1.15	16.62	(0.00)	6.902
3	Donnenwerth SB	103.50	769.49	0.135	0.00	0.11	0.16	2.38	(0.00)	5.672
3	Bleams EB	1238.65	1121.08	1.105	0.00	6.74	40.19	363.80	(0.00)	89.224
3	Amand NB	325.90	632.70	0.515	0.00	0.64	1.09	15.44	(0.00)	12.178
3	Bleams WB	739.89	1133.02	0.653	0.00	1.15	1.92	27.24	(0.00)	9.464
4	Donnenwerth SB	103.50	767.58	0.135	0.00	0.16	0.16	2.44	(0.00)	5.691
4	Bleams EB	1238.65	1120.77	1.105	0.00	40.19	70.46	830.87	(0.00)	187.444
4	Amand NB	325.90	626.35	0.520	0.00	1.09	1.12	16.61	(0.00)	12.565
4	Bleams WB	739.89	1132.55	0.653	0.00	1.92	1.95	29.06	(0.00)	9.616
5	Donnenwerth SB	84.50	848.95	0.100	0.00	0.16	0.12	1.79	(0.00)	4.946
5	Bleams EB	1011.35	1138.98	0.888	0.00	70.46	42.74	848.99	(0.00)	183.229
5	Amand NB	266.10	632.28	0.421	0.00	1.12	0.78	12.16	(0.00)	10.399
5	Bleams WB	604.11	1148.03	0.526	0.00	1.95	1.18	18.53	(0.00)	7.027
6	Donnenwerth SB	70.77	910.10	0.078	0.00	0.12	0.09	1.36	(0.00)	4.504
6	Bleams EB	846.96	1152.52	0.735	0.00	42.74	3.18	218.49	(0.00)	47.961
6	Amand NB	222.84	695.95	0.320	0.00	0.78	0.50	7.78	(0.00)	8.026
6	Bleams WB	505.92	1159.87	0.436	0.00	1.18	0.82	12.69	(0.00)	5.807

A8 - 90% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies	Vehicle Mix Varies Over Turn	Vehicle Mix Varies	Vehicle Mix Source	PCE Factor for a	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry

	Over Time		Over Entry		Truck (PCE)					
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1403.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	50.44	50.44	N/A	N/A
1	**Bleams EB**	657.24	657.24	N/A	N/A
1	**Amand NB**	175.41	175.41	N/A	N/A
1	**Bleams WB**	1056.25	1056.25	N/A	N/A
2	**Donnenwerth SB**	60.23	60.23	N/A	N/A
2	**Bleams EB**	784.81	784.81	N/A	N/A
2	**Amand NB**	209.46	209.46	N/A	N/A
2	**Bleams WB**	1261.27	1261.27	N/A	N/A
3	**Donnenwerth SB**	73.77	73.77	N/A	N/A
3	**Bleams EB**	961.19	961.19	N/A	N/A
3	**Amand NB**	256.54	256.54	N/A	N/A
3	**Bleams WB**	1544.73	1544.73	N/A	N/A
4	**Donnenwerth SB**	73.77	73.77	N/A	N/A
4	**Bleams EB**	961.19	961.19	N/A	N/A
4	**Amand NB**	256.54	256.54	N/A	N/A
4	**Bleams WB**	1544.73	1544.73	N/A	N/A
5	**Donnenwerth SB**	60.23	60.23	N/A	N/A
5	**Bleams EB**	784.81	784.81	N/A	N/A
5	**Amand NB**	209.46	209.46	N/A	N/A
5	**Bleams WB**	1261.27	1261.27	N/A	N/A
6	**Donnenwerth SB**	50.44	50.44	N/A	N/A
6	**Bleams EB**	657.24	657.24	N/A	N/A
6	**Amand NB**	175.41	175.41	N/A	N/A
6	**Bleams WB**	1056.25	1056.25	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000

	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	206.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.75	0.15	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.12	6.92	0.14	A	61.48	92.22	10.11	6.57	0.11	10.11	6.57	0.579	1357.445
Bleams EB	0.87	25.40	6.42	D	801.08	1201.62	293.07	14.63	3.26	293.14	14.64	0.579	1357.445
Amand NB	0.33	7.39	0.52	A	213.80	320.71	33.16	6.20	0.37	33.16	6.20	0.579	1357.445
Bleams WB	1.36	803.97	270.53	F	1287.42	1931.13	12405.98	385.45	137.84	13951.76	433.48	0.579	1357.445
						3545.68	12742.32	215.6255					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.11	123.93	1012.03	0.00	694.55	573.09	0.073	0.00	0.08
Bleams EB	657.24	164.31	651.43	871.22	190.92	0.00	1122.25	900.81	0.586	0.00	1.45
Amand NB	175.41	43.85	174.42	250.52	591.83	0.00	913.43	583.92	0.192	0.00	0.25

Bleams WB	1056.25	264.06	1025.23	655.53	110.73	0.00	1164.03	1050.01	0.907	0.00	7.76

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.12	139.21	1129.46	0.00	633.38	573.09	0.095	0.08	0.11
Bleams EB	784.81	196.20	780.87	974.34	215.24	0.00	1109.58	900.80	0.707	1.45	2.44
Amand NB	209.46	52.37	209.10	286.65	709.47	0.00	852.15	583.92	0.246	0.25	0.34
Bleams WB	1261.27	315.32	1135.93	785.83	132.73	0.00	1152.56	1050.01	1.094	7.76	39.09

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.64	144.59	1154.03	0.00	620.59	573.09	0.119	0.11	0.14
Bleams EB	961.19	240.30	947.10	1001.45	226.22	0.00	1103.86	900.80	0.871	2.44	5.96
Amand NB	256.54	64.13	255.83	312.24	861.08	0.00	773.18	583.92	0.332	0.34	0.52
Bleams WB	1544.73	386.18	1136.48	954.78	162.14	0.00	1137.25	1050.01	1.358	39.09	141.15

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.77	145.01	1154.60	0.00	620.29	573.09	0.119	0.14	0.14
Bleams EB	961.19	240.30	959.35	1002.00	226.36	0.00	1103.80	900.80	0.871	5.96	6.42
Amand NB	256.54	64.13	256.51	314.16	871.55	0.00	767.73	583.92	0.334	0.52	0.52
Bleams WB	1544.73	386.18	1136.73	965.18	162.88	0.00	1136.86	1050.01	1.359	141.15	243.15

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.35	141.40	1144.24	0.00	625.68	573.09	0.096	0.14	0.11
Bleams EB	784.81	196.20	799.87	986.84	217.75	0.00	1108.28	900.80	0.708	6.42	2.66
Amand NB	209.46	52.37	210.15	291.88	725.73	0.00	843.68	583.92	0.248	0.52	0.35
Bleams WB	1261.27	315.32	1151.76	801.99	133.89	0.00	1151.96	1050.01	1.095	243.15	270.53

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.52	137.70	1133.05	0.00	631.51	573.09	0.080	0.11	0.09
Bleams EB	657.24	164.31	661.66	972.68	210.89	0.00	1111.85	900.81	0.591	2.66	1.55
Amand NB	175.41	43.85	175.80	271.73	600.82	0.00	908.74	583.92	0.193	0.35	0.25
Bleams WB	1056.25	264.06	1158.99	664.86	111.76	0.00	1163.48	1050.01	0.908	270.53	244.85

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.19	0.08	5.863	A	A
Bleams EB	20.53	1.37	7.934	A	A
Amand NB	3.62	0.24	5.109	A	A
Bleams WB	91.02	6.07	23.573	C	C

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.61	0.11	6.591	A	A
Bleams EB	34.17	2.28	11.360	B	B
Amand NB	4.98	0.33	5.876	A	A
Bleams WB	362.33	24.16	87.044	F	F

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.06	0.14	6.909	A	A
Bleams EB	75.90	5.06	22.301	C	C
Amand NB	7.50	0.50	7.295	A	A
Bleams WB	1352.36	90.16	293.702	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.11	0.14	6.915	A	A
Bleams EB	93.47	6.23	25.398	D	C
Amand NB	7.80	0.52	7.393	A	A
Bleams WB	2882.32	192.15	610.984	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.73	0.12	6.686	A	A
Bleams EB	44.50	2.97	12.804	B	B
Amand NB	5.39	0.36	5.974	A	A
Bleams WB	3852.63	256.84	803.970	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.40	0.09	6.508	A	A
Bleams EB	24.51	1.63	8.476	A	A
Amand NB	3.87	0.26	5.159	A	A
Bleams WB	3865.32	257.69	800.648	F	F

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	7.76	0.00	0.00	1.05	16.80			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.44	0.00	0.00	5.25	8.40			N/A	N/A
Amand NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	39.09	0.00	17.85	101.85	141.75			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	5.96	0.00	0.00	11.55	23.10			N/A	N/A
Amand NB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	141.15	59.85	132.30	>199	>199			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	6.42	0.00	0.00	6.30	21.00			N/A	N/A
Amand NB	0.52	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	243.15	147.00	>199	>199	>199			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.66	0.00	0.00	5.25	9.45			N/A	N/A
Amand NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	270.53	165.90	>199	>199	>199			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.55	0.00	0.00	1.05	4.20			N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	244.85	136.50	>199	>199	>199			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Donnenwerth SB**	50.44	694.55	0.073	0.00	0.00	0.08	1.19	(0.00)	5.863
1	**Bleams EB**	657.24	1122.25	0.586	0.00	0.00	1.45	20.53	(0.00)	7.934
1	**Amand NB**	175.41	913.43	0.192	0.00	0.00	0.25	3.62	(0.00)	5.109
1	**Bleams WB**	1056.25	1164.03	0.907	0.00	0.00	7.76	91.02	(0.00)	23.573
2	**Donnenwerth SB**	60.23	633.38	0.095	0.00	0.08	0.11	1.61	(0.00)	6.591
2	**Bleams EB**	784.81	1109.58	0.707	0.00	1.45	2.44	34.17	(0.00)	11.360
2	**Amand NB**	209.46	852.15	0.246	0.00	0.25	0.34	4.98	(0.00)	5.876
2	**Bleams WB**	1261.27	1152.56	1.094	0.00	7.76	39.09	362.33	(0.00)	87.044
3	**Donnenwerth SB**	73.77	620.59	0.119	0.00	0.11	0.14	2.06	(0.00)	6.909
3	**Bleams EB**	961.19	1103.86	0.871	0.00	2.44	5.96	75.90	(0.00)	22.301
3	**Amand NB**	256.54	773.18	0.332	0.00	0.34	0.52	7.50	(0.00)	7.295
3	**Bleams WB**	1544.73	1137.25	1.358	0.00	39.09	141.15	1352.36	(0.00)	293.702
4	**Donnenwerth SB**	73.77	620.29	0.119	0.00	0.14	0.14	2.11	(0.00)	6.915
4	**Bleams EB**	961.19	1103.80	0.871	0.00	5.96	6.42	93.47	(0.00)	25.398
4	**Amand NB**	256.54	767.73	0.334	0.00	0.52	0.52	7.80	(0.00)	7.393
4	**Bleams WB**	1544.73	1136.86	1.359	0.00	141.15	243.15	2882.32	(0.00)	610.984
5	**Donnenwerth SB**	60.23	625.68	0.096	0.00	0.14	0.11	1.73	(0.00)	6.686
5	**Bleams EB**	784.81	1108.28	0.708	0.00	6.42	2.66	44.50	(0.00)	12.804
5	**Amand NB**	209.46	843.68	0.248	0.00	0.52	0.35	5.39	(0.00)	5.974
5	**Bleams WB**	1261.27	1151.96	1.095	0.00	243.15	270.53	3852.63	(0.00)	803.970
6	**Donnenwerth SB**	50.44	631.51	0.080	0.00	0.11	0.09	1.40	(0.00)	6.508
6	**Bleams EB**	657.24	1111.85	0.591	0.00	2.66	1.55	24.51	(0.00)	8.476
6	**Amand NB**	175.41	908.74	0.193	0.00	0.35	0.25	3.87	(0.00)	5.159
6	**Bleams WB**	1056.25	1163.48	0.908	0.00	270.53	244.85	3865.32	(0.00)	800.648

Bleams Road & Commonwealth/Abram Clemens Street Roundabout Capacity Analysis

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Report generation date: 2/8/2023 9:51:38 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - Dual E-W Single N-S - 2031							
Commonwealth SB	0.13	5.07	0.11	A	0.35	14.95	0.25	B
Bleams EB	2.08	5.16	0.67	A	0.87	3.26	0.46	A
Abram Clemens NB	1.31	18.22	0.56	C	0.43	6.87	0.29	A
Bleams WB	0.52	2.57	0.33	A	3.56	7.61	0.78	A
	90% - Dual E-W Single N-S - 2031							
Commonwealth SB	0.14	5.38	0.12	A	0.38	16.07	0.27	C
Bleams EB	2.46	6.12	0.70	A	0.97	3.61	0.48	A
Abram Clemens NB	1.48	20.68	0.59	C	0.47	7.42	0.31	A
Bleams WB	0.57	2.79	0.35	A	4.60	9.91	0.82	A
	95% - Single Lane - 2031							
Commonwealth SB	0.13	5.07	0.11	A	0.17	7.32	0.14	A
Bleams EB	151.12	447.53	1.22	F	4.72	18.23	0.83	C
Abram Clemens NB	0.78	10.81	0.43	B	0.43	6.86	0.29	A
Bleams WB	1.62	8.02	0.61	A	356.39	1024.54	1.42	F
	90% - Single Lane - 2031							
Commonwealth SB	0.14	5.38	0.12	A	0.17	7.33	0.14	A
Bleams EB	203.39	622.21	1.29	F	6.33	24.81	0.87	C
Abram Clemens NB	0.79	10.84	0.43	B	0.47	7.41	0.31	A
Bleams WB	1.87	9.26	0.64	A	426.52	1318.58	1.50	F

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A5 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry

		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	83.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	62.49	62.49	N/A	N/A
1	**Bleams EB**	1000.54	1000.54	N/A	N/A
1	**Abram Clemens NB**	180.68	180.68	N/A	N/A
1	**Bleams WB**	503.66	503.66	N/A	N/A
2	**Commonwealth SB**	74.62	74.62	N/A	N/A
2	**Bleams EB**	1194.74	1194.74	N/A	N/A
2	**Abram Clemens NB**	215.76	215.76	N/A	N/A
2	**Bleams WB**	601.42	601.42	N/A	N/A
3	**Commonwealth SB**	91.38	91.38	N/A	N/A
3	**Bleams EB**	1463.26	1463.26	N/A	N/A
3	**Abram Clemens NB**	264.24	264.24	N/A	N/A
3	**Bleams WB**	736.58	736.58	N/A	N/A
4	**Commonwealth SB**	91.38	91.38	N/A	N/A
4	**Bleams EB**	1463.26	1463.26	N/A	N/A
4	**Abram Clemens NB**	264.24	264.24	N/A	N/A
4	**Bleams WB**	736.58	736.58	N/A	N/A
5	**Commonwealth SB**	74.62	74.62	N/A	N/A
5	**Bleams EB**	1194.74	1194.74	N/A	N/A
5	**Abram Clemens NB**	215.76	215.76	N/A	N/A
5	**Bleams WB**	601.42	601.42	N/A	N/A
6	**Commonwealth SB**	62.49	62.49	N/A	N/A
6	**Bleams EB**	1000.54	1000.54	N/A	N/A
6	**Abram Clemens NB**	180.68	180.68	N/A	N/A
6	**Bleams WB**	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	12.000	0.000	71.000
	2	19.000	0.000	48.000	1262.000
	3	0.000	120.000	0.000	120.000
	4	42.000	541.000	86.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.14	0.00	0.86
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.81	0.13	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.11	5.07	0.13	A	76.16	114.24	8.72	4.58	0.10	8.72	4.58	0.579	1357.445
Bleams EB	0.67	5.16	2.08	A	1219.51	1829.27	123.25	4.04	1.37	123.26	4.04	0.723	2436.345
Abram Clemens NB	0.56	18.22	1.31	C	220.23	330.34	64.34	11.69	0.71	64.34	11.69	0.579	1357.445
Bleams WB	0.33	2.57	0.52	A	613.89	920.83	36.34	2.37	0.40	36.34	2.37	0.723	2436.345
						3194.68	232.65	4.3695					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.20	45.80	560.56	0.00	981.36	92.32	0.064	0.00	0.07
Bleams EB	1000.54	250.14	997.15	504.97	117.80	0.00	2233.62	2062.38	0.448	0.00	0.85
Abram Clemens NB	180.68	45.17	179.32	100.60	1014.35	0.00	731.86	153.17	0.247	0.00	0.34
Bleams WB	503.66	125.91	502.45	1089.75	103.92	0.00	2243.16	2241.68	0.225	0.00	0.30

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.53	54.80	670.81	0.00	920.75	92.32	0.081	0.07	0.09
Bleams EB	1194.74	298.69	1193.27	604.31	141.02	0.00	2217.67	2062.38	0.539	0.85	1.22
Abram Clemens NB	215.76	53.94	214.92	120.37	1213.93	0.00	622.13	153.17	0.347	0.34	0.55
Bleams WB	601.42	150.35	601.08	1304.33	124.52	0.00	2229.01	2241.68	0.270	0.30	0.39

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.24	67.08	820.50	0.00	838.44	92.32	0.109	0.09	0.13
Bleams EB	1463.26	365.81	1459.87	739.08	172.67	0.00	2195.94	2062.38	0.666	1.22	2.06
Abram Clemens NB	264.24	66.06	261.35	147.34	1485.19	0.00	472.98	153.17	0.559	0.55	1.27
Bleams WB	736.58	184.15	736.04	1595.00	151.54	0.00	2210.45	2241.68	0.333	0.39	0.52

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.38	67.16	822.39	0.00	837.41	92.32	0.109	0.13	0.13
Bleams EB	1463.26	365.81	1463.19	740.91	172.86	0.00	2195.81	2062.38	0.666	2.06	2.08
Abram Clemens NB	264.24	66.06	264.10	147.53	1488.51	0.00	471.16	153.17	0.561	1.27	1.31
Bleams WB	736.58	184.15	736.58	1599.65	152.97	0.00	2209.47	2241.68	0.333	0.52	0.52

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.76	54.92	673.52	0.00	919.26	92.32	0.081	0.13	0.09
Bleams EB	1194.74	298.69	1198.11	606.95	141.33	0.00	2217.46	2062.38	0.539	2.08	1.24
Abram Clemens NB	215.76	53.94	218.71	120.65	1218.79	0.00	619.46	153.17	0.348	1.31	0.57
Bleams WB	601.42	150.35	601.95	1311.01	126.48	0.00	2227.66	2241.68	0.270	0.52	0.39

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.57	45.97	563.14	0.00	979.95	92.32	0.064	0.09	0.07
Bleams EB	1000.54	250.14	1002.06	507.40	118.31	0.00	2233.27	2062.38	0.448	1.24	0.86
Abram Clemens NB	180.68	45.17	181.57	100.98	1019.39	0.00	729.09	153.17	0.248	0.57	0.35
Bleams WB	503.66	125.91	504.00	1095.85	105.11	0.00	2242.34	2241.68	0.225	0.39	0.31

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.04	0.07	4.111	A	A
Bleams EB	12.40	0.83	3.050	A	A
Abram Clemens NB	4.93	0.33	6.825	A	A
Bleams WB	4.48	0.30	2.170	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

Commonwealth SB	1.36	0.09	4.467	A	A
Bleams EB	17.81	1.19	3.685	A	A
Abram Clemens NB	7.94	0.53	9.263	A	A
Bleams WB	5.73	0.38	2.322	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.88	0.13	5.059	A	A
Bleams EB	29.73	1.98	5.112	A	A
Abram Clemens NB	17.62	1.17	17.625	C	B
Bleams WB	7.73	0.52	2.564	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.92	0.13	5.066	A	A
Bleams EB	31.09	2.07	5.159	A	A
Abram Clemens NB	19.43	1.30	18.225	C	B
Bleams WB	7.85	0.52	2.565	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.42	0.09	4.476	A	A
Bleams EB	19.09	1.27	3.719	A	A
Abram Clemens NB	9.01	0.60	9.501	A	A
Bleams WB	5.92	0.39	2.325	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.09	0.07	4.120	A	A
Bleams EB	13.12	0.87	3.073	A	A
Abram Clemens NB	5.41	0.36	6.916	A	A
Bleams WB	4.63	0.31	2.174	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.85	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Commonwealth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.22	0.00	0.00	2.10	3.15			N/A	N/A
Abram Clemens NB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.27	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.31	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.52	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.24	0.00	0.00	1.05	2.10			N/A	N/A
Abram Clemens NB	0.57	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.86	0.00	0.00	1.05	1.05			N/A	N/A
Abram Clemens NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	62.49	981.36	0.064	0.00	0.00	0.07	1.04	(0.00)	4.111
1	Bleams EB	1000.54	2233.62	0.448	0.00	0.00	0.85	12.40	(0.00)	3.050
1	Abram Clemens NB	180.68	731.86	0.247	0.00	0.00	0.34	4.93	(0.00)	6.825
1	Bleams WB	503.66	2243.16	0.225	0.00	0.00	0.30	4.48	(0.00)	2.170
2	Commonwealth SB	74.62	920.75	0.081	0.00	0.07	0.09	1.36	(0.00)	4.467
2	Bleams EB	1194.74	2217.67	0.539	0.00	0.85	1.22	17.81	(0.00)	3.685
2	Abram Clemens NB	215.76	622.13	0.347	0.00	0.34	0.55	7.94	(0.00)	9.263
2	Bleams WB	601.42	2229.01	0.270	0.00	0.30	0.39	5.73	(0.00)	2.322
3	Commonwealth SB	91.38	838.44	0.109	0.00	0.09	0.13	1.88	(0.00)	5.059
3	Bleams EB	1463.26	2195.94	0.666	0.00	1.22	2.06	29.73	(0.00)	5.112
3	Abram Clemens NB	264.24	472.98	0.559	0.00	0.55	1.27	17.62	(0.00)	17.625
3	Bleams WB	736.58	2210.45	0.333	0.00	0.39	0.52	7.73	(0.00)	2.564
4	Commonwealth SB	91.38	837.41	0.109	0.00	0.13	0.13	1.92	(0.00)	5.066
4	Bleams EB	1463.26	2195.81	0.666	0.00	2.06	2.08	31.09	(0.00)	5.159
4	Abram Clemens NB	264.24	471.16	0.561	0.00	1.27	1.31	19.43	(0.00)	18.225
4	Bleams WB	736.58	2209.47	0.333	0.00	0.52	0.52	7.85	(0.00)	2.565
5	Commonwealth SB	74.62	919.26	0.081	0.00	0.13	0.09	1.42	(0.00)	4.476
5	Bleams EB	1194.74	2217.46	0.539	0.00	2.08	1.24	19.09	(0.00)	3.719
5	Abram Clemens NB	215.76	619.46	0.348	0.00	1.31	0.57	9.01	(0.00)	9.501
5	Bleams WB	601.42	2227.66	0.270	0.00	0.52	0.39	5.92	(0.00)	2.325
6	Commonwealth SB	62.49	979.95	0.064	0.00	0.09	0.07	1.09	(0.00)	4.120
6	Bleams EB	1000.54	2233.27	0.448	0.00	1.24	0.86	13.12	(0.00)	3.073
6	Abram Clemens NB	180.68	729.09	0.248	0.00	0.57	0.35	5.41	(0.00)	6.916
6	Bleams WB	503.66	2242.34	0.225	0.00	0.39	0.31	4.63	(0.00)	2.174

A5 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None

Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	78.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	880.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	58.72	58.72	N/A	N/A
1	**Bleams EB**	662.51	662.51	N/A	N/A
1	**Abram Clemens NB**	156.59	156.59	N/A	N/A
1	**Bleams WB**	1170.69	1170.69	N/A	N/A
2	**Commonwealth SB**	70.12	70.12	N/A	N/A
2	**Bleams EB**	791.10	791.10	N/A	N/A
2	**Abram Clemens NB**	186.99	186.99	N/A	N/A
2	**Bleams WB**	1397.91	1397.91	N/A	N/A
3	**Commonwealth SB**	85.88	85.88	N/A	N/A
3	**Bleams EB**	968.90	968.90	N/A	N/A
3	**Abram Clemens NB**	229.01	229.01	N/A	N/A
3	**Bleams WB**	1712.09	1712.09	N/A	N/A
4	**Commonwealth SB**	85.88	85.88	N/A	N/A

4	Bleams EB	968.90	968.90	N/A	N/A
4	Abram Clemens NB	229.01	229.01	N/A	N/A
4	Bleams WB	1712.09	1712.09	N/A	N/A
5	Commonwealth SB	70.12	70.12	N/A	N/A
5	Bleams EB	791.10	791.10	N/A	N/A
5	Abram Clemens NB	186.99	186.99	N/A	N/A
5	Bleams WB	1397.91	1397.91	N/A	N/A
6	Commonwealth SB	58.72	58.72	N/A	N/A
6	Bleams EB	662.51	662.51	N/A	N/A
6	Abram Clemens NB	156.59	156.59	N/A	N/A
6	Bleams WB	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	65.000
	2	37.000	0.000	102.000	741.000
	3	0.000	104.000	0.000	104.000
	4	88.000	1286.000	181.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.17	0.00	0.83
	2	0.04	0.00	0.12	0.84
	3	0.00	0.50	0.00	0.50
	4	0.06	0.83	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.25	14.95	0.35	B	71.57	107.36	18.35	10.26	0.20	18.35	10.26	0.579	1357.445
Bleams EB	0.46	3.26	0.87	A	807.50	1211.26	57.76	2.86	0.64	57.77	2.86	0.723	2436.345
Abram Clemens NB	0.29	6.87	0.43	A	190.86	286.30	27.68	5.80	0.31	27.68	5.80	0.579	1357.445
Bleams WB	0.78	7.61	3.56	A	1426.90	2140.34	189.80	5.32	2.11	189.82	5.32	0.723	2436.345
						3745.26	293.59	4.7034					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.30	93.77	1178.02	0.00	641.87	97.84	0.091	0.00	0.10
Bleams EB	662.51	165.63	660.69	1052.00	184.32	0.00	2187.93	2084.67	0.303	0.00	0.45
Abram Clemens NB	156.59	39.15	155.76	212.32	632.70	0.00	941.70	231.40	0.166	0.00	0.21
Bleams WB	1170.69	292.67	1166.13	682.80	105.66	0.00	2241.96	2174.86	0.522	0.00	1.14

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	69.88	112.21	1409.85	0.00	514.41	97.84	0.136	0.10	0.16
Bleams EB	791.10	197.78	790.51	1259.07	220.67	0.00	2162.97	2084.67	0.366	0.45	0.60
Abram Clemens NB	186.99	46.75	186.68	254.06	757.12	0.00	873.29	231.40	0.214	0.21	0.28
Bleams WB	1397.91	349.48	1395.48	817.22	126.58	0.00	2227.59	2174.86	0.628	1.14	1.75

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.16	137.19	1722.80	0.00	342.34	97.84	0.251	0.16	0.34
Bleams EB	968.90	242.22	967.83	1538.52	269.43	0.00	2129.48	2084.67	0.455	0.60	0.87
Abram Clemens NB	229.01	57.25	228.42	310.65	926.61	0.00	780.10	231.40	0.294	0.28	0.43
Bleams WB	1712.09	428.02	1705.08	1000.13	154.90	0.00	2208.14	2174.86	0.775	1.75	3.50

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.85	137.61	1729.47	0.00	338.67	97.84	0.254	0.34	0.35
Bleams EB	968.90	242.22	968.88	1544.52	270.80	0.00	2128.54	2084.67	0.455	0.87	0.87
Abram Clemens NB	229.01	57.25	229.00	311.56	928.12	0.00	779.27	231.40	0.294	0.43	0.43
Bleams WB	1712.09	428.02	1711.84	1001.89	155.24	0.00	2207.91	2174.86	0.775	3.50	3.56

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	70.85	112.82	1419.25	0.00	509.24	97.84	0.138	0.35	0.17
Bleams EB	791.10	197.78	792.16	1267.52	222.58	0.00	2161.66	2084.67	0.366	0.87	0.61
Abram Clemens NB	186.99	46.75	187.57	255.36	759.39	0.00	872.05	231.40	0.214	0.43	0.29
Bleams WB	1397.91	349.48	1404.98	819.86	127.09	0.00	2227.24	2174.86	0.628	3.56	1.79

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.97	94.28	1185.29	0.00	637.88	97.84	0.092	0.17	0.11
Bleams EB	662.51	165.63	663.11	1058.55	185.71	0.00	2186.98	2084.67	0.303	0.61	0.46
Abram Clemens NB	156.59	39.15	156.90	213.42	635.40	0.00	940.22	231.40	0.167	0.29	0.21
Bleams WB	1170.69	292.67	1173.23	685.97	106.33	0.00	2241.50	2174.86	0.522	1.79	1.16

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.53	0.10	6.473	A	A
Bleams EB	6.69	0.45	2.471	A	A
Abram Clemens NB	3.04	0.20	4.804	A	A
Bleams WB	16.57	1.10	3.500	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.39	0.16	8.499	A	A
Bleams EB	8.91	0.59	2.752	A	A
Abram Clemens NB	4.17	0.28	5.502	A	A
Bleams WB	25.36	1.69	4.528	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	4.90	0.33	14.657	B	B
Bleams EB	12.81	0.85	3.251	A	A
Abram Clemens NB	6.30	0.42	6.844	A	A
Bleams WB	49.03	3.27	7.410	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	5.24	0.35	14.950	B	B
Bleams EB	13.09	0.87	3.258	A	A
Abram Clemens NB	6.50	0.43	6.868	A	A
Bleams WB	53.04	3.54	7.610	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.64	0.18	8.637	A	A
Bleams EB	9.29	0.62	2.761	A	A
Abram Clemens NB	4.44	0.30	5.528	A	A
Bleams WB	28.00	1.87	4.635	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.65	0.11	6.531	A	A
Bleams EB	6.96	0.46	2.482	A	A

Abram Clemens NB	3.23	0.22	4.829	A	A
Bleams WB	17.81	1.19	3.548	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.75	0.00	0.00	3.15	5.25			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.50	0.00	0.00	0.00	5.25			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.61	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.79	0.00	0.00	3.15	5.25			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.16	0.00	0.00	2.10	3.15			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Commonwealth SB**	58.72	641.87	0.091	0.00	0.00	0.10	1.53	(0.00)	6.473
1	**Bleams EB**	662.51	2187.93	0.303	0.00	0.00	0.45	6.69	(0.00)	2.471
1	**Abram Clemens NB**	156.59	941.70	0.166	0.00	0.00	0.21	3.04	(0.00)	4.804
1	**Bleams WB**	1170.69	2241.96	0.522	0.00	0.00	1.14	16.57	(0.00)	3.500
2	**Commonwealth SB**	70.12	514.41	0.136	0.00	0.10	0.16	2.39	(0.00)	8.499
2	**Bleams EB**	791.10	2162.97	0.366	0.00	0.45	0.60	8.91	(0.00)	2.752
2	**Abram Clemens NB**	186.99	873.29	0.214	0.00	0.21	0.28	4.17	(0.00)	5.502
2	**Bleams WB**	1397.91	2227.59	0.628	0.00	1.14	1.75	25.36	(0.00)	4.528
3	**Commonwealth SB**	85.88	342.34	0.251	0.00	0.16	0.34	4.90	(0.00)	14.657
3	**Bleams EB**	968.90	2129.48	0.455	0.00	0.60	0.87	12.81	(0.00)	3.251
3	**Abram Clemens NB**	229.01	780.10	0.294	0.00	0.28	0.43	6.30	(0.00)	6.844
3	**Bleams WB**	1712.09	2208.14	0.775	0.00	1.75	3.50	49.03	(0.00)	7.410

4	**Commonwealth SB**	85.88	338.67	0.254	0.00	0.34	0.35	5.24	(0.00)	14.950
4	**Bleams EB**	968.90	2128.54	0.455	0.00	0.87	0.87	13.09	(0.00)	3.258
4	**Abram Clemens NB**	229.01	779.27	0.294	0.00	0.43	0.43	6.50	(0.00)	6.868
4	**Bleams WB**	1712.09	2207.91	0.775	0.00	3.50	3.56	53.04	(0.00)	7.610
5	**Commonwealth SB**	70.12	509.24	0.138	0.00	0.35	0.17	2.64	(0.00)	8.637
5	**Bleams EB**	791.10	2161.66	0.366	0.00	0.87	0.61	9.29	(0.00)	2.761
5	**Abram Clemens NB**	186.99	872.05	0.214	0.00	0.43	0.29	4.44	(0.00)	5.528
5	**Bleams WB**	1397.91	2227.24	0.628	0.00	3.56	1.79	28.00	(0.00)	4.635
6	**Commonwealth SB**	58.72	637.88	0.092	0.00	0.17	0.11	1.65	(0.00)	6.531
6	**Bleams EB**	662.51	2186.98	0.303	0.00	0.61	0.46	6.96	(0.00)	2.482
6	**Abram Clemens NB**	156.59	940.22	0.167	0.00	0.29	0.21	3.23	(0.00)	4.829
6	**Bleams WB**	1170.69	2241.50	0.522	0.00	1.79	1.16	17.81	(0.00)	3.548

A6 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	

2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	83.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A

Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	62.49	62.49	N/A	N/A
1	**Bleams EB**	1000.54	1000.54	N/A	N/A
1	**Abram Clemens NB**	180.68	180.68	N/A	N/A
1	**Bleams WB**	503.66	503.66	N/A	N/A
2	**Commonwealth SB**	74.62	74.62	N/A	N/A
2	**Bleams EB**	1194.74	1194.74	N/A	N/A
2	**Abram Clemens NB**	215.76	215.76	N/A	N/A
2	**Bleams WB**	601.42	601.42	N/A	N/A
3	**Commonwealth SB**	91.38	91.38	N/A	N/A
3	**Bleams EB**	1463.26	1463.26	N/A	N/A
3	**Abram Clemens NB**	264.24	264.24	N/A	N/A
3	**Bleams WB**	736.58	736.58	N/A	N/A
4	**Commonwealth SB**	91.38	91.38	N/A	N/A
4	**Bleams EB**	1463.26	1463.26	N/A	N/A
4	**Abram Clemens NB**	264.24	264.24	N/A	N/A
4	**Bleams WB**	736.58	736.58	N/A	N/A
5	**Commonwealth SB**	74.62	74.62	N/A	N/A
5	**Bleams EB**	1194.74	1194.74	N/A	N/A
5	**Abram Clemens NB**	215.76	215.76	N/A	N/A
5	**Bleams WB**	601.42	601.42	N/A	N/A
6	**Commonwealth SB**	62.49	62.49	N/A	N/A
6	**Bleams EB**	1000.54	1000.54	N/A	N/A
6	**Abram Clemens NB**	180.68	180.68	N/A	N/A
6	**Bleams WB**	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	12.000	0.000	71.000
	2	19.000	0.000	48.000	1262.000
	3	0.000	120.000	0.000	120.000
	4	42.000	541.000	86.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.00	0.14	0.00	0.86
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.81	0.13	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.12	5.38	0.14	A	76.16	114.24	9.25	4.86	0.10	9.25	4.86	0.579	1357.445
Bleams EB	0.70	6.12	2.46	A	1219.51	1829.27	141.48	4.64	1.57	141.50	4.64	0.723	2436.345
Abram Clemens NB	0.59	20.68	1.48	C	220.23	330.34	71.09	12.91	0.79	71.10	12.91	0.579	1357.445
Bleams WB	0.35	2.79	0.57	A	613.89	920.83	39.23	2.56	0.44	39.23	2.56	0.723	2436.345
						3194.68	261.05	4.9028					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.19	45.79	560.43	0.00	929.78	141.14	0.067	0.00	0.08
Bleams EB	1000.54	250.14	996.80	504.84	117.77	0.00	2116.08	1937.33	0.473	0.00	0.94
Abram Clemens NB	180.68	45.17	179.22	100.58	1013.99	0.00	693.53	186.14	0.261	0.00	0.37
Bleams WB	503.66	125.91	502.36	1089.35	103.86	0.00	2125.13	2114.13	0.237	0.00	0.33

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.53	54.79	670.73	0.00	872.33	141.14	0.086	0.08	0.10
Bleams EB	1194.74	298.69	1193.00	604.24	141.02	0.00	2100.96	1937.33	0.569	0.94	1.37
Abram Clemens NB	215.76	53.94	214.84	120.35	1213.67	0.00	589.52	186.14	0.366	0.37	0.60
Bleams WB	601.42	150.35	601.05	1304.03	124.47	0.00	2111.72	2114.13	0.285	0.33	0.42

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.23	67.06	820.23	0.00	794.46	141.14	0.115	0.10	0.14
Bleams EB	1463.26	365.81	1458.99	738.81	172.65	0.00	2080.37	1937.33	0.703	1.37	2.44
Abram Clemens NB	264.24	66.06	260.91	147.31	1484.34	0.00	448.53	186.14	0.589	0.60	1.43
Bleams WB	736.58	184.15	735.98	1593.94	151.31	0.00	2094.26	2114.13	0.352	0.42	0.57

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.38	67.16	822.36	0.00	793.35	141.14	0.115	0.14	0.14
Bleams EB	1463.26	365.81	1463.15	740.88	172.86	0.00	2080.24	1937.33	0.703	2.44	2.46
Abram Clemens NB	264.24	66.06	264.05	147.53	1488.47	0.00	446.38	186.14	0.592	1.43	1.48
Bleams WB	736.58	184.15	736.58	1599.58	152.94	0.00	2093.20	2114.13	0.352	0.57	0.57

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.76	54.94	673.81	0.00	870.72	141.14	0.086	0.14	0.10
Bleams EB	1194.74	298.69	1199.00	607.23	141.34	0.00	2100.74	1937.33	0.569	2.46	1.40
Abram Clemens NB	215.76	53.94	219.18	120.69	1219.65	0.00	586.41	186.14	0.368	1.48	0.62
Bleams WB	601.42	150.35	602.01	1312.10	126.73	0.00	2110.25	2114.13	0.285	0.57	0.42

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.58	45.97	563.22	0.00	928.33	141.14	0.067	0.10	0.08
Bleams EB	1000.54	250.14	1002.34	507.47	118.32	0.00	2115.72	1937.33	0.473	1.40	0.95
Abram Clemens NB	180.68	45.17	181.67	101.00	1019.67	0.00	690.57	186.14	0.262	0.62	0.38
Bleams WB	503.66	125.91	504.03	1096.18	105.16	0.00	2124.28	2114.13	0.237	0.42	0.33

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.10	0.07	4.356	A	A
Bleams EB	13.65	0.91	3.366	A	A
Abram Clemens NB	5.28	0.35	7.329	A	A
Bleams WB	4.80	0.32	2.327	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.44	0.10	4.738	A	A
Bleams EB	20.00	1.33	4.156	A	A
Abram Clemens NB	8.59	0.57	10.063	B	B
Bleams WB	6.17	0.41	2.502	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.00	0.13	5.373	A	A

Bleams EB	34.81	2.32	6.040	A	A
Abram Clemens NB	19.60	1.31	19.805	C	B
Bleams WB	8.38	0.56	2.781	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.04	0.14	5.384	A	A
Bleams EB	36.78	2.45	6.123	A	A
Abram Clemens NB	21.90	1.46	20.678	C	C
Bleams WB	8.52	0.57	2.785	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.51	0.10	4.751	A	A
Bleams EB	21.69	1.45	4.212	A	A
Abram Clemens NB	9.89	0.66	10.385	B	B
Bleams WB	6.39	0.43	2.508	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.16	0.08	4.367	A	A
Bleams EB	14.55	0.97	3.402	A	A
Abram Clemens NB	5.83	0.39	7.441	A	A
Bleams WB	4.97	0.33	2.334	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.94	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.37	0.00	0.00	2.10	4.20			N/A	N/A
Abram Clemens NB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.43	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.57	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.48	0.00	0.00	0.00	3.15			N/A	N/A
Bleams WB	0.57	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.40	0.00	0.00	2.10	3.15			N/A	N/A
Abram Clemens NB	0.62	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.95	0.00	0.00	1.05	2.10			N/A	N/A
Abram Clemens NB	0.38	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	62.49	929.78	0.067	0.00	0.00	0.08	1.10	(0.00)	4.356
1	Bleams EB	1000.54	2116.08	0.473	0.00	0.00	0.94	13.65	(0.00)	3.366
1	Abram Clemens NB	180.68	693.53	0.261	0.00	0.00	0.37	5.28	(0.00)	7.329
1	Bleams WB	503.66	2125.13	0.237	0.00	0.00	0.33	4.80	(0.00)	2.327
2	Commonwealth SB	74.62	872.33	0.086	0.00	0.08	0.10	1.44	(0.00)	4.738
2	Bleams EB	1194.74	2100.96	0.569	0.00	0.94	1.37	20.00	(0.00)	4.156
2	Abram Clemens NB	215.76	589.52	0.366	0.00	0.37	0.60	8.59	(0.00)	10.063
2	Bleams WB	601.42	2111.72	0.285	0.00	0.33	0.42	6.17	(0.00)	2.502
3	Commonwealth SB	91.38	794.46	0.115	0.00	0.10	0.14	2.00	(0.00)	5.373
3	Bleams EB	1463.26	2080.37	0.703	0.00	1.37	2.44	34.81	(0.00)	6.040
3	Abram Clemens NB	264.24	448.53	0.589	0.00	0.60	1.43	19.60	(0.00)	19.805
3	Bleams WB	736.58	2094.26	0.352	0.00	0.42	0.57	8.38	(0.00)	2.781
4	Commonwealth SB	91.38	793.35	0.115	0.00	0.14	0.14	2.04	(0.00)	5.384
4	Bleams EB	1463.26	2080.24	0.703	0.00	2.44	2.46	36.78	(0.00)	6.123
4	Abram Clemens NB	264.24	446.38	0.592	0.00	1.43	1.48	21.90	(0.00)	20.678
4	Bleams WB	736.58	2093.20	0.352	0.00	0.57	0.57	8.52	(0.00)	2.785
5	Commonwealth SB	74.62	870.72	0.086	0.00	0.14	0.10	1.51	(0.00)	4.751
5	Bleams EB	1194.74	2100.74	0.569	0.00	2.46	1.40	21.69	(0.00)	4.212
5	Abram Clemens NB	215.76	586.41	0.368	0.00	1.48	0.62	9.89	(0.00)	10.385
5	Bleams WB	601.42	2110.25	0.285	0.00	0.57	0.42	6.39	(0.00)	2.508
6	Commonwealth SB	62.49	928.33	0.067	0.00	0.10	0.08	1.16	(0.00)	4.367
6	Bleams EB	1000.54	2115.72	0.473	0.00	1.40	0.95	14.55	(0.00)	3.402
6	Abram Clemens NB	180.68	690.57	0.262	0.00	0.62	0.38	5.83	(0.00)	7.441
6	Bleams WB	503.66	2124.28	0.237	0.00	0.42	0.33	4.97	(0.00)	2.334

A6 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)

Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	78.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	880.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	58.72	58.72	N/A	N/A
1	**Bleams EB**	662.51	662.51	N/A	N/A
1	**Abram Clemens NB**	156.59	156.59	N/A	N/A
1	**Bleams WB**	1170.69	1170.69	N/A	N/A
2	**Commonwealth SB**	70.12	70.12	N/A	N/A
2	**Bleams EB**	791.10	791.10	N/A	N/A
2	**Abram Clemens NB**	186.99	186.99	N/A	N/A
2	**Bleams WB**	1397.91	1397.91	N/A	N/A
3	**Commonwealth SB**	85.88	85.88	N/A	N/A
3	**Bleams EB**	968.90	968.90	N/A	N/A
3	**Abram Clemens NB**	229.01	229.01	N/A	N/A
3	**Bleams WB**	1712.09	1712.09	N/A	N/A
4	**Commonwealth SB**	85.88	85.88	N/A	N/A
4	**Bleams EB**	968.90	968.90	N/A	N/A
4	**Abram Clemens NB**	229.01	229.01	N/A	N/A
4	**Bleams WB**	1712.09	1712.09	N/A	N/A
5	**Commonwealth SB**	70.12	70.12	N/A	N/A
5	**Bleams EB**	791.10	791.10	N/A	N/A
5	**Abram Clemens NB**	186.99	186.99	N/A	N/A
5	**Bleams WB**	1397.91	1397.91	N/A	N/A
6	**Commonwealth SB**	58.72	58.72	N/A	N/A

6	**Bleams EB**	662.51	662.51	N/A	N/A
6	**Abram Clemens NB**	156.59	156.59	N/A	N/A
6	**Bleams WB**	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	13.000	0.000	65.000
	2	37.000	0.000	102.000	741.000
	3	0.000	104.000	0.000	104.000
	4	88.000	1286.000	181.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.00	0.17	0.00	0.83
	2	0.04	0.00	0.12	0.84
	3	0.00	0.50	0.00	0.50
	4	0.06	0.83	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.27	16.07	0.38	C	71.57	107.36	19.58	10.94	0.22	19.58	10.94	0.579	1357.445
Bleams EB	0.48	3.61	0.97	A	807.50	1211.26	63.24	3.13	0.70	63.24	3.13	0.723	2436.345

Abram Clemens NB	0.31	7.42	0.47	A	190.86	286.30	29.73	6.23	0.33	29.73	6.23	0.579	1357.445
Bleams WB	0.82	9.91	4.60	A	1426.90	2140.34	230.64	6.47	2.56	230.66	6.47	0.723	2436.345
						3745.26	343.19	5.498					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.28	93.73	1177.47	0.00	608.38	144.67	0.097	0.00	0.11
Bleams EB	662.51	165.63	660.55	1051.51	184.24	0.00	2072.84	1958.59	0.320	0.00	0.49
Abram Clemens NB	156.59	39.15	155.71	212.24	632.55	0.00	892.22	256.95	0.176	0.00	0.22
Bleams WB	1170.69	292.67	1165.58	682.63	105.63	0.00	2123.98	2055.53	0.551	0.00	1.28

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	69.87	112.18	1409.31	0.00	487.62	144.68	0.144	0.11	0.17
Bleams EB	791.10	197.78	790.44	1258.58	220.59	0.00	2049.18	1958.59	0.386	0.49	0.66
Abram Clemens NB	186.99	46.75	186.66	253.99	757.04	0.00	827.37	256.95	0.226	0.22	0.30
Bleams WB	1397.91	349.48	1394.92	817.14	126.56	0.00	2110.36	2055.53	0.662	1.28	2.03

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.11	137.02	1720.13	0.00	325.71	144.67	0.264	0.17	0.37
Bleams EB	968.90	242.22	967.67	1536.17	269.07	0.00	2017.64	1958.59	0.480	0.66	0.96
Abram Clemens NB	229.01	57.25	228.36	310.31	926.43	0.00	739.14	256.95	0.310	0.30	0.47
Bleams WB	1712.09	428.02	1702.28	999.93	154.87	0.00	2091.94	2055.53	0.818	2.03	4.48

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.84	137.60	1729.24	0.00	320.97	144.67	0.268	0.37	0.38
Bleams EB	968.90	242.22	968.88	1544.32	270.76	0.00	2016.54	1958.59	0.480	0.96	0.97
Abram Clemens NB	229.01	57.25	229.00	311.53	928.11	0.00	738.26	256.95	0.310	0.47	0.47
Bleams WB	1712.09	428.02	1711.60	1001.87	155.24	0.00	2091.70	2055.53	0.819	4.48	4.60

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	70.91	112.99	1422.06	0.00	480.97	144.68	0.146	0.38	0.18
Bleams EB	791.10	197.78	792.31	1270.00	222.97	0.00	2047.63	1958.59	0.386	0.97	0.66
Abram Clemens NB	186.99	46.75	187.63	255.72	759.56	0.00	826.06	256.95	0.226	0.47	0.31
Bleams WB	1397.91	349.48	1407.93	820.06	127.13	0.00	2110.00	2055.53	0.663	4.60	2.10

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.99	94.31	1185.90	0.00	603.99	144.67	0.097	0.18	0.11
Bleams EB	662.51	165.63	663.19	1059.09	185.80	0.00	2071.82	1958.59	0.320	0.66	0.50

Abram Clemens NB	156.59	39.15	156.93	213.51	635.48	0.00	890.69	256.95	0.176	0.31	0.23
Bleams WB	1170.69	292.67	1173.86	686.06	106.35	0.00	2123.51	2055.53	0.551	2.10	1.30

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.62	0.11	6.865	A	A
Bleams EB	7.23	0.48	2.673	A	A
Abram Clemens NB	3.24	0.22	5.125	A	A
Bleams WB	18.51	1.23	3.924	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.54	0.17	9.043	A	A
Bleams EB	9.70	0.65	3.001	A	A
Abram Clemens NB	4.46	0.30	5.897	A	A
Bleams WB	29.24	1.95	5.261	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	5.22	0.35	15.660	C	B
Bleams EB	14.13	0.94	3.594	A	A
Abram Clemens NB	6.78	0.45	7.391	A	A
Bleams WB	61.34	4.09	9.468	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	5.61	0.37	16.070	C	B
Bleams EB	14.48	0.97	3.607	A	A
Abram Clemens NB	7.02	0.47	7.421	A	A
Bleams WB	68.27	4.55	9.910	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.83	0.19	9.236	A	A
Bleams EB	10.15	0.68	3.015	A	A
Abram Clemens NB	4.77	0.32	5.928	A	A
Bleams WB	33.15	2.21	5.458	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.76	0.12	6.941	A	A
Bleams EB	7.55	0.50	2.684	A	A
Abram Clemens NB	3.45	0.23	5.155	A	A
Bleams WB	20.12	1.34	3.993	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.66	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.03	0.00	0.00	4.20	6.30			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.96	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	4.48	0.00	0.00	2.10	11.55			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.38	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.97	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.47	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	4.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.18	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.66	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.10	0.00	0.00	4.20	6.30			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.30	0.00	0.00	2.10	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	58.72	608.38	0.097	0.00	0.00	0.11	1.62	(0.00)	6.865
1	Bleams EB	662.51	2072.84	0.320	0.00	0.00	0.49	7.23	(0.00)	2.673
1	Abram Clemens NB	156.59	892.22	0.176	0.00	0.00	0.22	3.24	(0.00)	5.125
1	Bleams WB	1170.69	2123.98	0.551	0.00	0.00	1.28	18.51	(0.00)	3.924
2	Commonwealth SB	70.12	487.62	0.144	0.00	0.11	0.17	2.54	(0.00)	9.043
2	Bleams EB	791.10	2049.18	0.386	0.00	0.49	0.66	9.70	(0.00)	3.001
2	Abram Clemens NB	186.99	827.37	0.226	0.00	0.22	0.30	4.46	(0.00)	5.897
2	Bleams WB	1397.91	2110.36	0.662	0.00	1.28	2.03	29.24	(0.00)	5.261
3	Commonwealth SB	85.88	325.71	0.264	0.00	0.17	0.37	5.22	(0.00)	15.660
3	Bleams EB	968.90	2017.64	0.480	0.00	0.66	0.96	14.13	(0.00)	3.594
3	Abram Clemens NB	229.01	739.14	0.310	0.00	0.30	0.47	6.78	(0.00)	7.391
3	Bleams WB	1712.09	2091.94	0.818	0.00	2.03	4.48	61.34	(0.00)	9.468
4	Commonwealth SB	85.88	320.97	0.268	0.00	0.37	0.38	5.61	(0.00)	16.070
4	Bleams EB	968.90	2016.54	0.480	0.00	0.96	0.97	14.48	(0.00)	3.607
4	Abram Clemens NB	229.01	738.26	0.310	0.00	0.47	0.47	7.02	(0.00)	7.421
4	Bleams WB	1712.09	2091.70	0.819	0.00	4.48	4.60	68.27	(0.00)	9.910
5	Commonwealth SB	70.12	480.97	0.146	0.00	0.38	0.18	2.83	(0.00)	9.236
5	Bleams EB	791.10	2047.63	0.386	0.00	0.97	0.66	10.15	(0.00)	3.015

5	**Abram Clemens NB**	186.99	826.06	0.226	0.00	0.47	0.31	4.77	(0.00)	5.928
5	**Bleams WB**	1397.91	2110.00	0.663	0.00	4.60	2.10	33.15	(0.00)	5.458
6	**Commonwealth SB**	58.72	603.99	0.097	0.00	0.18	0.11	1.76	(0.00)	6.941
6	**Bleams EB**	662.51	2071.82	0.320	0.00	0.66	0.50	7.55	(0.00)	2.684
6	**Abram Clemens NB**	156.59	890.69	0.176	0.00	0.31	0.23	3.45	(0.00)	5.155
6	**Bleams WB**	1170.69	2123.51	0.551	0.00	2.10	1.30	20.12	(0.00)	3.993

A7 - 95% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00

Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	83.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Commonwealth SB	62.49	62.49	N/A	N/A
1	Bleams EB	1000.54	1000.54	N/A	N/A
1	Abram Clemens NB	180.68	180.68	N/A	N/A
1	Bleams WB	503.66	503.66	N/A	N/A
2	Commonwealth SB	74.62	74.62	N/A	N/A
2	Bleams EB	1194.74	1194.74	N/A	N/A
2	Abram Clemens NB	215.76	215.76	N/A	N/A
2	Bleams WB	601.42	601.42	N/A	N/A
3	Commonwealth SB	91.38	91.38	N/A	N/A
3	Bleams EB	1463.26	1463.26	N/A	N/A
3	Abram Clemens NB	264.24	264.24	N/A	N/A
3	Bleams WB	736.58	736.58	N/A	N/A
4	Commonwealth SB	91.38	91.38	N/A	N/A
4	Bleams EB	1463.26	1463.26	N/A	N/A
4	Abram Clemens NB	264.24	264.24	N/A	N/A
4	Bleams WB	736.58	736.58	N/A	N/A
5	Commonwealth SB	74.62	74.62	N/A	N/A
5	Bleams EB	1194.74	1194.74	N/A	N/A
5	Abram Clemens NB	215.76	215.76	N/A	N/A
5	Bleams WB	601.42	601.42	N/A	N/A
6	Commonwealth SB	62.49	62.49	N/A	N/A
6	Bleams EB	1000.54	1000.54	N/A	N/A
6	Abram Clemens NB	180.68	180.68	N/A	N/A
6	Bleams WB	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	12.000	0.000	71.000
	2	19.000	0.000	48.000	1262.000
	3	0.000	120.000	0.000	120.000
	4	42.000	541.000	86.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.14	0.00	0.86
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.81	0.13	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050

	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.11	5.07	0.13	A	76.16	114.24	8.72	4.58	0.10	8.72	4.58	0.579	1357.445
Bleams EB	1.22	447.53	151.12	F	1219.51	1829.27	6818.13	223.63	75.76	7039.81	230.91	0.579	1357.445
Abram Clemens NB	0.43	10.81	0.78	B	220.23	330.34	50.99	9.26	0.57	51.00	9.26	0.579	1357.445
Bleams WB	0.61	8.02	1.62	A	613.89	920.83	99.70	6.50	1.11	99.72	6.50	0.579	1357.445
						3194.68	6977.54	131.0467					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.20	45.50	559.01	0.00	982.21	558.90	0.064	0.00	0.07
Bleams EB	1000.54	250.14	983.44	503.63	117.59	0.00	1224.92	946.29	0.817	0.00	4.28
Abram Clemens NB	180.68	45.17	179.34	99.89	1001.13	0.00	739.13	525.21	0.244	0.00	0.34
Bleams WB	503.66	125.91	500.78	1076.74	103.73	0.00	1232.54	1137.75	0.409	0.00	0.72

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.53	54.11	670.10	0.00	921.14	558.90	0.081	0.07	0.09
Bleams EB	1194.74	298.69	1148.89	603.71	140.92	0.00	1212.09	946.29	0.986	4.28	15.74
Abram Clemens NB	215.76	53.94	215.02	118.66	1171.15	0.00	645.65	525.21	0.334	0.34	0.52
Bleams WB	601.42	150.35	600.27	1262.23	123.94	0.00	1221.43	1137.75	0.492	0.72	1.01

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.24	63.12	819.70	0.00	838.88	558.90	0.109	0.09	0.13
Bleams EB	1463.26	365.81	1190.98	738.51	172.43	0.00	1194.77	946.29	1.225	15.74	83.81
Abram Clemens NB	264.24	66.06	263.23	137.39	1226.01	0.00	615.48	525.21	0.429	0.52	0.77
Bleams WB	736.58	184.15	734.18	1340.60	148.64	0.00	1207.85	1137.75	0.610	1.01	1.61

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.38	63.31	822.37	0.00	837.41	558.90	0.109	0.13	0.13
Bleams EB	1463.26	365.81	1194.03	740.91	172.85	0.00	1194.54	946.29	1.225	83.81	151.12
Abram Clemens NB	264.24	66.06	264.20	137.80	1229.07	0.00	613.80	525.21	0.431	0.77	0.78
Bleams WB	736.58	184.15	736.51	1344.10	149.17	0.00	1207.55	1137.75	0.610	1.61	1.62

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.75	55.11	674.17	0.00	918.90	558.90	0.081	0.13	0.09
Bleams EB	1194.74	298.69	1203.38	607.37	141.56	0.00	1211.74	946.29	0.986	151.12	148.96
Abram Clemens NB	215.76	53.94	216.60	121.08	1223.86	0.00	616.67	525.21	0.350	0.78	0.57
Bleams WB	601.42	150.35	603.78	1314.96	125.50	0.00	1220.57	1137.75	0.493	1.62	1.03

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.57	49.08	563.76	0.00	979.60	558.90	0.064	0.09	0.07
Bleams EB	1000.54	250.14	1215.89	507.91	118.42	0.00	1224.46	946.29	0.817	148.96	95.12
Abram Clemens NB	180.68	45.17	181.21	108.81	1225.50	0.00	615.77	525.21	0.293	0.57	0.44
Bleams WB	503.66	125.91	504.85	1298.72	107.99	0.00	1230.20	1137.75	0.409	1.03	0.73

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.04	0.07	4.108	A	A
Bleams EB	55.59	3.71	14.755	B	B
Abram Clemens NB	4.87	0.32	6.736	A	A
Bleams WB	10.41	0.69	5.147	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.36	0.09	4.464	A	A
Bleams EB	169.37	11.29	42.462	E	D
Abram Clemens NB	7.53	0.50	8.763	A	A
Bleams WB	14.64	0.98	6.074	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.88	0.13	5.056	A	A
Bleams EB	749.84	49.99	160.909	F	F
Abram Clemens NB	11.15	0.74	10.698	B	B
Bleams WB	23.02	1.53	7.939	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.92	0.13	5.066	A	A

Bleams EB	1762.13	117.48	359.573	F	F
Abram Clemens NB	11.71	0.78	10.808	B	B
Bleams WB	24.25	1.62	8.020	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.42	0.09	4.480	A	A
Bleams EB	2250.58	150.04	447.533	F	F
Abram Clemens NB	8.91	0.59	9.468	A	A
Bleams WB	16.06	1.07	6.153	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.09	0.07	4.123	A	A
Bleams EB	1830.61	122.04	362.468	F	F
Abram Clemens NB	6.82	0.45	8.709	A	A
Bleams WB	11.32	0.75	5.221	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.28	0.00	0.00	8.40	15.75			N/A	N/A
Abram Clemens NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.72	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	15.74	0.00	7.35	38.85	53.55			N/A	N/A
Abram Clemens NB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.01	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	83.81	39.90	78.75	123.90	138.60			N/A	N/A
Abram Clemens NB	0.77	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.61	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	151.12	89.25	145.95	>199	>199			N/A	N/A
Abram Clemens NB	0.78	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	148.96	79.80	142.80	>199	>199			N/A	N/A
Abram Clemens NB	0.57	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.03	0.00	0.00	1.05	1.05			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	95.12	33.60	87.15	154.35	177.45			N/A	N/A
Abram Clemens NB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.73	0.00	0.00	1.05	1.05			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	62.49	982.21	0.064	0.00	0.00	0.07	1.04	(0.00)	4.108
1	Bleams EB	1000.54	1224.92	0.817	0.00	0.00	4.28	55.59	(0.00)	14.755
1	Abram Clemens NB	180.68	739.13	0.244	0.00	0.00	0.34	4.87	(0.00)	6.736
1	Bleams WB	503.66	1232.54	0.409	0.00	0.00	0.72	10.41	(0.00)	5.147

2	Commonwealth SB	74.62	921.14	0.081	0.00	0.07	0.09	1.36	(0.00)	4.464
2	Bleams EB	1194.74	1212.09	0.986	0.00	4.28	15.74	169.37	(0.00)	42.462
2	Abram Clemens NB	215.76	645.65	0.334	0.00	0.34	0.52	7.53	(0.00)	8.763
2	Bleams WB	601.42	1221.43	0.492	0.00	0.72	1.01	14.64	(0.00)	6.074
3	Commonwealth SB	91.38	838.88	0.109	0.00	0.09	0.13	1.88	(0.00)	5.056
3	Bleams EB	1463.26	1194.77	1.225	0.00	15.74	83.81	749.84	(0.00)	160.909
3	Abram Clemens NB	264.24	615.48	0.429	0.00	0.52	0.77	11.15	(0.00)	10.698
3	Bleams WB	736.58	1207.85	0.610	0.00	1.01	1.61	23.02	(0.00)	7.939
4	Commonwealth SB	91.38	837.41	0.109	0.00	0.13	0.13	1.92	(0.00)	5.066
4	Bleams EB	1463.26	1194.54	1.225	0.00	83.81	151.12	1762.13	(0.00)	359.573
4	Abram Clemens NB	264.24	613.80	0.431	0.00	0.77	0.78	11.71	(0.00)	10.808
4	Bleams WB	736.58	1207.55	0.610	0.00	1.61	1.62	24.25	(0.00)	8.020
5	Commonwealth SB	74.62	918.90	0.081	0.00	0.13	0.09	1.42	(0.00)	4.480
5	Bleams EB	1194.74	1211.74	0.986	0.00	151.12	148.96	2250.58	(0.00)	447.533
5	Abram Clemens NB	215.76	616.67	0.350	0.00	0.78	0.57	8.91	(0.00)	9.468
5	Bleams WB	601.42	1220.57	0.493	0.00	1.62	1.03	16.06	(0.00)	6.153
6	Commonwealth SB	62.49	979.60	0.064	0.00	0.09	0.07	1.09	(0.00)	4.123
6	Bleams EB	1000.54	1224.46	0.817	0.00	148.96	95.12	1830.61	(0.00)	362.468
6	Abram Clemens NB	180.68	615.77	0.293	0.00	0.57	0.44	6.82	(0.00)	8.709
6	Bleams WB	503.66	1230.20	0.409	0.00	1.03	0.73	11.32	(0.00)	5.221

A7 - 95% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies	Vehicle Mix Varies Over Turn	Vehicle Mix Varies	Vehicle Mix Source	PCE Factor for a	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry

	Over Time		Over Entry		Truck (PCE)					
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	78.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	880.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	58.72	58.72	N/A	N/A
1	**Bleams EB**	662.51	662.51	N/A	N/A
1	**Abram Clemens NB**	156.59	156.59	N/A	N/A
1	**Bleams WB**	1170.69	1170.69	N/A	N/A
2	**Commonwealth SB**	70.12	70.12	N/A	N/A
2	**Bleams EB**	791.10	791.10	N/A	N/A
2	**Abram Clemens NB**	186.99	186.99	N/A	N/A
2	**Bleams WB**	1397.91	1397.91	N/A	N/A
3	**Commonwealth SB**	85.88	85.88	N/A	N/A
3	**Bleams EB**	968.90	968.90	N/A	N/A
3	**Abram Clemens NB**	229.01	229.01	N/A	N/A
3	**Bleams WB**	1712.09	1712.09	N/A	N/A
4	**Commonwealth SB**	85.88	85.88	N/A	N/A
4	**Bleams EB**	968.90	968.90	N/A	N/A
4	**Abram Clemens NB**	229.01	229.01	N/A	N/A
4	**Bleams WB**	1712.09	1712.09	N/A	N/A
5	**Commonwealth SB**	70.12	70.12	N/A	N/A
5	**Bleams EB**	791.10	791.10	N/A	N/A
5	**Abram Clemens NB**	186.99	186.99	N/A	N/A
5	**Bleams WB**	1397.91	1397.91	N/A	N/A
6	**Commonwealth SB**	58.72	58.72	N/A	N/A
6	**Bleams EB**	662.51	662.51	N/A	N/A
6	**Abram Clemens NB**	156.59	156.59	N/A	N/A
6	**Bleams WB**	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	13.000	0.000	65.000
	2	37.000	0.000	102.000	741.000

	3	0.000	104.000	0.000	104.000
	4	88.000	1286.000	181.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.17	0.00	0.83
	2	0.04	0.00	0.12	0.84
	3	0.00	0.50	0.00	0.50
	4	0.06	0.83	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.14	7.32	0.17	A	71.57	107.36	12.46	6.96	0.14	12.46	6.96	0.579	1357.445
Bleams EB	0.83	18.23	4.72	C	807.50	1211.26	234.19	11.60	2.60	234.24	11.60	0.579	1357.445
Abram Clemens NB	0.29	6.86	0.43	A	190.86	286.30	27.64	5.79	0.31	27.64	5.79	0.579	1357.445
Bleams WB	1.42	1024.54	356.39	F	1426.90	2140.34	16441.20	460.89	182.68	19295.06	540.90	0.579	1357.445
						3745.26	16715.49	267.7863					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.32	91.36	1140.08	0.00	662.73	557.31	0.089	0.00	0.10
Bleams EB	662.51	165.63	657.33	1018.75	179.65	0.00	1190.80	963.08	0.556	0.00	1.29
Abram Clemens NB	156.59	39.15	155.76	207.25	629.74	0.00	943.33	566.08	0.166	0.00	0.21

Bleams WB	1170.69	292.67	1125.92	679.98	105.52	0.00	1231.56	1111.69	0.951	0.00	11.19

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	69.98	101.69	1236.19	0.00	609.89	557.31	0.115	0.10	0.14
Bleams EB	791.10	197.78	787.99	1106.85	199.33	0.00	1179.98	963.08	0.670	1.29	2.07
Abram Clemens NB	186.99	46.75	186.68	232.34	754.98	0.00	874.47	566.08	0.214	0.21	0.28
Bleams WB	1397.91	349.48	1211.41	815.19	126.47	0.00	1220.03	1111.69	1.146	11.19	57.82

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.73	108.48	1250.28	0.00	602.14	557.32	0.143	0.14	0.17
Bleams EB	968.90	242.22	959.15	1124.40	211.61	0.00	1173.23	963.07	0.826	2.07	4.51
Abram Clemens NB	229.01	57.25	228.43	251.34	919.42	0.00	784.06	566.08	0.292	0.28	0.43
Bleams WB	1712.09	428.02	1204.21	993.30	154.54	0.00	1204.60	1111.69	1.421	57.82	184.79

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.88	108.85	1250.52	0.00	602.01	557.32	0.143	0.17	0.17
Bleams EB	968.90	242.22	968.06	1124.67	211.73	0.00	1173.16	963.07	0.826	4.51	4.72
Abram Clemens NB	229.01	57.25	228.99	252.37	927.41	0.00	779.66	566.08	0.294	0.43	0.43
Bleams WB	1712.09	428.02	1204.17	1001.21	155.20	0.00	1204.24	1111.69	1.422	184.79	311.77

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	70.26	102.69	1244.17	0.00	605.50	557.31	0.116	0.17	0.14
Bleams EB	791.10	197.78	801.15	1113.95	200.49	0.00	1179.34	963.08	0.671	4.72	2.21
Abram Clemens NB	186.99	46.75	187.56	234.80	766.84	0.00	867.95	566.08	0.215	0.43	0.29
Bleams WB	1397.91	349.48	1219.40	826.94	127.46	0.00	1219.49	1111.69	1.146	311.77	356.39

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.83	97.46	1236.42	0.00	609.76	557.31	0.096	0.14	0.11
Bleams EB	662.51	165.63	665.91	1103.35	191.89	0.00	1184.07	963.08	0.560	2.21	1.36
Abram Clemens NB	156.59	39.15	156.91	220.06	637.75	0.00	938.93	566.08	0.167	0.29	0.21
Bleams WB	1170.69	292.67	1227.43	688.20	106.45	0.00	1231.04	1111.69	0.951	356.39	342.21

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.47	0.10	6.250	A	A
Bleams EB	18.42	1.23	7.020	A	A
Abram Clemens NB	3.04	0.20	4.794	A	A
Bleams WB	122.33	8.16	28.794	D	C

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.98	0.13	6.999	A	A
Bleams EB	29.39	1.96	9.563	A	A
Abram Clemens NB	4.16	0.28	5.493	A	A
Bleams WB	524.16	34.94	114.166	F	F

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.54	0.17	7.318	A	A
Bleams EB	59.83	3.99	16.916	C	B
Abram Clemens NB	6.26	0.42	6.796	A	A
Bleams WB	1819.79	121.32	369.613	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.60	0.17	7.322	A	A
Bleams EB	69.52	4.63	18.232	C	B
Abram Clemens NB	6.48	0.43	6.863	A	A
Bleams WB	3724.17	248.28	742.942	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.13	0.14	7.066	A	A
Bleams EB	35.75	2.38	10.245	B	B
Abram Clemens NB	4.47	0.30	5.559	A	A
Bleams WB	5011.22	334.08	990.182	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.73	0.12	6.861	A	A
Bleams EB	21.28	1.42	7.344	A	A
Abram Clemens NB	3.24	0.22	4.837	A	A
Bleams WB	5239.53	349.30	1024.538	F	F

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	11.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.07	0.00	0.00	4.20	6.30			N/A	N/A
Abram Clemens NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	57.82	0.00	14.70	159.60	>199			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.51	0.00	0.00	5.25	15.75			N/A	N/A
Abram Clemens NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	184.79	51.45	164.85	>199	>199			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.72	0.00	0.00	1.05	10.50			N/A	N/A
Abram Clemens NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	311.77	156.45	>199	>199	>199			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.21	0.00	0.00	4.20	7.35			N/A	N/A
Abram Clemens NB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	356.39	194.25	>199	>199	>199			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.36	0.00	0.00	1.05	4.20			N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	342.21	178.50	>199	>199	>199			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	58.72	662.73	0.089	0.00	0.00	0.10	1.47	(0.00)	6.250
1	Bleams EB	662.51	1190.80	0.556	0.00	0.00	1.29	18.42	(0.00)	7.020
1	Abram Clemens NB	156.59	943.33	0.166	0.00	0.00	0.21	3.04	(0.00)	4.794
1	Bleams WB	1170.69	1231.56	0.951	0.00	0.00	11.19	122.33	(0.00)	28.794
2	Commonwealth SB	70.12	609.89	0.115	0.00	0.10	0.14	1.98	(0.00)	6.999
2	Bleams EB	791.10	1179.98	0.670	0.00	1.29	2.07	29.39	(0.00)	9.563
2	Abram Clemens NB	186.99	874.47	0.214	0.00	0.21	0.28	4.16	(0.00)	5.493
2	Bleams WB	1397.91	1220.03	1.146	0.00	11.19	57.82	524.16	(0.00)	114.166
3	Commonwealth SB	85.88	602.14	0.143	0.00	0.14	0.17	2.54	(0.00)	7.318
3	Bleams EB	968.90	1173.23	0.826	0.00	2.07	4.51	59.83	(0.00)	16.916
3	Abram Clemens NB	229.01	784.06	0.292	0.00	0.28	0.43	6.26	(0.00)	6.796
3	Bleams WB	1712.09	1204.60	1.421	0.00	57.82	184.79	1819.79	(0.00)	369.613
4	Commonwealth SB	85.88	602.01	0.143	0.00	0.17	0.17	2.60	(0.00)	7.322
4	Bleams EB	968.90	1173.16	0.826	0.00	4.51	4.72	69.52	(0.00)	18.232
4	Abram Clemens NB	229.01	779.66	0.294	0.00	0.43	0.43	6.48	(0.00)	6.863
4	Bleams WB	1712.09	1204.24	1.422	0.00	184.79	311.77	3724.17	(0.00)	742.942
5	Commonwealth SB	70.12	605.50	0.116	0.00	0.17	0.14	2.13	(0.00)	7.066
5	Bleams EB	791.10	1179.34	0.671	0.00	4.72	2.21	35.75	(0.00)	10.245
5	Abram Clemens NB	186.99	867.95	0.215	0.00	0.43	0.29	4.47	(0.00)	5.559
5	Bleams WB	1397.91	1219.49	1.146	0.00	311.77	356.39	5011.22	(0.00)	990.182
6	Commonwealth SB	58.72	609.76	0.096	0.00	0.14	0.11	1.73	(0.00)	6.861
6	Bleams EB	662.51	1184.07	0.560	0.00	2.21	1.36	21.28	(0.00)	7.344
6	Abram Clemens NB	156.59	938.93	0.167	0.00	0.29	0.21	3.24	(0.00)	4.837
6	Bleams WB	1170.69	1231.04	0.951	0.00	356.39	342.21	5239.53	(0.00)	1024.538

A8 - 90% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None

Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	83.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	62.49	62.49	N/A	N/A
1	**Bleams EB**	1000.54	1000.54	N/A	N/A
1	**Abram Clemens NB**	180.68	180.68	N/A	N/A
1	**Bleams WB**	503.66	503.66	N/A	N/A
2	**Commonwealth SB**	74.62	74.62	N/A	N/A
2	**Bleams EB**	1194.74	1194.74	N/A	N/A
2	**Abram Clemens NB**	215.76	215.76	N/A	N/A
2	**Bleams WB**	601.42	601.42	N/A	N/A
3	**Commonwealth SB**	91.38	91.38	N/A	N/A
3	**Bleams EB**	1463.26	1463.26	N/A	N/A
3	**Abram Clemens NB**	264.24	264.24	N/A	N/A
3	**Bleams WB**	736.58	736.58	N/A	N/A
4	**Commonwealth SB**	91.38	91.38	N/A	N/A

4	Bleams EB	1463.26	1463.26	N/A	N/A
4	Abram Clemens NB	264.24	264.24	N/A	N/A
4	Bleams WB	736.58	736.58	N/A	N/A
5	Commonwealth SB	74.62	74.62	N/A	N/A
5	Bleams EB	1194.74	1194.74	N/A	N/A
5	Abram Clemens NB	215.76	215.76	N/A	N/A
5	Bleams WB	601.42	601.42	N/A	N/A
6	Commonwealth SB	62.49	62.49	N/A	N/A
6	Bleams EB	1000.54	1000.54	N/A	N/A
6	Abram Clemens NB	180.68	180.68	N/A	N/A
6	Bleams WB	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	12.000	0.000	71.000
	2	19.000	0.000	48.000	1262.000
	3	0.000	120.000	0.000	120.000
	4	42.000	541.000	86.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.14	0.00	0.86
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.81	0.13	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.12	5.38	0.14	A	76.16	114.24	9.25	4.86	0.10	9.25	4.86	0.579	1357.445
Bleams EB	1.29	622.21	203.39	F	1219.51	1829.27	9299.28	305.02	103.33	10003.51	328.11	0.579	1357.445
Abram Clemens NB	0.43	10.84	0.79	B	220.23	330.34	51.87	9.42	0.58	51.88	9.42	0.579	1357.445
Bleams WB	0.64	9.26	1.87	A	613.89	920.83	112.24	7.31	1.25	112.25	7.31	0.579	1357.445
						3194.68	9472.64	177.9078					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.19	45.40	558.71	0.00	930.68	559.17	0.067	0.00	0.08
Bleams EB	1000.54	250.14	978.03	503.36	117.54	0.00	1160.48	900.27	0.862	0.00	5.63
Abram Clemens NB	180.68	45.17	179.25	99.66	995.90	0.00	702.95	520.55	0.257	0.00	0.36
Bleams WB	503.66	125.91	500.51	1071.54	103.61	0.00	1167.73	1079.42	0.431	0.00	0.79

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.53	53.63	669.93	0.00	872.74	559.17	0.086	0.08	0.10
Bleams EB	1194.74	298.69	1115.97	603.57	140.89	0.00	1148.31	900.27	1.040	5.63	25.32
Abram Clemens NB	215.76	53.94	215.03	117.45	1139.41	0.00	628.20	520.55	0.343	0.36	0.54
Bleams WB	601.42	150.35	600.09	1230.97	123.47	0.00	1157.39	1079.42	0.520	0.79	1.12

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.23	62.22	819.27	0.00	794.96	559.17	0.115	0.10	0.14
Bleams EB	1463.26	365.81	1130.29	738.14	172.36	0.00	1131.92	900.27	1.293	25.32	108.56
Abram Clemens NB	264.24	66.06	263.30	135.14	1167.51	0.00	613.56	520.55	0.431	0.54	0.78
Bleams WB	736.58	184.15	733.68	1283.00	147.81	0.00	1144.71	1079.42	0.643	1.12	1.84

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	91.38	22.85	91.38	62.41	822.35	0.00	793.35	559.17	0.115	0.14	0.14
Bleams EB	1463.26	365.81	1131.42	740.89	172.84	0.00	1131.67	900.27	1.293	108.56	191.52
Abram Clemens NB	264.24	66.06	264.21	135.54	1168.73	0.00	612.93	520.55	0.431	0.78	0.79
Bleams WB	736.58	184.15	736.48	1284.66	148.28	0.00	1144.46	1079.42	0.644	1.84	1.87

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	74.62	18.65	74.76	54.34	674.63	0.00	870.30	559.17	0.086	0.14	0.10
Bleams EB	1194.74	298.69	1147.27	607.76	141.63	0.00	1147.93	900.27	1.041	191.52	203.39
Abram Clemens NB	215.76	53.94	216.58	119.12	1169.79	0.00	612.37	520.55	0.352	0.79	0.58
Bleams WB	601.42	150.35	604.28	1261.68	124.69	0.00	1156.75	1079.42	0.520	1.87	1.15

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	62.49	15.62	62.58	48.21	563.96	0.00	927.94	559.17	0.067	0.10	0.08
Bleams EB	1000.54	250.14	1154.04	508.08	118.45	0.00	1160.00	900.27	0.863	203.39	165.02
Abram Clemens NB	180.68	45.17	181.23	106.60	1165.89	0.00	614.41	520.55	0.294	0.58	0.44
Bleams WB	503.66	125.91	505.05	1240.01	107.11	0.00	1165.91	1079.42	0.432	1.15	0.81

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.10	0.07	4.351	A	A
Bleams EB	69.96	4.66	18.879	C	B
Abram Clemens NB	5.19	0.35	7.199	A	A
Bleams WB	11.37	0.76	5.640	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.44	0.10	4.735	A	A
Bleams EB	248.21	16.55	62.801	F	E
Abram Clemens NB	7.84	0.52	9.132	A	A
Bleams WB	16.23	1.08	6.766	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.99	0.13	5.369	A	A
Bleams EB	1005.44	67.03	222.677	F	F
Abram Clemens NB	11.22	0.75	10.761	B	B
Bleams WB	26.23	1.75	9.131	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.04	0.14	5.384	A	A
Bleams EB	2250.74	150.05	481.383	F	F
Abram Clemens NB	11.76	0.78	10.838	B	B
Bleams WB	27.89	1.86	9.259	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.51	0.10	4.753	A	A
Bleams EB	2961.88	197.46	622.211	F	F
Abram Clemens NB	9.01	0.60	9.570	A	A
Bleams WB	18.03	1.20	6.878	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.16	0.08	4.368	A	A
Bleams EB	2763.05	184.20	575.111	F	F

Abram Clemens NB	6.85	0.46	8.737	A	A
Bleams WB	12.47	0.83	5.731	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	5.63	0.00	0.00	6.30	18.90			N/A	N/A
Abram Clemens NB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.79	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	25.32	0.00	13.65	63.00	86.10			N/A	N/A
Abram Clemens NB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.12	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	108.56	51.45	102.90	160.65	179.55			N/A	N/A
Abram Clemens NB	0.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	191.52	119.70	186.90	>199	>199			N/A	N/A
Abram Clemens NB	0.79	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	203.39	122.85	197.40	>199	>199			N/A	N/A
Abram Clemens NB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Bleams WB	1.15	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	165.02	81.90	157.50	>199	>199			N/A	N/A
Abram Clemens NB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.81	0.00	0.00	1.05	1.05			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Commonwealth SB**	62.49	930.68	0.067	0.00	0.00	0.08	1.10	(0.00)	4.351
1	**Bleams EB**	1000.54	1160.48	0.862	0.00	0.00	5.63	69.96	(0.00)	18.879
1	**Abram Clemens NB**	180.68	702.95	0.257	0.00	0.00	0.36	5.19	(0.00)	7.199
1	**Bleams WB**	503.66	1167.73	0.431	0.00	0.00	0.79	11.37	(0.00)	5.640
2	**Commonwealth SB**	74.62	872.74	0.086	0.00	0.08	0.10	1.44	(0.00)	4.735
2	**Bleams EB**	1194.74	1148.31	1.040	0.00	5.63	25.32	248.21	(0.00)	62.801
2	**Abram Clemens NB**	215.76	628.20	0.343	0.00	0.36	0.54	7.84	(0.00)	9.132
2	**Bleams WB**	601.42	1157.39	0.520	0.00	0.79	1.12	16.23	(0.00)	6.766
3	**Commonwealth SB**	91.38	794.96	0.115	0.00	0.10	0.14	1.99	(0.00)	5.369
3	**Bleams EB**	1463.26	1131.92	1.293	0.00	25.32	108.56	1005.44	(0.00)	222.677
3	**Abram Clemens NB**	264.24	613.56	0.431	0.00	0.54	0.78	11.22	(0.00)	10.761
3	**Bleams WB**	736.58	1144.71	0.643	0.00	1.12	1.84	26.23	(0.00)	9.131
4	**Commonwealth SB**	91.38	793.35	0.115	0.00	0.14	0.14	2.04	(0.00)	5.384
4	**Bleams EB**	1463.26	1131.67	1.293	0.00	108.56	191.52	2250.74	(0.00)	481.383
4	**Abram Clemens NB**	264.24	612.93	0.431	0.00	0.78	0.79	11.76	(0.00)	10.838
4	**Bleams WB**	736.58	1144.46	0.644	0.00	1.84	1.87	27.89	(0.00)	9.259

5	**Commonwealth SB**	74.62	870.30	0.086	0.00	0.14	0.10	1.51	(0.00)	4.753
5	**Bleams EB**	1194.74	1147.93	1.041	0.00	191.52	203.39	2961.88	(0.00)	622.211
5	**Abram Clemens NB**	215.76	612.37	0.352	0.00	0.79	0.58	9.01	(0.00)	9.570
5	**Bleams WB**	601.42	1156.75	0.520	0.00	1.87	1.15	18.03	(0.00)	6.878
6	**Commonwealth SB**	62.49	927.94	0.067	0.00	0.10	0.08	1.16	(0.00)	4.368
6	**Bleams EB**	1000.54	1160.00	0.863	0.00	203.39	165.02	2763.05	(0.00)	575.111
6	**Abram Clemens NB**	180.68	614.41	0.294	0.00	0.58	0.44	6.85	(0.00)	8.737
6	**Bleams WB**	503.66	1165.91	0.432	0.00	1.15	0.81	12.47	(0.00)	5.731

A8 - 90% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	78.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	880.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Commonwealth SB	58.72	58.72	N/A	N/A
1	Bleams EB	662.51	662.51	N/A	N/A
1	Abram Clemens NB	156.59	156.59	N/A	N/A
1	Bleams WB	1170.69	1170.69	N/A	N/A
2	Commonwealth SB	70.12	70.12	N/A	N/A
2	Bleams EB	791.10	791.10	N/A	N/A
2	Abram Clemens NB	186.99	186.99	N/A	N/A
2	Bleams WB	1397.91	1397.91	N/A	N/A
3	Commonwealth SB	85.88	85.88	N/A	N/A
3	Bleams EB	968.90	968.90	N/A	N/A
3	Abram Clemens NB	229.01	229.01	N/A	N/A
3	Bleams WB	1712.09	1712.09	N/A	N/A
4	Commonwealth SB	85.88	85.88	N/A	N/A
4	Bleams EB	968.90	968.90	N/A	N/A
4	Abram Clemens NB	229.01	229.01	N/A	N/A
4	Bleams WB	1712.09	1712.09	N/A	N/A
5	Commonwealth SB	70.12	70.12	N/A	N/A
5	Bleams EB	791.10	791.10	N/A	N/A
5	Abram Clemens NB	186.99	186.99	N/A	N/A
5	Bleams WB	1397.91	1397.91	N/A	N/A
6	Commonwealth SB	58.72	58.72	N/A	N/A
6	Bleams EB	662.51	662.51	N/A	N/A
6	Abram Clemens NB	156.59	156.59	N/A	N/A
6	Bleams WB	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	65.000
	2	37.000	0.000	102.000	741.000
	3	0.000	104.000	0.000	104.000
	4	88.000	1286.000	181.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.17	0.00	0.83
	2	0.04	0.00	0.12	0.84
	3	0.00	0.50	0.00	0.50
	4	0.06	0.83	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
From		1	2	3	4

	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.14	7.33	0.17	A	71.57	107.36	12.54	7.01	0.14	12.54	7.01	0.579	1357.445
Bleams EB	0.87	24.81	6.33	C	807.50	1211.26	289.94	14.36	3.22	290.00	14.37	0.579	1357.445
Abram Clemens NB	0.31	7.41	0.47	A	190.86	286.30	29.66	6.22	0.33	29.66	6.22	0.579	1357.445
Bleams WB	1.50	1318.58	426.52	F	1426.90	2140.34	19859.39	556.72	220.66	24538.99	687.90	0.579	1357.445
						3745.26	20191.53	323.4734					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.30	89.90	1116.27	0.00	640.25	557.28	0.092	0.00	0.11
Bleams EB	662.51	165.63	656.68	997.86	176.71	0.00	1129.66	915.76	0.586	0.00	1.46
Abram Clemens NB	156.59	39.15	155.71	204.24	629.15	0.00	893.99	558.09	0.175	0.00	0.22
Bleams WB	1170.69	292.67	1100.71	679.39	105.46	0.00	1166.77	1056.30	1.003	0.00	17.50

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	70.00	98.30	1180.24	0.00	606.93	557.28	0.116	0.11	0.14
Bleams EB	791.10	197.78	787.27	1057.81	192.44	0.00	1121.46	915.76	0.705	1.46	2.42
Abram Clemens NB	186.99	46.75	186.66	225.36	754.35	0.00	828.77	558.09	0.226	0.22	0.30
Bleams WB	1397.91	349.48	1152.11	814.57	126.43	0.00	1155.84	1056.30	1.209	17.50	78.94

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.73	104.73	1190.71	0.00	601.48	557.28	0.143	0.14	0.17
Bleams EB	968.90	242.22	955.02	1072.18	204.26	0.00	1115.30	915.76	0.869	2.42	5.89
Abram Clemens NB	229.01	57.25	228.38	243.52	915.77	0.00	744.69	558.09	0.308	0.30	0.46
Bleams WB	1712.09	428.02	1141.10	989.80	154.35	0.00	1141.30	1056.30	1.500	78.94	221.69

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	85.88	21.47	85.88	105.23	1190.77	0.00	601.45	557.28	0.143	0.17	0.17
Bleams EB	968.90	242.22	967.13	1072.29	204.36	0.00	1115.26	915.76	0.869	5.89	6.33
Abram Clemens NB	229.01	57.25	228.99	244.89	926.60	0.00	739.05	558.09	0.310	0.46	0.47
Bleams WB	1712.09	428.02	1140.84	1000.43	155.16	0.00	1140.88	1056.30	1.501	221.69	364.50

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	70.12	17.53	70.26	99.26	1183.58	0.00	605.20	557.28	0.116	0.17	0.14
Bleams EB	791.10	197.78	805.93	1060.83	193.01	0.00	1121.17	915.76	0.706	6.33	2.62
Abram Clemens NB	186.99	46.75	187.61	227.87	771.07	0.00	820.06	558.09	0.228	0.47	0.31
Bleams WB	1397.91	349.48	1155.14	830.99	127.69	0.00	1155.19	1056.30	1.210	364.50	425.20

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	58.72	14.68	58.83	93.99	1177.93	0.00	608.14	557.28	0.097	0.14	0.11
Bleams EB	662.51	165.63	666.86	1052.08	184.67	0.00	1125.51	915.76	0.589	2.62	1.53
Abram Clemens NB	156.59	39.15	156.94	212.95	638.58	0.00	889.07	558.09	0.176	0.31	0.23
Bleams WB	1170.69	292.67	1165.41	689.01	106.51	0.00	1166.22	1056.30	1.004	425.20	426.52

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.53	0.10	6.491	A	A
Bleams EB	20.60	1.37	7.898	A	A
Abram Clemens NB	3.23	0.22	5.113	A	A
Bleams WB	171.23	11.42	40.647	E	D

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.00	0.13	7.037	A	A
Bleams EB	33.94	2.26	11.176	B	B
Abram Clemens NB	4.45	0.30	5.884	A	A
Bleams WB	726.18	48.41	161.734	F	F

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.54	0.17	7.327	A	A
Bleams EB	75.16	5.01	21.867	C	C
Abram Clemens NB	6.71	0.45	7.312	A	A
Bleams WB	2254.90	150.33	480.780	F	F

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.61	0.17	7.330	A	A

Bleams EB	92.21	6.15	24.812	C	C
Abram Clemens NB	6.98	0.47	7.410	A	A
Bleams WB	4396.48	293.10	923.458	F	F

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.13	0.14	7.070	A	A
Bleams EB	43.81	2.92	12.507	B	B
Abram Clemens NB	4.81	0.32	5.981	A	A
Bleams WB	5922.76	394.85	1234.585	F	F

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.73	0.12	6.884	A	A
Bleams EB	24.22	1.61	8.317	A	A
Abram Clemens NB	3.46	0.23	5.166	A	A
Bleams WB	6387.84	425.86	1318.576	F	F

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	17.50	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.42	0.00	0.00	5.25	8.40			N/A	N/A
Abram Clemens NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	78.94	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	5.89	0.00	0.00	11.55	22.05			N/A	N/A
Abram Clemens NB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Bleams WB	221.69	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	6.33	0.00	0.00	5.25	21.00			N/A	N/A
Abram Clemens NB	0.47	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	364.50	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.62	0.00	0.00	4.20	9.45			N/A	N/A
Abram Clemens NB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	425.20	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.53	0.00	0.00	1.05	4.20			N/A	N/A
Abram Clemens NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	426.52	N/A	N/A	N/A	N/A	No excess capacity in final time segment - unable to calculate queue statistics		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	58.72	640.25	0.092	0.00	0.00	0.11	1.53	(0.00)	6.491
1	Bleams EB	662.51	1129.66	0.586	0.00	0.00	1.46	20.60	(0.00)	7.898
1	Abram Clemens NB	156.59	893.99	0.175	0.00	0.00	0.22	3.23	(0.00)	5.113
1	Bleams WB	1170.69	1166.77	1.003	0.00	0.00	17.50	171.23	(0.00)	40.647
2	Commonwealth SB	70.12	606.93	0.116	0.00	0.11	0.14	2.00	(0.00)	7.037
2	Bleams EB	791.10	1121.46	0.705	0.00	1.46	2.42	33.94	(0.00)	11.176
2	Abram Clemens NB	186.99	828.77	0.226	0.00	0.22	0.30	4.45	(0.00)	5.884
2	Bleams WB	1397.91	1155.84	1.209	0.00	17.50	78.94	726.18	(0.00)	161.734
3	Commonwealth SB	85.88	601.48	0.143	0.00	0.14	0.17	2.54	(0.00)	7.327
3	Bleams EB	968.90	1115.30	0.869	0.00	2.42	5.89	75.16	(0.00)	21.867
3	Abram Clemens NB	229.01	744.69	0.308	0.00	0.30	0.46	6.71	(0.00)	7.312
3	Bleams WB	1712.09	1141.30	1.500	0.00	78.94	221.69	2254.90	(0.00)	480.780
4	Commonwealth SB	85.88	601.45	0.143	0.00	0.17	0.17	2.61	(0.00)	7.330
4	Bleams EB	968.90	1115.26	0.869	0.00	5.89	6.33	92.21	(0.00)	24.812
4	Abram Clemens NB	229.01	739.05	0.310	0.00	0.46	0.47	6.98	(0.00)	7.410
4	Bleams WB	1712.09	1140.88	1.501	0.00	221.69	364.50	4396.48	(0.00)	923.458
5	Commonwealth SB	70.12	605.20	0.116	0.00	0.17	0.14	2.13	(0.00)	7.070
5	Bleams EB	791.10	1121.17	0.706	0.00	6.33	2.62	43.81	(0.00)	12.507
5	Abram Clemens NB	186.99	820.06	0.228	0.00	0.47	0.31	4.81	(0.00)	5.981
5	Bleams WB	1397.91	1155.19	1.210	0.00	364.50	425.20	5922.76	(0.00)	1234.585
6	Commonwealth SB	58.72	608.14	0.097	0.00	0.14	0.11	1.73	(0.00)	6.884
6	Bleams EB	662.51	1125.51	0.589	0.00	2.62	1.53	24.22	(0.00)	8.317
6	Abram Clemens NB	156.59	889.07	0.176	0.00	0.31	0.23	3.46	(0.00)	5.166
6	Bleams WB	1170.69	1166.22	1.004	0.00	425.20	426.52	6387.84	(0.00)	1318.576

Appendix F

Noise Study

Bleams Road Reconstruction

Bleams Road Class EA
Final Noise Assessment

(Road Widening from Fischer-Hallman Road to Commonwealth Street)

Project Location:

Bleams Road
Kitchener, ON

Prepared for:

Region of Waterloo
140 Frederick Street
Kitchener, ON N2G 4J3

Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

November 21, 2022

MTE File No.: 47727-100

Engineers, Scientists, Surveyors.

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Appendices

Appendix A Traffic Information
Appendix B Growth Calculations + STAMSON

Drawings

MTE Drawing 47727-104- NA1.4 ..... Encl.

1.0 Introduction

MTE Consultants (MTE) has prepared this noise assessment report as input to the Bleams Road reconstruction Class EA in the City of Kitchener. This Noise Assessment has been completed per Part B of the *Noise Policy Implementation Guideline* (Region of Waterloo, 2019) for existing developments impacted by proposed Regional Road undertakings. Bleams Road is proposed to be widened from Fischer-Hallman Road to approximately 130m west of Commonwealth Street.

The purpose of this Noise Assessment is to provide technical information and analysis as input to the recommended alignment and provide recommendations for noise mitigation measures that may be required and/or implemented per Part B of the Region's Noise Policy.

2.0 Criteria

This assessment has been completed using the requirements of the Region's *Implementation Guidelines for Noise Policies*, along with *NPC-300: Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning* (MECP, 2013). The Regional guidelines are comprised of the following Parts:

- Part A: New Development Impacted by Noise from Roads and Railways
- Part B: Existing Development Impacted by Proposed Regional Road Undertakings
- Part C: Existing Development Impacted by Noise from Existing Regional Roads

In addition, the MECP requires the use of the *Ontario Road Noise Analysis Method for Environment and Transportation* (ORNAMENT) to assess the noise impact of roadway projects on existing and planned residential uses, to establish the ambient noise sources, and for complaint investigation.

2.1 PART B – Existing Development Impacted by Proposed Road Undertakings

Per Part B of the *Implementation Guideline*, Proposed Road Undertakings refer to proposals for the widening of an existing Regional road, or the construction of a new Regional road, adjacent to an existing developed area of noise-sensitive land use.

The existing residential developments which are adjacent to, and just westerly of, the proposed widening of Bleams Road (Fischer-Hallman Road to Commonwealth Street) are considered to be existing developed areas of noise-sensitive land use. Therefore, these areas will be assessed according to criteria outlined in Part B of the *Implementation Guidelines.*

2.1.1 Noise Levels for Outdoor Living Areas

Existing and proposed noise levels for the daytime period will be assessed for the existing outdoor living areas affected by the proposed undertaking, using procedures acceptable to the MECP. The daytime period is defined as 7:00 am (07:00) to 11:00 pm (23:00). The existing noise level will be calculated using the current traffic volume. The projected noise level will be calculated using the 10-year traffic volume forecast and take into account the proposed design.

The Outdoor Living Area (OLA) is defined as an outdoor amenity area where the enjoyment of the outdoor environment is important. This can be the backyard or patio within 3 m of the rear wall of a residential unit. In this assessment, the OLA is assessed at a height of 1.5 m above ground level.

The types of noise control measures available for consideration include, but are not limited to:

- The location of the road allowance;
- The location of pavement within the road allowance;
- The vertical alignment;
- The pavement surface type; and
- Proposed noise barriers.

In the event that non-barrier alternatives are not sufficient, construction of a noise barrier will be recommended in the following situations:

- Where the projected noise level exceeds 65 dBA; or
- Where the projected noise level exceeds 60 dBA and the difference between the existing and projected noise levels is 5 dBA or more.

Table 2.1 – Recommended Noise Control Measures for Existing Outdoor Living Areas

Daytime (07:00-23:00)	Noise Control Measures
60 dBA or less	No requirements or conditions
60-65 dBA and exceeds existing noise by 0-5 dBA	No requirements or conditions
60-65 dBA and exceeds existing noise by 5 dBA or more	Noise barrier recommended to reduce projected noise levels by 5 dBA or more to 60 dBA or less
65+ dBA	Noise barrier recommended to reduce projected noise levels by 5 dBA or more to 60 dBA or less

3.0 Analysis Procedures

3.1 Road Traffic Data

The noise source considered for this analysis include:

- Bleams Road (Fischer-Hallman Road to Helena Feasby Street)
- Bleams Road (Helena Feasby Street to Commonwealth Street)
- Bleams Road (Commonwealth Street to 130 m west of Commonwealth Street)

Bleams Road:

Current (2022) and projected (2032) average annual daily traffic (AADT) traffic volumes for Bleams Road between Fischer-Hallman Road and Commonwealth Street were supplied by the Region of Waterloo on June 16, 2022 via a traffic data request. This document provided the % medium and heavy trucks, as well as the posted speed limits, that are used throughout the analysis.

Current (2022) and projected (2031) AADT traffic volumes Bleams Road for the Bleams Road widening segment west of Commonwealth Street were provided by the Region on September 21, 2022. This data set includes traffic information from Helena Feasby Street to Trussler Road, and is part of an ongoing TIS being completed by Salvini Consulting Ltd. The 2031 volumes were then forecasted to the horizon year of 2032, representing the anticipated 10-year post-construction horizon, using a growth rate of 0.5%. See **Appendix B** for the growth calculations.

It should be noted that the information provided from the traffic request and ongoing TIS have slightly differing AADTs between Fischer-Hallman Road and Commonwealth Street. For the purpose of this assessment, the higher current and 2032 volumes were used. The traffic volumes and vehicle distributions used are summarized in **Tables 3.1 to 3.5.**

3.2 Traffic Calculation Methods

Resulting road noise levels were calculated using the Stamson v5.03 computer program approved by the MECP. Daytime road noise levels were calculated based on 24-hour volume breakdown. The daytime volume (over 16 hours) is obtained by multiplying the AADT by the fraction of daily traffic expected during the daytime period (90%). Noise calculations are attached in **Appendix B**.

Existing Traffic

Table 3.1 – Current (2022) Road Traffic Volumes for Bleams Road (Fischer-Hallman Road to Commonwealth)

Bleams Road (Fischer-Hallman to Commonwealth)	Current AADT – 9,200 vpd Speed Limit = 60km/h		
	Cars	Medium Trucks (1.0%)	Heavy Trucks (2.0%)
Daytime Volume (16 hrs)	8,032	83	166

Table 3.2 – Current (2022) Road Traffic Volumes for Bleams Road (Commonwealth to Limit of Analysis)

Bleams Road (Commonwealth to Limit of Analysis)	Current AADT – 7,837 vpd Speed Limit = 60km/h		
	Cars	Medium Trucks (1.0%)	Heavy Trucks (2.0%)
Daytime Volume (16 hrs)	6,842	71	141

Projected Traffic

Table 3.3 – Projected (2032) Road Traffic Volumes for Bleams Road (Fischer-Hallman Road to Helena Feasby)

Bleams Road (Fischer-Hallman to Helena Feasby)	Current AADT – 24,219 vpd Speed Limit = 60km/h		
	Cars	Medium Trucks (1.0%)	Heavy Trucks (2.0%)
Daytime Volume (16 hrs)	21,143	218	436

Table 3.4 – Projected (2032) Road Traffic Volumes for Bleams Road (Helena Feasby to Commonwealth)

Bleams Road (Helena Feasby to Commonwealth)	Current AADT – 24,011 vpd Speed Limit = 60km/h		
	Cars	Medium Trucks (1.0%)	Heavy Trucks (2.0%)
Daytime Volume (16 hrs)	20,962	216	432

Table 3.5 – Projected (2032) Road Traffic Volumes for Bleams Road (Commonwealth to Limit of Analysis)

Bleams Road (Commonwealth to Limit of Analysis)	Current AADT – 22,724 vpd Speed Limit = 60km/h		
	Cars	Medium Trucks (1.0%)	Heavy Trucks (2.0%)
Daytime Volume (16 hrs)	19,838	205	409

3.3 Existing Noise Attenuation Measures

3.3.1 Williamsburg South Noise Wall

In September 2005, MTE completed a Final Environmental Noise Assessment for the Williamsburg South Subdivision, located in the northwest corner of Bleams Road and Fischer-Hallman Road.

The report initially concluded that a 3.0m high Durisol attenuation barrier would be required adjacent to Bleams Road. Further analysis of the noise wall requirements were completed in an Addendum dated September 2008. This analysis concluded that a 2.0m high reflective barrier along Bleams Road will sufficiently reduce outdoor amenity area noise levels to meet the Regional criteria. This noise wall is included within this report's analyses where applicable, and is seen on **MTE Drawing 47727-104-NA1.4**.

3.3.2 Bleams Road at Commonwealth Street Multi-Block Noise Fence

In December 2008, MTE completed a Final Environmental Noise Assessment for the multi-residential block located in the northeast corner of the intersection of Commonwealth Street and Bleams Road.

The report concluded that a 1.8m high noise fence be constructed adjacent to the outdoor living area of the unit closest to the intersection (2 Commonwealth Street). This noise wall is included within this reports' analyses where applicable, and is seen on **MTE Drawing 47727-104-NA1.4**.

4.0 Results and Analysis

4.1 Noise Level Calculations

This noise analysis has been completed to determine resulting noise levels from increased traffic along Bleams Road as a result of the proposed reconstruction on existing houses, and recommend noise mitigation measures if required.

Eight (8) OLAs were placed along the analyzed corridor at critical locations that would represent the "worst-case" within the area (i.e. closest to the centerline of Bleams Road). The assessed OLAs can be seen in **MTE Drawing 47727-104-NA1.4**. A summary of the noise levels at each OLA is provided in **Table 4.1** below.

The cross-section of each OLA between the road and point of assessment was analysed to determine the imperviousness of the intermediate surfaces. Per the MECP's *Ontario Road Noise Analysis Method for Environment and Transportation* (ORNAMENT), if more than half of the ground surface between the centerline of traffic and the point of assessment, the intermediate surface is considered reflective, and the modelling should be adjusted accordingly.

Table 4.1 – Noise Level Results

OLA	Municipal Address	Existing Bleams Road Alignment (2022)		Future Bleams Road Alignment (2032)		Increase in Noise Level (dBA)
		Distance from Road Centreline (m)	OLA Noise Level Limit (dBA)	Distance from Road Centreline (m)	OLA Noise Level Limit (dBA)	
From Study Limit to Commonwealth Street						
1	539 Commonwealth Crescent	36.6	56.6[1]	36.6	61.2[2]	**4.6**
2	507 Commonwealth Crescent	41.1	55.7[1]	44.2	59.8[2]	**4.1**
From Commonwealth Street to Helena Feasby Street						
3	2 Commonwealth Street	30.3	55.0[2]	42.5	58.0[2]	**3.0**
4	3 Helena Feasby Street	26.7	54.3[1]	23.8	59.1[1]	**4.8**
From Helena Feasby Street to Fischer-Hallman Road						
5	2 Harding Street	31.8	52.8[1]	29.1	57.4[1]	**4.6**
6	26 Harding Street	35.2	52.6[1]	32.9	57.2[1]	**4.6**
7	1385 Bleams Road	38.7	55.9[2]	41.4	59.8[2]	**3.9**
8	1375 Bleams Road	43.1	53.2[2]	45.5	57.1[2]	**3.9**

Note: 1 – Modelled as an absorptive intermediate surface
2 – Modelled as a reflective intermediate surface

As seen in **Table 4.1,** all OLAs experienced noise levels less than 65dBA, and an increase of less than 5dBA as a result of the Bleams Road reconstruction.

5.0 Conclusions

Based on the foregoing analysis, the following conclusions can be made:

1. All OLAs analysed experience a projected noise level increase of less than 5dBA as a result of the proposed road widening of Bleams Road from Fischer-Hallman Road to Commonwealth Street.
2. Per Part B of the Region's Noise Policy, it can be concluded that the proposed widening of Bleams Road between Fischer-Hallman Road and Commonwealth Street do not require any additional noise mitigation measures than what is already present on the existing lots.

All of which is respectfully submitted,

MTE Consultants Inc.



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Design Engineer
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5.0 Conclusions

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Appendix A

Traffic Information

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location

Bleams Road b/w Commonwealth Street & Fischer-Hallman Road, Kitchener, ON

2. Current AADT (2022)

Bleams Road
9,200

3. Forecast AADT (2032)

Bleams Road
24,000

4. Commercial Vehicle Rates

	Bleams Road
% Medium Trucks	1%
% Heavy Trucks	2%

5. Posted Speed Limit

Bleams Road
60 km/h

6. Day/Night Splits

Regional Standard 90/10 Day/Night Split

7. Expiry

Dec 31 2023

8. Notes

This forecast is intended for the purpose of carrying out a noise study for the **Bleams Road EA** only. The above AADT represents the traffic volumes on Bleams Road between Commonwealth Street and Fischer-Hallman Road.

Please note that the posted speed is subject to change as the EA progresses. Until now, the EA has assumed a 60 km/h posted speed limit. If that changes as the EA progresses, the modified posted speed limit should be used for the noise assessment.

This forecast remains valid up to the date indicated above. The Region of Waterloo should be contacted for an updated forecast if there are plans to use this forecast beyond the above validity period.

Bleams EA - Fischer-Hallman to Trussler, Kitchener

Traffic Volumes



Conversion Factor:

Bleams Road, East of Commonwealth:

2031 PM Peak Volume:	*2,471*
2031 AADT:	*23,996*
AADT Factor:	9.7109
Source:	DOCS_ADMIN-#4106868-2031 AADT for Noise Study - Bleams Road

Appendix B

Growth Calculations + STAMSON

Bleams Road
Part B Environmental Noise Assessment
Kitchener, Ontario

Project Number:	47727-104
Date:	September 22, 2022
Design By:	AJC
File:	Q:\47727\100\Noise\47727-104-Growth Rate Calcs.xlsx

Bleams Road (Forestwalk to Commonwealth) - Growth Rate Calculation

	AADT
2031	22611

Assumed Growth Rate

i = 0.005

0.50%

Projected Traffic, 2032

= 22611*(1.005)^1

22,724 AADT

Bleams Road
Part B Environmental Noise Assessment
Kitchener, Ontario

Project Number:	47727-104
Date:	September 22, 2022
Design By:	AJC
File:	Q:\47727\100\Noise\47727-104-Growth Rate Calcs.xlsx

Bleams Road (Commonwealth to Helena Feasby) - Growth Rate Calculation

	AADT
2031	23892

Assumed Growth Rate

i = 0.005

0.50%

Projected Traffic, 2032

= 23892*(1.005)^1

24,011 AADT

Bleams Road
Part B Environmental Noise Assessment
Kitchener, Ontario

Project Number:	47727-104
Date:	September 22, 2022
Design By:	AJC
File:	Q:\47727\100\Noise\47727-104-Growth Rate Calcs.xlsx

Bleams Road (Helena Feasby to Fischer-Hallman) - Growth Rate Calculation

	AADT
2031	24099

Assumed Growth Rate

i = 0.005

0.50%

Projected Traffic, 2032

= 23892*(1.005)^1

24,219 AADT

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:20:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola1ex.te Time Period: 16 hours
Description: ola 1 - 539 commonwealth - ex absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 6842 veh/TimePeriod *
Medium truck volume : 71 veh/TimePeriod *
Heavy truck volume : 141 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 36.60 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 56.55 + 0.00) = 56.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.44	0.00	-6.43	-1.46	0.00	0.00	0.00	56.55

Segment Leq : 56.55 dBA

Total Leq All Segments: 56.55 dBA

TOTAL Leq FROM ALL SOURCES: 56.55

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:21:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola1futa.te Time Period: 16 hours
Description: ola 1 - 539 commonwealth - fut absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 19838 veh/TimePeriod *
Medium truck volume : 205 veh/TimePeriod *
Heavy truck volume : 409 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 36.60 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 61.18 + 0.00) = 61.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	69.06	0.00	-6.43	-1.46	0.00	0.00	0.00	61.18

Segment Leq : 61.18 dBA

Total Leq All Segments: 61.18 dBA

TOTAL Leq FROM ALL SOURCES: 61.18

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:22:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola2ex.te Time Period: 16 hours
Description: ola 2 - 507 commonwealth - ex absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 6842 veh/TimePeriod *
Medium truck volume : 71 veh/TimePeriod *
Heavy truck volume : 141 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 41.10 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 55.72 + 0.00) = 55.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.44	0.00	-7.27	-1.46	0.00	0.00	0.00	55.72

Segment Leq : 55.72 dBA

Total Leq All Segments: 55.72 dBA

TOTAL Leq FROM ALL SOURCES: 55.72

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:23:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola2futa.te Time Period: 16 hours
Description: ola 2 - 507 commonwealth - fut absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 19838 veh/TimePeriod *
Medium truck volume : 205 veh/TimePeriod *
Heavy truck volume : 409 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.20 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 59.82 + 0.00) = 59.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	69.06	0.00	-7.79	-1.46	0.00	0.00	0.00	59.82

Segment Leq : 59.82 dBA

Total Leq All Segments: 59.82 dBA

TOTAL Leq FROM ALL SOURCES: 59.82

STAMSON 5.0 NORMAL REPORT Date: 12-09-2022 16:38:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola3exa.te Time Period: 16 hours
Description: ola 3 - commonwealth block - ex reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 30.30 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Barrier receiver distance : 3.00 m
Source elevation : 336.00 m
Receiver elevation : 338.30 m
Barrier elevation : 338.30 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.24	339.54

ROAD (0.00 + 55.03 + 0.00) = 55.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.66	0.00	-3.05	0.00	0.00	0.00	-6.57	55.03

Segment Leq : 55.03 dBA

Total Leq All Segments: 55.03 dBA

TOTAL Leq FROM ALL SOURCES: 55.03

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:11:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola3futr.te Time Period: 16 hours
Description: ola 3 - 2 commonwealth - fut reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 20962 veh/TimePeriod *
Medium truck volume : 216 veh/TimePeriod *
Heavy truck volume : 432 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 42.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Barrier receiver distance : 3.00 m
Source elevation : 335.75 m
Receiver elevation : 338.30 m
Barrier elevation : 338.30 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.30	339.60

ROAD (0.00 + 58.01 + 0.00) = 58.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.82	0.00	-4.52	0.00	0.00	0.00	-6.28	58.01

Segment Leq : 58.01 dBA

Total Leq All Segments: 58.01 dBA

TOTAL Leq FROM ALL SOURCES: 58.01

STAMSON 5.0 NORMAL REPORT Date: 12-09-2022 16:49:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola4ex.te Time Period: 16 hours
Description: OLA 4 - 3 HELENA FEASBY - EX ABSORP

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.70 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 8.20 m
Source elevation : 335.30 m
Receiver elevation : 336.30 m
Barrier elevation : 335.70 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.70	337.40

ROAD (0.00 + 54.25 + 0.00) = 54.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	64.66	0.00	-3.88	-1.27	0.00	0.00	-5.26	54.25

Segment Leq : 54.25 dBA

Total Leq All Segments: 54.25 dBA

TOTAL Leq FROM ALL SOURCES: 54.25

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:15:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola4fut.te Time Period: 16 hours
Description: ola 4 - 3 helena feasby - fut absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 20962 veh/TimePeriod *
Medium truck volume : 216 veh/TimePeriod *
Heavy truck volume : 432 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 23.80 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 8.20 m
Source elevation : 335.30 m
Receiver elevation : 336.30 m
Barrier elevation : 335.70 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.65	337.35

ROAD (0.00 + 59.08 + 0.00) = 59.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	68.82	0.00	-3.11	-1.27	0.00	0.00	-5.37	59.08

Segment Leq : 59.08 dBA

Total Leq All Segments: 59.08 dBA

TOTAL Leq FROM ALL SOURCES: 59.08

STAMSON 5.0 NORMAL REPORT Date: 13-09-2022 09:03:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola5exa.te Time Period: 16 hours
Description: ola 5 - 2 harding - ex absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 31.80 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 13.50 m
Source elevation : 335.80 m
Receiver elevation : 336.30 m
Barrier elevation : 336.00 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.46	337.46

ROAD (0.00 + 52.75 + 0.00) = 52.75 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	64.66	0.00	-5.06	-1.27	0.00	0.00	-5.59	52.75

Segment Leq : 52.75 dBA

Total Leq All Segments: 52.75 dBA

TOTAL Leq FROM ALL SOURCES: 52.75

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:01:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola5futa.te Time Period: 16 hours
Description: OLA 5 - 2 HARDING - FUT ABSORP

Road data, segment # 1: BLEAMS

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.10 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 13.50 m
Source elevation : 335.80 m
Receiver elevation : 336.30 m
Barrier elevation : 336.00 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.42	337.42

ROAD (0.00 + 57.43 + 0.00) = 57.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	68.86	0.00	-4.46	-1.27	0.00	0.00	-5.71	57.43

Segment Leq : 57.43 dBA

Total Leq All Segments: 57.43 dBA

TOTAL Leq FROM ALL SOURCES: 57.43

STAMSON 5.0 NORMAL REPORT Date: 13-09-2022 09:10:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola6exa.te Time Period: 16 hours
Description: ola 6 - 26 harding - ex absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.20 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 18.30 m
Source elevation : 336.70 m
Receiver elevation : 337.95 m
Barrier elevation : 336.80 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.84	338.64

ROAD (0.00 + 52.61 + 0.00) = 52.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	64.66	0.00	-5.74	-1.27	0.00	0.00	-5.05	52.61

Segment Leq : 52.61 dBA

Total Leq All Segments: 52.61 dBA

TOTAL Leq FROM ALL SOURCES: 52.61

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:02:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola6futa.te Time Period: 16 hours
Description: ola 6 - 26 harding - fut absorp

Road data, segment # 1: BLEAMS

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 18.30 m
Source elevation : 336.70 m
Receiver elevation : 337.95 m
Barrier elevation : 336.80 m
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.78	338.58

ROAD (0.00 + 57.21 + 0.00) = 57.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.55	68.86	0.00	-5.28	-1.27	0.00	0.00	-5.10	57.21

Segment Leq : 57.21 dBA

Total Leq All Segments: 57.21 dBA

TOTAL Leq FROM ALL SOURCES: 57.21

STAMSON 5.0 NORMAL REPORT Date: 13-09-2022 09:29:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola7ex.te Time Period: 16 hours
Description: ola 7 - 1385 bleams - ex reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg -60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 38.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: house

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: house

Angle1 Angle2 : -60.00 deg 60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 38.70 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -60.00 deg Angle2 : 60.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 3.00 m
Source elevation : 336.15 m
Receiver elevation : 337.50 m
Barrier elevation : 337.50 m
Reference angle : 0.00

Road data, segment # 3: bleams2

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: bleams2

Angle1 Angle2 : 60.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 38.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 52.76 + 0.00) = 52.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-60	0.00	64.66	0.00	-4.12	-7.78	0.00	0.00	0.00	52.76

Segment Leq : 52.76 dBA

Results segment # 2: house

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.37	338.87

ROAD (0.00 + 38.83 + 0.00) = 38.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	60	0.00	64.66	0.00	-4.12	-1.76	0.00	0.00	-19.96	38.83

Segment Leq : 38.83 dBA

Results segment # 3: bleams2

Source height = 1.19 m

ROAD (0.00 + 52.76 + 0.00) = 52.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.00	64.66	0.00	-4.12	-7.78	0.00	0.00	0.00	52.76

Segment Leq : 52.76 dBA

Total Leq All Segments: 55.86 dBA

TOTAL Leq FROM ALL SOURCES: 55.86

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:03:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola7fut.te Time Period: 16 hours
Description: ola 7 - 1385 bleams - fut reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg -60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 41.40 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: house

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: house

Angle1 Angle2 : -60.00 deg 60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 41.40 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -60.00 deg Angle2 : 60.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 3.00 m
Source elevation : 336.15 m
Receiver elevation : 337.50 m
Barrier elevation : 337.50 m
Reference angle : 0.00

Road data, segment # 3: bleams2

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: bleams2

Angle1 Angle2 : 60.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 41.40 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 56.67 + 0.00) = 56.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-60	0.00	68.86	0.00	-4.41	-7.78	0.00	0.00	0.00	56.67

Segment Leq : 56.67 dBA

Results segment # 2: house

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.38	338.88

ROAD (0.00 + 42.74 + 0.00) = 42.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-60	60	0.00	68.86	0.00	-4.41	-1.76	0.00	0.00	-19.95	42.74

Segment Leq : 42.74 dBA

Results segment # 3: bleams2

Source height = 1.19 m

ROAD (0.00 + 56.67 + 0.00) = 56.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
60	90	0.00	68.86	0.00	-4.41	-7.78	0.00	0.00	0.00	56.67

Segment Leq : 56.67 dBA

Total Leq All Segments: 59.77 dBA

TOTAL Leq FROM ALL SOURCES: 59.77

STAMSON 5.0 NORMAL REPORT Date: 13-09-2022 09:49:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola8ex.te Time Period: 16 hours
Description: ola89 - 1375 bleams - ex reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg -70.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 43.10 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: house

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: house

Angle1 Angle2 : -70.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 43.10 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -70.00 deg Angle2 : 75.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 3.00 m
Source elevation : 336.85 m
Receiver elevation : 337.00 m
Barrier elevation : 337.00 m
Reference angle : 0.00

Road data, segment # 3: bleams2

Car traffic volume : 8032 veh/TimePeriod *
Medium truck volume : 83 veh/TimePeriod *
Heavy truck volume : 166 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: bleams2

Angle1 Angle2 : 75.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 43.10 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 50.54 + 0.00) = 50.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-70	0.00	64.66	0.00	-4.58	-9.54	0.00	0.00	0.00	50.54

Segment Leq : 50.54 dBA

Results segment # 2: house

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.47	338.47

ROAD (0.00 + 39.66 + 0.00) = 39.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	75	0.00	64.66	0.00	-4.58	-0.94	0.00	0.00	-19.48	39.66

Segment Leq : 39.66 dBA

Results segment # 3: bleams2

Source height = 1.19 m

ROAD (0.00 + 49.29 + 0.00) = 49.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
75	90	0.00	64.66	0.00	-4.58	-10.79	0.00	0.00	0.00	49.29

Segment Leq : 49.29 dBA

Total Leq All Segments: 53.17 dBA

TOTAL Leq FROM ALL SOURCES: 53.17

STAMSON 5.0 NORMAL REPORT Date: 21-09-2022 11:06:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola8fut.te Time Period: 16 hours
Description: ola 8 - 1375 bleams - fut reflect

Road data, segment # 1: BLEAMS

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BLEAMS

Angle1 Angle2 : -90.00 deg -70.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: house

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: house

Angle1 Angle2 : -70.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.50 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -70.00 deg Angle2 : 75.00 deg
Barrier height : 6.00 m
Barrier receiver distance : 3.00 m
Source elevation : 336.85 m
Receiver elevation : 337.00 m
Barrier elevation : 337.00 m
Reference angle : 0.00

Road data, segment # 3: bleams2

Car traffic volume : 21143 veh/TimePeriod *
Medium truck volume : 218 veh/TimePeriod *
Heavy truck volume : 436 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: bleams2

Angle1 Angle2 : 75.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 45.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BLEAMS

Source height = 1.19 m

ROAD (0.00 + 54.50 + 0.00) = 54.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-70	0.00	68.86	0.00	-4.82	-9.54	0.00	0.00	0.00	54.50

Segment Leq : 54.50 dBA

results segment # 2: house

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.47	338.47

ROAD (0.00 + 43.63 + 0.00) = 43.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	75	0.00	68.86	0.00	-4.82	-0.94	0.00	0.00	-19.47	43.63

Segment Leq : 43.63 dBA

Results segment # 3: bleams2

Source height = 1.19 m

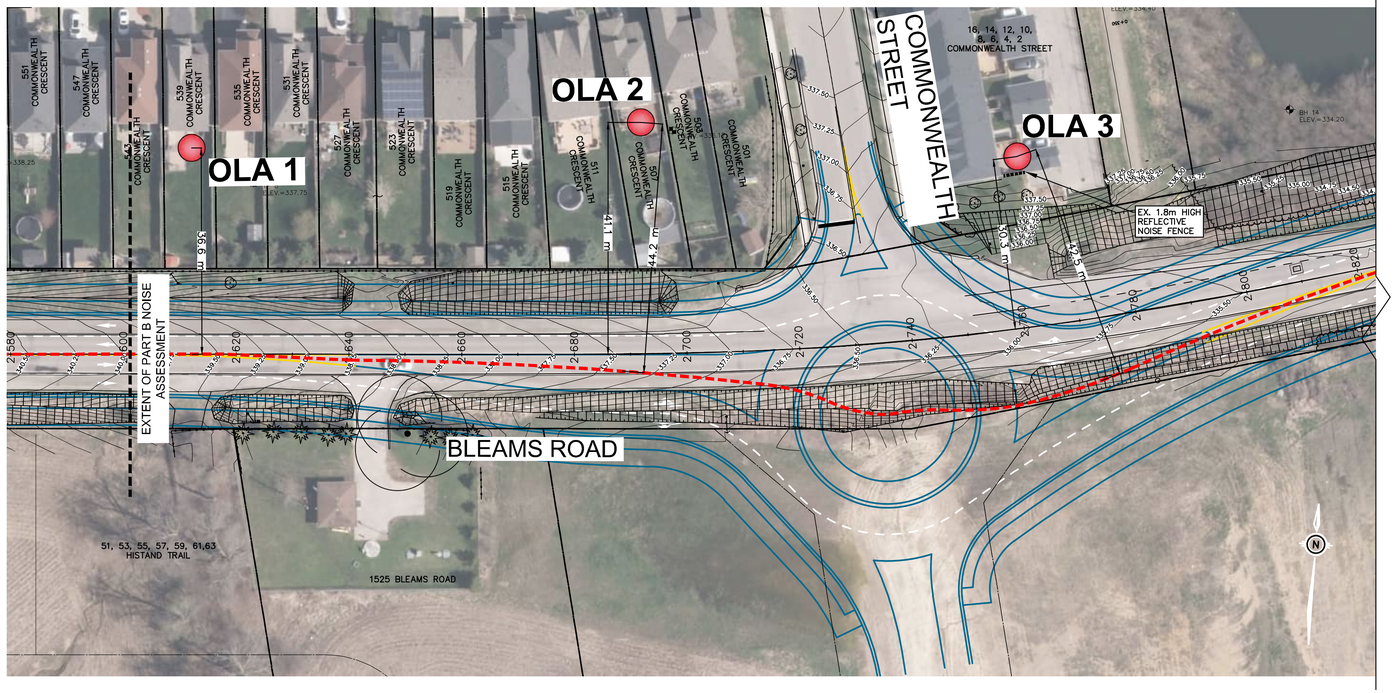
ROAD (0.00 + 53.25 + 0.00) = 53.25 dBA

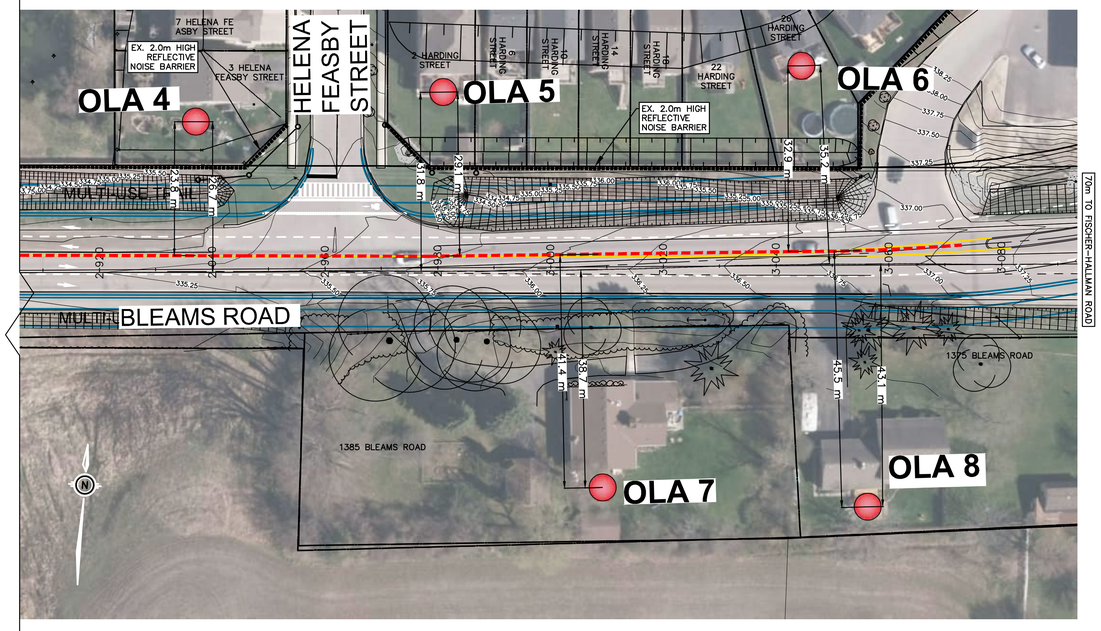
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
75	90	0.00	68.86	0.00	-4.82	-10.79	0.00	0.00	0.00	53.25

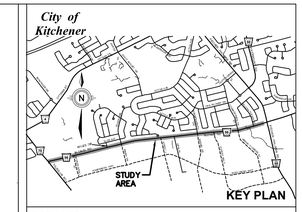
Segment Leq : 53.25 dBA

Total Leq All Segments: 57.13 dBA

TOTAL Leq FROM ALL SOURCES: 57.13







DISCLAIMER:
THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NPRESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

LEGEND

- ROAD CENTRELINE
- 326.0 — EXISTING CONTOURS
- OLA 1 — OUTDOOR LIVING AREA (OLA)

Region of Waterloo

MTE
Engineers, Scientists, Surveyors
519-743-6500

CONTROLLING BENCHMARK ???
--
ELEV. ???.???

No.	ISSUE/REVISION	BY	DATE

BLEAMS ROAD RECONSTRUCTION TRUSSLER ROAD TO FISCHER-HALLMAN ROAD

NOISE STUDY

BLEAMS ROAD
(FORESTWALK TRAIL TO FISCHER-HALLMAN ROAD)

DRAWN BY: JMD	CONTRACT No.
CHECKED BY: .	FILE No. -
DATE: 2022-06-08	DRAWING No. N1.4
SCALE 1:500	SHEET 4 OF 4
CADD FILE: 47727-100-NA1.dwg	

P:\P\47727\100\47727-100-NA1

October 27, 2022 – 3:00:28 PM – Plotted By: Alex Cressman

Appendix G

Public Consultation

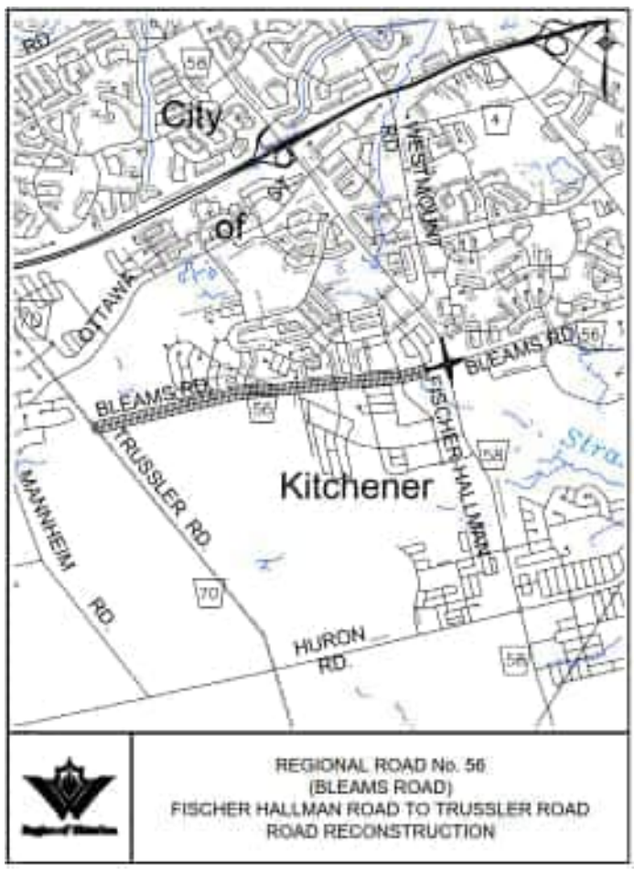
G1 – NOTICE OF COMMENCEMENT

Notice of Study Commencement

Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road, Kitchener
Class Environmental Assessment and Preliminary Design

The Study:

The Region of Waterloo has initiated a Class Environmental Assessment Study (Class EA) and preliminary design for improvements to a section of Bleams Road in Kitchener. The study will investigate current and projected traffic patterns between Fischer-Hallman Road and Trussler Road to determine the need for improvements to accommodate the intensification of land along Bleams Road. Pedestrians, cyclists and motorists will be considered throughout the study to ensure efficient and desirable interconnections between developments on both sides of the roadway. The results of this study will determine which intersection improvements are required and can be incorporated into the design.



The Process:

The study will be conducted in accordance with Schedule “C” requirements as outlined in the Municipal Engineers Association *"Municipal Class Environmental Assessment"* (October 2000, as amended to 2015). This is an approved process under the Ontario *Environmental Assessment Act*. The Class EA process includes public consultation, an evaluation of alternative solutions and alternative design concepts, an assessment of potential impacts associated with the proposed improvements, and development of measures to mitigate those impacts.

Comments:

Public, Indigenous and agency consultation with interested parties, including the public, businesses, and technical or regulatory agencies will form an integral part of this Class EA study to identify and address interests within the study area. A minimum of two public consultation centres will be held during the study to provide opportunities to learn about the study, and to share feedback. Upon completion of the study, an Environmental Study Report will be prepared and made available for public review and comment.

We want to hear from you. If you have any questions or concerns within the study area, want to know more about the study, or would like to join the project mailing list, please contact the project team:

Greg Proctor, C.E.T.
Project Manager
Transportation and Environmental Services - Design & Construction
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4J3
519 575-4729
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Dot Roga, C.E.T.
Senior Project Manager,
MTE Consultants Inc

520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

519 743-6500
droga@mte85.com

Study information will be posted on the Region of Waterloo’s website:
https://www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_05705_InfoSheet.pdf

Check for an upcoming project info webpage at https://www.engagewr.ca/bleams-rd where there will be the ability to receive email notifications of project information updates.

All comments and information provided become part of the consultation process and are being collected to assist the Region of Waterloo in making a decision when considering design alternatives for road capacity and intersection improvements of Bleams Road. All submissions will become part of the public record files for this matter. Personal information collected is under the

authority of the Municipal Act, 2001 and in compliance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990. Questions about the collection of personal information should be directed to Greg Proctor, Project Manager at gproctor@regionofwaterloo.ca or 519 575-4729.

November 3, 2021

G2 – INTERSECTION CONTROL STUDY

Bleams Road:

Trussler Road to Fischer-Hallman Road

Intersection Control Study

Project Location:

Bleams Road from Trussler Road to
Fischer-Hallman Road in the City of Kitchener

Prepared for:

Region of Waterloo
150 Fredrick Street, Kitchener, ON

Prepared by:

MTE Consultants
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

Revised: November 30, 2021

MTE File No.: 47727-100

Engineers, Scientists, Surveyors.

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1.0 Introduction

1.1 Overview

MTE Consultants Inc. was retained by the Region of Waterloo to provide engineering services for the design and construction of Bleams Road from Trussler Road to Fischer-Hallman Road. Investment into this corridor has been made to better serve the existing development as well as four new developments which will place an increased load on the corridor.

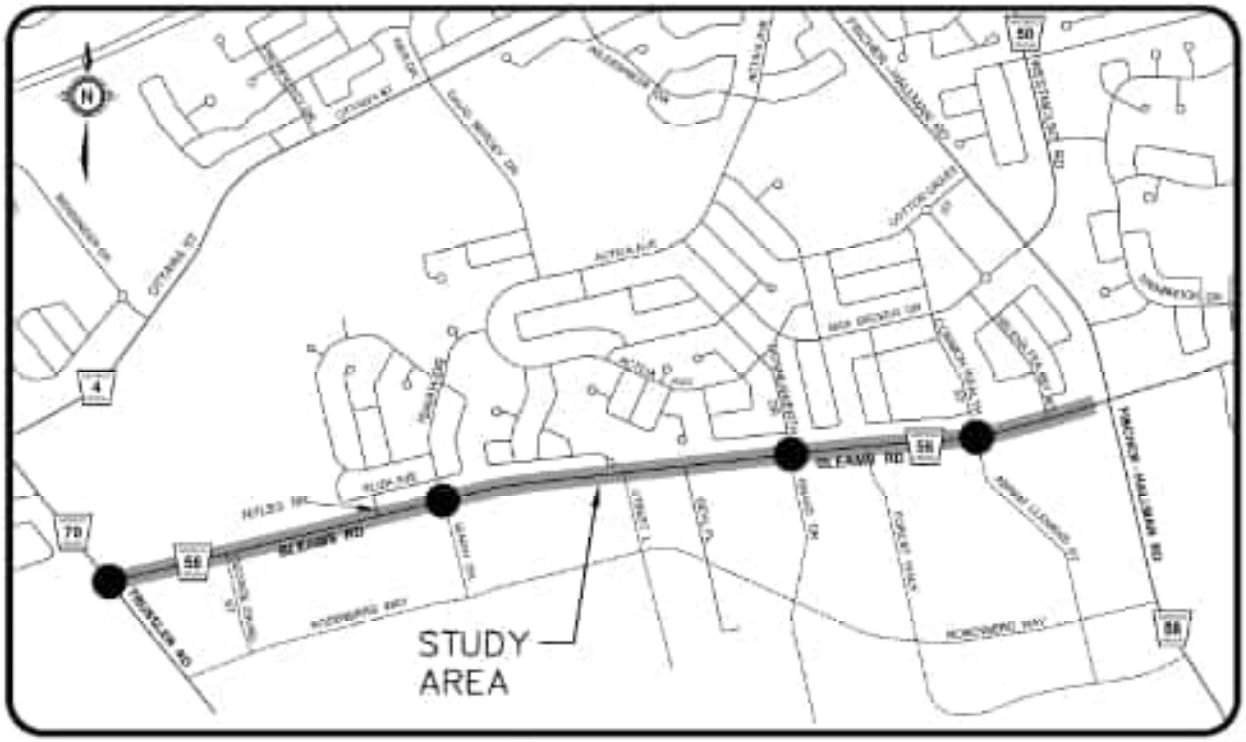
Bleams Road is currently a two Lane arterial road with a Regional classification of Neighbourhood Connector Avenue – there are currently right turn lanes at entrances to the existing residential subdivisions on the north side of Bleams at Donnenwerth Drive and Commonwealth Street. This section of Bleams is currently undergoing a Schedule C Municipal Class Environmental Assessment, in which it is proposed to modify a portion of Bleams to four lanes, two in each direction.

There are four intersections with Bleams Road that this report will focus on; Trussler Road, Isaiah Drive, Donnenwerth Drive, and Commonwealth Street.

- Trussler Road is a north/south rural arterial road at the west end of the study area which has a posted speed limit of 60km/h with a single lane in each direction. The intersection is currently controlled utilizing temporary cable mounted signals with a southbound left turn lane comprised of 20m storage and 50m taper.
- Isaiah Drive is located in the center-west portion of the study area, 1.0km east of Trussler Road. It currently has a north only leg into Eby Estates within the Laurentian West neighbourhood, designated as a minor neighbourhood collector street with a posted speed limit of 50km/h and provides access to Fischer-Hallman Road via Activa Avenue. Future plans to extend Isaiah Drive to the south into the Rosenberg neighbourhood are currently underway and included in this study.
- Donnenwerth Drive is located in the center-east portion of the study area, 1.1km east of Isaiah Drive and 580m west of Commonwealth Street. It currently has a north leg providing access into the Big Springs subdivision within the Laurentian West neighbourhood, designated as a minor neighbourhood collector street with a posted speed limit of 50km/h. Future plans to construct a street to the south as Amand Drive are underway and included in this study.
- Commonwealth Street is located in the eastern portion of the study area, 600m east of Donnenwerth Drive and 430m from Fischer-Hallman Road. It currently consists of a north leg providing access to the Williamsburg subdivision within the Laurentian West neighbourhood, designated as a major community collector street with a posted 50km/h speed limit providing access to the Williamsburg Community Centre and Fischer-Hallman Road via Max Becker Drive or Cotton Grass Street. Future plans to construct a street to the south as Abram Clemens Street are underway and included in this study.

Bleams Road is proposed to be a two lane into four arterial road, which is to be the main access to the developments on the north and future developments on the south of the road.

Figure 1 – Location Plan



1.2 Purpose of Study

The Region of Waterloo has identified the need for urbanizing the Bleams Road corridor within the study area and as the planning for various developments on the south side of Bleams Road has progressed traffic studies have identified the need for intersection control studies at four key intersections via roundabout screening tools. During preliminary design various intersection design options were prepared in consultation with the Region of Waterloo. During those consultations the desire to analyze the corridor as a whole rather than four independent reports was agreed and three design options were brought forward to be analyzed in this report.

The three corridor design options are: roundabouts at all four major intersections, signalized control at all four intersections, and a hybrid alternative with a roundabout at either end of the corridor and signalized control at the two center intersections. These options are analyzed using various criteria including construction costs, societal costs, traffic operations, property impacts, pedestrian and cyclist effects, speed control, fuel consumption and emissions, area land uses, construction staging, maintenance and aesthetics.

2.0 Intersection Control Alternatives

The analysis is to determine the most advantageous alternative from a list of three cases: four new roundabouts, four new signalized intersections, and a hybrid of two alternatives with roundabouts installed at the intersection of Bleams with Trussler and with Commonwealth, and signalized intersection where Bleams intersects Isaiah and Donnenwerth. This report will present the analysis in this order.

2.1 Analysis Inputs

Peak hour and Average Annual Daily Traffic ("AADT") forecasts for 2031 were prepared by Salvini Consulting in consultation with Region of Waterloo staff to develop an agreed upon forecast for the corridor. The forecasts were used to develop signalized and roundabout concept designs to accommodate anticipated volumes, projected volumes and roundabout flow sheets can be found in Appendix A.

The design concepts provided are considered adequate for the evaluation of the intersection functionality, as well as estimating construction costs and property impacts. The designs are considered part of the preliminary design process, and therefore require further refinement as the design process continues.

2.2 Roundabout Alternative

The roundabout design concept is based on the forecasted volumes input into roundabout flow sheets, preliminary modeling in Arcady and input from the design team. All of the roundabouts were designed utilizing a dual lane Inscribed Circle Diameter ("ICD") of 52m and circulatory road width of 9.4m and a single lane ICD of 46m and circulatory road width of 6.5m. The circulatory can accommodate a bus turning without rolling over the central island curb and a WB-20 transport truck with the aid of the truck apron for trailer tracking. Full size functional design drawings for the entire corridor can be found in Appendix E.

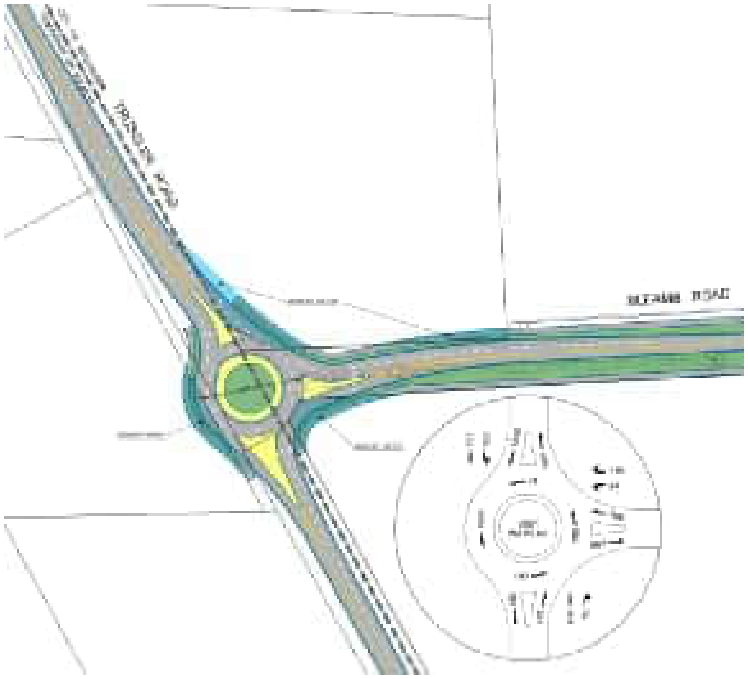
Figure 2 – Roundabout Concept



Trussler Road

The roundabout is a three leg design with dual lane entries for all legs, dual circulatory lanes north/south on Trussler Road with an ICD of 52m and circulatory road width of 9.4m and a single circulating lane for the left turning traffic with an ICD of 46m and circulatory road width of 6.5m. The southbound Trussler entry volumes are virtually 50/50 between the through and left turn movements, so to accommodate the high volumes of left turns the lane designations consist of a dedicated left turn and dedicated through lane. In contrast the majority of the northbound Trussler volumes are through movements so a traditional dual lane through movement is proposed.

Figure 3 – Roundabout Concept – Trussler Road



From Trussler Road to Isaiah Drive Bleams Road is brought to a two lane section, one lane in each direction, with dedicated right and left turn lanes onto George Israel Street and onto Nyles Drive. Both mid-block accesses at George Israel Street and Nyles Drive would permit full turning movements onto/off of Bleams Road.

Isaiah Drive

The roundabout is a four leg design with dual lanes east/west on Bleams Road and single lane north/south on Isaiah Drive. The dual lane entries/exits are maintained for 100m with a 100m taper back to a single lane in each direction.

Figure 4 – Roundabout Concept – Isaiah Drive



From Isaiah Drive to Donnenwerth Drive/Amand Drive Bleams Road is tapered to a two lane section, one lane in each direction, with dedicated westbound left turn lane onto Street L, the only mid-block access between the two major intersections. Street L will permit full turning movements onto/off of Bleams Road.

Donnenwerth Drive / Amand Drive

The roundabout is a four leg design with dual lanes east/west on Bleams road and single lane north/south on Isaiah

Figure 5 – Roundabout Concept – Donnenwerth Drive / Amand Drive



From Donnenwerth Drive/Amand Drive to Commonwealth Street/Abram Clemens Way Bleams road is maintained as a four lane cross section. Due to the close proximity of the two intersections, 580m, and the requirement for a westbound left turn lane onto Forest Walk Trail, the only mid-block access between the two intersections, it was felt best to maintain a four lane section for better lane continuity and roundabout lane utilization. Due to high traffic volumes it may be warranted to restrict left out movements on Forest Walk Trail during peak hour volumes.

Commonwealth Street / Abram Clemens Way

The roundabout is a four leg design with dual lanes east/west on Bleams road and single lane north/south on Isaiah Drive.

Figure 6 – Roundabout Concept – Commonwealth / Abram Clemens



From Commonwealth Street/Abram Clemens Way to Fischer-Hallman Road Bleams road is maintained as a four lane section due to high traffic volumes, the proximity of the two major intersections (430m), and the mid-block accesses to Helena Feasby Street and the Williamsburg Plaza.

2.3 Signalized Intersection Alternative

The signalized design concept was derived using the forecasted volumes along with consultations with the project team. The concept drawing of the signalized intersection is shown below in Figure 7, and is designed to accommodate the traffic projections for 2031. Full size functional design drawings for the entire corridor can be found in Appendix E.

Figure 7 – Signalized Concept



Trussler Road

The design consists of one through lane in each direction on Trussler Road, with dual southbound left turn lanes required to accommodate the large left turn volumes along with a northbound right turn lane with storage lengths of 95m and 30m, respectively. Bleams Road ends at Trussler Road, with the westbound lane transitioning into a right turn lane and the development of a left turn lane with 30m of storage. Additional property to the north side of the intersection is anticipated to accommodate this design.

Figure 8 – Signalized Intersection Concept – Trussler Road



From Trussler Road to Isaiah Drive Bleams Road is a two lane section, one lane in each direction, with dedicated eastbound right and westbound left turn lanes onto George Israel Street and an eastbound left onto Nyles Drive. Both mid-block accesses at George Israel Street and Nyles Drive would permit full turning movements onto/off of Bleams Road.

Isaiah Drive

The design consists of one through lane in each direction on Isaiah Drive, with a northbound left turn lane onto Bleams Road. Bleams Road consists of one through lane in each direction, with right and left turn lanes in both directions, utilizing 30m storage in each turn lane. It is not anticipated that additional property would be required to accommodate this design.

Figure 9 – Signalized Intersection Concept – Isaiah Drive



From Isaiah Drive to Donnenwerth Drive/Amand Drive Bleams Road is a two lane section, one lane in each direction, with a dedicated westbound left turn lane onto Street L, the only mid-block access between the two major intersections. Street L will permit full turning movements onto/off of Bleams Road.

Donnenwerth Drive / Amand Drive

The design consists of one through lane in each direction on Donnenwerth/Amand Drive, with a northbound right turn lane onto Bleams Road. Bleams Road consists of one through lane in each direction, with right and left turn lanes in both directions, utilizing 30m storage in each turn lane. It is not anticipated that additional property would be required to accommodate this design.

Figure 10 – Signalized Intersection Concept – Donnenwerth Drive / Amand Drive



From Donnenwerth Drive/Amand Drive to Commonwealth Street/Abram Clemens Way, Bleams Road is a two lane section, one lane in each direction, with a westbound left turn lane onto Forest Walk Trail. West Forest Trail is the only mid-block access between the two intersections, and while it would provide full turning movements onto/off of Bleams Road, due to high traffic volumes it may be warranted to restrict left out movements on Forest Walk Trail during peak hour volumes.

Commonwealth Street / Abram Clemens Way

The design consists of one through lane in each direction on Commonwealth Street/Abram Clemens Way, with a southbound left turn lane, and a northbound right turn lane onto Bleams Road. Bleams Road consists of a single through lane eastbound with both right and left turn lanes, both having 30m of storage. The westbound leg approaches with two lanes coming out of the Fischer Hallman roundabout with the left lane becoming a dedicated left turn lane and a single through lane. An eastbound right turn lane is also required with a 30m storage. It is not anticipated that additional property would be required to accommodate this design.

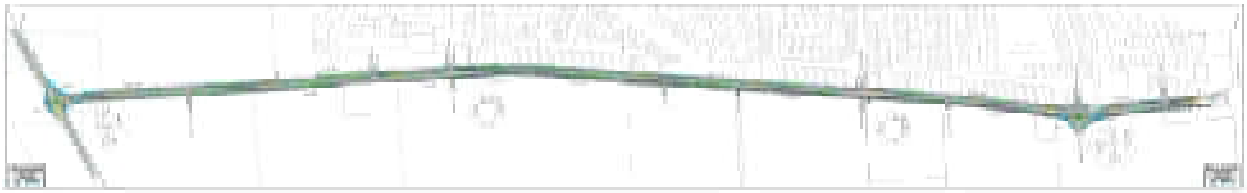
Figure 11 – Signalized Intersection Concept – Commonwealth / Abram Clemens



2.4 Hybrid Alternative

The Hybrid alternative utilizes roundabout intersection control at the furthest west and east intersections of Bleams Road & Trussler Road as well as at Bleams Road and Commonwealth St./Abram Clemens Way. The central two intersections of Bleams Road & Isaiah Drive and Bleams Road and Donnenwerth/Amand Drive would be signal controlled. Refer to the previous sections for detailed intersection configurations. Bleams road would utilize a two lane section for the bulk of the corridor, with four lane sections required at the roundabouts and between Commonwealth Street/Abram Clemens Way and Fischer-Hallman Road. Full size functional design drawings for the entire corridor can be found in Appendix E.

Figure 12 – Hybrid Concept



3.0 Quantitative Evaluation

3.1 Injury Collision Costs

Roundabout Injury Collision Prediction

The data provided by the Region of Waterloo in the form of the Safety Assessment Methodology (revised in January 2021) is used to predict the safety performance of an intersection based on the 10-year horizon AADT. Using the standard spreadsheet that is provided by the Region and the PM peak traffic volumes, estimations for future expected collisions on an annual basis were calculated. Combined the roundabout concept is estimated to have 50.4 collisions per year; 45.4 PDO, and 5.0 Injury.

Traffic Signal Injury Collision Prediction

The data provided by the Region of Waterloo in the form of the Safety Assessment Methodology (revised in January 2021) is used to predict the safety performance of an intersection based on the 10-year horizon AADT. Using the standard spreadsheet that is provided by the Region and the PM peak traffic volumes, estimations for future expected collisions on an annual basis were calculated. The signalized intersection is estimated to have 26.7 collisions per year, 18.0 PDO, and 8.7 injury.

Life Cycle Societal Costs

The annual societal costs for a signalized intersection and a roundabout were calculated in net present value terms. The 20-Year present value cost used a 6% discount rate. The results are summarized in Table 1 below.

Table 3.1 – Comparison of Annual Collision Performance

20-Year Present Value Collision Costs (Direct Capital Costs)				
Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Roundabouts	**$5,840,002**	**$2,341,783**	**$3,498,219**	**$0**
Bleams at Trussler	$1,205,164	$483,259	$721,905	$0
Bleams at Isaiah	$1,753,160	$703,000	$1,050,160	$0
Bleams at Donnenwerth/Amand	$1,596,384	$640,134	$956,250	$0
Bleams at Commonwealth/Abram Clemens	$1,285,294	$515,390	$769,904	$0
Signals	**$7,418,522**	**$1,030,573**	**$6,064,950**	**$323,000**
Bleams at Trussler	$1,503,070	$301,085	$1,144,985	$57,000
Bleams at Isaiah	$1,540,881	$194,989	$1,269,892	$76,000
Bleams at Donnenwerth/Amand	$2,221,351	$273,558	$1,852,794	$95,000
Bleams at Commonwealth/Abram Clemens	$2,153,220	$260,941	$1,797,279	$95,000
Hybrid	**$6,252,690**	**$1,467,196**	**$4,614,495**	**$171,000**
Bleams at Trussler	$1,205,164	$483,259	$721,905	$0
Bleams at Isaiah	$1,540,881	$194,989	$1,269,892	$76,000
Bleams at Donnenwerth/Amand	$2,221,351	$273,558	$1,852,794	$95,000
Bleams at Commonwealth/Abram Clemens	$1,285,294	$515,390	$769,904	$0

The previous table does not include additional costs or any saving that may be associated with property damages. It is difficult to provide an estimate which represents property damage crash savings, and so societal costs are more difficult to obtain. The savings associated with roundabouts are generally societal savings.

3.2 Other Life Cycle Costs

In order to establish life cycle costing a number of assumptions surrounding maintenance costs are required. The present values of maintenance costs through 2041 are presented below:

Maintenance Item	Roundabout	Signalized Intersection	Hybrid
Traffic Signals		$10,000 / year	$5,000 / year
Street Lighting	$6,000 / year	$ 4,000 / year	$5,000 / year
Total Life Cycle Cost	$95,400	$222,500	$ 159,000

Present costs are over the 20-year period, and discount rate of 2.5% is assumed.

3.3 Capital Costs

The estimates that were developed for capital costs included costs for construction and engineering fees. Some assumptions made to establish the estimates are as follows:

- The design process has not progressed far enough to properly estimate the full extent of underground construction works. Therefore, while utility costs are provided, they are partial estimates.
- Full road reconstruction regardless of the option selected.
- The roundabout or signalized intersection will be constructed with other Regional Road improvements.
- Similar roundabout and intersection construction projects were used to develop these estimates. Unique features that may arise during design may not be accounted for.
- Construction cost estimates include 20% for Engineering Fees, 20% for contingency, and 5% for maintenance.

A summary of the costs is provided below in Table 2. It should be noted that actual construction costs will depend on the timing of construction, contractor availability and scheduling, along with many other factors. The property required outside of dedicated property from developments are included at a fair market rate in the cost estimates below to capture the cost of the required property acquisition for each option.

Table 3.2 – Summary of Construction Costs

Description	Roundabout	Signalized	Hybrid
Site Preparation and Removals	$ 1,220,100	$ 1,220,100	$ 1,220,100
Road Works	$ 7,761,900	$ 6,673,400	$ 7,072,600
Storm	$ 2,486,000	$ 2,486,000	$ 2,486,000
Utilities	$ 300,000	$ 50,000	$ 150,000
Street Lighting and Signals	$ 822,000	$ 1,822,000	$ 1,322,000
Provisional Unsuitable Soils	$ 350,000	$ 350,000	$ 350,000
Property Acquisition	$ 332,000	$ 104,000	$ 332,000
Sub-Total	$ 13,271,250	$ 12,704,479	$ 12,931,828
Engineering (20%)	$ 2,654,250	$ 2,540,896	$ 2,586,366
Contingency (20%)	$ 2,654,250	$ 2,540,896	$ 2,586,366
Maintenance (5%)	$ 663,562	$ 635,224	$ 646,591
Total	**$ 19,243,311**	**$ 18,421,495**	**$ 18,751,150**

3.4 Results of Quantitative Evaluation

The table below summarizes the total capital, life cycle and collision cost estimates to establish a direct comparison of total costs associated with the three options. The total overall cost of a full roundabout about option is $19,243,311, the cost for a full signalized option is $18,421,495, and the hybrid option is estimated at a cost of $18,751,150. There is a $821,817 difference in cost between the highest cost roundabout option and the lowest cost signalized option.

Table 3.3 – Comparison of Capital and Life Cycle Costs

Cost Item	Roundabout	Signalized	Hybrid
Present Value Collision Costs	$ 5,840,000	$ 7,418,500	$ 6,252,700
Other Life Cycle Costs	$ 95,400	$ 222,500	$ 159,000
Capital Cost	$ 19,243,311	$ 18,421,495	$ 18,751,150
Total	$ 25,178,400	$ 26,884,311	$ 25,162,850

4.0 Qualitative Evaluation

4.1 Traffic Operations

An operational analysis was completed using the forecasted 2031 AM & PM peak volumes for both the roundabout and signalized design concepts to determine the level of service (LOS). The analysis was done using ARCADY for the roundabout concept and Synchro for the signalized concept.

Roundabout Analysis

For the roundabout capacity ARCADY Capacity intercept adjustments of 10% and 5% were made as per Region of Waterloo specifications to represent opening capacity and 10+ year

capacity respectively. The results for the PM peak operations are summarized in the tables below with detailed analysis output available in Appendix C.

Table 4.1 – 2031 PM Peak Hour Roundabout Operations: Bleams/Trussler

	Performance Measure	Direction/Approach/Lane			
		EB	WB	NB	SB
90% Intercept Adjust.	Level of Service		A	A	A
	Delay (s)		4.4	4.9	8.3
	Volume/Capacity		0.50	0.53	0.79
	95th Percentile Queue (m)		<14m	<14m	49m
	Overall LOS	A			
95% Intercept Adjust.	Level of Service		A	A	A
	Delay (s)		4.0	4.4	6.6
	Volume/Capacity		0.47	0.50	0.75
	95th Percentile Queue (m)		<14m	<14m	35m
	Storage (m)	A			

Table 4.2 – 2031 PM Peak Hour Roundabout Operations: Bleams/Isaiah

	Performance Measure	Direction/Approach/Lane			
		EB	WB	NB	SB
90% Intercept Adjust.	Level of Service	A	A	A	A
	Delay (s)	3.4	3.7	8.3	8.0
	Volume/Capacity	0.43	0.51	0.34	0.20
	95th Percentile Queue (m)	<14m	<14m	<14m	<14m
	Overall LOS	A			
95% Intercept Adjust.	Level of Service	A	A	A	A
	Delay (s)	3.1	3.3	7.6	7.5
	Volume/Capacity	0.41	0.48	0.33	0.19
	95th Percentile Queue (m)	<14m	<14m	<14m	<14m
	Storage (m)	A			

Table 4.3 – 2031 PM Peak Hour Roundabout Operations: Bleams/Donnenwerth/Amand

	Performance Measure	Direction/Approach/Lane			
		EB	WB	NB	SB
90% Intercept Adjust.	Level of Service	A	A	A	A
	Delay (s)	3.5	6.4	7.4	9.9
	Volume/Capacity	0.48	0.72	0.33	0.16
	95th Percentile Queue (m)	<14m	28m	<14m	<14m
	Overall LOS	A			
95% Intercept Adjust.	Level of Service	A	A	A	A
	Delay (s)	3.2	5.3	6.8	9.3
	Volume/Capacity	0.45	0.68	0.32	0.15
	95th Percentile Queue (m)	<14m	21m	<14m	<14m
	Storage (m)	A			

Table 4.4 – 2031 PM Peak Hour RAB Operations: Bleams/Commonwealth/Abram Clemens

	Performance Measure	Direction/Approach/Lane			
		EB	WB	NB	SB
90% Intercept Adjust.	Level of Service	A	A	A	B
	Delay (s)	3.4	6.5	7.2	14.1
	Volume/Capacity	0.47	0.81	0.30	0.16
	95th Percentile Queue (m)	<14m	70m	<14m	<14m
	Overall LOS	A			
95% Intercept Adjust.	Level of Service	A	A	A	A
	Delay (s)	3.1	7.3	6.7	13.2
	Volume/Capacity	0.44	0.77	0.29	0.16
	95th Percentile Queue (m)	<14m	35m	<14m	<14m
	Storage (m)	A			

The roundabout analysis shows that all roundabouts would perform at an overall LOS 'A' at both the 90% and 95% intercept adjustments. The high LOS can be attributed to maintaining dual lanes east/west on Bleams for the three eastern roundabouts and north/south on Trussler. During preliminary design iterations, single lane roundabout volumes were tested which resulted in one or more legs in each roundabout displaying failing levels of service. In many cases the failure under the single lane configuration was significant, with the exception of Isaiah Drive, where the V/C ratio of the single failure was 1.01. While this report recommends a dual lane east/west on Bleams at the Isaiah intersection to ensure optimum peak hour levels of service, if the roundabout is the desired intersection control at this location, further discussion may be warranted to weight the tradeoffs between a high LOS versus collision and active transportation advantages with a single lane configuration.

Signalized Analysis

Table 4.5 – 2031 Peak Hour Signal Operations: Bleams/Trussler

	Performance Measure	Direction/Approach/Lane					
		WBL	WBR	SBL	SBT	NBT	NBR
AM Peak	Level of Service	C	D	E	A	D	A
	Delay (s)	26.2	47.1	73.9	9.0	42.3	9.5
	Volume/Capacity	0.08	0.97	0.99	0.44	0.92	0.09
	95th Percentile Queue (m)	12.0	187.3	81.8	59.5	187.3	10.1
	Storage (m)	30	-	110	-	-	30
PM Peak	Level of Service	C	C	E	B	D	B
	Delay (s)	28.1	30.8	67.7	10.2	53.9	11.6
	Volume/Capacity	0.11	0.88	1.00	0.59	0.96	0.12
	95th Percentile Queue (m)	13.7	169.6	108.7	91.1	187.8	12.2
	Storage (m)	30	-	110	-	-	30

Table 4.6 – 2031 Peak Hour Signal Operations: Bleams/Isaiah

	Performance Measure	Direction/Approach/Lane								
		EBL	EBT	EBR	WBL	WBT	WBR	NBTL	NBR	SB
AM Peak	Level of Service	A	B	A	B	B	A	B	A	B
	Delay (s)	7.3	11.6	2.8	10.1	11.3	2.8	16.6	4.7	17.1
	Volume/Capacity	0.06	0.60	0.05	0.26	0.59	0.08	0.29	0.36	0.49
	95th Percentile Queue (m)	3.8	70.2	3.4	12.1	67.6	4.5	20.0	12.5	29.2
	Storage (m)	30	-	30	30	-	30	-	30	-
PM Peak	Level of Service	A	A	A	B	A	A	C	A	B
	Delay (s)	5.8	7.0	1.8	11.1	7.2	1.9	23.0	6.9	16.0
	Volume/Capacity	0.16	0.47	0.10	0.50	0.49	0.10	0.29	0.29	0.35
	95th Percentile Queue (m)	8.0	59.0	4.8	32.3	61.5	5.2	20.7	11.8	18.1
	Storage (m)	30	-	30	30	-	30	-	30	-

Table 4.7 – 2031 Peak Hour Signal Operations: Bleams/Donnenwerth/Amand

	Performance Measure	Direction/Approach/Lane								
		EBL	EBT	EBR	WBL	WBT	WBR	NBTL	NBR	SB
AM Peak	Level of Service	A	B	A	C	A	A	D	A	C
	Delay (s)	5.2	18.2	2.8	31.3	7.5	1.5	35.5	9.5	20.7
	Volume/Capacity	0.01	0.84	0.06	0.58	0.43	0.03	0.58	0.35	0.39
	95th Percentile Queue (m)	1.4	217	4.8	29.6	56.7	2.1	36.8	15.7	18.7
	Storage (m)	30	-	30	30	-	30	-	30	-
PM Peak	Level of Service	A	A	A	B	B	A	C	A	B
	Delay (s)	9.3	8.5	1.8	10.8	16.7	2.7	31.4	7.4	15.4
	Volume/Capacity	0.20	0.56	0.13	0.44	0.83	0.14	0.47	0.29	0.27
	95th Percentile Queue (m)	5.9	84.4	6.3	26.4	216	8.9	29.3	11.2	12.3
	Storage (m)	30	-	30	30	-	30	-	30	-

Table 4.8 – 2031 Peak Hour Signal Operations: Bleams/Commonwealth/Abram Clemens

	Performance Measure	Direction/Approach/Lane								
		EBL	EBT	EBR	WBL	WBT	WBR	NBTL	NBR	SB
AM Peak	Level of Service	A	C	A	E	A	A	D	B	B
	Delay (s)	4.7	29.1	2.1	58.6	6.5	1.8	35.3	13.1	17.0
	Volume/Capacity	0.03	0.95	0.05	0.72	0.42	0.04	0.52	0.35	0.31
	95th Percentile Queue (m)	2.4	284	3.5	18.8	57.1	3.0	30.3	17.1	13.6
	Storage (m)	30	-	30	-	-	30	-	30	-
PM Peak	Level of Service	A	A	A	A	C	A	C	A	B
	Delay (s)	9.0	7.6	1.8	8.2	26.7	2.9	31.9	7.9	12.2
	Volume/Capacity	0.14	0.54	0.09	0.34	0.94	0.08	0.43	0.29	0.21
	95th Percentile Queue (m)	3.6	91.6	5.4	20.2	304	6.7	26.1	11.1	8.8
	Storage (m)	30	-	30	-	-	30	-	30	-

The signalized capacity analysis results show that during the peak hour east/west flows on Bleams Road would operate at a LOS B-C with moderate delays and side streets at levels of services ranging from A-D. The Trussler Road intersection would operate at an overall LOS D in both the AM and PM peak hours. The Isaiah Drive intersection would operate at an overall LOS of B in the AM and A in the PM peak hours. The Donnenwerth Drive/Amand Drive intersection would operate at an overall LOS B in both the AM and PM peak hours. The Commonwealth Street/Abram Clemens Way intersection would operate at an overall LOS C and B in the AM and PM peak hours respectively.

The overall traffic operations results show a reduced delay and an overall higher LOS for the roundabout over the signalized control for all the intersections, though the two central intersections in the corridor, Isaiah Drive and Donnenwerth Drive/Amand Drive, see less of a difference in operations than the other intersections at either end of the study area.

During preliminary design the topic of two lane vs. four lane sections were discussed and a desire to keep the section as confined as possible was expressed, pending traffic volumes. Due to the 10 year projected volumes the eastern section of the corridor was highlighted as requiring a four lane section from the study limit at the Fischer-Hallman roundabout to the Commonwealth St./Abram Clemens Way intersection. West of that intersection the projected volumes justify a two lane section which is currently proposed in the signalized and hybrid options, with a single through and dedicated left/right turn lanes at the Donnenwerth/Amand and Isaiah intersections.

In the all roundabout scenario, due to the close proximity of the Commonwealth/Abram Clemens and Donnenwerth/Amand intersections and the required dual lane circulatory along Bleams Road through the roundabout, a four lane section was maintained between those two intersections. West of the Donnenwerth/Amand intersection is then tapered down to two lanes with tapers back to four lanes through the Isaiah roundabout and back to two lanes west of Isaiah. With the requirement for two lanes through the roundabouts along Bleams Road it could be argued to justify a four lane section through the entire corridor for lane continuity and better roundabout lane utilization.

Under the signalized and hybrid options there is a question as to when the corridor would require widening to a four lane section. The controlling intersection is the Donnenwerth/Amand intersection, as the Isaiah intersection carries less through traffic on Bleams. In the peak hours, the Donnenwerth/Amand intersection carries about 1050 vehicles in the peak direction (EB in the AM and WB in the PM). Both peak directions are operating at a v/c of just under 0.85. Through traffic volumes would have to increase by 150 to 200 vehicles in each peak hour to reach a more critical v/c of 0.95. However, the background growth rate on Bleams is very low at 0.5% per year – because the traffic growth in this area is likely to be almost entirely driven by development, in particular given that we are at the edge of the urban boundary. The o.5% per year comes from the Region's model. At 0.5% per year, it would take 25 -30 years for traffic volumes to grow to the point where we would need two through lanes in each direction. So the short answer is that the two lane section on Bleams is likely to accommodate the demand for traffic over a long time horizon (more than 10 years beyond the chosen horizon for study) given that growth outside the adjacent development traffic is expected to be low. That is unless the Region's model indicates that there is anticipated to be additional growth from outside the area beyond the 2031 time horizon.

4.2 Results of Qualitative Evaluation

The following table provides a summary of the qualitative evaluation of signals versus roundabout, apart from traffic operations.

Table 4.9 – Summary of Qualitative Comments

Evaluation Criteria	Comments		
	Roundabout	Signalized Intersection	Hybrid
Transit	At the current time no transit routes are anticipated to run along the Bleams road corridor, there may be a route that crosses along one of the collector roads. Roundabouts allow full through movements which will allow bus stops to be brought closer to the pedestrian crossings, minimizing crossing distances and crossing delays due to pedestrian crossing right of way.	While no bus routes are anticipated to run along Bleams Road there may be routes planned to cross the corridor utilizing one of the collector streets. Bus stops located within right turn lanes will require busses to merge with traffic under green light conditions.	Since no transit routes are anticipated to run along Bleams Road neither option has an advantage from a transit perspective.
Emergency Services	With free flow of traffic and the ability to perform U-turns, emergency vehicles should be able to quickly and safely navigate the intersection	While emergency vehicle pre-emption could be utilized, during peak volumes navigation could become challenging.	Emergency vehicles will be able to maneuver well through the roundabouts and since peak hour LOS in the signalized intersections are high, overall maneuverability should be ok.
Pedestrians and persons with disabilities	Crossing distances are reduced in length, limited to one vehicle direction at a time and, as level 2 crossings, pedestrians are given the right of way over vehicles when crossing. All of these advantages aid in reducing pedestrian injury collisions. Multi-lane roundabouts can pose a limitation to accessibility for persons with disabilities in	Signals will require push button activation per AODA requirements with possible audible signals. Crossing distances are moderate with 4 travel lanes.	Pedestrians will be able to maneuver both intersection controls though with reduced crossing distances and single vehicle direction roundabouts will have a slight advantage for pedestrian safety.

Evaluation Criteria	Comments		
	Roundabout	Signalized Intersection	Hybrid
	comparison to signals. Multi-lane roundabouts also reduce the attractiveness of the pedestrian mode choice due to the perceived challenges around crossing multi-lane roundabout legs		
Cyclists	A multi-use trail system is proposed along both sides of Bleams Road. Cyclists have the option to take a lane within the roadway as a vehicle or cross along the pedestrian crossings as a pedestrian. There are limitations in the HTA for the use of cross-rides with multi-lane roundabouts which may reduce the continuity of cyclist's use of the multi-use trail system.	A multi-use trail system is proposed along both sides of Bleams road. Cross-rides could be utilized at signals for cyclists on the multi-use trail allowing for free flow during greens and the ability for signal actuation.	With increased utilization of cross-rides within the Region, cyclist may see improved ride ability within the signalized portion of the corridor.
Speed Control	Speeds are reduced with good deflection entering the roundabout.	Traffic speeds will remain high under green light conditions with the exception of peak conditions.	Roundabouts will reduce the speeds at either end of the study area, but high speeds are possible within the central signalized portion.
Compatibility	Lower speeds and less queueing should result in better access.	Excessive queueing could cause access problems.	
Noise, Fuel Consumption, Emissions	Less delay than signals results in decrease in fuel & emissions. Less stop & starts should decrease noise levels.	Since these will be new signals there will be an increase in noise, fuel consumption and emissions due to both vehicle delay and increased stop/starts.	When compared to the all roundabouts and all signal options, the hybrid option would have a moderate impact on noise, fuel consumption and emissions.
Maintenance	Work in circulatory roadway may require large vehicles to detour.	Lane closures are possible.	

Evaluation Criteria	Comments		
	Roundabout	Signalized Intersection	Hybrid
Construction Staging	More complicated, may require temporary roads.	Less complicated.	
Aesthetics	Decorative concrete and landscaped central island feature.	Less decorative concrete but newly grassed boulevards.	

5.0 Conclusions and Recommendations

The analysis which was conducted does not consider the cost of acquiring property, here it should be noted that the roundabouts, for both the full roundabout option and the hybrid option, do require the acquisition of additional land from future developments. Gaining use of this land may come at a cost to the Region.

Based on the foregoing analysis, it is concluded that:

i) The quantitative analysis, which takes into account cost estimates for construction costs, life cycle costs and collision costs, favours the Hybrid option over all others. The most expensive option over the 20-year study period is the Signalized option, which is higher than the Hybrid option by $899,644 or 3%. Again, the construction costs for the Hybrid option are estimated to be approximately $18,751,150 (97%) of the estimated more costly full Roundabout option. So, the Hybrid option has the lowest total cost.

ii) The qualitative analysis favours the roundabout option over the signalized option with a LOS of A, compared to a LOS C. At the intersection at the extremes of the project there are some slight overall qualitative preferences towards the roundabout option. The intersections at Bleams/Trussler, and Bleams/Commonwealth/Abram Clemens, are more suitable to a roundabout.

It is recommended that:

i) The Hybrid option is the preferred intersection configuration for the proposed Bleams Road corridor. While there are some qualitative advantages towards the full roundabout option, the Hybrid option is estimated to have the lowest construction and overall cost of the three considered. The intersection analysis showed an improvement in wait times for the roundabout rather than a signalized intersection at Bleams/Trussler, and Bleams/Commonwealth/Abram Clemens. For the central two intersections of Bleams/Isaiah and Bleams/Donnenwerth/Amand while roundabouts would provide a slightly better LOS, the quantitative analysis favored the hybrid alternative. Furthermore, there are also modest advantages with respect to active transportation, specifically cyclists who, through the use of cross-rides at signalized intersections, would enjoy a more continuous multi-use trail network within the central portion of the study area. Therefore, the signalized option is preferred for those locations.

ii) A detailed roundabout design checks package be prepared for the roundabout designs prior to proceeding with property acquisitions.

All of which is respectfully submitted,

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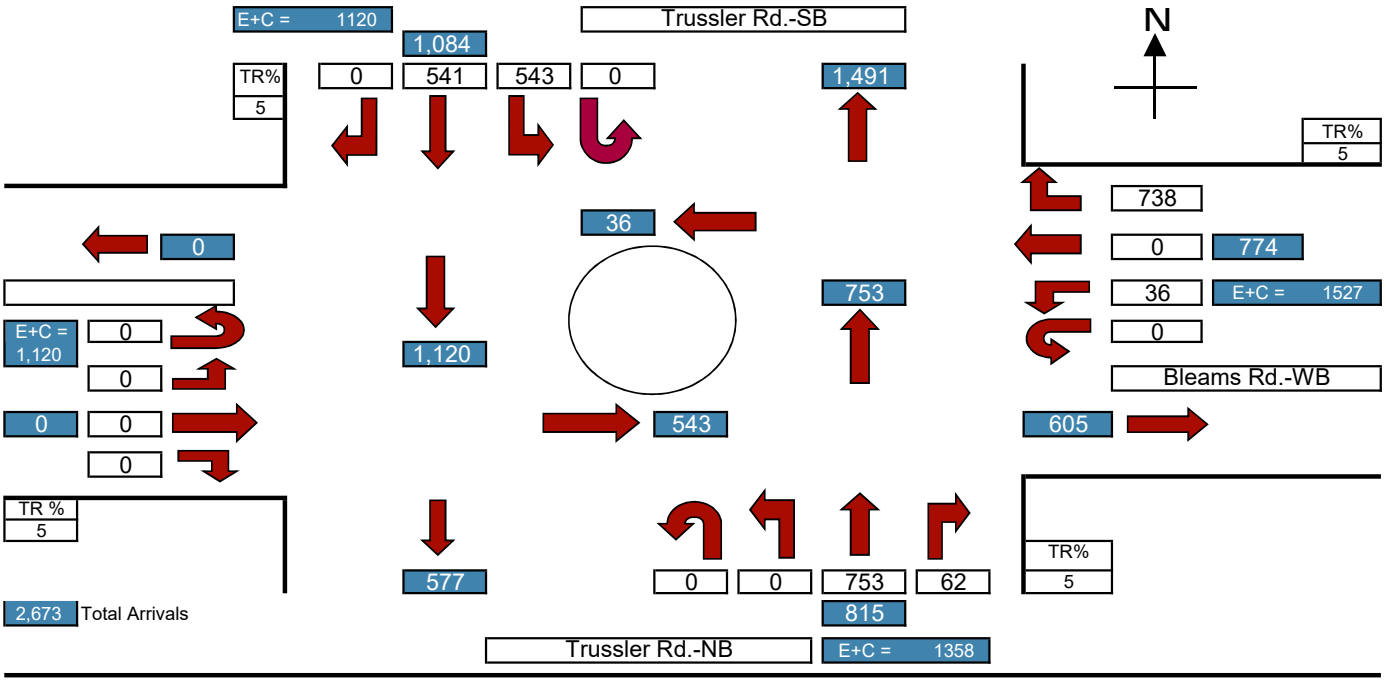
Appendix A

Traffic Volumes and Roundabout Flow Sheets

ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction
Project No.: 47727-100
Intersection: Bleams Road & Trussler Road
Time Period: **AM PEAK 2031**

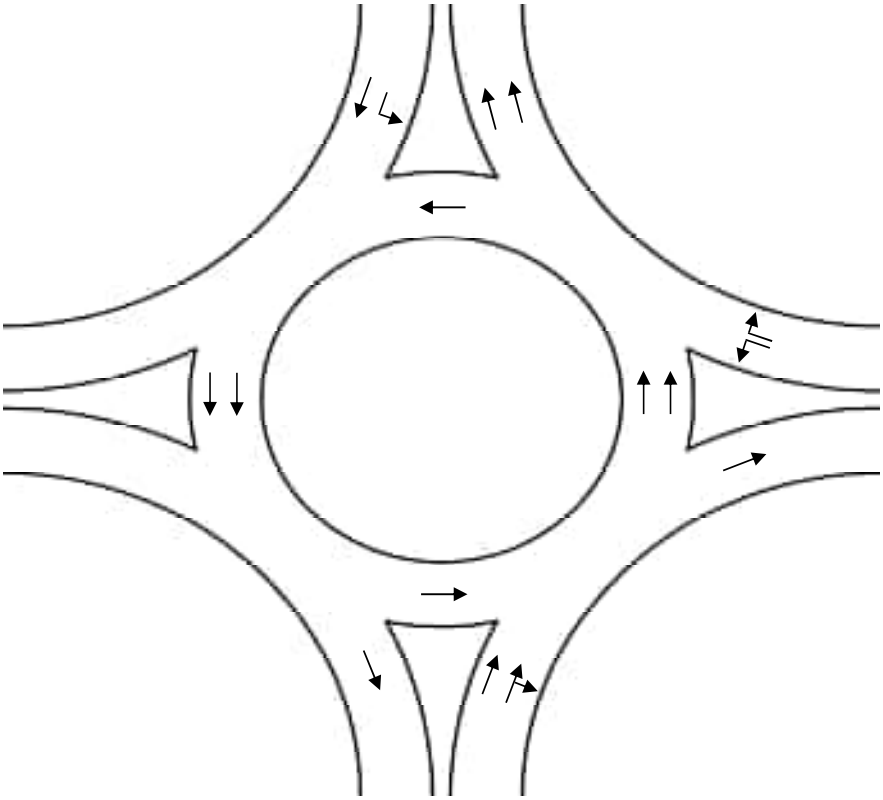
Prepared By: NPD
Sheet: **1 of 8**



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

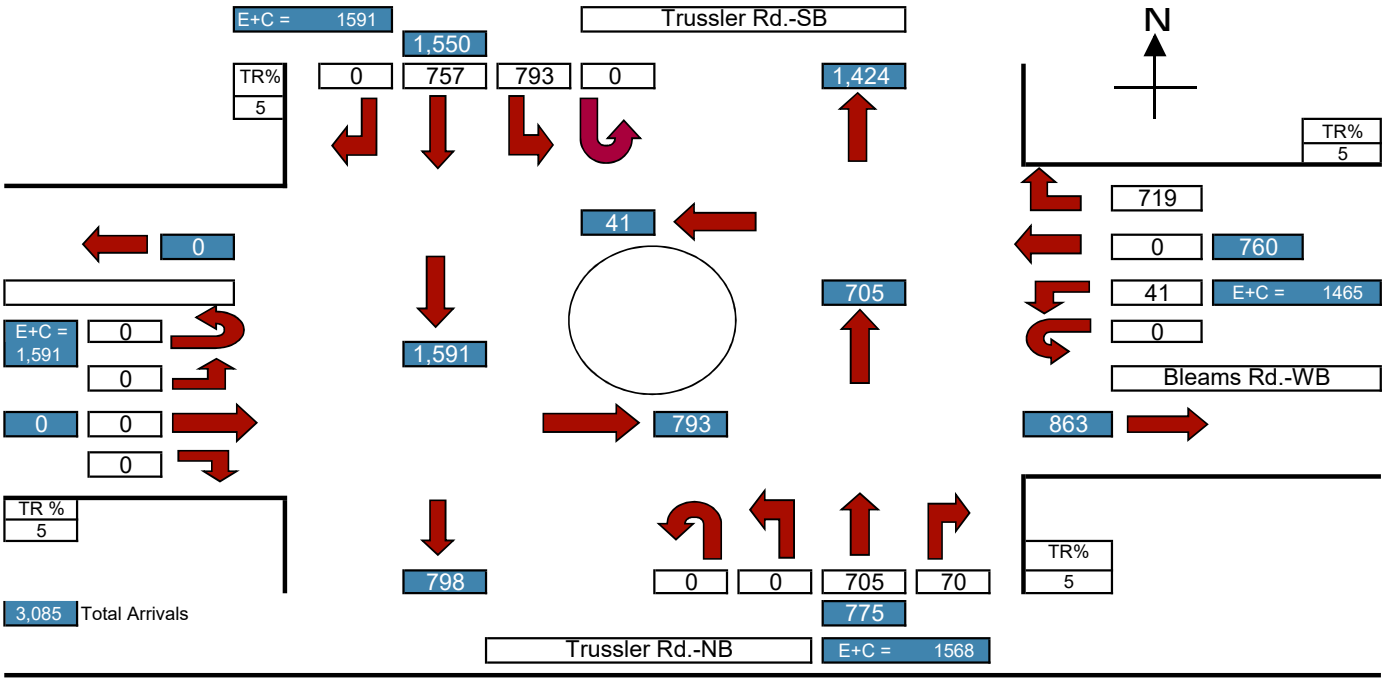
		Model Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Trussler Rd.-SB	1.05	0	541	543	0
	1.05	0	0	0	0
Trussler Rd.-NB	1.05	62	753	0	0
Bleams Rd.-WB	1.05	738	0	36	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction
Project No.: 47727-100
Intersection: Bleams Road & Trussler Road
Time Period: **PM PEAK 2031**

Prepared By: NPD
Sheet: **2 of 8**



Capacity Guidelines

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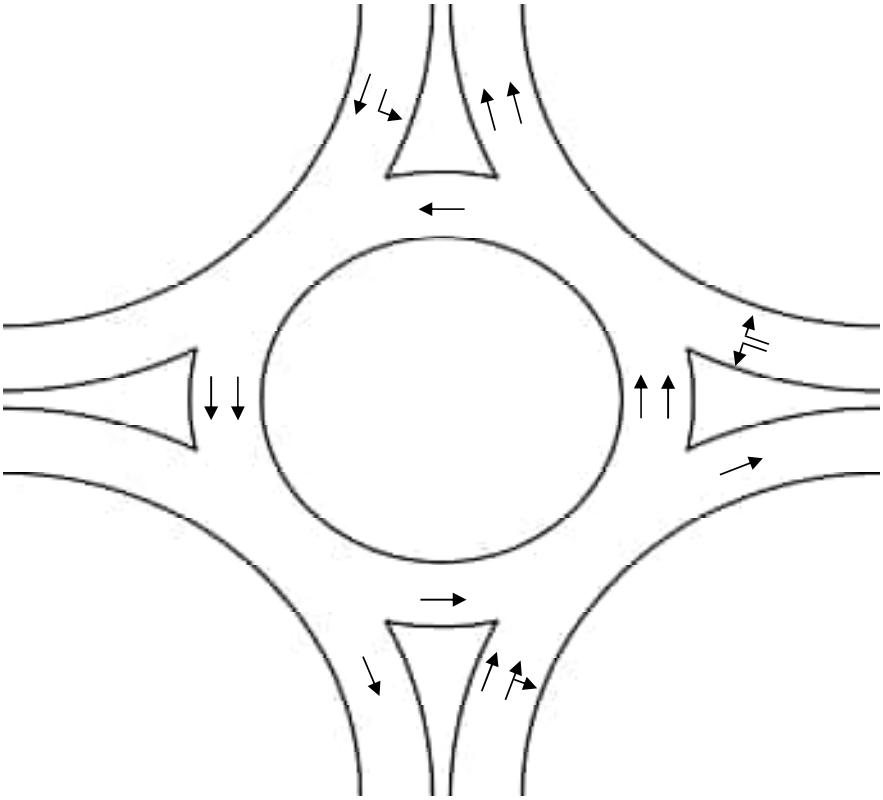
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

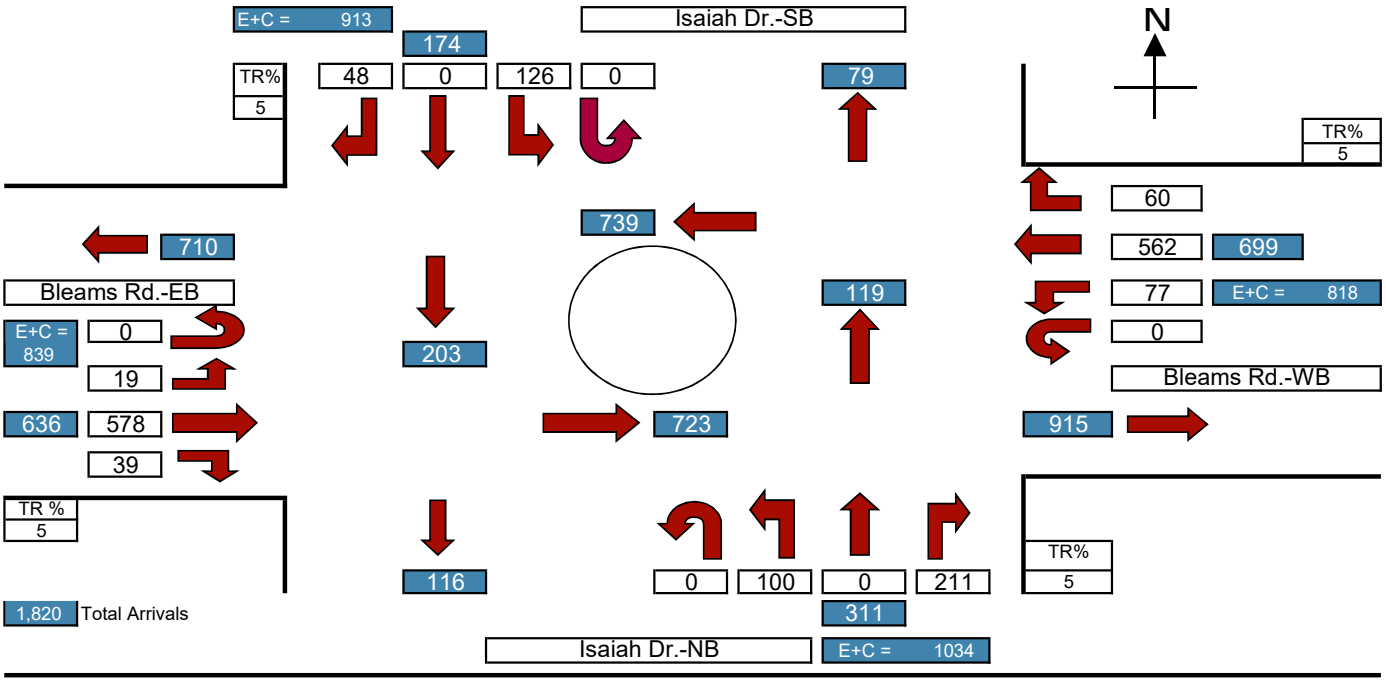
		Model Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Trussler Rd.-SB	1.05	0	757	793	0
	1.05	0	0	0	0
Trussler Rd.-NB	1.05	70	705	0	0
Bleams Rd.-WB	1.05	719	0	41	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction
Project No.: 47727-100
Intersection: Bleams Road & Isaiah Drive
Time Period: **AM PEAK 2031**

Prepared By: NPD
Sheet: **3 of 8**



Capacity Guidelines

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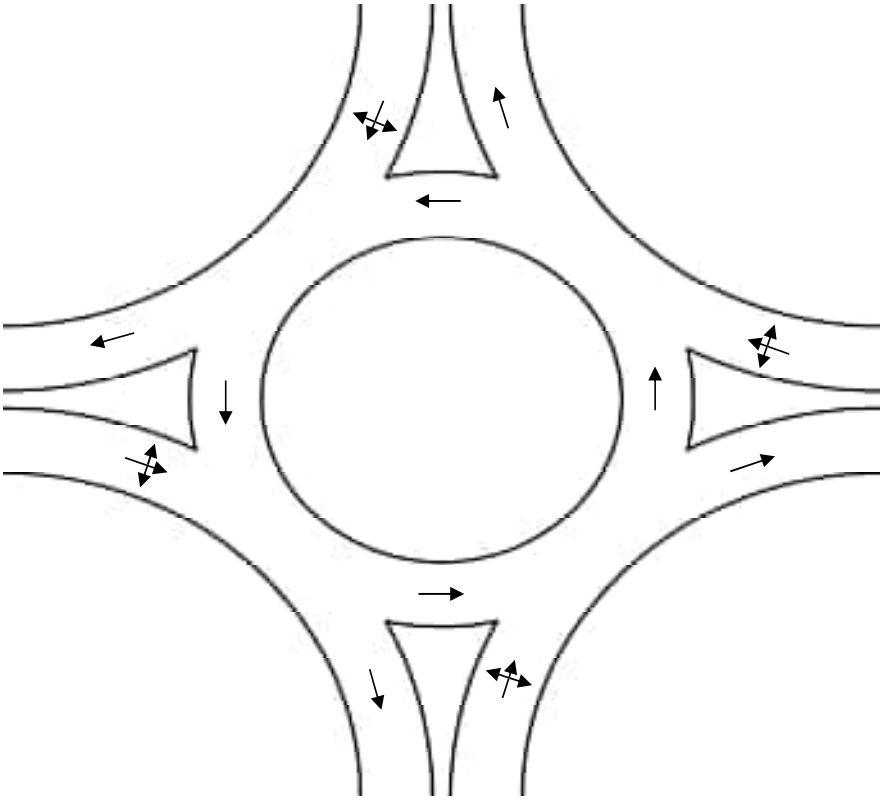
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

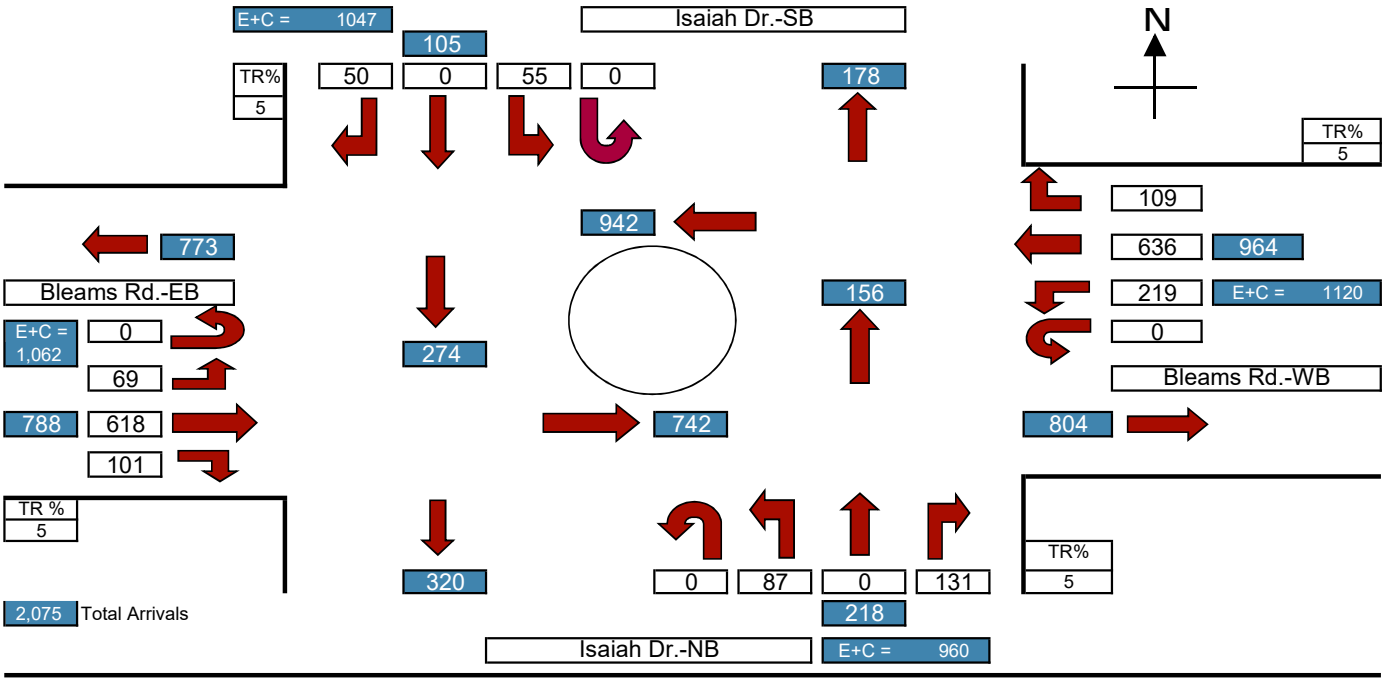
Leg	PCU	Model Inputs 1st Exit	2nd Exit	3rd Exit	U-turn
Isaiah Dr.-SB	1.05	48	0	126	0
Bleams Rd.-EB	1.05	39	578	19	0
Isaiah Dr.-NB	1.05	211	0	100	0
Bleams Rd.-WB	1.05	60	562	77	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction
Project No.: 47727-100
Intersection: Bleams Road & Isaiah Drive
Time Period: **PM PEAK 2031**

Prepared By: NPD
Sheet: **4 of 8**



Capacity Guidelines

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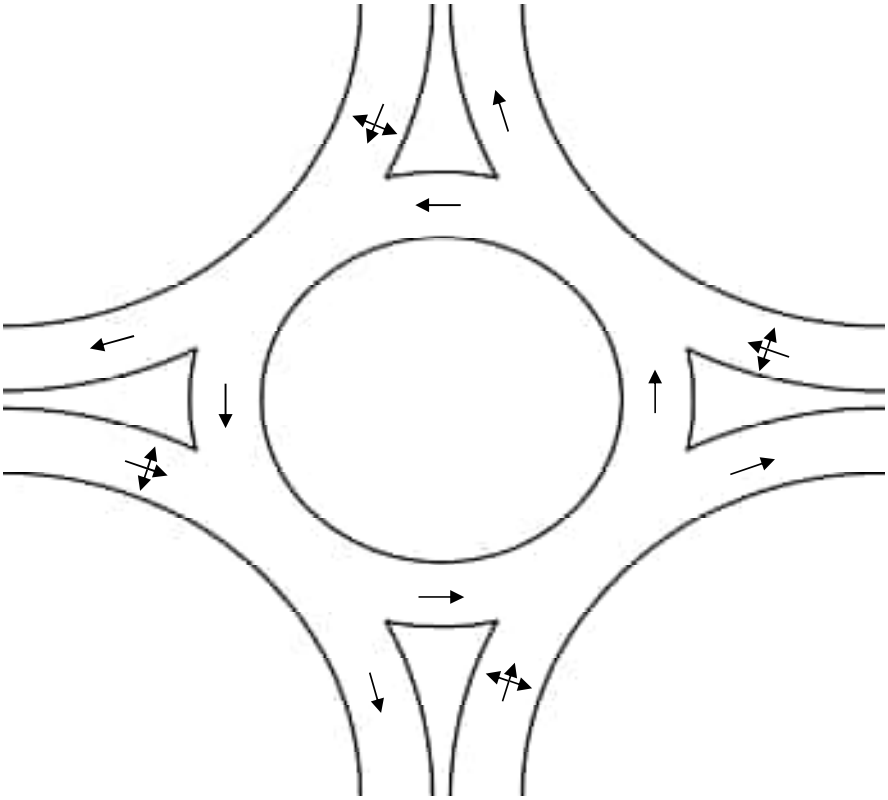
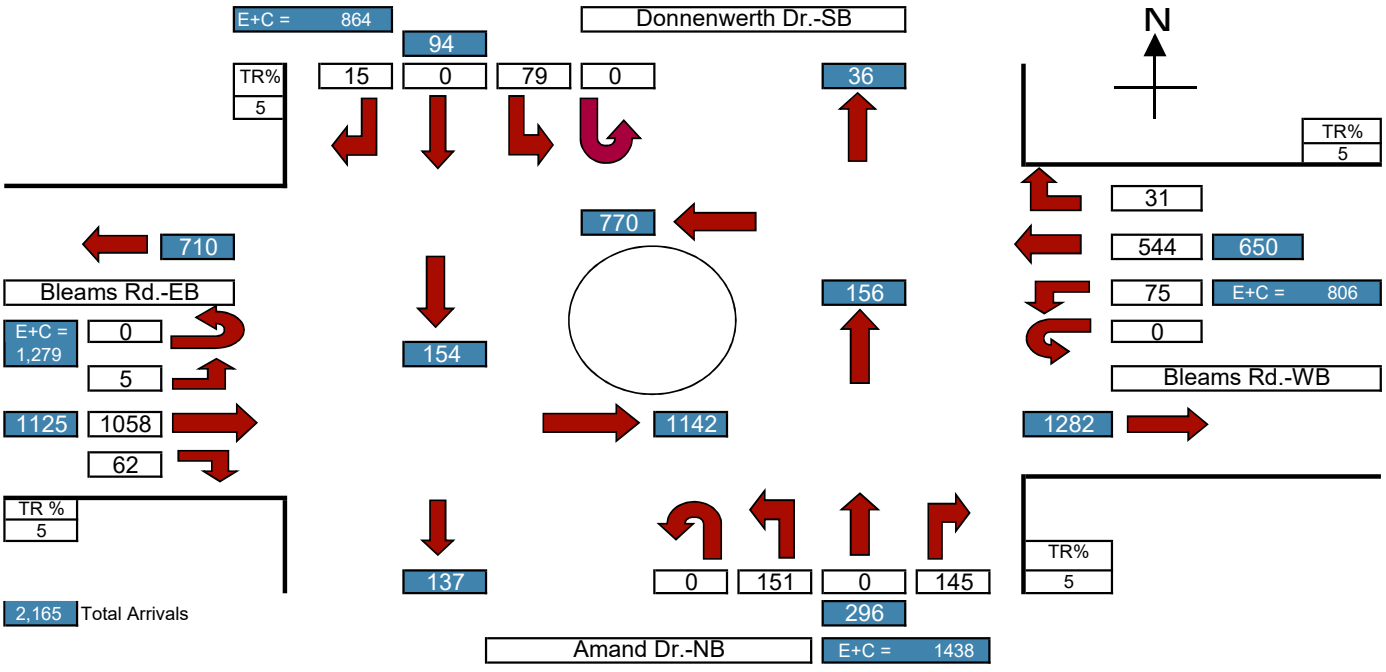
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

		Model Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Isaiah Dr.-SB	1.05	50	0	55	0
Bleams Rd.-EB	1.05	101	618	69	0
Isaiah Dr.-NB	1.05	131	0	87	0
Bleams Rd.-WB	1.05	109	636	219	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction **Prepared By:** NPD
Project No.: 47727-100 **Sheet:** 5 of 8
Intersection: Bleams Rd. & Donnenwerth Dr. / Amand Dr.
Time Period: **AM PEAK 2031**



Capacity Guidelines

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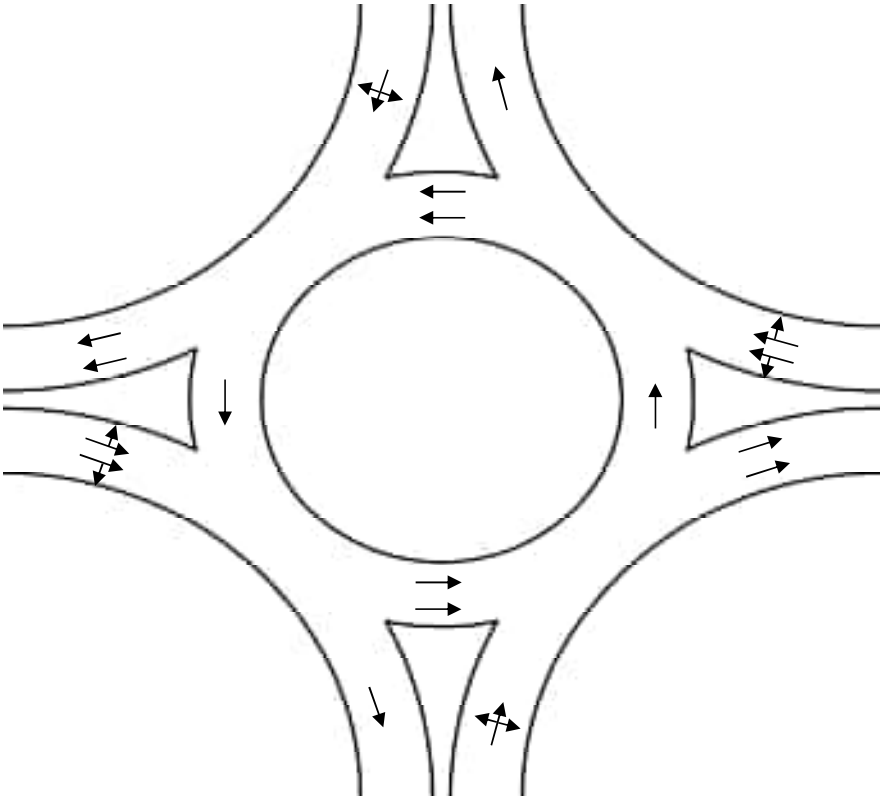
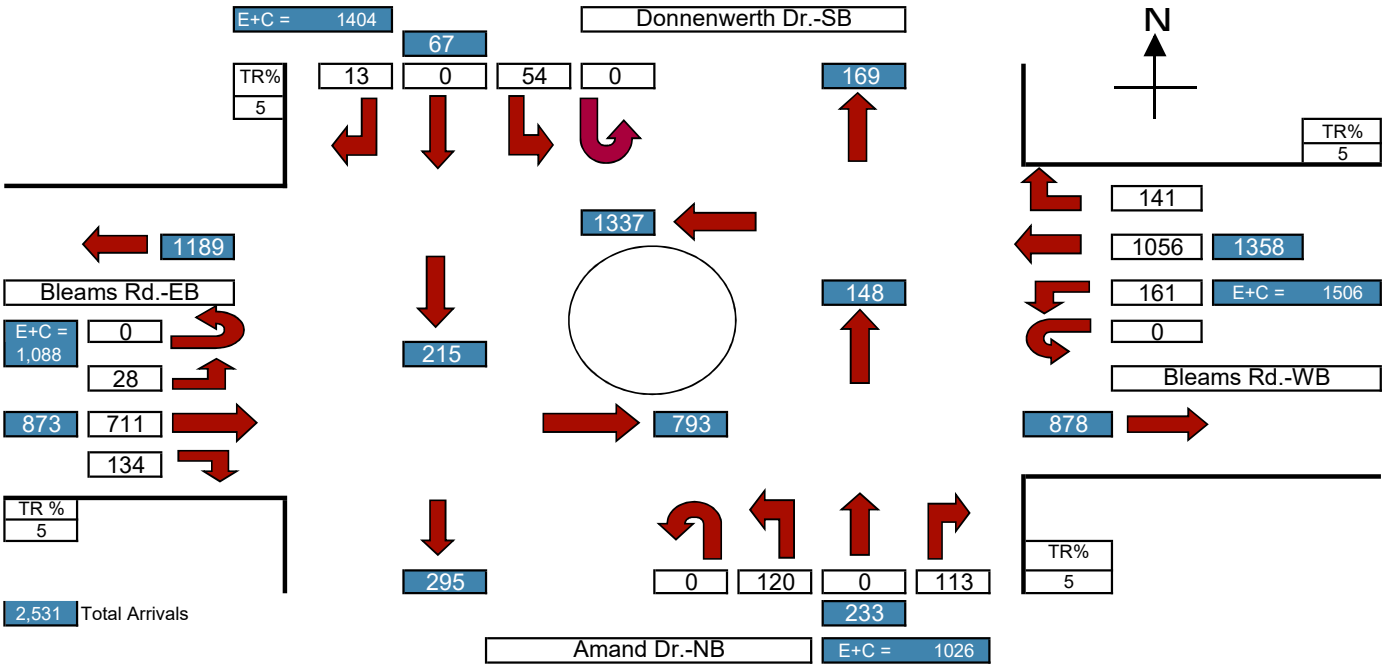
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

		Model Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Donnenwerth Dr.-SI	1.05	15	0	79	0
Bleams Rd.-EB	1.05	62	1058	5	0
Amand Dr.-NB	1.05	145	0	151	0
Bleams Rd.-WB	1.05	31	544	75	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction **Prepared By:** NPD
Project No.: 47727-100 **Sheet:** 6 of 8
Intersection: Bleams Rd. & Donnenwerth Dr. / Amand Dr.
Time Period: **PM PEAK 2031**



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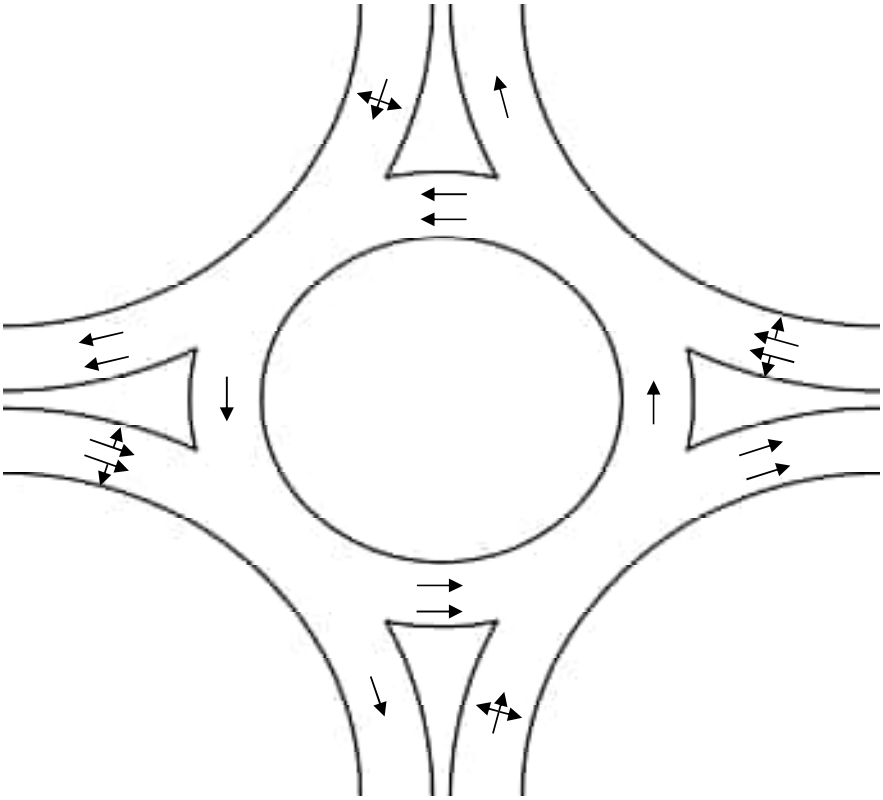
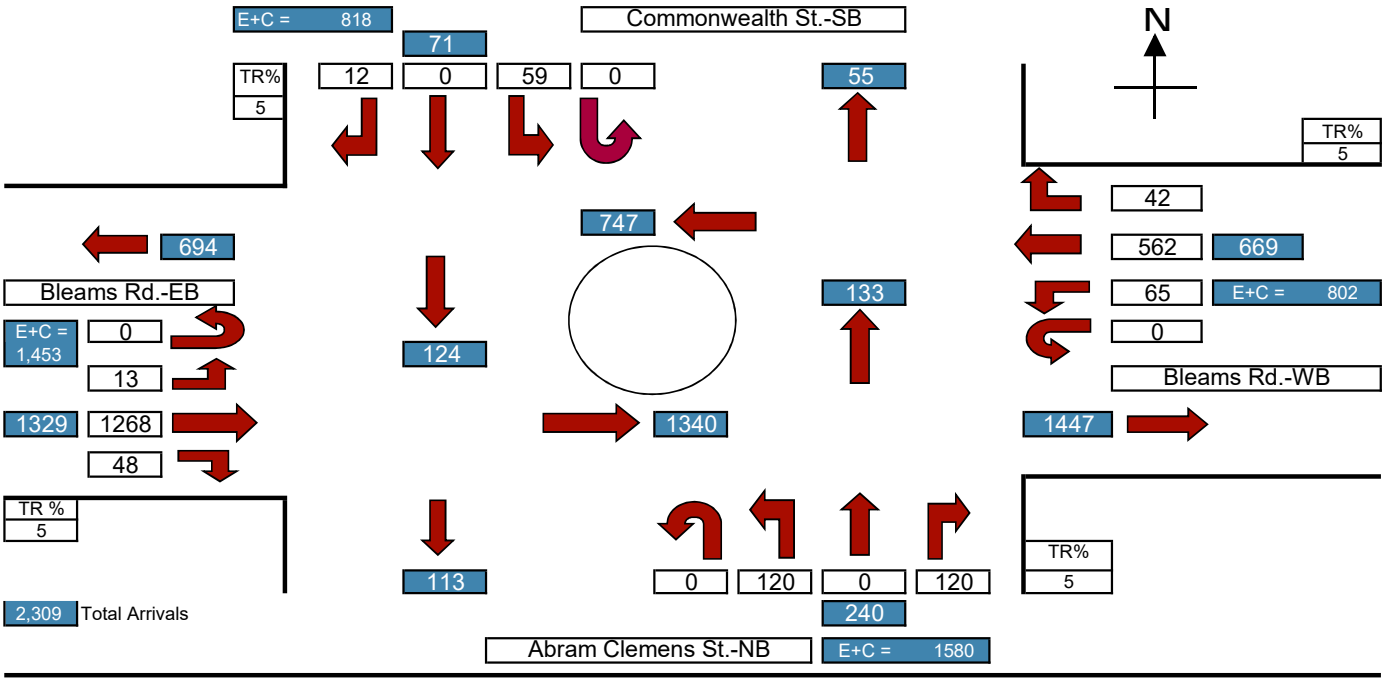
3. Entry flow + circulating flow > 2200vph use three-lane entry

Leg	PCU	Model Inputs 1st Exit	2nd Exit	3rd Exit	U-turn
Donnenwerth Dr.-SI	1.05	13	0	54	0
Bleams Rd.-EB	1.05	134	711	28	0
Amand Dr.-NB	1.05	113	0	120	0
Bleams Rd.-WB	1.05	141	1056	161	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction **Prepared By:** NPD
Project No.: 47727-100 **Sheet:** 7of 8
Intersection: Bleams Rd. & Commonwealth St. /Abram Clemens St.
Time Period: **AM PEAK 2031**



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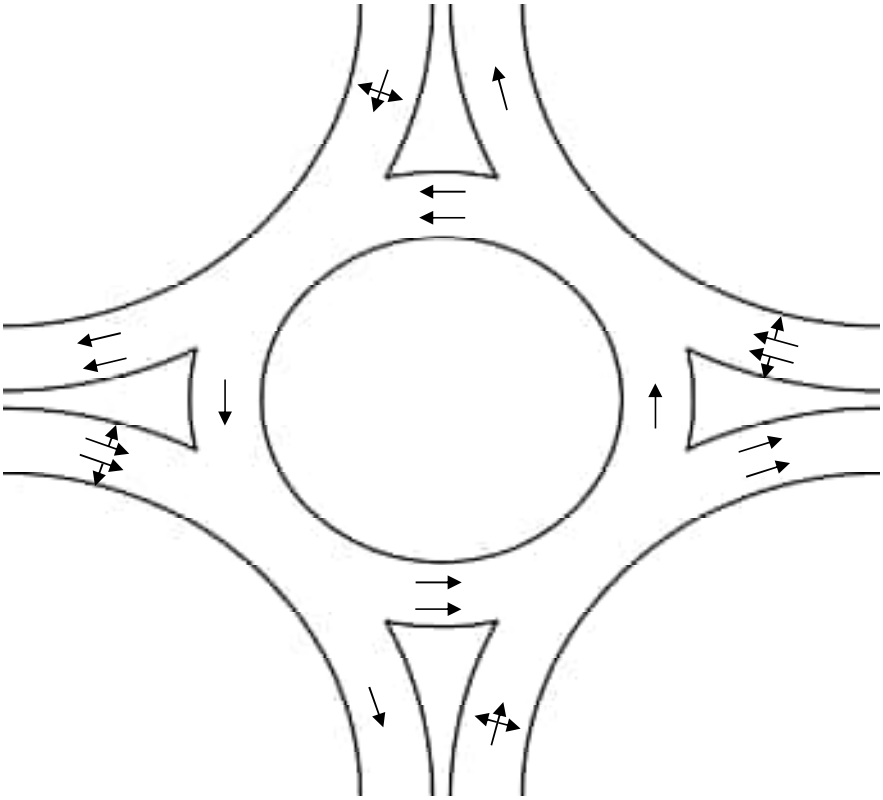
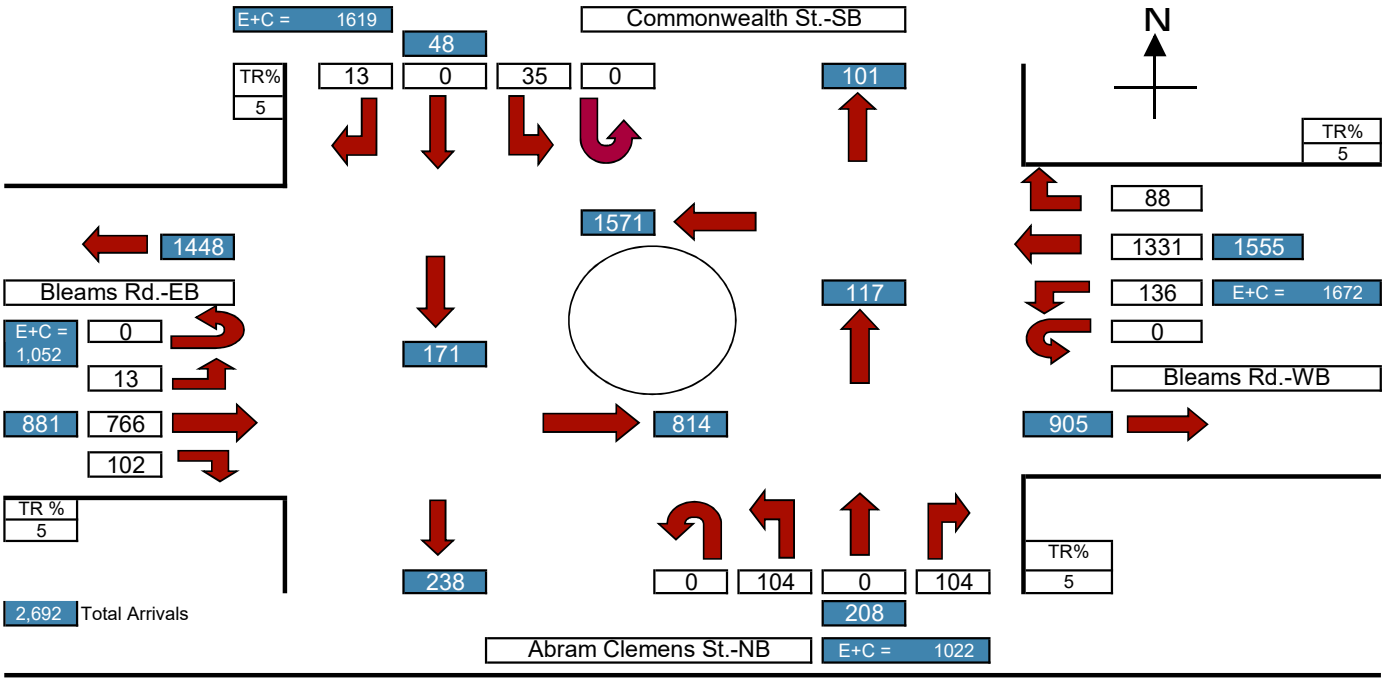
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

Leg	PCU	Model Inputs 1st Exit	2nd Exit	3rd Exit	U-turn
ommonwealth St.-S	1.05	12	0	59	0
Bleams Rd.-EB	1.05	48	1268	13	0
bram Clemens St.-N	1.05	120	0	120	0
Bleams Rd.-WB	1.05	42	562	65	0



ROUNDABOUT TRAFFIC FLOW SHEET

Project: Bleams Road Reconstruction **Prepared By:** NPD
Project No.: 47727-100 **Sheet:** 8 of 8
Intersection: Bleams Rd. & Commonwealth St. /Abram Clemens St.
Time Period: **PM PEAK 2031**



Capacity Guidelines

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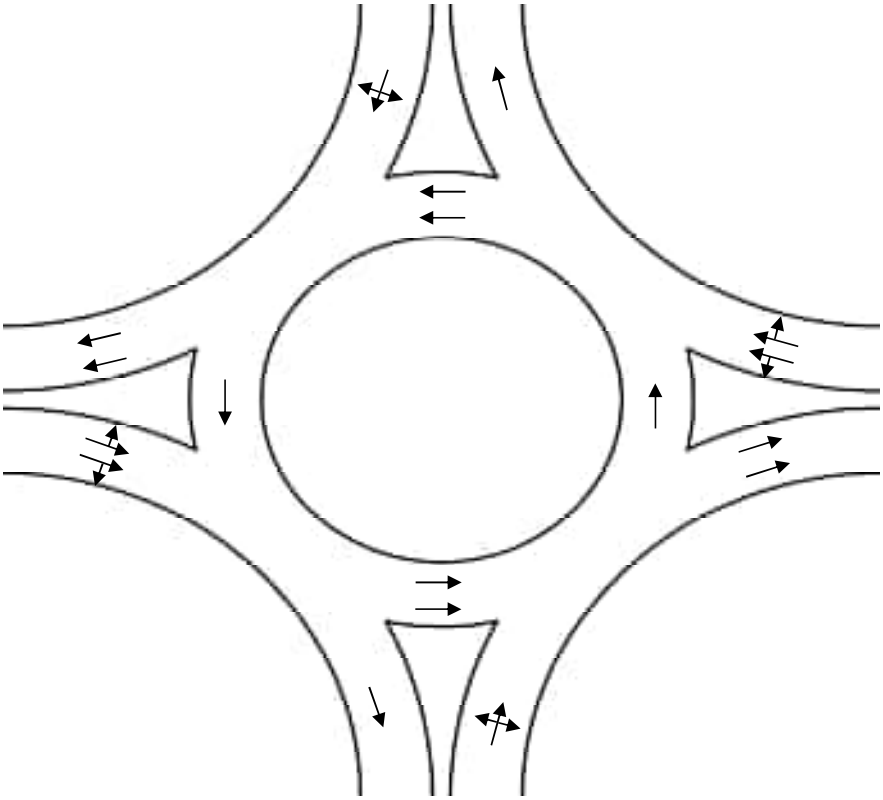
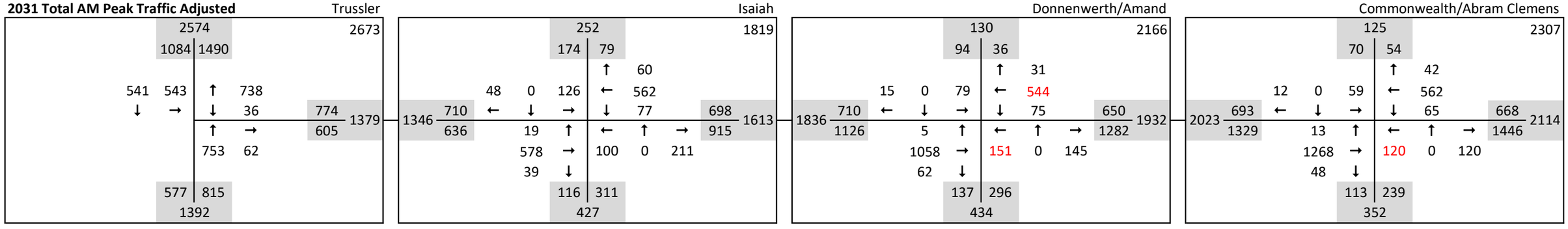
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

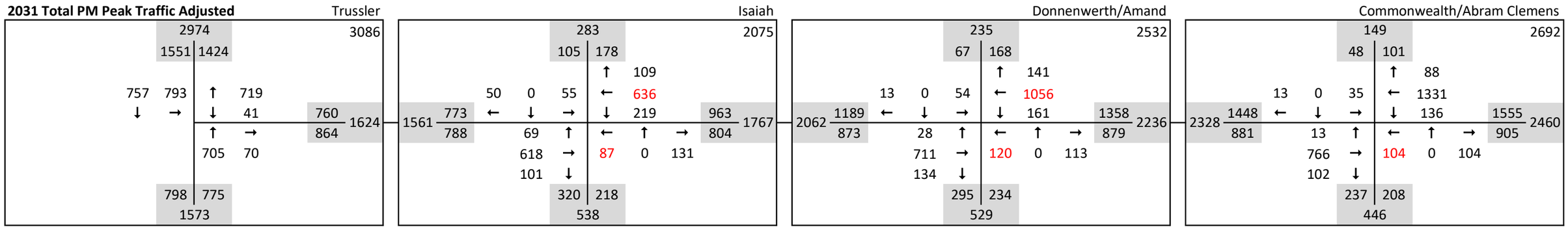
		Model Inputs			
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
ommonwealth St.-S	1.05	13	0	35	0
Bleams Rd.-EB	1.05	102	766	13	0
bram Clemens St.-N	1.05	104	0	104	0
Bleams Rd.-WB	1.05	88	1331	136	0



2031 Total AM Peak Traffic Adjusted



2031 Total PM Peak Traffic Adjusted



Appendix B

Safety Analysis Background

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Trussler Road and Bleams Road - 2031 AADT

Major Road: Trussler Road

Minor Road: Bleams Road

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	1 Approach
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	YES
Number of approaches with FPLTP:	2
Is the proposed intersection "new" or is it existing:	EXISTING
Does control and number of approaches remain the same:	YES
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 36

5-Year PDO Collisions: 30

Proposed RA Configuration? MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 29,740

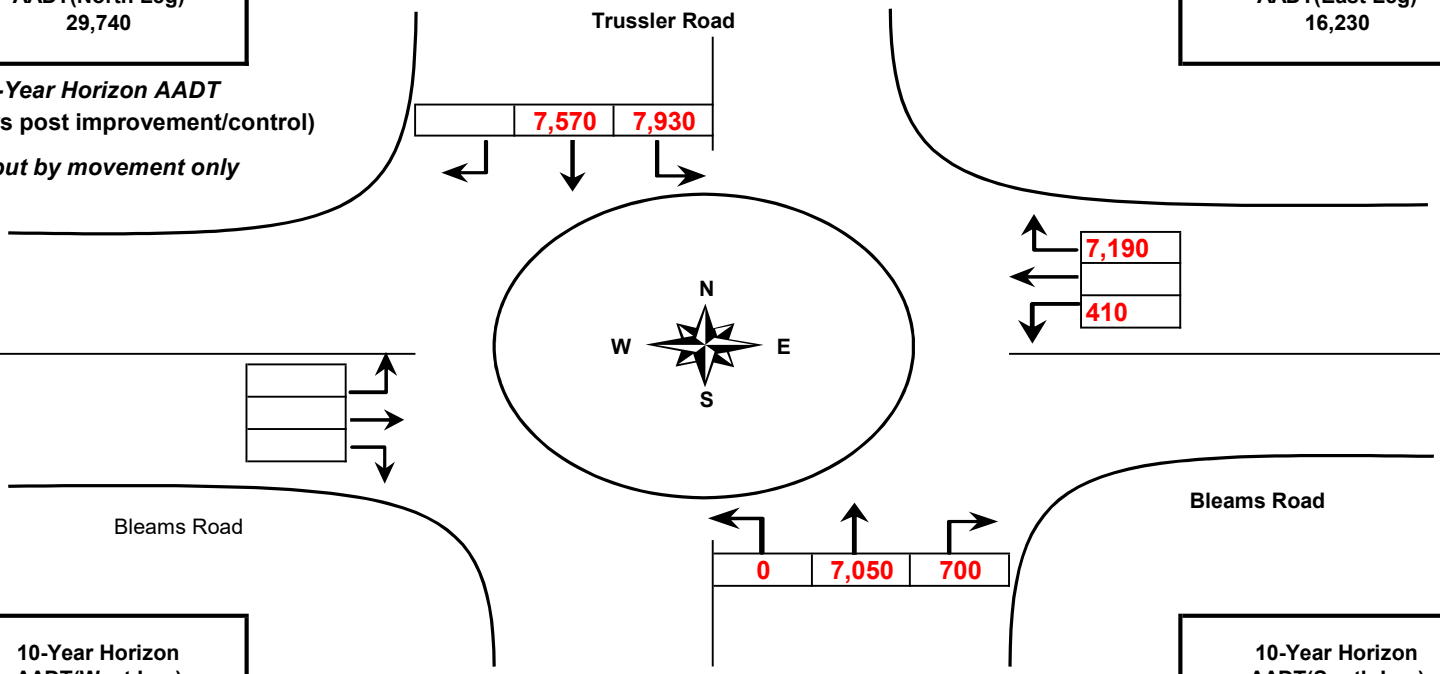
Minor Road (mid-block) 10-Year Horizon AADT: 16,230

10-Year Horizon AADT(North Leg) 29,740

10-Year Horizon AADT(East Leg) 16,230

10-Year Horizon AADT
(10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 0

10-Year Horizon AADT(South Leg) 15,730

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO_{SIG} = $5,000
PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$1,503,070.09	$301,085.43	$1,144,984.89	$56,999.77
Roundabout	$1,205,164.05	$483,258.85	$721,905.20	$0.00

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES

SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Trussler Road and Bleams Road - 2031 AADT**

Major Road: **Trussler Road**
Minor Road: **Bleams Road**

Major Road Direction:	North / South	**Roundabout Conflicts:**	**23610**
Urban or Rural:	Urban		
Proposed Control:	Signalized	**5-Year Total Collisions:**	**36**
Proposed Config.	3-Leg Intersection	**5-Year PDO Collisions:**	**30**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**6.90**	**5.25**	**1.65**	**0.00**
Roundabout	**10.40**	**9.36**	**1.04**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-12.13**	**1.11**	**0.26**	**0.33**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-13.24**	**1.14**	**0.3**	**0.36**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.86	**0.92**	**1.59**	Total	PDO
				1.106241145	**1.270879506**
	Illumination	Protected LT Phasing			
	0.91	**0.88**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Isaiah Drive - 2031 AADT

Major Road: Bleams Road

Minor Road: Isaiah Drive

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	**Major**	2 Approaches
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A
Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 1

5-Year PDO Collisions: 0

Proposed RA Configuration? MULTI - 1 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 17,680

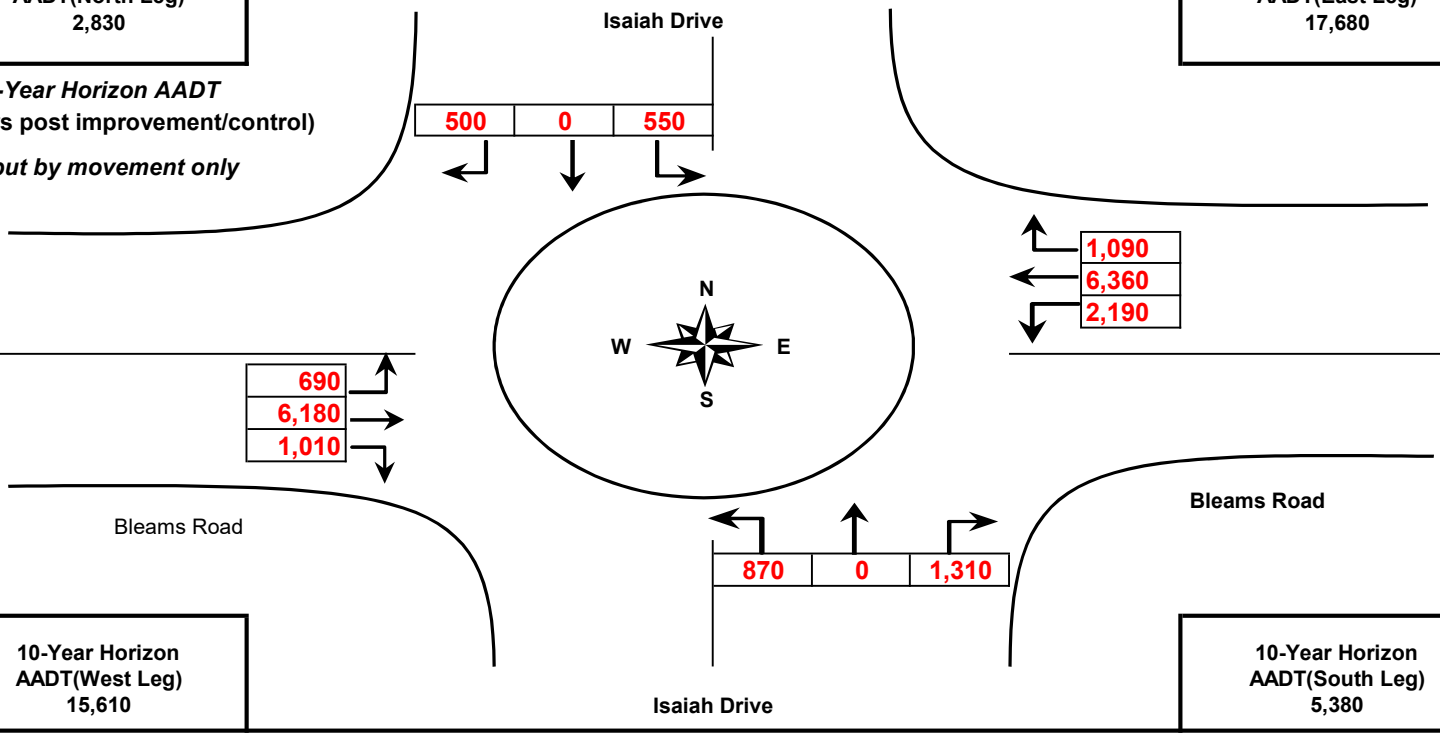
Minor Road (mid-block) 10-Year Horizon AADT: 5,380

10-Year Horizon AADT(North Leg) 2,830

10-Year Horizon AADT(East Leg) 17,680

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 15,610

10-Year Horizon AADT(South Leg) 5,380

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO_{SIG} = $5,000
PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$1,540,880.69	$194,988.66	$1,269,892.33	$75,999.70
Roundabout	$1,753,159.81	$702,999.73	$1,050,160.08	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES

SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Isaiah Drive - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Isaiah Drive**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**19980**
Urban or Rural:	Urban		
Proposed Control:	Signalized	**5-Year Total Collisions:**	**1**
Proposed Config.	4-Leg Intersection	**5-Year PDO Collisions:**	**0**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**5.24**	**3.40**	**1.83**	**0.00**
Roundabout	**15.13**	**13.62**	**1.51**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.88**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Donnenwerth/Amand - 2031 AADT

Major Road: Bleams Road

Minor Road: Donnenwerth/Amand

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	**Major**	No RT Lanes
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A
Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 9

5-Year PDO Collisions: 4

Proposed RA Configuration? MULTI - 1 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 22,560

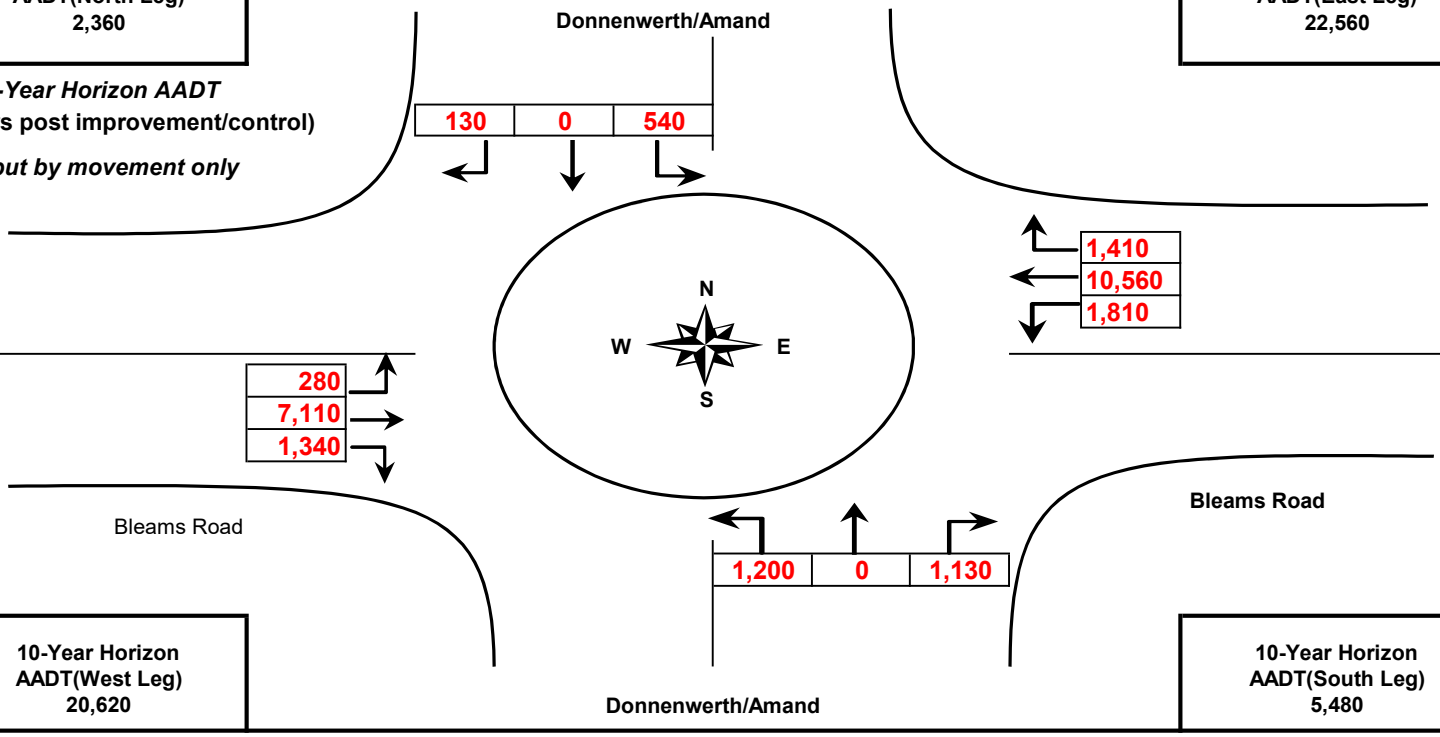
Minor Road (mid-block) 10-Year Horizon AADT: 5,480

10-Year Horizon AADT(North Leg) 2,360

10-Year Horizon AADT(East Leg) 22,560

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 20,620

10-Year Horizon AADT(South Leg) 5,480

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO_{SIG} = $5,000
PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$2,221,350.97	$273,557.62	$1,852,793.72	$94,999.62
Roundabout	$1,596,383.64	$640,134.03	$956,249.60	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES

SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: **Bleams Road and Donnenwerth/Amand - 2031 AADT**

Major Road: **Bleams Road**
Minor Road: **Donnenwerth/Amand**

Major Road Direction:	East / West	**Roundabout Conflicts:**	**17810**
Urban or Rural:	Urban		
Proposed Control:	Signalized	**5-Year Total Collisions:**	**9**
Proposed Config.	4-Leg Intersection	**5-Year PDO Collisions:**	**4**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**7.45**	**4.77**	**2.67**	**0.01**
Roundabout	**13.78**	**12.40**	**1.38**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.96**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Commonwealth/Abram Clemens 2031 AADT

Major Road: Bleams Road

Minor Road: Commonwealth/Abram Clemens

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	2 Approaches	**Major**	2 Approaches
Minor	1 Approach	**Minor**	1 Approach

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A
Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions:	3
5-Year PDO Collisions:	3

Proposed RA Configuration? MULTI - 1 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 24,600

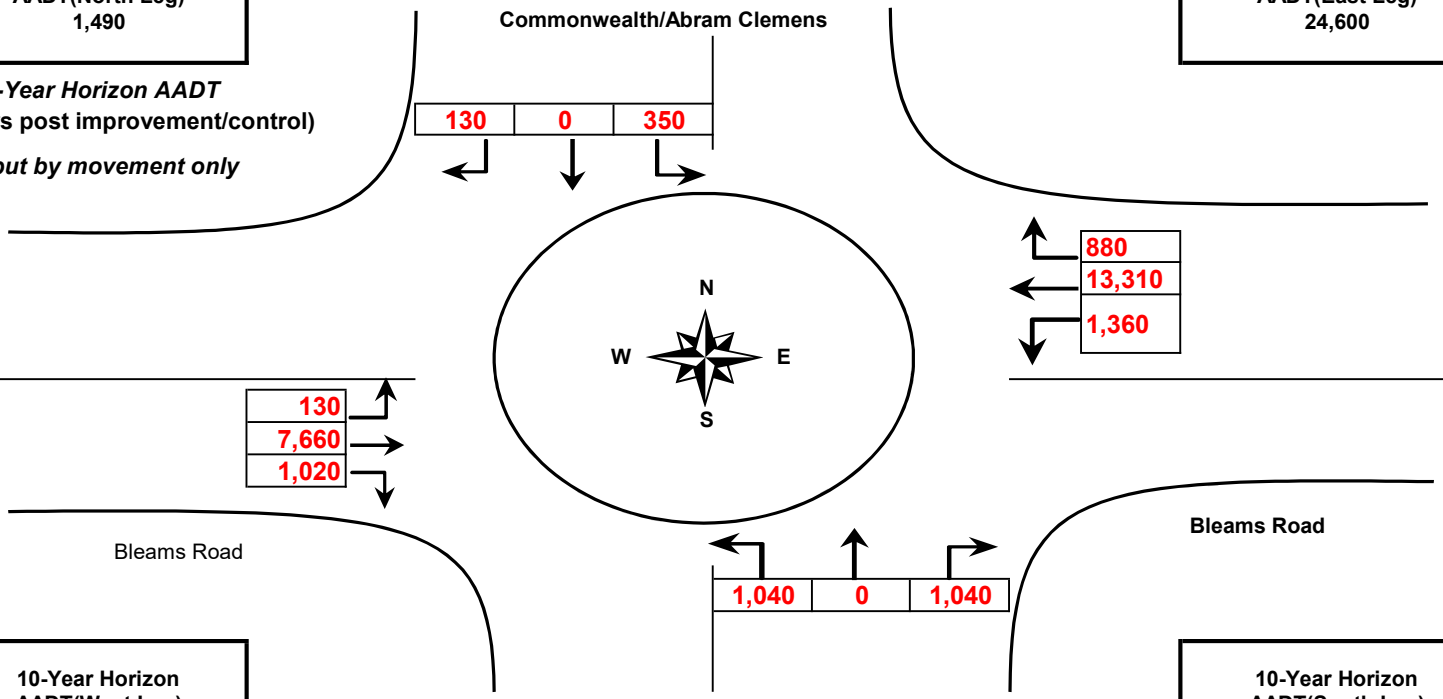
Minor Road (mid-block) 10-Year Horizon AADT: 4,460

10-Year Horizon AADT(North Leg) 1,490

10-Year Horizon AADT(East Leg) 24,600

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 23,290

10-Year Horizon AADT(South Leg) 4,460

Direct Capital Costs

Fatal =	$1,656,500
Injury =	$60,500
PDO_{SIG} =	$5,000
PDO_{RA} =	$4,500
Discount Rate =	0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	$2,153,219.64	$260,940.71	$1,797,279.31	$94,999.62
Roundabout	$1,285,293.73	$515,390.06	$769,903.67	$0.00

* Roundabout calibration Factor - 1.5

INTERSECTION CONTROL STUDIES

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Last Rev JAN 2021

Scenario: Bleams Road and Commonwealth/Abram Clemens 2031 AADT

Major Road: Bleams Road
Minor Road: Commonwealth/Abram Clemens

Major Road Direction:	East / West
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	4-Leg Intersection

Roundabout Conflicts:	**13650**
5-Year Total Collisions:	**3**
5-Year PDO Collisions:	**3**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**7.14**	**4.55**	**2.59**	**0.01**
Roundabout	**11.09**	**9.99**	**1.11**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-10.99**	**1.07**	**0.23**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	4-Leg Intersection	**-11.02**	**1.02**	**0.24**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.73	**0.88**	**2.1**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

Appendix C

Capital Cost Estimates

TABLE 1 A - PRELIMINARY CONSTRUCTION COST ESTIMATE
Bleams Road - 4 Roundabout Intersections
Intersection Improvements EA
Project No. 47727-100
November 10, 2021

Item No.	Description	Unit	Unit Price	Estimated Quantity	Total Cost
A1 - Site Preparation & Removals					
A1.1	Bonding, Insurance, Etc.	lump sum	$120,000.00	1	$120,000.00
A1.2	Mobilization/Demobilization	lump sum	$95,000.00	1	$95,000.00
A1.3	Pre-condition Survey	lump sum	$8,000.00	1	$8,000.00
A1.4	Site Office	lump sum	$25,000.00	1	$25,000.00
A1.5	Traffic control	lump sum	$80,000.00	1	$80,000.00
A1.6	Construction layout	lump sum	$25,000.00	1	$25,000.00
A1.7	Coordination with Region Forces for Signage and Traffic Signal Installations	lump sum	$30,000.00	1	$30,000.00
A1.8	Expose existing utilities/watermain as directed by CA	hrs	$900.00	60	$54,000.00
A1.9	Supply & Install light duty silt fence, tree/pedestrian protrection fencing	m	$15.50	2000	$31,000.00
A1.10	Remove & dispose of existing asphalt	m^2	$6.50	28000	$182,000.00
A1.11	Remove & dispose of driveway median and sidewalk asphalt	m^2	$8.00	2000	$16,000.00
A1.12	Remove & dispose of existing concrete sidewalk, median, driveway, aprons	m^2	$16.00	400	$6,400.00
A1.13	Remove & dispose of existing curb, all types	m	$8.00	400	$3,200.00
A1.14	Remove & dispose of existing storm sewers/culverts				
A1.15	Pipes, leads, culverts	m	$60.00	800	$48,000.00
A1.16	Manholes and catchbasins	each	$500.00	12	$6,000.00
A1.17	Cold plane asphalt step joints	m^2	$55.00	300	$16,500.00
A1.18	Tree removals, protection, maintain & relocate as required	lump sum	$150,000.00	1	$150,000.00
A1.19	Strip topsoil, grubbing	lump sum	$250,000.00	1	$250,000.00
A1.20	Miscellaneous removals (signs, mailboxes, posts, paige wire, gates, etc.)	lump sum	$74,000.00	1	$74,000.00
				Subtotal Section A1 - Site Preparation & Removals	**$1,220,100.00**
A2 - Road Works					
A2.1	Excavate to subgrade	m^3	$14.00	36,017	$504,237.51
A2.2	Roadway Paving	m^2		52,199	
A2.2.1	Granular 'B' (450mm)	tonnes	$17.50	59,720	$1,045,105.74
A2.2.2	Granular 'A' (150mm)	tonnes	$24.00	19,907	$477,762.62
A2.2.3	SP19.0 binder asphalt for road construction (120mm)	tonnes	$100.00	15,660	$1,565,955.00
A2.2.4	HL3 surface asphalt for road restoration (50mm)	tonnes	$150.00	6,525	$978,721.88
A2.3	Concrete Curb	m	$55.00	10,327	$567,985.00
A2.4	Tack Coat	m^2	$0.60	104,397	$62,638.20
A2.5	Asphalt Multi-Use Trail	m^2	$70.00	21,261	$1,488,284.00
A2.6	Concrete sidewalk and island infil	m^2	$65.00	2,768	$179,923.25
A2.7	Stamped couloured concrete infil	m^2	$110.00	1,625	$178,744.50
A2.8	Boulevard restoration - topsoil & sod	m^2	$16.00	38,001	$608,016.00
A2.9	Pavement Markings Lines	m	$5.00	9,159	$45,793.00
A2.10	Pavement Markings Symbols	each	$80.00	60	$4,800.00
A2.11	Truncated Dome Plates	each	$300.00	180	$54,000.00
				Subtotal Section A2 - Road Works	**$7,761,966.70**
A3 - Storm Sewers					
A3.1	New Storm Sewer	m	$600.00	3,000	$1,800,000.00
A3.2	Catch Basin Maintenance holes	ea	$7,500.00	50	$375,000.00
A3.3	Catch basins with leads	ea	$4,800.00	50	$240,000.00
A3.4	Miscellaneous storm connections and adjustments	lump sum	$65,000.00	1	$65,000.00
A3.5	Sewer Main Testing	m	$15.00	400	$6,000.00
				Subtotal Section A4 - Storm Sewers	**$2,486,000.00**
A4 - Traffic Signals & Lighting					
A4.1	Full Signalized Intersection	lump sum	$250,000.00	0	$0.00
A4.2	Supply and install street light poles	m	$1,200.00	160	$192,000.00
A4.3	Supply and install conduit	m	$100.00	6,300	$630,000.00
				Subtotal Section A4 - Storm Sewers	**$822,000.00**
A6 - Miscellaneous/Provisional Items - Design					
A6.1	Allowance for contaminated material remediation	lump sum	$350,000.00	1	$350,000.00
A6.2	Utility Reloaction	lump sum	$300,000.00	1	$300,000.00
A6.3	Property Acquisition	lump sum	$331,182.48	1	$331,182.48
				Subtotal Section A6 - Miscellaneous/Provisional Items	**$981,182.48**
				Total Estimated Construction Cost	**$13,271,249.18**

TABLE 1 A - PRELIMINARY CONSTRUCTION COST ESTIMATE
Bleams Road - 4 Signalized Intersections
Intersection Improvements EA
Project No. 47727-100
November 10, 2021

Item No.	Description	Unit	Unit Price	Estimated Quantity	Total Cost
A1 - Site Preparation & Removals					
A1.1	Bonding, Insurance, Etc.	lump sum	$120,000.00	1	$120,000.00
A1.2	Mobilization/Demobilization	lump sum	$95,000.00	1	$95,000.00
A1.3	Pre-condition Survey	lump sum	$8,000.00	1	$8,000.00
A1.4	Site Office	lump sum	$25,000.00	1	$25,000.00
A1.5	Traffic control	lump sum	$80,000.00	1	$80,000.00
A1.6	Construction layout	lump sum	$25,000.00	1	$25,000.00
A1.7	Coordination with Region Forces for Signage and Traffic Signal Installations	lump sum	$30,000.00	1	$30,000.00
A1.8	Expose existing utilities/watermain as directed by CA	hrs	$900.00	60	$54,000.00
A1.9	Supply & Install light duty silt fence, tree/pedestrian protrection fencing	m	$15.50	2000	$31,000.00
A1.10	Remove & dispose of existing asphalt	m^2	$6.50	28000	$182,000.00
A1.11	Remove & dispose of driveway median and sidewalk asphalt	m^2	$8.00	2000	$16,000.00
A1.12	Remove & dispose of existing concrete sidewalk, median, driveway, aprons	m^2	$16.00	400	$6,400.00
A1.13	Remove & dispose of existing curb, all types	m	$8.00	400	$3,200.00
A1.14	Remove & dispose of existing storm sewers/culverts				
A1.15	Pipes, leads, culverts	m	$60.00	800	$48,000.00
A1.16	Manholes and catchbasins	each	$500.00	12	$6,000.00
A1.17	Cold plane asphalt step joints	m^2	$55.00	300	$16,500.00
A1.18	Tree removals, protection, maintain & relocate as required	lump sum	$150,000.00	1	$150,000.00
A1.19	Strip topsoil, grubbing	lump sum	$250,000.00	1	$250,000.00
A1.20	Miscellaneous removals (signs, mailboxes, posts, paige wire, gates, etc.)	lump sum	$74,000.00	1	$74,000.00
				Subtotal Section A1 - Site Preparation & Removals	**$1,220,100.00**
A2 - Road Works					
A2.1	Excavate to subgrade	m^3	$14.00	31,062	$434,872.91
A2.2	Roadway Paving	m^2		45,018	
A2.2.1	Granular 'B' (450mm)	tonnes	$17.50	51,086	$893,997.50
A2.2.2	Granular 'A' (150mm)	tonnes	$24.00	17,029	$408,684.57
A2.2.3	SP19.0 binder asphalt for road construction (120mm)	tonnes	$100.00	13,505	$1,350,537.00
A2.2.4	HL3 surface asphalt for road restoration (50mm)	tonnes	$150.00	5,627	$844,085.63
A2.3	Concrete Curb	m	$55.00	7,612	$418,651.75
A2.4	Tack Coat	m^2	$0.60	90,036	$54,021.48
A2.5	Asphalt Multi-Use Trail	m^2	$70.00	20,400	$1,427,989.50
A2.6	Concrete sidewalk and island infil	m^2	$65.00	288	$18,687.50
A2.7	Stamped couloured concrete infil	m^2	$110.00	0	$0.00
A2.8	Boulevard restoration - topsoil & sod	m^2	$16.00	46,682	$746,904.00
A2.9	Pavement Markings Lines	m	$5.00	8,941	$44,704.00
A2.10	Pavement Markings Symbols	each	$80.00	40	$3,200.00
A2.11	Truncated Dome Plates	each	$300.00	90	$27,000.00
				Subtotal Section A2 - Road Works	**$6,673,335.84**
A3 - Storm Sewers					
A3.1	New Storm Sewer	m	$600.00	3,000	$1,800,000.00
A3.2	Catch Basin Maintenance holes	ea	$7,500.00	50	$375,000.00
A3.3	Catch basins with leads	ea	$4,800.00	50	$240,000.00
A3.4	Miscellaneous storm connections and adjustments	lump sum	$65,000.00	1	$65,000.00
A3.5	Sewer Main Testing	m	$15.00	400	$6,000.00
				Subtotal Section A4 - Storm Sewers	**$2,486,000.00**
A4 - Traffic Signals & Lighting					
A4.1	Full Signalized Intersection	lump sum	$250,000.00	4	$1,000,000.00
A4.2	Supply and install street light poles	m	$1,200.00	160	$192,000.00
A4.3	Supply and install conduit	m	$100.00	6,300	$630,000.00
				Subtotal Section A4 - Storm Sewers	**$1,822,000.00**
A6 - Miscellaneous/Provisional Items - Design					
A6.1	Allowance for contaminated material remediation	lump sum	$350,000.00	1	$350,000.00
A6.2	Utility Reloaction	lump sum	$50,000.00	1	$50,000.00
A6.3	Property Acquisition	lump sum	$103,042.79	1	$103,042.79
				Subtotal Section A6 - Miscellaneous/Provisional Items	**$503,042.79**
				Total Estimated Construction Cost	**$12,704,478.62**

TABLE 1 A - PRELIMINARY CONSTRUCTION COST ESTIMATE
Bleams Road - 2 Roundabout & 2 Signalized Intersections
Intersection Improvements EA
Project No. 47727-100
November 10, 2021

Item No.	Description	Unit	Unit Price	Estimated Quantity	Total Cost
A1 - Site Preparation & Removals					
A1.1	Bonding, Insurance, Etc.	lump sum	$120,000.00	1	$120,000.00
A1.2	Mobilization/Demobilization	lump sum	$95,000.00	1	$95,000.00
A1.3	Pre-condition Survey	lump sum	$8,000.00	1	$8,000.00
A1.4	Site Office	lump sum	$25,000.00	1	$25,000.00
A1.5	Traffic control	lump sum	$80,000.00	1	$80,000.00
A1.6	Construction layout	lump sum	$25,000.00	1	$25,000.00
A1.7	Coordination with Region Forces for Signage and Traffic Signal Installations	lump sum	$30,000.00	1	$30,000.00
A1.8	Expose existing utilities/watermain as directed by CA	hrs	$900.00	60	$54,000.00
A1.9	Supply & Install light duty silt fence, tree/pedestrian protrection fencing	m	$15.50	2000	$31,000.00
A1.10	Remove & dispose of existing asphalt	m^2	$6.50	28000	$182,000.00
A1.11	Remove & dispose of driveway median and sidewalk asphalt	m^2	$8.00	2000	$16,000.00
A1.12	Remove & dispose of existing concrete sidewalk, median, driveway, aprons	m^2	$16.00	400	$6,400.00
A1.13	Remove & dispose of existing curb, all types	m	$8.00	400	$3,200.00
A1.14	Remove & dispose of existing storm sewers/culverts				
A1.15	Pipes, leads, culverts	m	$60.00	800	$48,000.00
A1.16	Manholes and catchbasins	each	$500.00	12	$6,000.00
A1.17	Cold plane asphalt step joints	m^2	$55.00	300	$16,500.00
A1.18	Tree removals, protection, maintain & relocate as required	lump sum	$150,000.00	1	$150,000.00
A1.19	Strip topsoil, grubbing	lump sum	$250,000.00	1	$250,000.00
A1.20	Miscellaneous removals (signs, mailboxes, posts, paige wire, gates, etc.)	lump sum	$74,000.00	1	$74,000.00
				Subtotal Section A1 - Site Preparation & Removals	**$1,220,100.00**
A2 - Road Works					
A2.1	Excavate to subgrade	m^3	$14.00	31,562	$441,871.58
A2.2	Roadway Paving	m^2		45,742	
A2.2.1	Granular 'B' (450mm)	tonnes	$17.50	52,476	$918,325.49
A2.2.2	Granular 'A' (150mm)	tonnes	$24.00	17,492	$419,805.94
A2.2.3	SP19.0 binder asphalt for road construction (120mm)	tonnes	$100.00	13,723	$1,372,272.00
A2.2.4	HL3 surface asphalt for road restoration (50mm)	tonnes	$150.00	5,718	$857,670.00
A2.3	Concrete Curb	m	$55.00	9,488	$521,812.50
A2.4	Tack Coat	m^2	$0.60	91,485	$54,890.88
A2.5	Asphalt Multi-Use Trail	m^2	$70.00	20,939	$1,465,744.00
A2.6	Concrete sidewalk and island infil	m^2	$65.00	1,703	$110,704.75
A2.7	Stamped couloured concrete infil	m^2	$110.00	825	$90,700.50
A2.8	Boulevard restoration - topsoil & sod	m^2	$16.00	45,899	$734,376.00
A2.9	Pavement Markings Lines	m	$5.00	8,154	$40,771.50
A2.10	Pavement Markings Symbols	each	$80.00	50	$4,000.00
A2.11	Truncated Dome Plates	each	$300.00	132	$39,600.00
				Subtotal Section A2 - Road Works	**$7,072,545.14**
A3 - Storm Sewers					
A3.1	New Storm Sewer	m	$600.00	3,000	$1,800,000.00
A3.2	Catch Basin Maintenance holes	ea	$7,500.00	50	$375,000.00
A3.3	Catch basins with leads	ea	$4,800.00	50	$240,000.00
A3.4	Miscellaneous storm connections and adjustments	lump sum	$65,000.00	1	$65,000.00
A3.5	Sewer Main Testing	m	$15.00	400	$6,000.00
				Subtotal Section A4 - Storm Sewers	**$2,486,000.00**
A4 - Traffic Signals & Lighting					
A4.1	Full Signalized Intersection	lump sum	$250,000.00	2	$500,000.00
A4.2	Supply and install street light poles	m	$1,200.00	160	$192,000.00
A4.3	Supply and install conduit	m	$100.00	6,300	$630,000.00
				Subtotal Section A4 - Storm Sewers	**$1,322,000.00**
A6 - Miscellaneous/Provisional Items - Design					
A6.1	Allowance for contaminated material remediation	lump sum	$350,000.00	1	$350,000.00
A6.2	Utility Reloaction	lump sum	$150,000.00	1	$150,000.00
A6.3	Property Acquisition	lump sum	$331,182.48	1	$331,182.48
				Subtotal Section A6 - Miscellaneous/Provisional Items	**$831,182.48**
				Total Estimated Construction Cost	**$12,931,827.61**

Appendix D

Capacity Analysis Output

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Trussler Rd.
Date: November 2021

Drawn By: NPD
Sheet: **1 of 4**

	Trussler		Trussler	Bleams
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	3		4	4
Level of Service (LOS)	A		A	A
Queue Length (m)	<14		<14	<14
V/C Ratio	0.52		0.47	0.49
Overall Average Delay (s)	3			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7		4	4
Level of Service (LOS)	A		A	A
Queue Length (m)	35		<14	<14
V/C Ratio	0.75		0.50	0.47
Overall Average Delay (s)	4			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	4		4	5
Level of Service (LOS)	A		A	A
Queue Length (m)	<14		<14	<14
V/C Ratio	0.55		0.50	0.52
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8		5	4
Level of Service (LOS)	A		A	A
Queue Length (m)	49		<14	<14
V/C Ratio	0.79		0.53	0.50
Overall Average Delay (s)	5			
Overall LOS	A			

Notes:

- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Project No.: 47727-100-100
Intersection: Bleams Rd. at Isaiah Dr.
Date: November 2021

Drawn By: NPD
Sheet: 2 of 4

	Isaiah Dr.	Bleams Rd.	Isaiah Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	3	9	3
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.26	0.32	0.46	0.35
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8	3	8	3
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.19	0.41	0.33	0.48
Overall Average Delay (s)	3			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	7	3	10	3
Level of Service (LOS)	A	A	B	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.27	0.34	0.48	0.37
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	8	3	8	4
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	<14
V/C Ratio	0.20	0.43	0.34	0.51
Overall Average Delay (s)	4			
Overall LOS	A			

Notes:

- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 3 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Donnenwerth/Amand Dr.
Date: November 2021

	Donnenwerth	Bleams Rd.	Amand Dr.	Bleams Rd.
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	4	14	3
Level of Service (LOS)	A	A	B	A
Queue Length (m)	<14	<14	14	<14
V/C Ratio	0.13	0.56	0.54	0.33
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	9	3	7	5
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	21
V/C Ratio	0.15	0.45	0.32	0.68
Overall Average Delay (s)	4			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	6	4	16	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	14	14	<14
V/C Ratio	0.13	0.59	0.58	0.34
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	10	4	7	6
Level of Service (LOS)	A	A	A	A
Queue Length (m)	<14	<14	<14	28
V/C Ratio	0.16	0.48	0.33	0.72
Overall Average Delay (s)	4			
Overall LOS	A			

Notes:

- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

CAPACITY ANALYSIS SUMMARY

Project: Bleams Road: Trussler Rd. to Fischer Hallman Rd.
Drawn By: NPD
Sheet: 4 of 4
Project No.: 47727-100-100
Intersection: Bleams Rd. at Commonsealth/Abram Clemens St.
Date: November 2021

	Commonwealth	Bleams Rd	Abram Clemens	Bleams Rd
AM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	5	18	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	21	14	<14
V/C Ratio	0.09	0.66	0.55	0.33
Overall Average Delay (s)	4			
Overall LOS	A			

PM Peak - Model Results (y-intercept = 95%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	13	3	7	7
Level of Service (LOS)	B	A	A	A
Queue Length (m)	<14	<14	<14	35
V/C Ratio	0.16	0.44	0.29	0.77
Overall Average Delay (s)	5			
Overall LOS	A			

AM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	5	6	20	3
Level of Service (LOS)	A	A	C	A
Queue Length (m)	<14	28	21	<14
V/C Ratio	0.10	0.70	0.58	0.35
Overall Average Delay (s)	5			
Overall LOS	A			

PM Peak - Design Check (y-intercept = 90%)	**SB**	**EB**	**NB**	**WB**
Average Delay (s)	14	3	7	9
Level of Service (LOS)	B	A	A	A
Queue Length (m)	<14	<14	<14	70
V/C Ratio	0.16	0.47	0.30	0.81
Overall Average Delay (s)	5			
Overall LOS	A			

Notes:

- Values shown are the maximum values over all of the 15 minute time segments.
- Delays are the maximum value of average delay over all of the time segments
- Queue lenths are 95th percentile values and are based on an average vehicle length of 7 meters

Trussler Road & Bleams Road Roundabout Capacity Analysis

Version: 7.1.1.245 [9th June 2011]
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The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

File: Q:\47727\100\ICS\Arcady\Bleams & Trussler.arc7
Report generation date: 11/25/2021 10:06:20 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - 2031							
Trussler SB	1.14	3.45	0.52	A	3.06	6.55	0.75	A
Trussler NB	0.93	3.75	0.47	A	1.03	4.39	0.50	A
Bleams WB	1.00	4.23	0.49	A	0.93	4.00	0.47	A
	90% - 2031							
Trussler SB	1.28	3.88	0.55	A	3.84	8.26	0.79	A
Trussler NB	1.03	4.17	0.50	A	1.15	4.90	0.53	A
Bleams WB	1.11	4.72	0.52	A	1.03	4.44	0.50	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.
2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

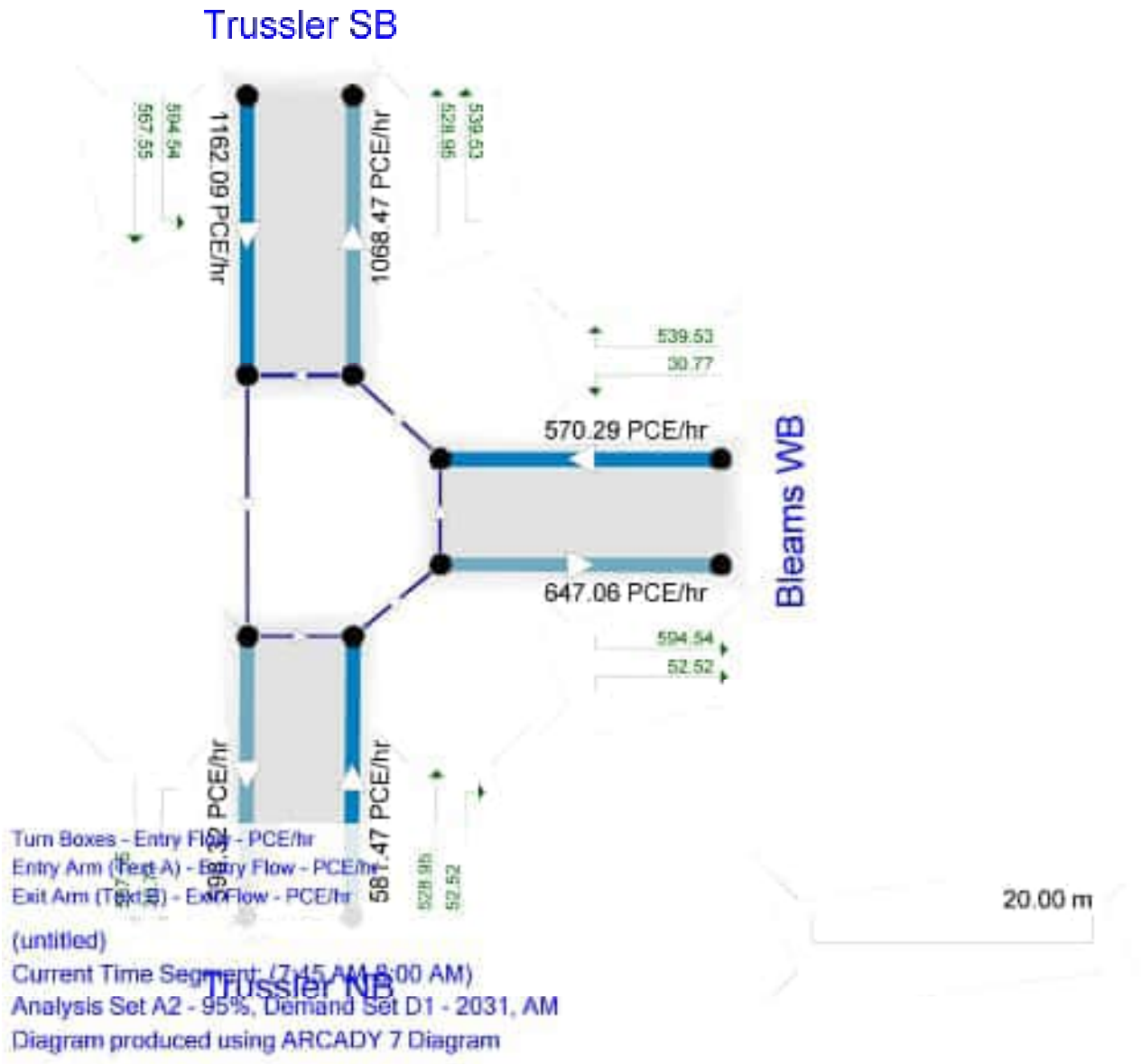
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin



The intersection diagram reflects the last run of ARCADY.

A2 - 95% - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95%		Yes		(D1)		100.000	95.000	10 Year Horizon - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	816.09	816.09	N/A	N/A
1	Trussler NB	613.57	613.57	N/A	N/A
1	Bleams WB	582.71	582.71	N/A	N/A
2	Trussler SB	974.49	974.49	N/A	N/A
2	Trussler NB	732.67	732.67	N/A	N/A
2	Bleams WB	695.81	695.81	N/A	N/A
3	Trussler SB	1193.51	1193.51	N/A	N/A
3	Trussler NB	897.33	897.33	N/A	N/A
3	Bleams WB	852.19	852.19	N/A	N/A
4	Trussler SB	1193.51	1193.51	N/A	N/A
4	Trussler NB	897.33	897.33	N/A	N/A

4	**Bleams WB**	852.19	852.19	N/A	N/A
5	**Trussler SB**	974.49	974.49	N/A	N/A
5	**Trussler NB**	732.67	732.67	N/A	N/A
5	**Bleams WB**	695.81	695.81	N/A	N/A
6	**Trussler SB**	816.09	816.09	N/A	N/A
6	**Trussler NB**	613.57	613.57	N/A	N/A
6	**Bleams WB**	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCE) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Truck Percentages - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Trussler SB	0.52	3.45	1.14	A	994.70	1492.05	74.43	2.99	0.83	74.44	2.99	0.723	2436.345
Trussler NB	0.47	3.75	0.93	A	747.86	1121.79	59.70	3.19	0.66	59.71	3.19	0.723	2436.345
Bleams WB	0.49	4.23	1.00	A	710.24	1065.35	62.12	3.50	0.69	62.12	3.50	0.723	2436.345
						3679.19	196.25	3.2004					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	816.09	204.02	813.79	1119.11	27.02	0.00	2295.97	2271.67	0.355	0.00	0.58
Trussler NB	613.57	153.39	611.77	433.16	407.64	0.00	2034.56	1532.99	0.302	0.00	0.45
Bleams WB	582.71	145.68	580.89	454.18	565.23	0.00	1926.33	1341.76	0.303	0.00	0.45

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	974.49	243.62	973.71	1339.11	32.33	0.00	2292.32	2271.67	0.425	0.58	0.77
Trussler NB	732.67	183.17	732.02	518.29	487.75	0.00	1979.54	1532.99	0.370	0.45	0.61
Bleams WB	695.81	173.95	695.11	543.44	676.33	0.00	1850.02	1341.76	0.376	0.45	0.63

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1193.51	298.38	1192.05	1639.07	39.57	0.00	2287.35	2271.67	0.522	0.77	1.14
Trussler NB	897.33	224.33	896.07	634.49	597.12	0.00	1904.42	1532.99	0.471	0.61	0.93
Bleams WB	852.19	213.05	850.74	665.29	827.91	0.00	1745.92	1341.76	0.488	0.63	0.99

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1193.51	298.38	1193.49	1641.59	39.64	0.00	2287.31	2271.67	0.522	1.14	1.14
Trussler NB	897.33	224.33	897.32	635.28	597.85	0.00	1903.93	1532.99	0.471	0.93	0.93
Bleams WB	852.19	213.05	852.17	666.11	829.05	0.00	1745.13	1341.76	0.488	0.99	1.00

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	974.49	243.62	975.94	1342.90	32.43	0.00	2292.25	2271.67	0.425	1.14	0.78
Trussler NB	732.67	183.17	733.91	519.50	488.87	0.00	1978.77	1532.99	0.370	0.93	0.62
Bleams WB	695.81	173.95	697.25	544.70	678.08	0.00	1848.82	1341.76	0.376	1.00	0.64

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	816.09	204.02	816.89	1123.80	27.14	0.00	2295.89	2271.67	0.355	0.78	0.58
Trussler NB	613.57	153.39	614.23	434.83	409.20	0.00	2033.49	1532.99	0.302	0.62	0.46
Bleams WB	582.71	145.68	583.43	455.92	567.51	0.00	1924.76	1341.76	0.303	0.64	0.46

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	8.48	0.57	2.547	A	A
Trussler NB	6.65	0.44	2.653	A	A
Bleams WB	6.67	0.44	2.806	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	11.40	0.76	2.865	A	A
Trussler NB	9.06	0.60	3.028	A	A
Bleams WB	9.28	0.62	3.271	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	16.67	1.11	3.446	A	A
Trussler NB	13.62	0.91	3.743	A	A
Bleams WB	14.51	0.97	4.215	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	17.09	1.14	3.454	A	A
Trussler NB	13.96	0.93	3.754	A	A
Bleams WB	14.93	1.00	4.232	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	11.93	0.80	2.876	A	A
Trussler NB	9.48	0.63	3.038	A	A
Bleams WB	9.76	0.65	3.285	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	8.85	0.59	2.558	A	A
Trussler NB	6.93	0.46	2.664	A	A
Bleams WB	6.98	0.47	2.821	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.77	0.00	0.00	0.00	1.05			N/A	N/A
Trussler NB	0.61	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.99	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.00	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	816.09	2295.97	0.355	0.00	0.00	0.58	8.48	(0.00)	2.547
1	Trussler NB	613.57	2034.56	0.302	0.00	0.00	0.45	6.65	(0.00)	2.653
1	Bleams WB	582.71	1926.33	0.303	0.00	0.00	0.45	6.67	(0.00)	2.806
2	Trussler SB	974.49	2292.32	0.425	0.00	0.58	0.77	11.40	(0.00)	2.865
2	Trussler NB	732.67	1979.54	0.370	0.00	0.45	0.61	9.06	(0.00)	3.028
2	Bleams WB	695.81	1850.02	0.376	0.00	0.45	0.63	9.28	(0.00)	3.271
3	Trussler SB	1193.51	2287.35	0.522	0.00	0.77	1.14	16.67	(0.00)	3.446
3	Trussler NB	897.33	1904.42	0.471	0.00	0.61	0.93	13.62	(0.00)	3.743
3	Bleams WB	852.19	1745.92	0.488	0.00	0.63	0.99	14.51	(0.00)	4.215
4	Trussler SB	1193.51	2287.31	0.522	0.00	1.14	1.14	17.09	(0.00)	3.454
4	Trussler NB	897.33	1903.93	0.471	0.00	0.93	0.93	13.96	(0.00)	3.754
4	Bleams WB	852.19	1745.13	0.488	0.00	0.99	1.00	14.93	(0.00)	4.232
5	Trussler SB	974.49	2292.25	0.425	0.00	1.14	0.78	11.93	(0.00)	2.876
5	Trussler NB	732.67	1978.77	0.370	0.00	0.93	0.62	9.48	(0.00)	3.038
5	Bleams WB	695.81	1848.82	0.376	0.00	1.00	0.64	9.76	(0.00)	3.285
6	Trussler SB	816.09	2295.89	0.355	0.00	0.78	0.58	8.85	(0.00)	2.558
6	Trussler NB	613.57	2033.49	0.302	0.00	0.62	0.46	6.93	(0.00)	2.664
6	Bleams WB	582.71	1924.76	0.303	0.00	0.64	0.46	6.98	(0.00)	2.821

A2 - 95% - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95%		Yes		(D1)		100.000	95.000	10 Year Horizon - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	1166.92	1166.92	N/A	N/A
1	Trussler NB	583.46	583.46	N/A	N/A
1	Bleams WB	572.17	572.17	N/A	N/A
2	Trussler SB	1393.42	1393.42	N/A	N/A
2	Trussler NB	696.71	696.71	N/A	N/A
2	Bleams WB	683.22	683.22	N/A	N/A
3	Trussler SB	1706.58	1706.58	N/A	N/A
3	Trussler NB	853.29	853.29	N/A	N/A
3	Bleams WB	836.78	836.78	N/A	N/A
4	Trussler SB	1706.58	1706.58	N/A	N/A
4	Trussler NB	853.29	853.29	N/A	N/A

4	**Bleams WB**	836.78	836.78	N/A	N/A
5	**Trussler SB**	1393.42	1393.42	N/A	N/A
5	**Trussler NB**	696.71	696.71	N/A	N/A
5	**Bleams WB**	683.22	683.22	N/A	N/A
6	**Trussler SB**	1166.92	1166.92	N/A	N/A
6	**Trussler NB**	583.46	583.46	N/A	N/A
6	**Bleams WB**	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCE) - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Truck Percentages - Bleams & Trussler (for whole period)

		To		
		1	**2**	**3**
From	**1**	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Trussler SB	0.75	6.55	3.06	A	1422.31	2133.46	170.32	4.79	1.89	170.34	4.79	0.723	2436.345
Trussler NB	0.50	4.39	1.03	A	711.15	1066.73	63.88	3.59	0.71	63.88	3.59	0.723	2436.345
Bleams WB	0.47	4.00	0.93	A	697.39	1046.08	58.45	3.35	0.65	58.45	3.35	0.723	2436.345
						4246.27	292.65	4.1352					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1166.92	291.73	1162.60	1068.74	30.77	0.00	2293.39	2263.94	0.509	0.00	1.08
Trussler NB	583.46	145.87	581.62	598.57	594.80	0.00	1906.02	1519.03	0.306	0.00	0.46
Bleams WB	572.17	143.04	570.43	647.34	529.08	0.00	1951.15	1365.48	0.293	0.00	0.43

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1393.42	348.35	1391.28	1278.87	36.82	0.00	2289.24	2263.94	0.609	1.08	1.61
Trussler NB	696.71	174.18	695.98	716.31	711.80	0.00	1825.66	1519.03	0.382	0.46	0.64
Bleams WB	683.22	170.81	682.57	774.66	633.11	0.00	1879.70	1365.48	0.363	0.43	0.60

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1706.58	426.65	1700.95	1565.23	45.07	0.00	2283.57	2263.93	0.747	1.61	3.02
Trussler NB	853.29	213.32	851.76	875.79	870.23	0.00	1716.85	1519.03	0.497	0.64	1.03
Bleams WB	836.78	209.19	835.47	947.16	774.82	0.00	1782.38	1365.48	0.469	0.60	0.92

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1706.58	426.65	1706.42	1567.81	45.14	0.00	2283.52	2263.93	0.747	3.02	3.06
Trussler NB	853.29	213.32	853.26	878.53	873.03	0.00	1714.93	1519.03	0.498	1.03	1.03
Bleams WB	836.78	209.19	836.76	950.10	776.20	0.00	1781.43	1365.48	0.470	0.92	0.93

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1393.42	348.35	1399.06	1282.75	36.93	0.00	2289.17	2263.94	0.609	3.06	1.65
Trussler NB	696.71	174.18	698.23	720.21	715.78	0.00	1822.93	1519.03	0.382	1.03	0.65
Bleams WB	683.22	170.81	684.51	778.84	635.17	0.00	1878.29	1365.48	0.364	0.93	0.60

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1166.92	291.73	1169.15	1073.37	30.90	0.00	2293.30	2263.94	0.509	1.65	1.10
Trussler NB	583.46	145.87	584.21	601.90	598.15	0.00	1903.72	1519.03	0.306	0.65	0.47
Bleams WB	572.17	143.04	572.83	650.92	531.44	0.00	1949.53	1365.48	0.293	0.60	0.44

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	15.74	1.05	3.331	A	A
Trussler NB	6.78	0.45	2.850	A	A
Bleams WB	6.39	0.43	2.734	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	23.52	1.57	4.199	A	A
Trussler NB	9.49	0.63	3.344	A	A
Bleams WB	8.80	0.59	3.156	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	42.83	2.86	6.425	A	A
Trussler NB	15.01	1.00	4.361	A	A
Bleams WB	13.50	0.90	3.986	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	45.70	3.05	6.545	A	A
Trussler NB	15.48	1.03	4.386	A	A
Bleams WB	13.86	0.92	4.001	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	25.70	1.71	4.272	A	A
Trussler NB	10.01	0.67	3.364	A	A
Bleams WB	9.23	0.62	3.169	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	16.83	1.12	3.371	A	A
Trussler NB	7.10	0.47	2.867	A	A
Bleams WB	6.67	0.44	2.746	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.46	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.61	0.00	0.00	3.15	5.25			N/A	N/A
Trussler NB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.02	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.65	0.00	0.00	3.15	4.20			N/A	N/A
Trussler NB	0.65	0.00	0.00	0.00	>199			N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.10	0.00	0.00	2.10	3.15			N/A	N/A
Trussler NB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	1166.92	2293.39	0.509	0.00	0.00	1.08	15.74	(0.00)	3.331
1	Trussler NB	583.46	1906.02	0.306	0.00	0.00	0.46	6.78	(0.00)	2.850
1	Bleams WB	572.17	1951.15	0.293	0.00	0.00	0.43	6.39	(0.00)	2.734
2	Trussler SB	1393.42	2289.24	0.609	0.00	1.08	1.61	23.52	(0.00)	4.199
2	Trussler NB	696.71	1825.66	0.382	0.00	0.46	0.64	9.49	(0.00)	3.344
2	Bleams WB	683.22	1879.70	0.363	0.00	0.43	0.60	8.80	(0.00)	3.156
3	Trussler SB	1706.58	2283.57	0.747	0.00	1.61	3.02	42.83	(0.00)	6.425
3	Trussler NB	853.29	1716.85	0.497	0.00	0.64	1.03	15.01	(0.00)	4.361
3	Bleams WB	836.78	1782.38	0.469	0.00	0.60	0.92	13.50	(0.00)	3.986
4	Trussler SB	1706.58	2283.52	0.747	0.00	3.02	3.06	45.70	(0.00)	6.545
4	Trussler NB	853.29	1714.93	0.498	0.00	1.03	1.03	15.48	(0.00)	4.386
4	Bleams WB	836.78	1781.43	0.470	0.00	0.92	0.93	13.86	(0.00)	4.001
5	Trussler SB	1393.42	2289.17	0.609	0.00	3.06	1.65	25.70	(0.00)	4.272
5	Trussler NB	696.71	1822.93	0.382	0.00	1.03	0.65	10.01	(0.00)	3.364
5	Bleams WB	683.22	1878.29	0.364	0.00	0.93	0.60	9.23	(0.00)	3.169
6	Trussler SB	1166.92	2293.30	0.509	0.00	1.65	1.10	16.83	(0.00)	3.371
6	Trussler NB	583.46	1903.72	0.306	0.00	0.65	0.47	7.10	(0.00)	2.867
6	Bleams WB	572.17	1949.53	0.293	0.00	0.60	0.44	6.67	(0.00)	2.746

A3 - 90% - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90%		Yes		(D1)		100.000	90.000	Opening Day - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1084.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	815.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	774.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	816.09	816.09	N/A	N/A
1	Trussler NB	613.57	613.57	N/A	N/A
1	Bleams WB	582.71	582.71	N/A	N/A
2	Trussler SB	974.49	974.49	N/A	N/A
2	Trussler NB	732.67	732.67	N/A	N/A
2	Bleams WB	695.81	695.81	N/A	N/A
3	Trussler SB	1193.51	1193.51	N/A	N/A
3	Trussler NB	897.33	897.33	N/A	N/A
3	Bleams WB	852.19	852.19	N/A	N/A
4	Trussler SB	1193.51	1193.51	N/A	N/A
4	Trussler NB	897.33	897.33	N/A	N/A
4	Bleams WB	852.19	852.19	N/A	N/A

5	Trussler SB	974.49	974.49	N/A	N/A
5	Trussler NB	732.67	732.67	N/A	N/A
5	Bleams WB	695.81	695.81	N/A	N/A
6	Trussler SB	816.09	816.09	N/A	N/A
6	Trussler NB	613.57	613.57	N/A	N/A
6	Bleams WB	582.71	582.71	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	541.000	543.000
	2	753.000	0.000	62.000
	3	738.000	36.000	0.000

Turning Proportions (PCE) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.50	0.50
	2	0.92	0.00	0.08
	3	0.95	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Truck Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Trussler SB	0.55	3.88	1.28	A	994.70	1492.05	82.40	3.31	0.92	82.40	3.31	0.723	2436.345
Trussler NB	0.50	4.17	1.03	A	747.86	1121.79	65.48	3.50	0.73	65.48	3.50	0.723	2436.345
Bleams WB	0.52	4.72	1.11	A	710.24	1065.35	68.27	3.84	0.76	68.27	3.85	0.723	2436.345
						3679.19	216.15	3.525					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	816.09	204.02	813.58	1118.83	27.01	0.00	2175.14	2153.48	0.375	0.00	0.63
Trussler NB	613.57	153.39	611.62	433.05	407.54	0.00	1927.54	1490.83	0.318	0.00	0.49
Bleams WB	582.71	145.68	580.75	454.07	565.09	0.00	1825.03	1296.49	0.319	0.00	0.49

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	974.49	243.62	973.61	1338.96	32.33	0.00	2171.68	2153.48	0.449	0.63	0.85
Trussler NB	732.67	183.17	731.94	518.23	487.70	0.00	1875.39	1490.83	0.391	0.49	0.67
Bleams WB	695.81	173.95	695.02	543.38	676.26	0.00	1752.70	1296.49	0.397	0.49	0.69

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1193.51	298.38	1191.80	1638.70	39.56	0.00	2166.97	2153.48	0.551	0.85	1.28
Trussler NB	897.33	224.33	895.89	634.36	597.00	0.00	1804.27	1490.83	0.497	0.67	1.03
Bleams WB	852.19	213.05	850.52	665.15	827.74	0.00	1654.14	1296.49	0.515	0.69	1.10

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1193.51	298.38	1193.48	1641.58	39.64	0.00	2166.92	2153.48	0.551	1.28	1.28
Trussler NB	897.33	224.33	897.31	635.28	597.84	0.00	1803.72	1490.83	0.497	1.03	1.03
Bleams WB	852.19	213.05	852.16	666.10	829.05	0.00	1653.29	1296.49	0.515	1.10	1.11

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	974.49	243.62	976.18	1343.28	32.44	0.00	2171.60	2153.48	0.449	1.28	0.86
Trussler NB	732.67	183.17	734.10	519.63	488.99	0.00	1874.55	1490.83	0.391	1.03	0.68
Bleams WB	695.81	173.95	697.47	544.84	678.25	0.00	1751.40	1296.49	0.397	1.11	0.70

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	816.09	204.02	817.00	1123.95	27.14	0.00	2175.05	2153.48	0.375	0.86	0.63
Trussler NB	613.57	153.39	614.31	434.89	409.25	0.00	1926.43	1490.83	0.319	0.68	0.49
Bleams WB	582.71	145.68	583.51	455.99	567.58	0.00	1823.41	1296.49	0.320	0.70	0.50

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	9.22	0.61	2.772	A	A
Trussler NB	7.18	0.48	2.869	A	A
Bleams WB	7.20	0.48	3.028	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	12.52	0.83	3.154	A	A
Trussler NB	9.87	0.66	3.304	A	A
Bleams WB	10.11	0.67	3.572	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	18.65	1.24	3.869	A	A
Trussler NB	15.06	1.00	4.154	A	A
Bleams WB	16.09	1.07	4.694	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	19.18	1.28	3.882	A	A
Trussler NB	15.49	1.03	4.170	A	A
Bleams WB	16.62	1.11	4.718	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	13.17	0.88	3.165	A	A
Trussler NB	10.38	0.69	3.320	A	A
Bleams WB	10.69	0.71	3.591	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	9.66	0.64	2.786	A	A
Trussler NB	7.51	0.50	2.884	A	A
Bleams WB	7.56	0.50	3.052	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.85	0.00	0.00	1.05	1.05			N/A	N/A
Trussler NB	0.67	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.69	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.86	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.68	0.00	0.00	0.00	>199			N/A	N/A
Bleams WB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	0.63	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	816.09	2175.14	0.375	0.00	0.00	0.63	9.22	(0.00)	2.772
1	Trussler NB	613.57	1927.54	0.318	0.00	0.00	0.49	7.18	(0.00)	2.869
1	Bleams WB	582.71	1825.03	0.319	0.00	0.00	0.49	7.20	(0.00)	3.028
2	Trussler SB	974.49	2171.68	0.449	0.00	0.63	0.85	12.52	(0.00)	3.154
2	Trussler NB	732.67	1875.39	0.391	0.00	0.49	0.67	9.87	(0.00)	3.304
2	Bleams WB	695.81	1752.70	0.397	0.00	0.49	0.69	10.11	(0.00)	3.572
3	Trussler SB	1193.51	2166.97	0.551	0.00	0.85	1.28	18.65	(0.00)	3.869
3	Trussler NB	897.33	1804.27	0.497	0.00	0.67	1.03	15.06	(0.00)	4.154
3	Bleams WB	852.19	1654.14	0.515	0.00	0.69	1.10	16.09	(0.00)	4.694
4	Trussler SB	1193.51	2166.92	0.551	0.00	1.28	1.28	19.18	(0.00)	3.882
4	Trussler NB	897.33	1803.72	0.497	0.00	1.03	1.03	15.49	(0.00)	4.170
4	Bleams WB	852.19	1653.29	0.515	0.00	1.10	1.11	16.62	(0.00)	4.718
5	Trussler SB	974.49	2171.60	0.449	0.00	1.28	0.86	13.17	(0.00)	3.165
5	Trussler NB	732.67	1874.55	0.391	0.00	1.03	0.68	10.38	(0.00)	3.320
5	Bleams WB	695.81	1751.40	0.397	0.00	1.11	0.70	10.69	(0.00)	3.591
6	Trussler SB	816.09	2175.05	0.375	0.00	0.86	0.63	9.66	(0.00)	2.786
6	Trussler NB	613.57	1926.43	0.319	0.00	0.68	0.49	7.51	(0.00)	2.884
6	Bleams WB	582.71	1823.41	0.320	0.00	0.70	0.50	7.56	(0.00)	3.052

A3 - 90% - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90%		Yes		(D1)		100.000	90.000	Opening Day - ROW

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Trussler	1,2,3	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Trussler SB	
2	Trussler NB	
3	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Trussler SB	0.00	99999.00		0.00
Trussler NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00	
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Trussler SB	None
Trussler NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Trussler SB		((calculated))	((calculated))	0.723	2436.345
Trussler NB		((calculated))	((calculated))	0.723	2436.345
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Trussler SB	ONE HOUR	Yes	1550.00	100.000	N/A
Trussler NB	ONE HOUR	Yes	775.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	760.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Trussler SB	1166.92	1166.92	N/A	N/A
1	Trussler NB	583.46	583.46	N/A	N/A
1	Bleams WB	572.17	572.17	N/A	N/A
2	Trussler SB	1393.42	1393.42	N/A	N/A
2	Trussler NB	696.71	696.71	N/A	N/A
2	Bleams WB	683.22	683.22	N/A	N/A
3	Trussler SB	1706.58	1706.58	N/A	N/A
3	Trussler NB	853.29	853.29	N/A	N/A
3	Bleams WB	836.78	836.78	N/A	N/A
4	Trussler SB	1706.58	1706.58	N/A	N/A
4	Trussler NB	853.29	853.29	N/A	N/A
4	Bleams WB	836.78	836.78	N/A	N/A

5	Trussler SB	1393.42	1393.42	N/A	N/A
5	Trussler NB	696.71	696.71	N/A	N/A
5	Bleams WB	683.22	683.22	N/A	N/A
6	Trussler SB	1166.92	1166.92	N/A	N/A
6	Trussler NB	583.46	583.46	N/A	N/A
6	Bleams WB	572.17	572.17	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.000	757.000	793.000
	2	705.000	0.000	70.000
	3	719.000	41.000	0.000

Turning Proportions (PCE) - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	0.00	0.49	0.51
	2	0.91	0.00	0.09
	3	0.95	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	1.050	1.050	1.050
	2	1.050	1.050	1.050
	3	1.050	1.050	1.050

Truck Percentages - Bleams & Trussler (for whole period)

		To		
		1	2	3
From	1	5.000	5.000	5.000
	2	5.000	5.000	5.000
	3	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Trussler SB	0.79	8.26	3.84	A	1422.31	2133.46	203.11	5.71	2.26	203.13	5.71	0.723	2436.345
Trussler NB	0.53	4.90	1.15	A	711.15	1066.73	70.28	3.95	0.78	70.29	3.95	0.723	2436.345
Bleams WB	0.50	4.44	1.03	A	697.39	1046.08	64.06	3.67	0.71	64.07	3.67	0.723	2436.345
						4246.27	337.45	4.7682					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1166.92	291.73	1162.09	1068.47	30.77	0.00	2172.69	2146.46	0.537	0.00	1.21
Trussler NB	583.46	145.87	581.47	598.32	594.54	0.00	1805.87	1478.19	0.323	0.00	0.50
Bleams WB	572.17	143.04	570.29	647.06	528.95	0.00	1848.55	1317.79	0.310	0.00	0.47

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1393.42	348.35	1390.81	1278.72	36.82	0.00	2168.75	2146.45	0.643	1.21	1.86
Trussler NB	696.71	174.18	695.89	716.07	711.56	0.00	1729.73	1478.19	0.403	0.50	0.70
Bleams WB	683.22	170.81	682.50	774.41	633.04	0.00	1780.82	1317.79	0.384	0.47	0.65

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1706.58	426.65	1698.95	1564.84	45.06	0.00	2163.39	2146.45	0.789	1.86	3.77
Trussler NB	853.29	213.32	851.52	874.81	869.21	0.00	1627.16	1478.19	0.524	0.70	1.14
Bleams WB	836.78	209.19	835.29	946.12	774.61	0.00	1688.70	1317.79	0.496	0.65	1.02

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1706.58	426.65	1706.28	1567.80	45.14	0.00	2163.34	2146.45	0.789	3.77	3.84
Trussler NB	853.29	213.32	853.25	878.47	872.96	0.00	1624.72	1478.19	0.525	1.14	1.15
Bleams WB	836.78	209.19	836.75	950.03	776.19	0.00	1687.68	1317.79	0.496	1.02	1.03

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1393.42	348.35	1401.12	1283.14	36.94	0.00	2168.68	2146.45	0.643	3.84	1.92
Trussler NB	696.71	174.18	698.46	721.23	716.83	0.00	1726.30	1478.19	0.404	1.15	0.72
Bleams WB	683.22	170.81	684.70	779.92	635.38	0.00	1779.30	1317.79	0.384	1.03	0.66

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Trussler SB	1166.92	291.73	1169.67	1073.53	30.91	0.00	2172.60	2146.46	0.537	1.92	1.23
Trussler NB	583.46	145.87	584.30	602.16	598.42	0.00	1803.35	1478.19	0.324	0.72	0.50
Bleams WB	572.17	143.04	572.91	651.19	531.53	0.00	1846.87	1317.79	0.310	0.66	0.47

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	17.54	1.17	3.722	A	A
Trussler NB	7.32	0.49	3.081	A	A
Bleams WB	6.89	0.46	2.953	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	26.95	1.80	4.842	A	A
Trussler NB	10.35	0.69	3.652	A	A
Bleams WB	9.57	0.64	3.440	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	52.49	3.50	8.007	A	A
Trussler NB	16.67	1.11	4.863	A	A
Bleams WB	14.92	0.99	4.422	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	57.19	3.81	8.256	A	A
Trussler NB	17.26	1.15	4.899	A	A
Bleams WB	15.38	1.03	4.441	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	30.00	2.00	4.974	A	A
Trussler NB	10.98	0.73	3.682	A	A
Bleams WB	10.09	0.67	3.457	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Trussler SB	18.95	1.26	3.781	A	A
Trussler NB	7.70	0.51	3.104	A	A
Bleams WB	7.22	0.48	2.970	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.86	0.00	0.00	3.15	6.30			N/A	N/A
Trussler NB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.77	0.00	0.00	0.00	7.35			N/A	N/A
Trussler NB	1.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.02	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	3.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Trussler NB	1.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.03	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.92	0.00	0.00	4.20	6.30			N/A	N/A
Trussler NB	0.72	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.66	0.00	0.00	0.00	>199			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Trussler SB	1.23	0.00	0.00	2.10	3.15			N/A	N/A
Trussler NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.47	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Trussler SB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Trussler NB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Trussler SB	1166.92	2172.69	0.537	0.00	0.00	1.21	17.54	(0.00)	3.722
1	Trussler NB	583.46	1805.87	0.323	0.00	0.00	0.50	7.32	(0.00)	3.081
1	Bleams WB	572.17	1848.55	0.310	0.00	0.00	0.47	6.89	(0.00)	2.953
2	Trussler SB	1393.42	2168.75	0.643	0.00	1.21	1.86	26.95	(0.00)	4.842
2	Trussler NB	696.71	1729.73	0.403	0.00	0.50	0.70	10.35	(0.00)	3.652
2	Bleams WB	683.22	1780.82	0.384	0.00	0.47	0.65	9.57	(0.00)	3.440
3	Trussler SB	1706.58	2163.39	0.789	0.00	1.86	3.77	52.49	(0.00)	8.007
3	Trussler NB	853.29	1627.16	0.524	0.00	0.70	1.14	16.67	(0.00)	4.863
3	Bleams WB	836.78	1688.70	0.496	0.00	0.65	1.02	14.92	(0.00)	4.422
4	Trussler SB	1706.58	2163.34	0.789	0.00	3.77	3.84	57.19	(0.00)	8.256
4	Trussler NB	853.29	1624.72	0.525	0.00	1.14	1.15	17.26	(0.00)	4.899
4	Bleams WB	836.78	1687.68	0.496	0.00	1.02	1.03	15.38	(0.00)	4.441
5	Trussler SB	1393.42	2168.68	0.643	0.00	3.84	1.92	30.00	(0.00)	4.974
5	Trussler NB	696.71	1726.30	0.404	0.00	1.15	0.72	10.98	(0.00)	3.682
5	Bleams WB	683.22	1779.30	0.384	0.00	1.03	0.66	10.09	(0.00)	3.457
6	Trussler SB	1166.92	2172.60	0.537	0.00	1.92	1.23	18.95	(0.00)	3.781
6	Trussler NB	583.46	1803.35	0.324	0.00	0.72	0.50	7.70	(0.00)	3.104
6	Bleams WB	572.17	1846.87	0.310	0.00	0.66	0.47	7.22	(0.00)	2.970

Bleams Road & Isaiah Drive

Version: 7.1.1.245 [9th June 2011]
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File: C:_Work\47727-100\Arcady\Bleams & Isaiah.arc7
Report generation date: 11/2/2021 9:52:06 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - Single Lane - 2031							
Isaiah SB	0.31	5.81	0.23	A	0.20	6.25	0.16	A
Bleams EB	1.56	8.10	0.60	A	3.43	14.65	0.77	B
Isaiah NB	0.70	7.42	0.40	A	0.42	6.29	0.29	A
Bleams WB	1.78	8.43	0.63	A	7.41	26.65	0.89	D
	90% - Single Lane - 2031							
Isaiah SB	0.33	6.23	0.24	A	0.21	6.64	0.17	A
Bleams EB	1.79	9.32	0.63	A	4.36	18.82	0.81	C
Isaiah NB	0.77	8.13	0.42	A	0.45	6.79	0.30	A
Bleams WB	2.07	9.84	0.67	A	11.64	42.19	0.94	E
	95% - Dual E-W Single N-S - 2031							
Isaiah SB	0.37	6.93	0.26	A	0.24	7.50	0.19	A
Bleams EB	0.50	2.59	0.32	A	0.73	3.05	0.41	A
Isaiah NB	0.88	9.36	0.46	A	0.51	7.63	0.33	A
Bleams WB	0.55	2.60	0.35	A	0.98	3.33	0.48	A
	90% - Dual E-W Single N-S - 2031							
Isaiah SB	0.39	7.46	0.27	A	0.26	8.02	0.20	A
Bleams EB	0.54	2.81	0.34	A	0.80	3.35	0.43	A
Isaiah NB	0.98	10.36	0.48	B	0.55	8.28	0.34	A
Bleams WB	0.60	2.82	0.37	A	1.09	3.71	0.51	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.
2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

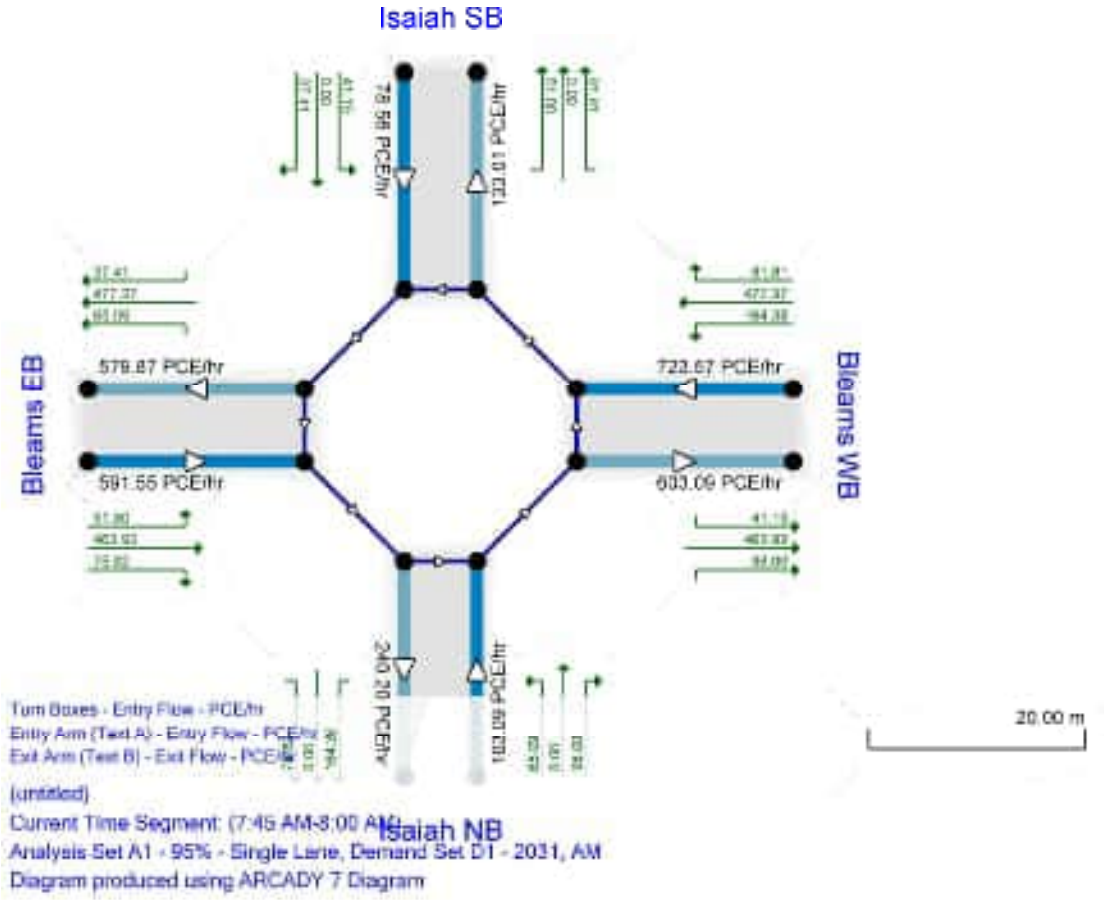
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin



The intersection diagram reflects the last run of ARCADY.

A1 - 95% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.23	5.81	0.31	A	159.67	239.50	20.35	5.10	0.23	20.35	5.10	0.579	1357.445
Bleams EB	0.60	8.10	1.56	A	583.60	875.41	95.36	6.54	1.06	95.37	6.54	0.579	1357.445
Isaiah NB	0.40	7.42	0.70	A	285.38	428.07	43.81	6.14	0.49	43.82	6.14	0.579	1357.445
Bleams WB	0.63	8.43	1.78	A	641.41	962.12	107.89	6.73	1.20	107.90	6.73	0.579	1357.445
						2505.1	267.41	6.405					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.36	59.13	553.14	0.00	985.44	601.56	0.133	0.00	0.16
Bleams EB	478.81	119.70	476.07	531.47	152.03	0.00	1205.98	978.77	0.397	0.00	0.68
Isaiah NB	234.14	58.53	232.85	86.83	541.28	0.00	991.97	544.92	0.236	0.00	0.32
Bleams WB	526.24	131.56	523.18	685.03	89.09	0.00	1240.59	1177.16	0.424	0.00	0.77

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.21	70.88	663.04	0.00	925.02	601.56	0.169	0.16	0.21
Bleams EB	571.75	142.94	570.65	637.05	182.20	0.00	1189.39	978.77	0.481	0.68	0.96
Isaiah NB	279.58	69.90	279.09	104.08	648.78	0.00	932.86	544.92	0.300	0.32	0.45
Bleams WB	628.39	157.10	627.13	821.08	106.79	0.00	1230.86	1177.16	0.511	0.77	1.08

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.20	86.68	810.85	0.00	843.75	601.56	0.227	0.21	0.31
Bleams EB	700.25	175.06	697.92	779.11	222.94	0.00	1167.00	978.77	0.600	0.96	1.54
Isaiah NB	342.42	85.60	341.42	127.28	793.58	0.00	853.24	544.92	0.401	0.45	0.69
Bleams WB	769.61	192.40	766.89	1004.37	130.63	0.00	1217.75	1177.16	0.632	1.08	1.76

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.97	813.57	0.00	842.26	601.56	0.227	0.31	0.31
Bleams EB	700.25	175.06	700.18	781.65	223.49	0.00	1166.69	978.77	0.600	1.54	1.56
Isaiah NB	342.42	85.60	342.39	127.70	795.97	0.00	851.93	544.92	0.402	0.69	0.70
Bleams WB	769.61	192.40	769.53	1007.35	131.01	0.00	1217.54	1177.16	0.632	1.76	1.78

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.79	71.32	667.11	0.00	922.78	601.56	0.170	0.31	0.22
Bleams EB	571.75	142.94	574.05	640.85	183.05	0.00	1188.93	978.77	0.481	1.56	0.99
Isaiah NB	279.58	69.90	280.57	104.72	652.38	0.00	930.88	544.92	0.300	0.70	0.45
Bleams WB	628.39	157.10	631.07	825.58	107.36	0.00	1230.54	1177.16	0.511	1.78	1.11

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.21	59.62	557.73	0.00	982.92	601.56	0.133	0.22	0.16
Bleams EB	478.81	119.70	479.96	535.81	153.13	0.00	1205.38	978.77	0.397	0.99	0.70
Isaiah NB	234.14	58.53	234.65	87.55	545.54	0.00	989.62	544.92	0.237	0.45	0.33
Bleams WB	526.24	131.56	527.56	690.40	89.79	0.00	1240.21	1177.16	0.424	1.11	0.78

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.34	0.16	4.418	A	A
Bleams EB	9.93	0.66	5.161	A	A
Isaiah NB	4.70	0.31	4.971	A	A
Bleams WB	11.08	0.74	5.247	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.13	0.21	4.915	A	A
Bleams EB	13.98	0.93	6.097	A	A
Isaiah NB	6.53	0.44	5.778	A	A
Bleams WB	15.71	1.05	6.248	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.49	0.30	5.790	A	A
Bleams EB	22.10	1.47	8.017	A	A
Isaiah NB	10.08	0.67	7.369	A	A
Bleams WB	25.14	1.68	8.332	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.61	0.31	5.808	A	A
Bleams EB	23.28	1.55	8.100	A	A
Isaiah NB	10.47	0.70	7.417	A	A
Bleams WB	26.60	1.77	8.433	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.30	0.22	4.936	A	A
Bleams EB	15.31	1.02	6.172	A	A
Isaiah NB	7.01	0.47	5.822	A	A
Bleams WB	17.31	1.15	6.332	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.48	0.17	4.440	A	A
Bleams EB	10.76	0.72	5.220	A	A
Isaiah NB	5.02	0.33	5.009	A	A
Bleams WB	12.05	0.80	5.315	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.68	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.77	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.96	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.08	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.69	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.76	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.70	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.78	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.99	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.11	0.00	0.00	1.05	2.10			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.70	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.78	0.00	0.00	1.05	1.05			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	985.44	0.133	0.00	0.00	0.16	2.34	(0.00)	4.418
1	Bleams EB	478.81	1205.98	0.397	0.00	0.00	0.68	9.93	(0.00)	5.161
1	Isaiah NB	234.14	991.97	0.236	0.00	0.00	0.32	4.70	(0.00)	4.971
1	Bleams WB	526.24	1240.59	0.424	0.00	0.00	0.77	11.08	(0.00)	5.247
2	Isaiah SB	156.42	925.02	0.169	0.00	0.16	0.21	3.13	(0.00)	4.915
2	Bleams EB	571.75	1189.39	0.481	0.00	0.68	0.96	13.98	(0.00)	6.097
2	Isaiah NB	279.58	932.86	0.300	0.00	0.32	0.45	6.53	(0.00)	5.778
2	Bleams WB	628.39	1230.86	0.511	0.00	0.77	1.08	15.71	(0.00)	6.248
3	Isaiah SB	191.58	843.75	0.227	0.00	0.21	0.31	4.49	(0.00)	5.790
3	Bleams EB	700.25	1167.00	0.600	0.00	0.96	1.54	22.10	(0.00)	8.017
3	Isaiah NB	342.42	853.24	0.401	0.00	0.45	0.69	10.08	(0.00)	7.369
3	Bleams WB	769.61	1217.75	0.632	0.00	1.08	1.76	25.14	(0.00)	8.332
4	Isaiah SB	191.58	842.26	0.227	0.00	0.31	0.31	4.61	(0.00)	5.808
4	Bleams EB	700.25	1166.69	0.600	0.00	1.54	1.56	23.28	(0.00)	8.100
4	Isaiah NB	342.42	851.93	0.402	0.00	0.69	0.70	10.47	(0.00)	7.417
4	Bleams WB	769.61	1217.54	0.632	0.00	1.76	1.78	26.60	(0.00)	8.433
5	Isaiah SB	156.42	922.78	0.170	0.00	0.31	0.22	3.30	(0.00)	4.936
5	Bleams EB	571.75	1188.93	0.481	0.00	1.56	0.99	15.31	(0.00)	6.172
5	Isaiah NB	279.58	930.88	0.300	0.00	0.70	0.45	7.01	(0.00)	5.822
5	Bleams WB	628.39	1230.54	0.511	0.00	1.78	1.11	17.31	(0.00)	6.332
6	Isaiah SB	131.00	982.92	0.133	0.00	0.22	0.16	2.48	(0.00)	4.440
6	Bleams EB	478.81	1205.38	0.397	0.00	0.99	0.70	10.76	(0.00)	5.220
6	Isaiah NB	234.14	989.62	0.237	0.00	0.45	0.33	5.02	(0.00)	5.009
6	Bleams WB	526.24	1240.21	0.424	0.00	1.11	0.78	12.05	(0.00)	5.315

A1 - 95% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Single Lane		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.16	6.25	0.20	A	96.35	144.52	12.99	5.39	0.14	12.99	5.39	0.579	1357.445
Bleams EB	0.77	14.65	3.43	B	723.08	1084.62	178.55	9.88	1.98	178.58	9.88	0.579	1357.445
Isaiah NB	0.29	6.29	0.42	A	200.04	300.06	27.11	5.42	0.30	27.11	5.42	0.579	1357.445
Bleams WB	0.89	26.65	7.41	D	884.58	1326.87	320.28	14.48	3.56	320.34	14.49	0.579	1357.445
						2856.07	538.93	11.3218					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.65	132.96	703.55	0.00	902.75	611.03	0.088	0.00	0.10
Bleams EB	593.25	148.31	589.04	577.49	204.71	0.00	1177.02	976.09	0.504	0.00	1.05
Isaiah NB	164.12	41.03	163.29	239.02	554.74	0.00	984.57	645.71	0.167	0.00	0.21
Bleams WB	725.75	181.44	719.77	601.28	116.74	0.00	1225.38	1100.90	0.592	0.00	1.49

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.26	159.35	843.05	0.00	826.04	611.03	0.114	0.10	0.13
Bleams EB	708.40	177.10	706.09	692.00	245.31	0.00	1154.70	976.09	0.613	1.05	1.63
Isaiah NB	195.98	48.99	195.69	286.44	664.96	0.00	923.96	645.71	0.212	0.21	0.28
Bleams WB	866.62	216.65	862.48	720.73	139.92	0.00	1212.64	1100.90	0.715	1.49	2.53

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.36	193.47	1021.84	0.00	727.75	611.03	0.159	0.13	0.20
Bleams EB	867.60	216.90	860.88	839.52	297.68	0.00	1125.90	976.08	0.771	1.63	3.31
Isaiah NB	240.02	60.01	239.49	347.59	810.96	0.00	843.69	645.71	0.284	0.28	0.41
Bleams WB	1061.38	265.35	1044.34	879.49	170.96	0.00	1195.58	1100.90	0.888	2.53	6.79

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.66	1034.96	0.00	720.53	611.03	0.160	0.20	0.20
Bleams EB	867.60	216.90	867.13	849.44	301.11	0.00	1124.02	976.08	0.772	3.31	3.43
Isaiah NB	240.02	60.01	240.01	351.70	816.54	0.00	840.62	645.71	0.286	0.41	0.42
Bleams WB	1061.38	265.35	1058.91	884.84	171.71	0.00	1195.16	1100.90	0.888	6.79	7.41

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.64	162.73	863.60	0.00	814.75	611.03	0.116	0.20	0.14
Bleams EB	708.40	177.10	715.24	707.55	250.69	0.00	1151.74	976.09	0.615	3.43	1.72
Isaiah NB	195.98	48.99	196.50	292.79	673.14	0.00	919.47	645.71	0.213	0.42	0.29
Bleams WB	866.62	216.65	885.28	728.59	141.05	0.00	1212.02	1100.90	0.715	7.41	2.74

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.20	134.77	713.51	0.00	897.27	611.03	0.088	0.14	0.10
Bleams EB	593.25	148.31	595.78	585.27	207.44	0.00	1175.52	976.09	0.505	1.72	1.08
Isaiah NB	164.12	41.03	164.42	242.32	560.90	0.00	981.18	645.71	0.167	0.29	0.21
Bleams WB	725.75	181.44	730.50	607.53	117.79	0.00	1224.81	1100.90	0.593	2.74	1.56

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.47	0.10	4.585	A	A
Bleams EB	15.08	1.01	6.385	A	A
Isaiah NB	3.05	0.20	4.597	A	A
Bleams WB	21.17	1.41	7.393	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.98	0.13	5.165	A	A
Bleams EB	23.33	1.56	8.381	A	A
Isaiah NB	4.13	0.28	5.187	A	A
Bleams WB	35.49	2.37	10.665	B	B

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.88	0.19	6.169	A	A
Bleams EB	45.17	3.01	13.913	B	B
Isaiah NB	6.05	0.40	6.251	A	A
Bleams WB	85.04	5.67	22.764	C	C

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.98	0.20	6.248	A	A
Bleams EB	50.74	3.38	14.645	B	B
Isaiah NB	6.24	0.42	6.292	A	A
Bleams WB	107.29	7.15	26.648	D	C

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.12	0.14	5.252	A	A
Bleams EB	27.34	1.82	8.790	A	A
Isaiah NB	4.40	0.29	5.231	A	A
Bleams WB	46.72	3.11	12.174	B	B

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.56	0.10	4.621	A	A
Bleams EB	16.90	1.13	6.550	A	A
Isaiah NB	3.24	0.22	4.629	A	A
Bleams WB	24.56	1.64	7.718	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.05	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.63	0.00	0.00	3.15	5.25			N/A	N/A
Isaiah NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.53	0.00	0.00	5.25	8.40			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	3.31	0.00	0.00	2.10	9.45			N/A	N/A
Isaiah NB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	6.79	0.00	0.00	14.70	26.25			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	3.43	0.00	0.00	0.00	4.20			N/A	N/A
Isaiah NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	7.41	0.00	0.00	9.45	26.25			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.72	0.00	0.00	3.15	5.25			N/A	N/A
Isaiah NB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.74	0.00	0.00	5.25	9.45			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.08	0.00	0.00	1.05	3.15			N/A	N/A
Isaiah NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.56	0.00	0.00	1.05	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	902.75	0.088	0.00	0.00	0.10	1.47	(0.00)	4.585
1	Bleams EB	593.25	1177.02	0.504	0.00	0.00	1.05	15.08	(0.00)	6.385
1	Isaiah NB	164.12	984.57	0.167	0.00	0.00	0.21	3.05	(0.00)	4.597
1	Bleams WB	725.75	1225.38	0.592	0.00	0.00	1.49	21.17	(0.00)	7.393
2	Isaiah SB	94.39	826.04	0.114	0.00	0.10	0.13	1.98	(0.00)	5.165
2	Bleams EB	708.40	1154.70	0.613	0.00	1.05	1.63	23.33	(0.00)	8.381
2	Isaiah NB	195.98	923.96	0.212	0.00	0.21	0.28	4.13	(0.00)	5.187
2	Bleams WB	866.62	1212.64	0.715	0.00	1.49	2.53	35.49	(0.00)	10.665
3	Isaiah SB	115.61	727.75	0.159	0.00	0.13	0.20	2.88	(0.00)	6.169
3	Bleams EB	867.60	1125.90	0.771	0.00	1.63	3.31	45.17	(0.00)	13.913
3	Isaiah NB	240.02	843.69	0.284	0.00	0.28	0.41	6.05	(0.00)	6.251
3	Bleams WB	1061.38	1195.58	0.888	0.00	2.53	6.79	85.04	(0.00)	22.764
4	Isaiah SB	115.61	720.53	0.160	0.00	0.20	0.20	2.98	(0.00)	6.248
4	Bleams EB	867.60	1124.02	0.772	0.00	3.31	3.43	50.74	(0.00)	14.645
4	Isaiah NB	240.02	840.62	0.286	0.00	0.41	0.42	6.24	(0.00)	6.292
4	Bleams WB	1061.38	1195.16	0.888	0.00	6.79	7.41	107.29	(0.00)	26.648
5	Isaiah SB	94.39	814.75	0.116	0.00	0.20	0.14	2.12	(0.00)	5.252
5	Bleams EB	708.40	1151.74	0.615	0.00	3.43	1.72	27.34	(0.00)	8.790
5	Isaiah NB	195.98	919.47	0.213	0.00	0.42	0.29	4.40	(0.00)	5.231
5	Bleams WB	866.62	1212.02	0.715	0.00	7.41	2.74	46.72	(0.00)	12.174
6	Isaiah SB	79.05	897.27	0.088	0.00	0.14	0.10	1.56	(0.00)	4.621
6	Bleams EB	593.25	1175.52	0.505	0.00	1.72	1.08	16.90	(0.00)	6.550
6	Isaiah NB	164.12	981.18	0.167	0.00	0.29	0.21	3.24	(0.00)	4.629
6	Bleams WB	725.75	1224.81	0.593	0.00	2.74	1.56	24.56	(0.00)	7.718

A2 - 90% - Single Lane - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.24	6.23	0.33	A	159.67	239.50	21.74	5.45	0.24	21.74	5.45	0.579	1357.445
Bleams EB	0.63	9.32	1.79	A	583.60	875.41	107.13	7.34	1.19	107.14	7.34	0.579	1357.445
Isaiah NB	0.42	8.13	0.77	A	285.38	428.07	47.54	6.66	0.53	47.55	6.66	0.579	1357.445
Bleams WB	0.67	9.84	2.07	A	641.41	962.12	122.26	7.62	1.36	122.28	7.63	0.579	1357.445
						2505.1	298.67	7.153					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.32	59.10	552.84	0.00	933.74	599.47	0.140	0.00	0.17
Bleams EB	478.81	119.70	475.82	531.19	151.96	0.00	1142.54	931.51	0.419	0.00	0.75
Isaiah NB	234.14	58.53	232.75	86.78	541.01	0.00	939.90	540.13	0.249	0.00	0.35
Bleams WB	526.24	131.56	522.88	684.70	89.06	0.00	1175.31	1116.74	0.448	0.00	0.84

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.20	70.86	662.83	0.00	876.44	599.47	0.178	0.17	0.23
Bleams EB	571.75	142.94	570.49	636.86	182.17	0.00	1126.81	931.51	0.507	0.75	1.07
Isaiah NB	279.58	69.90	279.04	104.04	648.61	0.00	883.85	540.13	0.316	0.35	0.48
Bleams WB	628.39	157.10	626.92	820.89	106.77	0.00	1166.09	1116.74	0.539	0.84	1.21

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.17	86.61	810.25	0.00	799.65	599.47	0.240	0.23	0.33
Bleams EB	700.25	175.06	697.45	778.58	222.85	0.00	1105.62	931.51	0.633	1.07	1.77
Isaiah NB	342.42	85.60	341.30	127.18	793.11	0.00	808.58	540.13	0.423	0.48	0.76
Bleams WB	769.61	192.40	766.28	1003.84	130.58	0.00	1153.68	1116.74	0.667	1.21	2.04

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.97	813.53	0.00	797.95	599.47	0.240	0.33	0.33
Bleams EB	700.25	175.06	700.15	781.61	223.49	0.00	1105.29	931.51	0.634	1.77	1.79
Isaiah NB	342.42	85.60	342.39	127.70	795.94	0.00	807.11	540.13	0.424	0.76	0.77
Bleams WB	769.61	192.40	769.49	1007.32	131.01	0.00	1153.46	1116.74	0.667	2.04	2.07

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.82	71.38	667.71	0.00	873.90	599.47	0.179	0.33	0.23
Bleams EB	571.75	142.94	574.52	641.39	183.14	0.00	1126.30	931.51	0.508	1.79	1.10
Isaiah NB	279.58	69.90	280.68	104.81	652.85	0.00	881.64	540.13	0.317	0.77	0.49
Bleams WB	628.39	157.10	631.68	826.11	107.41	0.00	1165.75	1116.74	0.539	2.07	1.25

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.23	59.65	557.95	0.00	931.07	599.47	0.141	0.23	0.17
Bleams EB	478.81	119.70	480.14	536.01	153.17	0.00	1141.92	931.51	0.419	1.10	0.77
Isaiah NB	234.14	58.53	234.70	87.58	545.73	0.00	937.44	540.13	0.250	0.49	0.35
Bleams WB	526.24	131.56	527.79	690.62	89.81	0.00	1174.92	1116.74	0.448	1.25	0.86

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.49	0.17	4.701	A	A
Bleams EB	10.83	0.72	5.645	A	A
Isaiah NB	5.03	0.34	5.336	A	A
Bleams WB	12.14	0.81	5.767	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.33	0.22	5.247	A	A
Bleams EB	15.47	1.03	6.779	A	A
Isaiah NB	7.04	0.47	6.245	A	A
Bleams WB	17.49	1.17	6.990	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.80	0.32	6.208	A	A
Bleams EB	25.13	1.68	9.196	A	A
Isaiah NB	10.99	0.73	8.070	A	A
Bleams WB	28.88	1.93	9.672	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.94	0.33	6.233	A	A
Bleams EB	26.71	1.78	9.324	A	A
Isaiah NB	11.47	0.76	8.132	A	A
Bleams WB	30.89	2.06	9.835	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.53	0.24	5.273	A	A
Bleams EB	17.15	1.14	6.883	A	A
Isaiah NB	7.61	0.51	6.300	A	A
Bleams WB	19.54	1.30	7.119	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.64	0.18	4.726	A	A
Bleams EB	11.83	0.79	5.725	A	A
Isaiah NB	5.41	0.36	5.382	A	A
Bleams WB	13.33	0.89	5.854	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.75	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.07	0.00	0.00	1.05	2.10			N/A	N/A
Isaiah NB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.21	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.77	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.76	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.04	0.00	0.00	0.00	2.10			N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.79	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.77	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.10	0.00	0.00	1.05	2.10			N/A	N/A
Isaiah NB	0.49	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.25	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.77	0.00	0.00	1.05	1.05			N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.86	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	933.74	0.140	0.00	0.00	0.17	2.49	(0.00)	4.701
1	Bleams EB	478.81	1142.54	0.419	0.00	0.00	0.75	10.83	(0.00)	5.645
1	Isaiah NB	234.14	939.90	0.249	0.00	0.00	0.35	5.03	(0.00)	5.336
1	Bleams WB	526.24	1175.31	0.448	0.00	0.00	0.84	12.14	(0.00)	5.767
2	Isaiah SB	156.42	876.44	0.178	0.00	0.17	0.23	3.33	(0.00)	5.247
2	Bleams EB	571.75	1126.81	0.507	0.00	0.75	1.07	15.47	(0.00)	6.779
2	Isaiah NB	279.58	883.85	0.316	0.00	0.35	0.48	7.04	(0.00)	6.245
2	Bleams WB	628.39	1166.09	0.539	0.00	0.84	1.21	17.49	(0.00)	6.990
3	Isaiah SB	191.58	799.65	0.240	0.00	0.23	0.33	4.80	(0.00)	6.208
3	Bleams EB	700.25	1105.62	0.633	0.00	1.07	1.77	25.13	(0.00)	9.196
3	Isaiah NB	342.42	808.58	0.423	0.00	0.48	0.76	10.99	(0.00)	8.070
3	Bleams WB	769.61	1153.68	0.667	0.00	1.21	2.04	28.88	(0.00)	9.672
4	Isaiah SB	191.58	797.95	0.240	0.00	0.33	0.33	4.94	(0.00)	6.233
4	Bleams EB	700.25	1105.29	0.634	0.00	1.77	1.79	26.71	(0.00)	9.324
4	Isaiah NB	342.42	807.11	0.424	0.00	0.76	0.77	11.47	(0.00)	8.132
4	Bleams WB	769.61	1153.46	0.667	0.00	2.04	2.07	30.89	(0.00)	9.835
5	Isaiah SB	156.42	873.90	0.179	0.00	0.33	0.23	3.53	(0.00)	5.273
5	Bleams EB	571.75	1126.30	0.508	0.00	1.79	1.10	17.15	(0.00)	6.883
5	Isaiah NB	279.58	881.64	0.317	0.00	0.77	0.49	7.61	(0.00)	6.300
5	Bleams WB	628.39	1165.75	0.539	0.00	2.07	1.25	19.54	(0.00)	7.119
6	Isaiah SB	131.00	931.07	0.141	0.00	0.23	0.17	2.64	(0.00)	4.726
6	Bleams EB	478.81	1141.92	0.419	0.00	1.10	0.77	11.83	(0.00)	5.725
6	Isaiah NB	234.14	937.44	0.250	0.00	0.49	0.35	5.41	(0.00)	5.382
6	Bleams WB	526.24	1174.92	0.448	0.00	1.25	0.86	13.33	(0.00)	5.854

A2 - 90% - Single Lane - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Single Lane		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00	
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.579	1357.445
Isaiah NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.579	1357.445

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.17	6.64	0.21	A	96.35	144.52	13.81	5.73	0.15	13.81	5.73	0.579	1357.445
Bleams EB	0.81	18.82	4.36	C	723.08	1084.62	214.05	11.84	2.38	214.09	11.84	0.579	1357.445
Isaiah NB	0.30	6.79	0.45	A	200.04	300.06	29.09	5.82	0.32	29.09	5.82	0.579	1357.445
Bleams WB	0.94	42.19	11.64	E	884.58	1326.87	438.36	19.82	4.87	438.44	19.83	0.579	1357.445
						2856.07	695.31	14.607					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.62	132.82	702.77	0.00	855.64	606.15	0.092	0.00	0.11
Bleams EB	593.25	148.31	588.55	576.89	204.51	0.00	1115.18	932.35	0.532	0.00	1.17
Isaiah NB	164.12	41.03	163.23	238.76	554.30	0.00	932.97	632.92	0.176	0.00	0.22
Bleams WB	725.75	181.44	718.92	600.85	116.68	0.00	1160.92	1047.61	0.625	0.00	1.71

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.25	159.16	841.94	0.00	783.15	606.15	0.121	0.11	0.14
Bleams EB	708.40	177.10	705.59	691.16	245.02	0.00	1094.07	932.35	0.647	1.17	1.87
Isaiah NB	195.98	48.99	195.67	286.09	664.52	0.00	875.56	632.92	0.224	0.22	0.30
Bleams WB	866.62	216.65	861.23	720.32	139.87	0.00	1148.84	1047.61	0.754	1.71	3.05

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.35	192.10	1012.71	0.00	694.20	606.15	0.167	0.14	0.21
Bleams EB	867.60	216.90	858.55	832.72	295.34	0.00	1067.86	932.35	0.812	1.87	4.14
Isaiah NB	240.02	60.01	239.44	344.96	808.93	0.00	800.34	632.92	0.300	0.30	0.45
Bleams WB	1061.38	265.35	1034.08	877.64	170.74	0.00	1132.77	1047.61	0.937	3.05	9.88

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.59	195.11	1030.91	0.00	684.72	606.15	0.169	0.21	0.21
Bleams EB	867.60	216.90	866.72	846.43	300.07	0.00	1065.40	932.35	0.814	4.14	4.36
Isaiah NB	240.02	60.01	240.00	350.61	816.18	0.00	796.57	632.92	0.301	0.45	0.45
Bleams WB	1061.38	265.35	1054.34	884.51	171.67	0.00	1132.28	1047.61	0.937	9.88	11.64

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.65	164.55	876.19	0.00	765.31	606.15	0.123	0.21	0.15
Bleams EB	708.40	177.10	717.78	716.93	253.91	0.00	1089.44	932.35	0.650	4.36	2.01
Isaiah NB	195.98	48.99	196.55	296.34	675.36	0.00	869.92	632.92	0.225	0.45	0.31
Bleams WB	866.62	216.65	899.46	730.62	141.29	0.00	1148.11	1047.61	0.755	11.64	3.43

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.21	135.02	715.11	0.00	849.21	606.15	0.093	0.15	0.11
Bleams EB	593.25	148.31	596.42	586.47	207.85	0.00	1113.43	932.35	0.533	2.01	1.22
Isaiah NB	164.12	41.03	164.45	242.80	561.47	0.00	929.24	632.92	0.177	0.31	0.23
Bleams WB	725.75	181.44	732.28	608.06	117.85	0.00	1160.31	1047.61	0.625	3.43	1.80

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.55	0.10	4.863	A	A
Bleams EB	16.73	1.12	7.116	A	A
Isaiah NB	3.25	0.22	4.906	A	A
Bleams WB	23.98	1.60	8.427	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.10	0.14	5.485	A	A
Bleams EB	26.63	1.78	9.658	A	A
Isaiah NB	4.41	0.29	5.557	A	A
Bleams WB	42.20	2.81	12.898	B	B

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.05	0.20	6.527	A	A
Bleams EB	55.00	3.67	17.339	C	B
Isaiah NB	6.50	0.43	6.732	A	A
Bleams WB	115.15	7.68	31.843	D	C

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.16	0.21	6.641	A	A
Bleams EB	64.07	4.27	18.821	C	B
Isaiah NB	6.72	0.45	6.791	A	A
Bleams WB	163.14	10.88	42.187	E	D

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.28	0.15	5.639	A	A
Bleams EB	32.56	2.17	10.412	B	B
Isaiah NB	4.73	0.32	5.617	A	A
Bleams WB	65.31	4.35	16.938	C	B

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.66	0.11	4.909	A	A
Bleams EB	19.07	1.27	7.357	A	A
Isaiah NB	3.47	0.23	4.944	A	A
Bleams WB	28.59	1.91	8.960	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.71	0.00	1.05	2.10	2.10			N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.14	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.87	0.00	0.00	4.20	5.25			N/A	N/A
Isaiah NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.05	0.00	0.00	6.30	10.50			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.14	0.00	0.00	5.25	14.70			N/A	N/A
Isaiah NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	9.88	0.00	1.05	25.20	38.85			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	4.36	0.00	0.00	1.05	9.45			N/A	N/A
Isaiah NB	0.45	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	11.64	0.00	0.00	26.25	47.25			N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.01	0.00	0.00	4.20	6.30			N/A	N/A
Isaiah NB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.43	0.00	0.00	6.30	12.60			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.22	0.00	0.00	1.05	3.15			N/A	N/A
Isaiah NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.80	0.00	0.00	1.05	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Isaiah NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	855.64	0.092	0.00	0.00	0.11	1.55	(0.00)	4.863
1	Bleams EB	593.25	1115.18	0.532	0.00	0.00	1.17	16.73	(0.00)	7.116
1	Isaiah NB	164.12	932.97	0.176	0.00	0.00	0.22	3.25	(0.00)	4.906
1	Bleams WB	725.75	1160.92	0.625	0.00	0.00	1.71	23.98	(0.00)	8.427
2	Isaiah SB	94.39	783.15	0.121	0.00	0.11	0.14	2.10	(0.00)	5.485
2	Bleams EB	708.40	1094.07	0.647	0.00	1.17	1.87	26.63	(0.00)	9.658
2	Isaiah NB	195.98	875.56	0.224	0.00	0.22	0.30	4.41	(0.00)	5.557
2	Bleams WB	866.62	1148.84	0.754	0.00	1.71	3.05	42.20	(0.00)	12.898
3	Isaiah SB	115.61	694.20	0.167	0.00	0.14	0.21	3.05	(0.00)	6.527
3	Bleams EB	867.60	1067.86	0.812	0.00	1.87	4.14	55.00	(0.00)	17.339
3	Isaiah NB	240.02	800.34	0.300	0.00	0.30	0.45	6.50	(0.00)	6.732
3	Bleams WB	1061.38	1132.77	0.937	0.00	3.05	9.88	115.15	(0.00)	31.843
4	Isaiah SB	115.61	684.72	0.169	0.00	0.21	0.21	3.16	(0.00)	6.641
4	Bleams EB	867.60	1065.40	0.814	0.00	4.14	4.36	64.07	(0.00)	18.821
4	Isaiah NB	240.02	796.57	0.301	0.00	0.45	0.45	6.72	(0.00)	6.791
4	Bleams WB	1061.38	1132.28	0.937	0.00	9.88	11.64	163.14	(0.00)	42.187
5	Isaiah SB	94.39	765.31	0.123	0.00	0.21	0.15	2.28	(0.00)	5.639
5	Bleams EB	708.40	1089.44	0.650	0.00	4.36	2.01	32.56	(0.00)	10.412
5	Isaiah NB	195.98	869.92	0.225	0.00	0.45	0.31	4.73	(0.00)	5.617
5	Bleams WB	866.62	1148.11	0.755	0.00	11.64	3.43	65.31	(0.00)	16.938
6	Isaiah SB	79.05	849.21	0.093	0.00	0.15	0.11	1.66	(0.00)	4.909
6	Bleams EB	593.25	1113.43	0.533	0.00	2.01	1.22	19.07	(0.00)	7.357
6	Isaiah NB	164.12	929.24	0.177	0.00	0.31	0.23	3.47	(0.00)	4.944
6	Bleams WB	725.75	1160.31	0.625	0.00	3.43	1.80	28.59	(0.00)	8.960

A3 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.26	6.93	0.37	A	159.67	239.50	23.86	5.98	0.27	23.86	5.98	0.552	1225.224
Bleams EB	0.32	2.59	0.50	A	583.60	875.41	34.79	2.38	0.39	34.79	2.38	0.723	2436.345
Isaiah NB	0.46	9.36	0.88	A	285.38	428.07	53.42	7.49	0.59	53.43	7.49	0.552	1225.224
Bleams WB	0.35	2.60	0.55	A	641.41	962.12	38.35	2.39	0.43	38.35	2.39	0.723	2436.345
						2505.1	150.42	3.603					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.26	59.33	554.71	0.00	872.89	68.27	0.150	0.00	0.18
Bleams EB	478.81	119.70	477.66	532.81	152.16	0.00	2210.03	2110.39	0.217	0.00	0.29
Isaiah NB	234.14	58.53	232.63	87.12	542.69	0.00	879.19	98.52	0.266	0.00	0.38
Bleams WB	526.24	131.56	524.97	686.25	89.07	0.00	2253.35	2249.47	0.234	0.00	0.32

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.17	70.98	663.82	0.00	815.63	68.27	0.192	0.18	0.25
Bleams EB	571.75	142.94	571.43	637.72	182.27	0.00	2189.34	2110.39	0.261	0.29	0.37
Isaiah NB	279.58	69.90	278.96	104.22	649.48	0.00	823.15	98.52	0.340	0.38	0.53
Bleams WB	628.39	157.10	628.03	821.67	106.77	0.00	2241.20	2249.47	0.280	0.32	0.41

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.11	86.92	812.69	0.00	737.51	68.27	0.260	0.25	0.36
Bleams EB	700.25	175.06	699.72	780.69	223.10	0.00	2161.30	2110.39	0.324	0.37	0.50
Isaiah NB	342.42	85.60	341.06	127.62	795.20	0.00	746.69	98.52	0.459	0.53	0.87
Bleams WB	769.61	192.40	769.03	1005.70	130.57	0.00	2224.85	2249.47	0.346	0.41	0.55

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.98	813.64	0.00	737.01	68.27	0.260	0.36	0.37
Bleams EB	700.25	175.06	700.24	781.71	223.50	0.00	2161.03	2110.39	0.324	0.50	0.50
Isaiah NB	342.42	85.60	342.38	127.72	796.03	0.00	746.25	98.52	0.459	0.87	0.88
Bleams WB	769.61	192.40	769.61	1007.40	131.01	0.00	2224.55	2249.47	0.346	0.55	0.55

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.88	71.08	665.30	0.00	814.85	68.27	0.192	0.37	0.25
Bleams EB	571.75	142.94	572.27	639.29	182.89	0.00	2188.92	2110.39	0.261	0.50	0.37
Isaiah NB	279.58	69.90	280.92	104.38	650.78	0.00	822.47	98.52	0.340	0.88	0.55
Bleams WB	628.39	157.10	628.96	824.28	107.42	0.00	2240.75	2249.47	0.280	0.55	0.41

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.25	59.52	556.89	0.00	871.74	68.27	0.150	0.25	0.19
Bleams EB	478.81	119.70	479.14	535.09	153.06	0.00	2209.41	2110.39	0.217	0.37	0.29
Isaiah NB	234.14	58.53	234.78	87.39	544.80	0.00	878.08	98.52	0.267	0.55	0.39
Bleams WB	526.24	131.56	526.60	689.78	89.81	0.00	2252.85	2249.47	0.234	0.41	0.32

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.69	0.18	5.084	A	A
Bleams EB	4.28	0.29	2.181	A	A
Isaiah NB	5.48	0.37	5.834	A	A
Bleams WB	4.71	0.31	2.186	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.63	0.24	5.732	A	A
Bleams EB	5.49	0.37	2.336	A	A
Isaiah NB	7.79	0.52	6.939	A	A
Bleams WB	6.05	0.40	2.343	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.33	0.36	6.912	A	A
Bleams EB	7.42	0.49	2.586	A	A
Isaiah NB	12.56	0.84	9.287	A	A
Bleams WB	8.18	0.55	2.594	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.49	0.37	6.929	A	A
Bleams EB	7.53	0.50	2.587	A	A
Isaiah NB	13.18	0.88	9.357	A	A
Bleams WB	8.31	0.55	2.597	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.86	0.26	5.750	A	A
Bleams EB	5.66	0.38	2.338	A	A
Isaiah NB	8.49	0.57	6.996	A	A
Bleams WB	6.24	0.42	2.345	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.86	0.19	5.106	A	A
Bleams EB	4.42	0.29	2.184	A	A
Isaiah NB	5.92	0.39	5.883	A	A
Bleams WB	4.87	0.32	2.191	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.18	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.38	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.53	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.87	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.50	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.88	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.55	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	872.89	0.150	0.00	0.00	0.18	2.69	(0.00)	5.084
1	Bleams EB	478.81	2210.03	0.217	0.00	0.00	0.29	4.28	(0.00)	2.181
1	Isaiah NB	234.14	879.19	0.266	0.00	0.00	0.38	5.48	(0.00)	5.834
1	Bleams WB	526.24	2253.35	0.234	0.00	0.00	0.32	4.71	(0.00)	2.186
2	Isaiah SB	156.42	815.63	0.192	0.00	0.18	0.25	3.63	(0.00)	5.732
2	Bleams EB	571.75	2189.34	0.261	0.00	0.29	0.37	5.49	(0.00)	2.336
2	Isaiah NB	279.58	823.15	0.340	0.00	0.38	0.53	7.79	(0.00)	6.939
2	Bleams WB	628.39	2241.20	0.280	0.00	0.32	0.41	6.05	(0.00)	2.343
3	Isaiah SB	191.58	737.51	0.260	0.00	0.25	0.36	5.33	(0.00)	6.912
3	Bleams EB	700.25	2161.30	0.324	0.00	0.37	0.50	7.42	(0.00)	2.586
3	Isaiah NB	342.42	746.69	0.459	0.00	0.53	0.87	12.56	(0.00)	9.287
3	Bleams WB	769.61	2224.85	0.346	0.00	0.41	0.55	8.18	(0.00)	2.594
4	Isaiah SB	191.58	737.01	0.260	0.00	0.36	0.37	5.49	(0.00)	6.929
4	Bleams EB	700.25	2161.03	0.324	0.00	0.50	0.50	7.53	(0.00)	2.587
4	Isaiah NB	342.42	746.25	0.459	0.00	0.87	0.88	13.18	(0.00)	9.357
4	Bleams WB	769.61	2224.55	0.346	0.00	0.55	0.55	8.31	(0.00)	2.597
5	Isaiah SB	156.42	814.85	0.192	0.00	0.37	0.25	3.86	(0.00)	5.750
5	Bleams EB	571.75	2188.92	0.261	0.00	0.50	0.37	5.66	(0.00)	2.338
5	Isaiah NB	279.58	822.47	0.340	0.00	0.88	0.55	8.49	(0.00)	6.996
5	Bleams WB	628.39	2240.75	0.280	0.00	0.55	0.41	6.24	(0.00)	2.345
6	Isaiah SB	131.00	871.74	0.150	0.00	0.25	0.19	2.86	(0.00)	5.106
6	Bleams EB	478.81	2209.41	0.217	0.00	0.37	0.29	4.42	(0.00)	2.184
6	Isaiah NB	234.14	878.08	0.267	0.00	0.55	0.39	5.92	(0.00)	5.883
6	Bleams WB	526.24	2252.85	0.234	0.00	0.41	0.32	4.87	(0.00)	2.191

A3 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.19	7.50	0.24	A	96.35	144.52	15.31	6.36	0.17	15.31	6.36	0.552	1225.224
Bleams EB	0.41	3.05	0.73	A	723.08	1084.62	49.10	2.72	0.55	49.10	2.72	0.723	2436.345
Isaiah NB	0.33	7.63	0.51	A	200.04	300.06	32.18	6.43	0.36	32.18	6.43	0.552	1225.224
Bleams WB	0.48	3.33	0.98	A	884.58	1326.87	64.33	2.91	0.71	64.33	2.91	0.723	2436.345
						2856.07	160.92	3.3806					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.59	133.64	707.02	0.00	792.96	121.06	0.100	0.00	0.12
Bleams EB	593.25	148.31	591.68	580.02	205.58	0.00	2173.33	1938.47	0.273	0.00	0.39
Isaiah NB	164.12	41.03	163.15	240.25	557.00	0.00	871.68	243.87	0.188	0.00	0.24
Bleams WB	725.75	181.44	723.74	603.24	116.92	0.00	2234.23	2131.11	0.325	0.00	0.50

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.23	159.90	846.11	0.00	719.98	121.06	0.131	0.12	0.16
Bleams EB	708.40	177.10	707.91	694.25	246.08	0.00	2145.52	1938.47	0.330	0.39	0.52
Isaiah NB	195.98	48.99	195.62	287.46	666.53	0.00	814.21	243.87	0.241	0.24	0.33
Bleams WB	866.62	216.65	865.95	722.10	140.06	0.00	2218.34	2131.11	0.391	0.50	0.67

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.28	195.77	1035.80	0.00	620.43	121.06	0.186	0.16	0.24
Bleams EB	867.60	216.90	866.74	849.86	301.23	0.00	2107.64	1938.47	0.412	0.52	0.73
Isaiah NB	240.02	60.01	239.33	351.94	816.04	0.00	735.75	243.87	0.326	0.33	0.50
Bleams WB	1061.38	265.35	1060.16	883.96	171.41	0.00	2196.80	2131.11	0.483	0.67	0.97

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.98	1037.14	0.00	619.73	121.06	0.187	0.24	0.24
Bleams EB	867.60	216.90	867.60	851.07	301.67	0.00	2107.34	1938.47	0.412	0.73	0.73
Isaiah NB	240.02	60.01	240.01	352.32	816.95	0.00	735.28	243.87	0.326	0.50	0.51
Bleams WB	1061.38	265.35	1061.37	885.20	171.75	0.00	2196.57	2131.11	0.483	0.97	0.98

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.71	160.23	848.18	0.00	718.89	121.06	0.131	0.24	0.16
Bleams EB	708.40	177.10	709.25	696.13	246.76	0.00	2145.05	1938.47	0.330	0.73	0.52
Isaiah NB	195.98	48.99	196.66	288.06	667.95	0.00	813.46	243.87	0.241	0.51	0.34
Bleams WB	866.62	216.65	867.82	724.02	140.59	0.00	2217.97	2131.11	0.391	0.98	0.68

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.22	134.13	709.93	0.00	791.43	121.06	0.100	0.16	0.12
Bleams EB	593.25	148.31	593.74	582.63	206.52	0.00	2172.69	1938.47	0.273	0.52	0.40
Isaiah NB	164.12	41.03	164.48	241.13	559.14	0.00	870.56	243.87	0.189	0.34	0.25
Bleams WB	725.75	181.44	726.43	605.99	117.63	0.00	2233.74	2131.11	0.325	0.68	0.51

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.69	0.11	5.288	A	A
Bleams EB	5.79	0.39	2.388	A	A
Isaiah NB	3.52	0.23	5.329	A	A
Bleams WB	7.41	0.49	2.499	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.31	0.15	6.039	A	A
Bleams EB	7.63	0.51	2.629	A	A
Isaiah NB	4.84	0.32	6.108	A	A
Bleams WB	9.90	0.66	2.793	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.48	0.23	7.478	A	A
Bleams EB	10.77	0.72	3.045	A	A
Isaiah NB	7.31	0.49	7.603	A	A
Bleams WB	14.32	0.95	3.323	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.58	0.24	7.497	A	A
Bleams EB	10.98	0.73	3.048	A	A
Isaiah NB	7.56	0.50	7.631	A	A
Bleams WB	14.65	0.98	3.329	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.46	0.16	6.060	A	A
Bleams EB	7.92	0.53	2.635	A	A
Isaiah NB	5.18	0.35	6.134	A	A
Bleams WB	10.33	0.69	2.803	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.79	0.12	5.308	A	A
Bleams EB	6.01	0.40	2.396	A	A
Isaiah NB	3.76	0.25	5.355	A	A
Bleams WB	7.72	0.51	2.508	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.67	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.73	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.50	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.97	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.73	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.51	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.98	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.68	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.51	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

WB									

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	792.96	0.100	0.00	0.00	0.12	1.69	(0.00)	5.288
1	Bleams EB	593.25	2173.33	0.273	0.00	0.00	0.39	5.79	(0.00)	2.388
1	Isaiah NB	164.12	871.68	0.188	0.00	0.00	0.24	3.52	(0.00)	5.329
1	Bleams WB	725.75	2234.23	0.325	0.00	0.00	0.50	7.41	(0.00)	2.499
2	Isaiah SB	94.39	719.98	0.131	0.00	0.12	0.16	2.31	(0.00)	6.039
2	Bleams EB	708.40	2145.52	0.330	0.00	0.39	0.52	7.63	(0.00)	2.629
2	Isaiah NB	195.98	814.21	0.241	0.00	0.24	0.33	4.84	(0.00)	6.108
2	Bleams WB	866.62	2218.34	0.391	0.00	0.50	0.67	9.90	(0.00)	2.793
3	Isaiah SB	115.61	620.43	0.186	0.00	0.16	0.24	3.48	(0.00)	7.478
3	Bleams EB	867.60	2107.64	0.412	0.00	0.52	0.73	10.77	(0.00)	3.045
3	Isaiah NB	240.02	735.75	0.326	0.00	0.33	0.50	7.31	(0.00)	7.603
3	Bleams WB	1061.38	2196.80	0.483	0.00	0.67	0.97	14.32	(0.00)	3.323
4	Isaiah SB	115.61	619.73	0.187	0.00	0.24	0.24	3.58	(0.00)	7.497
4	Bleams EB	867.60	2107.34	0.412	0.00	0.73	0.73	10.98	(0.00)	3.048
4	Isaiah NB	240.02	735.28	0.326	0.00	0.50	0.51	7.56	(0.00)	7.631
4	Bleams WB	1061.38	2196.57	0.483	0.00	0.97	0.98	14.65	(0.00)	3.329
5	Isaiah SB	94.39	718.89	0.131	0.00	0.24	0.16	2.46	(0.00)	6.060
5	Bleams EB	708.40	2145.05	0.330	0.00	0.73	0.52	7.92	(0.00)	2.635
5	Isaiah NB	195.98	813.46	0.241	0.00	0.51	0.34	5.18	(0.00)	6.134
5	Bleams WB	866.62	2217.97	0.391	0.00	0.98	0.68	10.33	(0.00)	2.803
6	Isaiah SB	79.05	791.43	0.100	0.00	0.16	0.12	1.79	(0.00)	5.308
6	Bleams EB	593.25	2172.69	0.273	0.00	0.52	0.40	6.01	(0.00)	2.396
6	Isaiah NB	164.12	870.56	0.189	0.00	0.34	0.25	3.76	(0.00)	5.355
6	Bleams WB	725.75	2233.74	0.325	0.00	0.68	0.51	7.72	(0.00)	2.508

A4 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	174.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	636.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	311.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	699.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	131.00	131.00	N/A	N/A
1	Bleams EB	478.81	478.81	N/A	N/A
1	Isaiah NB	234.14	234.14	N/A	N/A
1	Bleams WB	526.24	526.24	N/A	N/A
2	Isaiah SB	156.42	156.42	N/A	N/A
2	Bleams EB	571.75	571.75	N/A	N/A
2	Isaiah NB	279.58	279.58	N/A	N/A
2	Bleams WB	628.39	628.39	N/A	N/A
3	Isaiah SB	191.58	191.58	N/A	N/A
3	Bleams EB	700.25	700.25	N/A	N/A
3	Isaiah NB	342.42	342.42	N/A	N/A
3	Bleams WB	769.61	769.61	N/A	N/A
4	Isaiah SB	191.58	191.58	N/A	N/A
4	Bleams EB	700.25	700.25	N/A	N/A
4	Isaiah NB	342.42	342.42	N/A	N/A
4	Bleams WB	769.61	769.61	N/A	N/A
5	Isaiah SB	156.42	156.42	N/A	N/A
5	Bleams EB	571.75	571.75	N/A	N/A
5	Isaiah NB	279.58	279.58	N/A	N/A
5	Bleams WB	628.39	628.39	N/A	N/A
6	Isaiah SB	131.00	131.00	N/A	N/A
6	Bleams EB	478.81	478.81	N/A	N/A
6	Isaiah NB	234.14	234.14	N/A	N/A
6	Bleams WB	526.24	526.24	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	48.000	0.000	126.000
	2	19.000	0.000	39.000	578.000
	3	0.000	100.000	0.000	211.000
	4	60.000	562.000	77.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.28	0.00	0.72
	2	0.03	0.00	0.06	0.91
	3	0.00	0.32	0.00	0.68
	4	0.09	0.80	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.27	7.46	0.39	A	159.67	239.50	25.56	6.40	0.28	25.56	6.40	0.552	1225.224
Bleams EB	0.34	2.81	0.54	A	583.60	875.41	37.51	2.57	0.42	37.51	2.57	0.723	2436.345
Isaiah NB	0.48	10.36	0.98	B	285.38	428.07	58.36	8.18	0.65	58.36	8.18	0.552	1225.224
Bleams WB	0.37	2.82	0.60	A	641.41	962.12	41.45	2.58	0.46	41.45	2.59	0.723	2436.345
						2505.1	162.88	3.901					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	130.21	59.32	554.58	0.00	827.01	115.05	0.158	0.00	0.20
Bleams EB	478.81	119.70	477.57	532.68	152.11	0.00	2093.74	1986.12	0.229	0.00	0.31
Isaiah NB	234.14	58.53	232.51	87.10	542.58	0.00	832.97	134.48	0.281	0.00	0.41
Bleams WB	526.24	131.56	524.87	686.06	89.03	0.00	2134.78	2125.97	0.247	0.00	0.34

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.15	70.98	663.77	0.00	772.73	115.05	0.202	0.20	0.26
Bleams EB	571.75	142.94	571.40	637.66	182.25	0.00	2074.13	1986.12	0.276	0.31	0.40
Isaiah NB	279.58	69.90	278.89	104.22	649.44	0.00	779.85	134.48	0.359	0.41	0.58
Bleams WB	628.39	157.10	628.00	821.58	106.75	0.00	2123.26	2125.97	0.296	0.34	0.44

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.07	86.91	812.57	0.00	698.75	115.05	0.274	0.26	0.39
Bleams EB	700.25	175.06	699.67	780.57	223.07	0.00	2047.57	1986.12	0.342	0.40	0.54
Isaiah NB	342.42	85.60	340.88	127.61	795.12	0.00	707.43	134.48	0.484	0.58	0.96
Bleams WB	769.61	192.40	768.97	1005.49	130.51	0.00	2107.79	2125.97	0.365	0.44	0.60

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	191.58	47.89	191.57	86.98	813.63	0.00	698.22	115.05	0.274	0.39	0.39
Bleams EB	700.25	175.06	700.24	781.70	223.50	0.00	2047.29	1986.12	0.342	0.54	0.54
Isaiah NB	342.42	85.60	342.37	127.72	796.03	0.00	706.98	134.48	0.484	0.96	0.98
Bleams WB	769.61	192.40	769.61	1007.39	131.01	0.00	2107.47	2125.97	0.365	0.60	0.60

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	156.42	39.11	156.92	71.09	665.42	0.00	771.91	115.05	0.203	0.39	0.27
Bleams EB	571.75	142.94	572.32	639.41	182.93	0.00	2073.69	1986.12	0.276	0.54	0.40
Isaiah NB	279.58	69.90	281.10	104.39	650.86	0.00	779.14	134.48	0.359	0.98	0.60
Bleams WB	628.39	157.10	629.02	824.48	107.48	0.00	2122.78	2125.97	0.296	0.60	0.44

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	131.00	32.75	131.28	59.52	556.95	0.00	825.83	115.05	0.159	0.27	0.20
Bleams EB	478.81	119.70	479.17	535.15	153.07	0.00	2093.11	1986.12	0.229	0.40	0.31
Isaiah NB	234.14	58.53	234.86	87.40	544.85	0.00	831.84	134.48	0.281	0.60	0.42
Bleams WB	526.24	131.56	526.64	689.87	89.83	0.00	2134.26	2125.97	0.247	0.44	0.34

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.86	0.19	5.419	A	A
Bleams EB	4.58	0.31	2.338	A	A
Isaiah NB	5.89	0.39	6.279	A	A
Bleams WB	5.05	0.34	2.345	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.88	0.26	6.127	A	A
Bleams EB	5.90	0.39	2.515	A	A
Isaiah NB	8.44	0.56	7.534	A	A
Bleams WB	6.51	0.43	2.528	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.72	0.38	7.437	A	A
Bleams EB	8.03	0.54	2.802	A	A
Isaiah NB	13.81	0.92	10.268	B	B
Bleams WB	8.88	0.59	2.821	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	5.91	0.39	7.459	A	A
Bleams EB	8.16	0.54	2.805	A	A
Isaiah NB	14.56	0.97	10.364	B	B
Bleams WB	9.03	0.60	2.824	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	4.14	0.28	6.153	A	A
Bleams EB	6.10	0.41	2.518	A	A
Isaiah NB	9.26	0.62	7.614	A	A
Bleams WB	6.74	0.45	2.531	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.05	0.20	5.446	A	A
Bleams EB	4.74	0.32	2.342	A	A
Isaiah NB	6.40	0.43	6.341	A	A
Bleams WB	5.23	0.35	2.351	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.96	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.54	0.00	0.00	0.00	1.05			N/A	N/A
Isaiah NB	0.98	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.60	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.27	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	131.00	827.01	0.158	0.00	0.00	0.20	2.86	(0.00)	5.419
1	Bleams EB	478.81	2093.74	0.229	0.00	0.00	0.31	4.58	(0.00)	2.338
1	Isaiah NB	234.14	832.97	0.281	0.00	0.00	0.41	5.89	(0.00)	6.279
1	Bleams WB	526.24	2134.78	0.247	0.00	0.00	0.34	5.05	(0.00)	2.345
2	Isaiah SB	156.42	772.73	0.202	0.00	0.20	0.26	3.88	(0.00)	6.127
2	Bleams EB	571.75	2074.13	0.276	0.00	0.31	0.40	5.90	(0.00)	2.515
2	Isaiah NB	279.58	779.85	0.359	0.00	0.41	0.58	8.44	(0.00)	7.534
2	Bleams WB	628.39	2123.26	0.296	0.00	0.34	0.44	6.51	(0.00)	2.528
3	Isaiah SB	191.58	698.75	0.274	0.00	0.26	0.39	5.72	(0.00)	7.437
3	Bleams EB	700.25	2047.57	0.342	0.00	0.40	0.54	8.03	(0.00)	2.802
3	Isaiah NB	342.42	707.43	0.484	0.00	0.58	0.96	13.81	(0.00)	10.268
3	Bleams WB	769.61	2107.79	0.365	0.00	0.44	0.60	8.88	(0.00)	2.821
4	Isaiah SB	191.58	698.22	0.274	0.00	0.39	0.39	5.91	(0.00)	7.459
4	Bleams EB	700.25	2047.29	0.342	0.00	0.54	0.54	8.16	(0.00)	2.805
4	Isaiah NB	342.42	706.98	0.484	0.00	0.96	0.98	14.56	(0.00)	10.364
4	Bleams WB	769.61	2107.47	0.365	0.00	0.60	0.60	9.03	(0.00)	2.824
5	Isaiah SB	156.42	771.91	0.203	0.00	0.39	0.27	4.14	(0.00)	6.153
5	Bleams EB	571.75	2073.69	0.276	0.00	0.54	0.40	6.10	(0.00)	2.518
5	Isaiah NB	279.58	779.14	0.359	0.00	0.98	0.60	9.26	(0.00)	7.614
5	Bleams WB	628.39	2122.78	0.296	0.00	0.60	0.44	6.74	(0.00)	2.531
6	Isaiah SB	131.00	825.83	0.159	0.00	0.27	0.20	3.05	(0.00)	5.446
6	Bleams EB	478.81	2093.11	0.229	0.00	0.40	0.31	4.74	(0.00)	2.342
6	Isaiah NB	234.14	831.84	0.281	0.00	0.60	0.42	6.40	(0.00)	6.341
6	Bleams WB	526.24	2134.26	0.247	0.00	0.44	0.34	5.23	(0.00)	2.351

A4 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Isaiah	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Isaiah SB	
2	Bleams EB	
3	Isaiah NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Isaiah SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Isaiah NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Isaiah SB	None
Bleams EB	None
Isaiah NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Isaiah SB		((calculated))	((calculated))	0.552	1225.224
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Isaiah NB		((calculated))	((calculated))	0.552	1225.224
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Isaiah SB	ONE HOUR	Yes	105.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	788.00	100.000	N/A
Isaiah NB	ONE HOUR	Yes	218.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	964.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Isaiah SB	79.05	79.05	N/A	N/A
1	Bleams EB	593.25	593.25	N/A	N/A
1	Isaiah NB	164.12	164.12	N/A	N/A
1	Bleams WB	725.75	725.75	N/A	N/A
2	Isaiah SB	94.39	94.39	N/A	N/A
2	Bleams EB	708.40	708.40	N/A	N/A
2	Isaiah NB	195.98	195.98	N/A	N/A
2	Bleams WB	866.62	866.62	N/A	N/A
3	Isaiah SB	115.61	115.61	N/A	N/A
3	Bleams EB	867.60	867.60	N/A	N/A
3	Isaiah NB	240.02	240.02	N/A	N/A
3	Bleams WB	1061.38	1061.38	N/A	N/A
4	Isaiah SB	115.61	115.61	N/A	N/A
4	Bleams EB	867.60	867.60	N/A	N/A
4	Isaiah NB	240.02	240.02	N/A	N/A
4	Bleams WB	1061.38	1061.38	N/A	N/A
5	Isaiah SB	94.39	94.39	N/A	N/A
5	Bleams EB	708.40	708.40	N/A	N/A
5	Isaiah NB	195.98	195.98	N/A	N/A
5	Bleams WB	866.62	866.62	N/A	N/A
6	Isaiah SB	79.05	79.05	N/A	N/A
6	Bleams EB	593.25	593.25	N/A	N/A
6	Isaiah NB	164.12	164.12	N/A	N/A
6	Bleams WB	725.75	725.75	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.000	50.000	0.000	55.000
	2	69.000	0.000	101.000	618.000
	3	0.000	87.000	0.000	131.000
	4	109.000	636.000	219.000	0.000

Turning Proportions (PCE) - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.48	0.00	0.52
	2	0.09	0.00	0.13	0.78
	3	0.00	0.40	0.00	0.60
	4	0.11	0.66	0.23	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Isaiah (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Isaiah SB	0.20	8.02	0.26	A	96.35	144.52	16.31	6.77	0.18	16.31	6.77	0.552	1225.224
Bleams EB	0.43	3.35	0.80	A	723.08	1084.62	53.45	2.96	0.59	53.45	2.96	0.723	2436.345
Isaiah NB	0.34	8.28	0.55	A	200.04	300.06	34.65	6.93	0.39	34.65	6.93	0.552	1225.224
Bleams WB	0.51	3.71	1.09	A	884.58	1326.87	70.74	3.20	0.79	70.74	3.20	0.723	2436.345
						2856.07	175.15	3.6795					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	78.56	133.61	706.84	0.00	751.31	159.99	0.105	0.00	0.12
Bleams EB	593.25	148.31	591.55	579.87	205.53	0.00	2058.98	1839.68	0.288	0.00	0.42
Isaiah NB	164.12	41.03	163.09	240.20	556.88	0.00	825.86	263.71	0.199	0.00	0.26
Bleams WB	725.75	181.44	723.57	603.09	116.88	0.00	2116.66	2019.42	0.343	0.00	0.55

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.21	159.89	846.02	0.00	682.12	159.99	0.138	0.12	0.17
Bleams EB	708.40	177.10	707.85	694.18	246.06	0.00	2032.61	1839.68	0.349	0.42	0.56
Isaiah NB	195.98	48.99	195.59	287.43	666.48	0.00	771.38	263.71	0.254	0.26	0.35
Bleams WB	866.62	216.65	865.87	722.03	140.04	0.00	2101.59	2019.42	0.412	0.55	0.73

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.26	195.74	1035.61	0.00	587.87	159.99	0.197	0.17	0.25
Bleams EB	867.60	216.90	866.63	849.69	301.18	0.00	1996.75	1839.68	0.435	0.56	0.80
Isaiah NB	240.02	60.01	239.26	351.88	815.93	0.00	697.08	263.71	0.344	0.35	0.54
Bleams WB	1061.38	265.35	1059.98	883.82	171.37	0.00	2081.21	2019.42	0.510	0.73	1.08

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	115.61	28.90	115.60	195.98	1037.14	0.00	587.12	159.99	0.197	0.25	0.26
Bleams EB	867.60	216.90	867.59	851.07	301.67	0.00	1996.43	1839.68	0.435	0.80	0.80
Isaiah NB	240.02	60.01	240.01	352.32	816.94	0.00	696.58	263.71	0.345	0.54	0.55
Bleams WB	1061.38	265.35	1061.37	885.20	171.75	0.00	2080.96	2019.42	0.510	1.08	1.09

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	94.39	23.60	94.74	160.26	848.37	0.00	680.96	159.99	0.139	0.26	0.17
Bleams EB	708.40	177.10	709.35	696.29	246.82	0.00	2032.12	1839.68	0.349	0.80	0.56
Isaiah NB	195.98	48.99	196.72	288.11	668.06	0.00	770.59	263.71	0.254	0.55	0.36
Bleams WB	866.62	216.65	868.01	724.16	140.62	0.00	2101.21	2019.42	0.412	1.09	0.74

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Isaiah SB	79.05	19.76	79.23	134.14	710.02	0.00	749.73	159.99	0.105	0.17	0.12
Bleams EB	593.25	148.31	593.80	582.70	206.55	0.00	2058.32	1839.68	0.288	0.56	0.43
Isaiah NB	164.12	41.03	164.52	241.16	559.19	0.00	824.71	263.71	0.199	0.36	0.26
Bleams WB	725.75	181.44	726.51	606.06	117.65	0.00	2116.16	2019.42	0.343	0.74	0.55

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.79	0.12	5.615	A	A
Bleams EB	6.24	0.42	2.574	A	A
Isaiah NB	3.76	0.25	5.695	A	A
Bleams WB	8.02	0.53	2.713	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.46	0.16	6.428	A	A
Bleams EB	8.26	0.55	2.851	A	A
Isaiah NB	5.19	0.35	6.560	A	A
Bleams WB	10.81	0.72	3.057	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.71	0.25	7.992	A	A
Bleams EB	11.80	0.79	3.341	A	A
Isaiah NB	7.89	0.53	8.242	A	A
Bleams WB	15.89	1.06	3.696	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	3.83	0.26	8.016	A	A
Bleams EB	12.05	0.80	3.347	A	A
Isaiah NB	8.20	0.55	8.279	A	A
Bleams WB	16.30	1.09	3.706	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	2.62	0.17	6.453	A	A
Bleams EB	8.61	0.57	2.861	A	A
Isaiah NB	5.58	0.37	6.597	A	A
Bleams WB	11.34	0.76	3.070	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Isaiah SB	1.91	0.13	5.638	A	A
Bleams EB	6.49	0.43	2.581	A	A
Isaiah NB	4.03	0.27	5.728	A	A
Bleams WB	8.38	0.56	2.721	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.73	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.80	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.80	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.55	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	1.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.17	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.74	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Isaiah SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Isaiah NB	0.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Isaiah SB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Isaiah NB	3.50	4.00	30.00	20.00	40.00	25.00		0.552	1225.224
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Isaiah SB	79.05	751.31	0.105	0.00	0.00	0.12	1.79	(0.00)	5.615
1	Bleams EB	593.25	2058.98	0.288	0.00	0.00	0.42	6.24	(0.00)	2.574
1	Isaiah NB	164.12	825.86	0.199	0.00	0.00	0.26	3.76	(0.00)	5.695
1	Bleams WB	725.75	2116.66	0.343	0.00	0.00	0.55	8.02	(0.00)	2.713
2	Isaiah SB	94.39	682.12	0.138	0.00	0.12	0.17	2.46	(0.00)	6.428
2	Bleams EB	708.40	2032.61	0.349	0.00	0.42	0.56	8.26	(0.00)	2.851
2	Isaiah NB	195.98	771.38	0.254	0.00	0.26	0.35	5.19	(0.00)	6.560
2	Bleams WB	866.62	2101.59	0.412	0.00	0.55	0.73	10.81	(0.00)	3.057
3	Isaiah SB	115.61	587.87	0.197	0.00	0.17	0.25	3.71	(0.00)	7.992
3	Bleams EB	867.60	1996.75	0.435	0.00	0.56	0.80	11.80	(0.00)	3.341
3	Isaiah NB	240.02	697.08	0.344	0.00	0.35	0.54	7.89	(0.00)	8.242
3	Bleams WB	1061.38	2081.21	0.510	0.00	0.73	1.08	15.89	(0.00)	3.696
4	Isaiah SB	115.61	587.12	0.197	0.00	0.25	0.26	3.83	(0.00)	8.016
4	Bleams EB	867.60	1996.43	0.435	0.00	0.80	0.80	12.05	(0.00)	3.347
4	Isaiah NB	240.02	696.58	0.345	0.00	0.54	0.55	8.20	(0.00)	8.279
4	Bleams WB	1061.38	2080.96	0.510	0.00	1.08	1.09	16.30	(0.00)	3.706
5	Isaiah SB	94.39	680.96	0.139	0.00	0.26	0.17	2.62	(0.00)	6.453
5	Bleams EB	708.40	2032.12	0.349	0.00	0.80	0.56	8.61	(0.00)	2.861
5	Isaiah NB	195.98	770.59	0.254	0.00	0.55	0.36	5.58	(0.00)	6.597
5	Bleams WB	866.62	2101.21	0.412	0.00	1.09	0.74	11.34	(0.00)	3.070
6	Isaiah SB	79.05	749.73	0.105	0.00	0.17	0.12	1.91	(0.00)	5.638
6	Bleams EB	593.25	2058.32	0.288	0.00	0.56	0.43	6.49	(0.00)	2.581
6	Isaiah NB	164.12	824.71	0.199	0.00	0.36	0.26	4.03	(0.00)	5.728
6	Bleams WB	725.75	2116.16	0.343	0.00	0.74	0.55	8.38	(0.00)	2.721

Bleams Road & Donnenwerth/Amand Drive Roundabout Capacity Analysis

Version: 7.1.1.245 [9th June 2011]
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File: C:_Work\47727-100\Arcady\Bleams & Donnenwerth-Amand.arc7
Report generation date: 11/2/2021 10:13:22 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - Dual E-W Single N-S - 2031							
Donnenwerth SB	0.15	5.25	0.13	A	0.19	9.30	0.15	A
Bleams EB	1.35	3.94	0.56	A	0.84	3.17	0.45	A
Amand NB	1.23	13.86	0.54	B	0.48	6.83	0.32	A
Bleams WB	0.51	2.55	0.33	A	2.20	5.34	0.68	A
	90% - Dual E-W Single N-S - 2031							
Donnenwerth SB	0.16	5.59	0.13	A	0.20	9.91	0.16	A
Bleams EB	1.53	4.48	0.59	A	0.93	3.51	0.47	A
Amand NB	1.39	15.66	0.58	C	0.52	7.40	0.33	A
Bleams WB	0.55	2.77	0.34	A	2.62	6.38	0.72	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.
2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

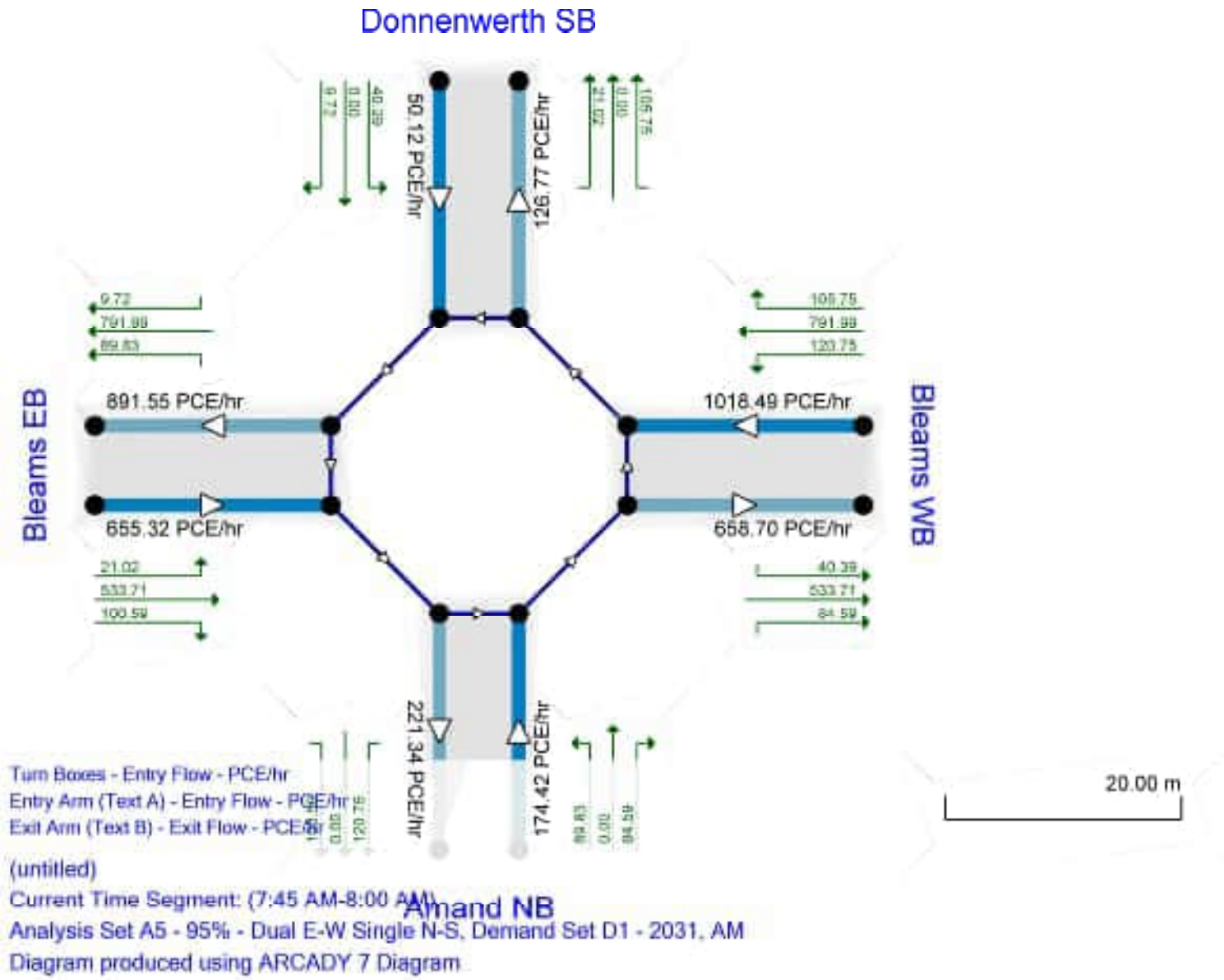
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin



The intersection diagram reflects the last run of ARCADY.

A5 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	

Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	650.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	70.77	70.77	N/A	N/A
1	**Bleams EB**	846.96	846.96	N/A	N/A
1	**Amand NB**	222.84	222.84	N/A	N/A
1	**Bleams WB**	489.35	489.35	N/A	N/A
2	**Donnenwerth SB**	84.50	84.50	N/A	N/A

2	Bleams EB	1011.35	1011.35	N/A	N/A
2	Amand NB	266.10	266.10	N/A	N/A
2	Bleams WB	584.34	584.34	N/A	N/A
3	Donnenwerth SB	103.50	103.50	N/A	N/A
3	Bleams EB	1238.65	1238.65	N/A	N/A
3	Amand NB	325.90	325.90	N/A	N/A
3	Bleams WB	715.66	715.66	N/A	N/A
4	Donnenwerth SB	103.50	103.50	N/A	N/A
4	Bleams EB	1238.65	1238.65	N/A	N/A
4	Amand NB	325.90	325.90	N/A	N/A
4	Bleams WB	715.66	715.66	N/A	N/A
5	Donnenwerth SB	84.50	84.50	N/A	N/A
5	Bleams EB	1011.35	1011.35	N/A	N/A
5	Amand NB	266.10	266.10	N/A	N/A
5	Bleams WB	584.34	584.34	N/A	N/A
6	Donnenwerth SB	70.77	70.77	N/A	N/A
6	Bleams EB	846.96	846.96	N/A	N/A
6	Amand NB	222.84	222.84	N/A	N/A
6	Bleams WB	489.35	489.35	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000
	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	75.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.84	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.25	0.15	A	86.26	129.38	10.16	4.71	0.11	10.16	4.71	0.579	1357.445
Bleams EB	0.56	3.94	1.35	A	1032.32	1548.48	85.40	3.31	0.95	85.41	3.31	0.723	2436.345
Amand NB	0.54	13.86	1.23	B	271.61	407.42	65.61	9.66	0.73	65.62	9.66	0.579	1357.445
Bleams WB	0.33	2.55	0.51	A	596.45	894.68	35.16	2.36	0.39	35.16	2.36	0.723	2436.345
						2979.96	196.33	3.953					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.44	27.04	577.78	0.00	971.89	64.62	0.073	0.00	0.08
Bleams EB	846.96	211.74	844.41	532.70	115.53	0.00	2235.18	2099.02	0.379	0.00	0.64
Amand NB	222.84	55.71	221.29	102.86	857.07	0.00	818.34	169.23	0.272	0.00	0.39
Bleams WB	489.35	122.34	488.18	961.72	116.64	0.00	2234.42	2248.83	0.219	0.00	0.29

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.34	691.48	0.00	909.38	64.62	0.093	0.08	0.11
Bleams EB	1011.35	252.84	1010.41	637.56	138.32	0.00	2219.53	2099.02	0.456	0.64	0.87
Amand NB	266.10	66.52	265.26	123.07	1025.66	0.00	725.64	169.23	0.367	0.39	0.60
Bleams WB	584.34	146.08	584.01	1151.11	139.81	0.00	2218.51	2248.83	0.263	0.29	0.37

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.32	39.60	846.04	0.00	824.40	64.62	0.126	0.11	0.15
Bleams EB	1238.65	309.66	1236.77	780.01	169.35	0.00	2198.22	2099.02	0.563	0.87	1.34
Amand NB	325.90	81.48	323.45	150.68	1255.45	0.00	599.30	169.23	0.544	0.60	1.21
Bleams WB	715.66	178.92	715.14	1408.40	170.50	0.00	2197.43	2248.83	0.326	0.37	0.51

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.64	847.74	0.00	823.47	64.62	0.126	0.15	0.15
Bleams EB	1238.65	309.66	1238.62	781.67	169.55	0.00	2198.08	2099.02	0.564	1.34	1.35
Amand NB	325.90	81.48	325.81	150.84	1257.34	0.00	598.26	169.23	0.545	1.21	1.23
Bleams WB	715.66	178.92	715.66	1411.44	171.71	0.00	2196.59	2248.83	0.326	0.51	0.51

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.67	32.40	693.96	0.00	908.02	64.62	0.093	0.15	0.11
Bleams EB	1011.35	252.84	1013.21	639.99	138.64	0.00	2219.31	2099.02	0.456	1.35	0.88
Amand NB	266.10	66.52	268.56	123.32	1028.53	0.00	724.06	169.23	0.368	1.23	0.62
Bleams WB	584.34	146.08	584.85	1155.59	141.51	0.00	2217.34	2248.83	0.264	0.51	0.38

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.87	27.12	580.46	0.00	970.42	64.62	0.073	0.11	0.08
Bleams EB	846.96	211.74	847.92	535.26	116.06	0.00	2234.82	2099.02	0.379	0.88	0.64
Amand NB	222.84	55.71	223.73	103.23	860.75	0.00	816.31	169.23	0.273	0.62	0.40
Bleams WB	489.35	122.34	489.68	966.58	117.90	0.00	2233.55	2248.83	0.219	0.38	0.30

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.20	0.08	4.192	A	A
Bleams EB	9.37	0.62	2.713	A	A
Amand NB	5.64	0.38	6.314	A	A
Bleams WB	4.34	0.29	2.164	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.58	0.11	4.582	A	A
Bleams EB	12.87	0.86	3.123	A	A
Amand NB	8.69	0.58	8.196	A	A
Bleams WB	5.55	0.37	2.312	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.20	0.15	5.240	A	A
Bleams EB	19.60	1.31	3.923	A	A
Amand NB	17.04	1.14	13.580	B	B
Bleams WB	7.47	0.50	2.550	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.25	0.15	5.249	A	A
Bleams EB	20.19	1.35	3.939	A	A
Amand NB	18.39	1.23	13.861	B	B
Bleams WB	7.59	0.51	2.551	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.65	0.11	4.593	A	A
Bleams EB	13.56	0.90	3.140	A	A
Amand NB	9.70	0.65	8.342	A	A
Bleams WB	5.73	0.38	2.317	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.26	0.08	4.202	A	A
Bleams EB	9.82	0.65	2.728	A	A
Amand NB	6.15	0.41	6.390	A	A
Bleams WB	4.48	0.30	2.169	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.29	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.87	0.00	0.00	1.05	1.05			N/A	N/A
Amand NB	0.60	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.51	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.15	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.23	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.51	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.88	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.38	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445

Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth SB	70.77	971.89	0.073	0.00	0.00	0.08	1.20	(0.00)	4.192
1	Bleams EB	846.96	2235.18	0.379	0.00	0.00	0.64	9.37	(0.00)	2.713
1	Amand NB	222.84	818.34	0.272	0.00	0.00	0.39	5.64	(0.00)	6.314
1	Bleams WB	489.35	2234.42	0.219	0.00	0.00	0.29	4.34	(0.00)	2.164
2	Donnenwerth SB	84.50	909.38	0.093	0.00	0.08	0.11	1.58	(0.00)	4.582
2	Bleams EB	1011.35	2219.53	0.456	0.00	0.64	0.87	12.87	(0.00)	3.123
2	Amand NB	266.10	725.64	0.367	0.00	0.39	0.60	8.69	(0.00)	8.196
2	Bleams WB	584.34	2218.51	0.263	0.00	0.29	0.37	5.55	(0.00)	2.312
3	Donnenwerth SB	103.50	824.40	0.126	0.00	0.11	0.15	2.20	(0.00)	5.240
3	Bleams EB	1238.65	2198.22	0.563	0.00	0.87	1.34	19.60	(0.00)	3.923
3	Amand NB	325.90	599.30	0.544	0.00	0.60	1.21	17.04	(0.00)	13.580
3	Bleams WB	715.66	2197.43	0.326	0.00	0.37	0.51	7.47	(0.00)	2.550
4	Donnenwerth SB	103.50	823.47	0.126	0.00	0.15	0.15	2.25	(0.00)	5.249
4	Bleams EB	1238.65	2198.08	0.564	0.00	1.34	1.35	20.19	(0.00)	3.939
4	Amand NB	325.90	598.26	0.545	0.00	1.21	1.23	18.39	(0.00)	13.861
4	Bleams WB	715.66	2196.59	0.326	0.00	0.51	0.51	7.59	(0.00)	2.551
5	Donnenwerth SB	84.50	908.02	0.093	0.00	0.15	0.11	1.65	(0.00)	4.593
5	Bleams EB	1011.35	2219.31	0.456	0.00	1.35	0.88	13.56	(0.00)	3.140
5	Amand NB	266.10	724.06	0.368	0.00	1.23	0.62	9.70	(0.00)	8.342
5	Bleams WB	584.34	2217.34	0.264	0.00	0.51	0.38	5.73	(0.00)	2.317
6	Donnenwerth SB	70.77	970.42	0.073	0.00	0.11	0.08	1.26	(0.00)	4.202
6	Bleams EB	846.96	2234.82	0.379	0.00	0.88	0.64	9.82	(0.00)	2.728
6	Amand NB	222.84	816.31	0.273	0.00	0.62	0.40	6.15	(0.00)	6.390
6	Bleams WB	489.35	2233.55	0.219	0.00	0.38	0.30	4.48	(0.00)	2.169

A5 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario	Time	Description	Locked	Run	Use	Relationship	Start	Finish	Time	Time	Traffic

	Name	Period Name			Automatically	Relationship		Time (HH:mm)	Time (HH:mm)	Period Length (min)	Segment Length (min)	Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1358.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Donnenwerth SB	50.44	50.44	N/A	N/A
1	Bleams EB	657.24	657.24	N/A	N/A
1	Amand NB	175.41	175.41	N/A	N/A
1	Bleams WB	1022.37	1022.37	N/A	N/A
2	Donnenwerth SB	60.23	60.23	N/A	N/A
2	Bleams EB	784.81	784.81	N/A	N/A
2	Amand NB	209.46	209.46	N/A	N/A
2	Bleams WB	1220.81	1220.81	N/A	N/A
3	Donnenwerth SB	73.77	73.77	N/A	N/A
3	Bleams EB	961.19	961.19	N/A	N/A
3	Amand NB	256.54	256.54	N/A	N/A
3	Bleams WB	1495.19	1495.19	N/A	N/A

4	Donnenwerth SB	73.77	73.77	N/A	N/A
4	Bleams EB	961.19	961.19	N/A	N/A
4	Amand NB	256.54	256.54	N/A	N/A
4	Bleams WB	1495.19	1495.19	N/A	N/A
5	Donnenwerth SB	60.23	60.23	N/A	N/A
5	Bleams EB	784.81	784.81	N/A	N/A
5	Amand NB	209.46	209.46	N/A	N/A
5	Bleams WB	1220.81	1220.81	N/A	N/A
6	Donnenwerth SB	50.44	50.44	N/A	N/A
6	Bleams EB	657.24	657.24	N/A	N/A
6	Amand NB	175.41	175.41	N/A	N/A
6	Bleams WB	1022.37	1022.37	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000
	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	161.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.78	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.15	9.30	0.19	A	61.48	92.22	11.21	7.29	0.12	11.21	7.29	0.579	1357.445
Bleams EB	0.45	3.17	0.84	A	801.08	1201.62	56.14	2.80	0.62	56.14	2.80	0.723	2436.345
Amand NB	0.32	6.83	0.48	A	213.80	320.71	30.89	5.78	0.34	30.89	5.78	0.579	1357.445
Bleams WB	0.68	5.34	2.20	A	1246.12	1869.19	129.16	4.15	1.44	129.17	4.15	0.723	2436.345
						3483.74	227.4	3.916					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.14	126.81	1002.94	0.00	738.13	142.25	0.068	0.00	0.08
Bleams EB	657.24	164.31	655.46	891.87	161.20	0.00	2203.81	2058.75	0.298	0.00	0.44
Amand NB	175.41	43.85	174.48	221.40	595.26	0.00	962.29	268.34	0.182	0.00	0.23
Bleams WB	1022.37	255.59	1018.86	658.86	110.89	0.00	2238.37	2174.26	0.457	0.00	0.88

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.10	151.75	1200.36	0.00	629.59	142.25	0.096	0.08	0.11
Bleams EB	784.81	196.20	784.24	1067.47	192.99	0.00	2181.98	2058.75	0.360	0.44	0.59
Amand NB	209.46	52.37	209.12	264.93	712.30	0.00	897.94	268.34	0.233	0.23	0.32
Bleams WB	1220.81	305.20	1219.25	788.57	132.86	0.00	2223.28	2174.26	0.549	0.88	1.27

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.46	185.66	1468.46	0.00	482.18	142.25	0.153	0.11	0.19
Bleams EB	961.19	240.30	960.17	1305.88	236.04	0.00	2152.42	2058.75	0.447	0.59	0.84
Amand NB	256.54	64.13	255.88	324.21	872.00	0.00	810.13	268.34	0.317	0.32	0.48
Bleams WB	1495.19	373.80	1491.54	965.30	162.58	0.00	2202.87	2174.26	0.679	1.27	2.18

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.76	186.06	1471.99	0.00	480.24	142.25	0.154	0.19	0.19
Bleams EB	961.19	240.30	961.18	1309.04	236.70	0.00	2151.96	2058.75	0.447	0.84	0.84
Amand NB	256.54	64.13	256.53	324.79	873.09	0.00	809.53	268.34	0.317	0.48	0.48
Bleams WB	1495.19	373.80	1495.11	966.68	162.94	0.00	2202.62	2174.26	0.679	2.18	2.20

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.54	152.34	1205.52	0.00	626.75	142.25	0.096	0.19	0.11
Bleams EB	784.81	196.20	785.82	1072.10	193.96	0.00	2181.32	2058.75	0.360	0.84	0.59
Amand NB	209.46	52.37	210.11	265.78	713.99	0.00	897.00	268.34	0.234	0.48	0.32
Bleams WB	1220.81	305.20	1224.45	790.69	133.41	0.00	2222.90	2174.26	0.549	2.20	1.29

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.58	127.42	1008.18	0.00	735.25	142.25	0.069	0.11	0.08
Bleams EB	657.24	164.31	657.82	896.60	162.17	0.00	2203.15	2058.75	0.298	0.59	0.45
Amand NB	175.41	43.85	175.76	222.37	597.61	0.00	960.99	268.34	0.183	0.32	0.24
Bleams WB	1022.37	255.59	1023.98	661.76	111.62	0.00	2237.87	2174.26	0.457	1.29	0.89

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.12	0.07	5.491	A	A
Bleams EB	6.55	0.44	2.439	A	A
Amand NB	3.40	0.23	4.794	A	A
Bleams WB	12.83	0.86	3.090	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.62	0.11	6.635	A	A
Bleams EB	8.68	0.58	2.702	A	A
Amand NB	4.66	0.31	5.485	A	A
Bleams WB	18.55	1.24	3.757	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.72	0.18	9.242	A	A
Bleams EB	12.39	0.83	3.167	A	A
Amand NB	7.02	0.47	6.811	A	A
Bleams WB	31.35	2.09	5.286	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.83	0.19	9.299	A	A
Bleams EB	12.66	0.84	3.173	A	A
Amand NB	7.25	0.48	6.834	A	A
Bleams WB	32.87	2.19	5.340	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.74	0.12	6.681	A	A
Bleams EB	9.04	0.60	2.710	A	A
Amand NB	4.96	0.33	5.509	A	A
Bleams WB	19.94	1.33	3.798	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.19	0.08	5.521	A	A
Bleams EB	6.81	0.45	2.448	A	A
Amand NB	3.61	0.24	4.817	A	A
Bleams WB	13.61	0.91	3.117	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.88	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.27	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.18	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.48	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.29	0.00	0.00	2.10	2.10			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.24	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.89	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth	50.44	738.13	0.068	0.00	0.00	0.08	1.12	(0.00)	5.491

	SB									
1	Bleams EB	657.24	2203.81	0.298	0.00	0.00	0.44	6.55	(0.00)	2.439
1	Amand NB	175.41	962.29	0.182	0.00	0.00	0.23	3.40	(0.00)	4.794
1	Bleams WB	1022.37	2238.37	0.457	0.00	0.00	0.88	12.83	(0.00)	3.090
2	Donnenwerth SB	60.23	629.59	0.096	0.00	0.08	0.11	1.62	(0.00)	6.635
2	Bleams EB	784.81	2181.98	0.360	0.00	0.44	0.59	8.68	(0.00)	2.702
2	Amand NB	209.46	897.94	0.233	0.00	0.23	0.32	4.66	(0.00)	5.485
2	Bleams WB	1220.81	2223.28	0.549	0.00	0.88	1.27	18.55	(0.00)	3.757
3	Donnenwerth SB	73.77	482.18	0.153	0.00	0.11	0.19	2.72	(0.00)	9.242
3	Bleams EB	961.19	2152.42	0.447	0.00	0.59	0.84	12.39	(0.00)	3.167
3	Amand NB	256.54	810.13	0.317	0.00	0.32	0.48	7.02	(0.00)	6.811
3	Bleams WB	1495.19	2202.87	0.679	0.00	1.27	2.18	31.35	(0.00)	5.286
4	Donnenwerth SB	73.77	480.24	0.154	0.00	0.19	0.19	2.83	(0.00)	9.299
4	Bleams EB	961.19	2151.96	0.447	0.00	0.84	0.84	12.66	(0.00)	3.173
4	Amand NB	256.54	809.53	0.317	0.00	0.48	0.48	7.25	(0.00)	6.834
4	Bleams WB	1495.19	2202.62	0.679	0.00	2.18	2.20	32.87	(0.00)	5.340
5	Donnenwerth SB	60.23	626.75	0.096	0.00	0.19	0.11	1.74	(0.00)	6.681
5	Bleams EB	784.81	2181.32	0.360	0.00	0.84	0.59	9.04	(0.00)	2.710
5	Amand NB	209.46	897.00	0.234	0.00	0.48	0.32	4.96	(0.00)	5.509
5	Bleams WB	1220.81	2222.90	0.549	0.00	2.20	1.29	19.94	(0.00)	3.798
6	Donnenwerth SB	50.44	735.25	0.069	0.00	0.11	0.08	1.19	(0.00)	5.521
6	Bleams EB	657.24	2203.15	0.298	0.00	0.59	0.45	6.81	(0.00)	2.448
6	Amand NB	175.41	960.99	0.183	0.00	0.32	0.24	3.61	(0.00)	4.817
6	Bleams WB	1022.37	2237.87	0.457	0.00	1.29	0.89	13.61	(0.00)	3.117

A6 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	94.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1125.00	100.000	N/A
Amand NB	ONE HOUR	Yes	296.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	650.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Donnenwerth SB**	70.77	70.77	N/A	N/A
1	**Bleams EB**	846.96	846.96	N/A	N/A
1	**Amand NB**	222.84	222.84	N/A	N/A
1	**Bleams WB**	489.35	489.35	N/A	N/A
2	**Donnenwerth SB**	84.50	84.50	N/A	N/A
2	**Bleams EB**	1011.35	1011.35	N/A	N/A
2	**Amand NB**	266.10	266.10	N/A	N/A
2	**Bleams WB**	584.34	584.34	N/A	N/A
3	**Donnenwerth SB**	103.50	103.50	N/A	N/A
3	**Bleams EB**	1238.65	1238.65	N/A	N/A
3	**Amand NB**	325.90	325.90	N/A	N/A
3	**Bleams WB**	715.66	715.66	N/A	N/A
4	**Donnenwerth SB**	103.50	103.50	N/A	N/A
4	**Bleams EB**	1238.65	1238.65	N/A	N/A
4	**Amand NB**	325.90	325.90	N/A	N/A
4	**Bleams WB**	715.66	715.66	N/A	N/A
5	**Donnenwerth SB**	84.50	84.50	N/A	N/A
5	**Bleams EB**	1011.35	1011.35	N/A	N/A
5	**Amand NB**	266.10	266.10	N/A	N/A
5	**Bleams WB**	584.34	584.34	N/A	N/A
6	**Donnenwerth SB**	70.77	70.77	N/A	N/A
6	**Bleams EB**	846.96	846.96	N/A	N/A
6	**Amand NB**	222.84	222.84	N/A	N/A
6	**Bleams WB**	489.35	489.35	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	15.000	0.000	79.000
	2	5.000	0.000	62.000	1058.000
	3	0.000	151.000	0.000	145.000
	4	31.000	544.000	75.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.16	0.00	0.84
	2	0.00	0.00	0.06	0.94
	3	0.00	0.51	0.00	0.49
	4	0.05	0.84	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.13	5.59	0.16	A	86.26	129.38	10.79	5.00	0.12	10.79	5.00	0.579	1357.445
Bleams EB	0.59	4.48	1.53	A	1032.32	1548.48	95.30	3.69	1.06	95.30	3.69	0.723	2436.345
Amand NB	0.58	15.66	1.39	C	271.61	407.42	72.46	10.67	0.81	72.47	10.67	0.579	1357.445
Bleams WB	0.34	2.77	0.55	A	596.45	894.68	37.92	2.54	0.42	37.92	2.54	0.723	2436.345
						2979.96	216.47	4.3585					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.42	27.03	577.64	0.00	920.82	116.51	0.077	0.00	0.09
Bleams EB	846.96	211.74	844.17	532.56	115.50	0.00	2117.56	1969.82	0.400	0.00	0.70
Amand NB	222.84	55.71	221.17	102.84	856.83	0.00	775.39	201.19	0.287	0.00	0.42
Bleams WB	489.35	122.34	488.10	961.42	116.58	0.00	2116.86	2120.23	0.231	0.00	0.31

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.40	32.34	691.40	0.00	861.56	116.51	0.098	0.09	0.11
Bleams EB	1011.35	252.84	1010.27	637.49	138.31	0.00	2102.72	1969.82	0.481	0.70	0.97
Amand NB	266.10	66.52	265.16	123.06	1025.53	0.00	687.52	201.19	0.387	0.42	0.65
Bleams WB	584.34	146.08	583.98	1150.93	139.76	0.00	2101.78	2120.23	0.278	0.31	0.40

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.31	39.60	845.79	0.00	781.14	116.51	0.132	0.11	0.16
Bleams EB	1238.65	309.66	1236.42	779.77	169.34	0.00	2082.53	1969.82	0.595	0.97	1.52
Amand NB	325.90	81.48	323.07	150.65	1255.11	0.00	567.94	201.19	0.574	0.65	1.36
Bleams WB	715.66	178.92	715.08	1407.87	170.30	0.00	2081.90	2120.23	0.344	0.40	0.55

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	103.50	25.87	103.49	39.64	847.72	0.00	780.14	116.51	0.133	0.16	0.16
Bleams EB	1238.65	309.66	1238.61	781.66	169.55	0.00	2082.39	1969.82	0.595	1.52	1.53
Amand NB	325.90	81.48	325.78	150.84	1257.33	0.00	566.78	201.19	0.575	1.36	1.39
Bleams WB	715.66	178.92	715.66	1411.41	171.70	0.00	2080.99	2120.23	0.344	0.55	0.55

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	84.50	21.13	84.68	32.40	694.22	0.00	860.09	116.51	0.098	0.16	0.12
Bleams EB	1011.35	252.84	1013.56	640.24	138.66	0.00	2102.49	1969.82	0.481	1.53	0.98
Amand NB	266.10	66.52	268.96	123.35	1028.87	0.00	685.78	201.19	0.388	1.39	0.68
Bleams WB	584.34	146.08	584.91	1156.12	141.71	0.00	2100.51	2120.23	0.278	0.55	0.41

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	70.77	17.69	70.88	27.12	580.54	0.00	919.31	116.51	0.077	0.12	0.09
Bleams EB	846.96	211.74	848.06	535.35	116.07	0.00	2117.19	1969.82	0.400	0.98	0.70
Amand NB	222.84	55.71	223.83	103.24	860.89	0.00	773.28	201.19	0.288	0.68	0.43
Bleams WB	489.35	122.34	489.71	966.77	117.95	0.00	2115.96	2120.23	0.231	0.41	0.32

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.27	0.08	4.442	A	A
Bleams EB	10.21	0.68	2.962	A	A
Amand NB	6.05	0.40	6.800	A	A
Bleams WB	4.65	0.31	2.320	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.67	0.11	4.864	A	A
Bleams EB	14.20	0.95	3.457	A	A
Amand NB	9.44	0.63	8.930	A	A
Bleams WB	5.97	0.40	2.490	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.34	0.16	5.575	A	A
Bleams EB	22.15	1.48	4.456	A	A
Amand NB	18.98	1.27	15.262	C	B
Bleams WB	8.09	0.54	2.763	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.40	0.16	5.585	A	A
Bleams EB	22.93	1.53	4.479	A	A
Amand NB	20.69	1.38	15.664	C	B
Bleams WB	8.23	0.55	2.767	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.76	0.12	4.877	A	A
Bleams EB	15.06	1.00	3.477	A	A
Amand NB	10.65	0.71	9.128	A	A
Bleams WB	6.18	0.41	2.494	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.34	0.09	4.457	A	A
Bleams EB	10.75	0.72	2.982	A	A
Amand NB	6.65	0.44	6.891	A	A
Bleams WB	4.81	0.32	2.326	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.31	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.97	0.00	0.00	1.05	2.10			N/A	N/A
Amand NB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.40	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.55	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.16	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.53	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	1.39	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.55	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.98	0.00	0.00	0.00	1.05			N/A	N/A
Amand NB	0.68	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.09	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.70	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.43	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth SB	70.77	920.82	0.077	0.00	0.00	0.09	1.27	(0.00)	4.442
1	Bleams EB	846.96	2117.56	0.400	0.00	0.00	0.70	10.21	(0.00)	2.962
1	Amand NB	222.84	775.39	0.287	0.00	0.00	0.42	6.05	(0.00)	6.800
1	Bleams WB	489.35	2116.86	0.231	0.00	0.00	0.31	4.65	(0.00)	2.320
2	Donnenwerth SB	84.50	861.56	0.098	0.00	0.09	0.11	1.67	(0.00)	4.864
2	Bleams EB	1011.35	2102.72	0.481	0.00	0.70	0.97	14.20	(0.00)	3.457
2	Amand NB	266.10	687.52	0.387	0.00	0.42	0.65	9.44	(0.00)	8.930
2	Bleams WB	584.34	2101.78	0.278	0.00	0.31	0.40	5.97	(0.00)	2.490
3	Donnenwerth SB	103.50	781.14	0.132	0.00	0.11	0.16	2.34	(0.00)	5.575
3	Bleams EB	1238.65	2082.53	0.595	0.00	0.97	1.52	22.15	(0.00)	4.456
3	Amand NB	325.90	567.94	0.574	0.00	0.65	1.36	18.98	(0.00)	15.262
3	Bleams WB	715.66	2081.90	0.344	0.00	0.40	0.55	8.09	(0.00)	2.763
4	Donnenwerth SB	103.50	780.14	0.133	0.00	0.16	0.16	2.40	(0.00)	5.585
4	Bleams EB	1238.65	2082.39	0.595	0.00	1.52	1.53	22.93	(0.00)	4.479
4	Amand NB	325.90	566.78	0.575	0.00	1.36	1.39	20.69	(0.00)	15.664
4	Bleams WB	715.66	2080.99	0.344	0.00	0.55	0.55	8.23	(0.00)	2.767
5	Donnenwerth SB	84.50	860.09	0.098	0.00	0.16	0.12	1.76	(0.00)	4.877
5	Bleams EB	1011.35	2102.49	0.481	0.00	1.53	0.98	15.06	(0.00)	3.477

5	**Amand NB**	266.10	685.78	0.388	0.00	1.39	0.68	10.65	(0.00)	9.128
5	**Bleams WB**	584.34	2100.51	0.278	0.00	0.55	0.41	6.18	(0.00)	2.494
6	**Donnenwerth SB**	70.77	919.31	0.077	0.00	0.12	0.09	1.34	(0.00)	4.457
6	**Bleams EB**	846.96	2117.19	0.400	0.00	0.98	0.70	10.75	(0.00)	2.982
6	**Amand NB**	222.84	773.28	0.288	0.00	0.68	0.43	6.65	(0.00)	6.891
6	**Bleams WB**	489.35	2115.96	0.231	0.00	0.41	0.32	4.81	(0.00)	2.326

A6 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Donnenwerth-Amand	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Donnenwerth SB	
2	Bleams EB	
3	Amand NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Donnenwerth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Amand NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Donnenwerth SB	None
Bleams EB	None
Amand NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Amand NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Donnenwerth SB	ONE HOUR	Yes	67.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	873.00	100.000	N/A
Amand NB	ONE HOUR	Yes	233.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1358.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Donnenwerth SB	50.44	50.44	N/A	N/A
1	Bleams EB	657.24	657.24	N/A	N/A
1	Amand NB	175.41	175.41	N/A	N/A
1	Bleams WB	1022.37	1022.37	N/A	N/A
2	Donnenwerth SB	60.23	60.23	N/A	N/A
2	Bleams EB	784.81	784.81	N/A	N/A
2	Amand NB	209.46	209.46	N/A	N/A
2	Bleams WB	1220.81	1220.81	N/A	N/A
3	Donnenwerth SB	73.77	73.77	N/A	N/A
3	Bleams EB	961.19	961.19	N/A	N/A
3	Amand NB	256.54	256.54	N/A	N/A
3	Bleams WB	1495.19	1495.19	N/A	N/A
4	Donnenwerth SB	73.77	73.77	N/A	N/A
4	Bleams EB	961.19	961.19	N/A	N/A
4	Amand NB	256.54	256.54	N/A	N/A
4	Bleams WB	1495.19	1495.19	N/A	N/A
5	Donnenwerth SB	60.23	60.23	N/A	N/A
5	Bleams EB	784.81	784.81	N/A	N/A
5	Amand NB	209.46	209.46	N/A	N/A
5	Bleams WB	1220.81	1220.81	N/A	N/A
6	Donnenwerth SB	50.44	50.44	N/A	N/A
6	Bleams EB	657.24	657.24	N/A	N/A
6	Amand NB	175.41	175.41	N/A	N/A
6	Bleams WB	1022.37	1022.37	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	54.000
	2	28.000	0.000	134.000	711.000
	3	0.000	120.000	0.000	113.000
	4	141.000	1056.000	161.000	0.000

Turning Proportions (PCE) - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.19	0.00	0.81
	2	0.03	0.00	0.15	0.81
	3	0.00	0.52	0.00	0.48
	4	0.10	0.78	0.12	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Donnenwerth- Amand (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Donnenwerth SB	0.16	9.91	0.20	A	61.48	92.22	11.91	7.75	0.13	11.91	7.75	0.579	1357.445
Bleams EB	0.47	3.51	0.93	A	801.08	1201.62	61.39	3.07	0.68	61.39	3.07	0.723	2436.345
Amand NB	0.33	7.40	0.52	A	213.80	320.71	33.24	6.22	0.37	33.24	6.22	0.579	1357.445
Bleams WB	0.72	6.38	2.62	A	1246.12	1869.19	148.95	4.78	1.65	148.96	4.78	0.723	2436.345
						3483.74	255.49	4.4003					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.12	126.77	1002.57	0.00	699.48	184.58	0.072	0.00	0.08
Bleams EB	657.24	164.31	655.32	891.55	161.14	0.00	2087.86	1937.38	0.315	0.00	0.48
Amand NB	175.41	43.85	174.42	221.34	595.12	0.00	911.71	289.96	0.192	0.00	0.25
Bleams WB	1022.37	255.59	1018.49	658.70	110.85	0.00	2120.59	2055.12	0.482	0.00	0.97

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.09	151.72	1200.09	0.00	596.59	184.58	0.101	0.08	0.12
Bleams EB	784.81	196.20	784.17	1067.23	192.95	0.00	2067.17	1937.38	0.380	0.48	0.64
Amand NB	209.46	52.37	209.10	264.88	712.24	0.00	850.71	289.96	0.246	0.25	0.34
Bleams WB	1220.81	305.20	1218.97	788.49	132.84	0.00	2106.28	2055.12	0.580	0.97	1.43

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.44	185.55	1467.54	0.00	457.28	184.58	0.161	0.12	0.20
Bleams EB	961.19	240.30	960.03	1305.07	235.90	0.00	2039.22	1937.38	0.471	0.64	0.93
Amand NB	256.54	64.13	255.81	324.07	871.86	0.00	767.56	289.96	0.334	0.34	0.52
Bleams WB	1495.19	373.80	1490.55	965.13	162.54	0.00	2086.95	2055.12	0.716	1.43	2.59

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	73.77	18.44	73.76	186.06	1471.95	0.00	454.99	184.58	0.162	0.20	0.20
Bleams EB	961.19	240.30	961.18	1309.01	236.70	0.00	2038.70	1937.38	0.471	0.93	0.93
Amand NB	256.54	64.13	256.52	324.78	873.09	0.00	766.92	289.96	0.335	0.52	0.52
Bleams WB	1495.19	373.80	1495.06	966.67	162.94	0.00	2086.69	2055.12	0.717	2.59	2.62

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	60.23	15.06	60.56	152.44	1206.45	0.00	593.28	184.58	0.102	0.20	0.12
Bleams EB	784.81	196.20	785.96	1072.92	194.09	0.00	2066.42	1937.38	0.380	0.93	0.65
Amand NB	209.46	52.37	210.17	265.92	714.13	0.00	849.72	289.96	0.247	0.52	0.35
Bleams WB	1220.81	305.20	1225.44	790.85	133.45	0.00	2105.88	2055.12	0.580	2.62	1.46

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Donnenwerth SB	50.44	12.61	50.59	127.45	1008.48	0.00	696.40	184.58	0.072	0.12	0.08
Bleams EB	657.24	164.31	657.89	896.86	162.21	0.00	2087.17	1937.38	0.315	0.65	0.48
Amand NB	175.41	43.85	175.79	222.42	597.68	0.00	910.38	289.96	0.193	0.35	0.25
Bleams WB	1022.37	255.59	1024.29	661.83	111.64	0.00	2120.07	2055.12	0.482	1.46	0.99

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.18	0.08	5.818	A	A
Bleams EB	7.07	0.47	2.635	A	A
Amand NB	3.62	0.24	5.121	A	A
Bleams WB	14.16	0.94	3.419	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.71	0.11	7.043	A	A
Bleams EB	9.44	0.63	2.944	A	A
Amand NB	4.99	0.33	5.889	A	A
Bleams WB	20.89	1.39	4.251	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	2.89	0.19	9.840	A	A
Bleams EB	13.65	0.91	3.500	A	A
Amand NB	7.58	0.51	7.375	A	A
Bleams WB	36.91	2.46	6.289	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	3.01	0.20	9.915	A	A
Bleams EB	13.98	0.93	3.507	A	A
Amand NB	7.85	0.52	7.405	A	A
Bleams WB	39.14	2.61	6.384	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.85	0.12	7.099	A	A
Bleams EB	9.87	0.66	2.956	A	A
Amand NB	5.34	0.36	5.918	A	A
Bleams WB	22.73	1.52	4.316	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Donnenwerth SB	1.27	0.08	5.853	A	A
Bleams EB	7.37	0.49	2.645	A	A
Amand NB	3.87	0.26	5.147	A	A
Bleams WB	15.12	1.01	3.454	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.97	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.43	0.00	0.00	2.10	4.20			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.93	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.52	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	2.62	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.12	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.65	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.46	0.00	0.00	2.10	3.15			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Donnenwerth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Amand NB	0.25	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.99	0.00	0.00	1.05	2.10			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Donnenwerth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Amand NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Donnenwerth SB	50.44	699.48	0.072	0.00	0.00	0.08	1.18	(0.00)	5.818
1	Bleams EB	657.24	2087.86	0.315	0.00	0.00	0.48	7.07	(0.00)	2.635
1	Amand NB	175.41	911.71	0.192	0.00	0.00	0.25	3.62	(0.00)	5.121
1	Bleams WB	1022.37	2120.59	0.482	0.00	0.00	0.97	14.16	(0.00)	3.419
2	Donnenwerth SB	60.23	596.59	0.101	0.00	0.08	0.12	1.71	(0.00)	7.043
2	Bleams EB	784.81	2067.17	0.380	0.00	0.48	0.64	9.44	(0.00)	2.944
2	Amand NB	209.46	850.71	0.246	0.00	0.25	0.34	4.99	(0.00)	5.889
2	Bleams WB	1220.81	2106.28	0.580	0.00	0.97	1.43	20.89	(0.00)	4.251
3	Donnenwerth SB	73.77	457.28	0.161	0.00	0.12	0.20	2.89	(0.00)	9.840
3	Bleams EB	961.19	2039.22	0.471	0.00	0.64	0.93	13.65	(0.00)	3.500
3	Amand NB	256.54	767.56	0.334	0.00	0.34	0.52	7.58	(0.00)	7.375
3	Bleams WB	1495.19	2086.95	0.716	0.00	1.43	2.59	36.91	(0.00)	6.289
4	Donnenwerth SB	73.77	454.99	0.162	0.00	0.20	0.20	3.01	(0.00)	9.915
4	Bleams EB	961.19	2038.70	0.471	0.00	0.93	0.93	13.98	(0.00)	3.507
4	Amand NB	256.54	766.92	0.335	0.00	0.52	0.52	7.85	(0.00)	7.405
4	Bleams WB	1495.19	2086.69	0.717	0.00	2.59	2.62	39.14	(0.00)	6.384
5	Donnenwerth SB	60.23	593.28	0.102	0.00	0.20	0.12	1.85	(0.00)	7.099
5	Bleams EB	784.81	2066.42	0.380	0.00	0.93	0.65	9.87	(0.00)	2.956
5	Amand NB	209.46	849.72	0.247	0.00	0.52	0.35	5.34	(0.00)	5.918
5	Bleams WB	1220.81	2105.88	0.580	0.00	2.62	1.46	22.73	(0.00)	4.316
6	Donnenwerth SB	50.44	696.40	0.072	0.00	0.12	0.08	1.27	(0.00)	5.853
6	Bleams EB	657.24	2087.17	0.315	0.00	0.65	0.48	7.37	(0.00)	2.645
6	Amand NB	175.41	910.38	0.193	0.00	0.35	0.25	3.87	(0.00)	5.147
6	Bleams WB	1022.37	2120.07	0.482	0.00	1.46	0.99	15.12	(0.00)	3.454

Bleams Road & Commonwealth/Abram Clemens Street Roundabout Capacity Analysis

Version: 7.1.1.245 [9th June 2011]
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File: C:_Work\47727-100\Arcady\Bleams & Commonwearth-Abram Clemens.arc7
Report generation date: 11/2/2021 10:19:44 AM

Summary of roundabout performance

	AM				PM			
	Queue (PCE)	Delay (s)	RFC	LOS	Queue (PCE)	Delay (s)	RFC	LOS
	95% - Dual E-W Single N-S - 2031							
Commonwealth SB	0.11	4.98	0.09	A	0.19	13.22	0.16	B
Bleams EB	2.01	4.99	0.66	A	0.84	3.11	0.44	A
Abram Clemens NB	1.27	17.61	0.55	C	0.42	6.66	0.29	A
Bleams WB	0.52	2.56	0.33	A	3.44	7.34	0.77	A
	90% - Dual E-W Single N-S - 2031							
Commonwealth SB	0.11	5.28	0.10	A	0.20	14.10	0.16	B
Bleams EB	2.37	5.90	0.70	A	0.92	3.43	0.47	A
Abram Clemens NB	1.43	19.94	0.58	C	0.45	7.19	0.30	A
Bleams WB	0.57	2.78	0.35	A	4.41	9.49	0.81	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.
2031 - AM runs from 07:45:00 to 09:15:00
2031 - PM runs from 16:45:00 to 18:15:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	3/18/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	MTEDOMAIN\NDuimering
Description	

Analysis Options

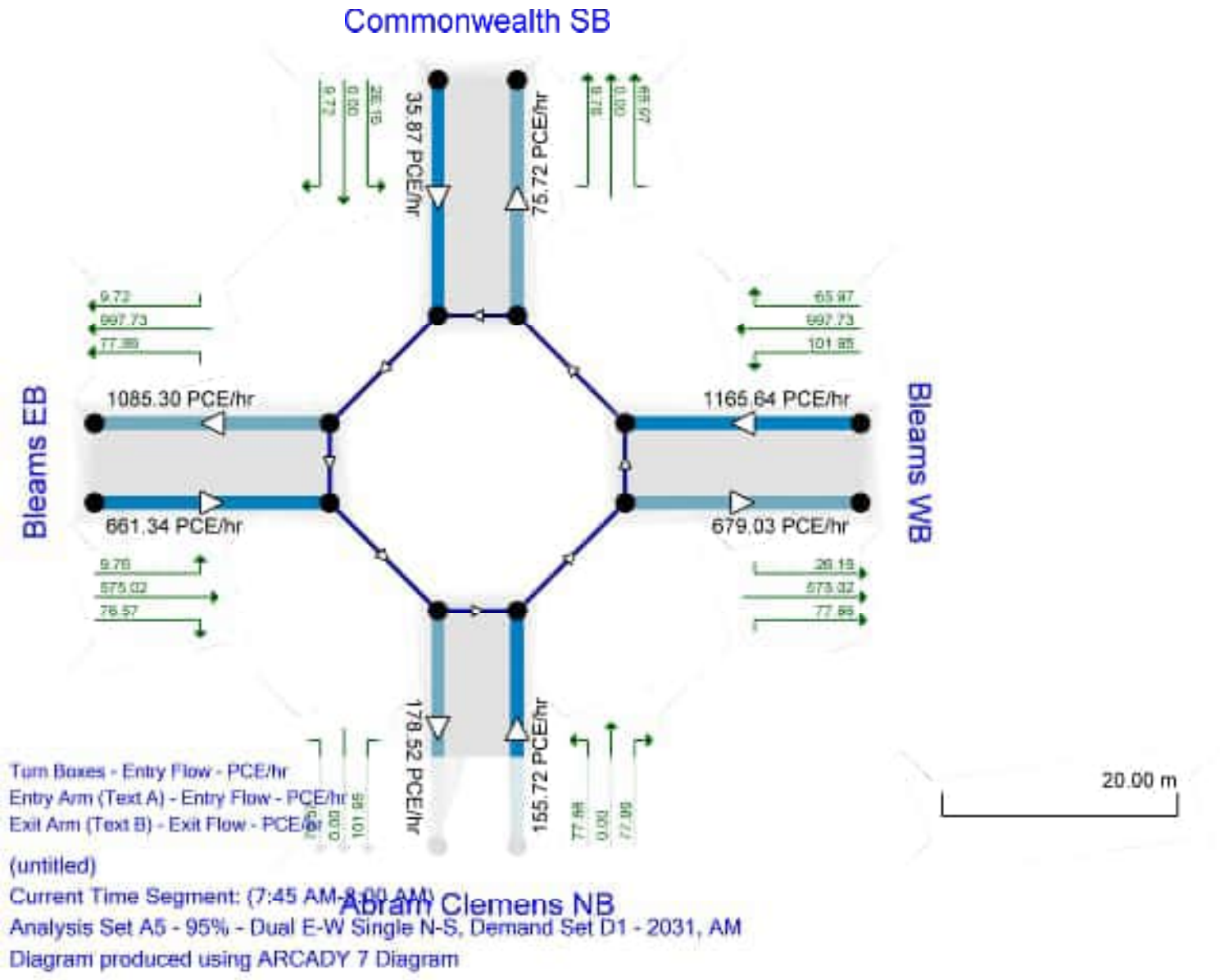
RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	Yes

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
Yes	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin



The intersection diagram reflects the last run of ARCADY.

A5 - 95% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	

Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	71.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	53.45	53.45	N/A	N/A
1	**Bleams EB**	1000.54	1000.54	N/A	N/A
1	**Abram Clemens NB**	180.68	180.68	N/A	N/A
1	**Bleams WB**	503.66	503.66	N/A	N/A

2	Commonwealth SB	63.83	63.83	N/A	N/A
2	Bleams EB	1194.74	1194.74	N/A	N/A
2	Abram Clemens NB	215.76	215.76	N/A	N/A
2	Bleams WB	601.42	601.42	N/A	N/A
3	Commonwealth SB	78.17	78.17	N/A	N/A
3	Bleams EB	1463.26	1463.26	N/A	N/A
3	Abram Clemens NB	264.24	264.24	N/A	N/A
3	Bleams WB	736.58	736.58	N/A	N/A
4	Commonwealth SB	78.17	78.17	N/A	N/A
4	Bleams EB	1463.26	1463.26	N/A	N/A
4	Abram Clemens NB	264.24	264.24	N/A	N/A
4	Bleams WB	736.58	736.58	N/A	N/A
5	Commonwealth SB	63.83	63.83	N/A	N/A
5	Bleams EB	1194.74	1194.74	N/A	N/A
5	Abram Clemens NB	215.76	215.76	N/A	N/A
5	Bleams WB	601.42	601.42	N/A	N/A
6	Commonwealth SB	53.45	53.45	N/A	N/A
6	Bleams EB	1000.54	1000.54	N/A	N/A
6	Abram Clemens NB	180.68	180.68	N/A	N/A
6	Bleams WB	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	12.000	0.000	59.000
	2	13.000	0.000	48.000	1268.000
	3	0.000	120.000	0.000	120.000
	4	42.000	562.000	65.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.17	0.00	0.83
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.84	0.10	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.09	4.98	0.11	A	65.15	97.73	7.36	4.52	0.08	7.36	4.52	0.579	1357.445
Bleams EB	0.66	4.99	2.01	A	1219.51	1829.27	120.27	3.94	1.34	120.28	3.95	0.723	2436.345
Abram Clemens NB	0.55	17.61	1.27	C	220.23	330.34	62.86	11.42	0.70	62.87	11.42	0.579	1357.445
Bleams WB	0.33	2.56	0.52	A	613.89	920.83	36.25	2.36	0.40	36.26	2.36	0.723	2436.345
						3178.17	226.74	4.2806					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	53.45	13.36	53.21	41.30	560.57	0.00	981.36	91.60	0.054	0.00	0.06
Bleams EB	1000.54	250.14	997.20	520.75	93.04	0.00	2250.63	2111.69	0.445	0.00	0.84
Abram Clemens NB	180.68	45.17	179.33	84.83	1005.40	0.00	736.78	128.60	0.245	0.00	0.34
Bleams WB	503.66	125.91	502.45	1085.31	99.42	0.00	2246.24	2256.18	0.224	0.00	0.30

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	63.83	15.96	63.76	49.41	670.82	0.00	920.74	91.60	0.069	0.06	0.08
Bleams EB	1194.74	298.69	1193.32	623.19	111.38	0.00	2238.03	2111.69	0.534	0.84	1.19
Abram Clemens NB	215.76	53.94	214.94	101.50	1203.20	0.00	628.03	128.60	0.344	0.34	0.54
Bleams WB	601.42	150.35	601.08	1299.00	119.14	0.00	2232.70	2256.18	0.269	0.30	0.39

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	78.17	19.54	78.05	60.49	820.57	0.00	838.41	91.60	0.093	0.08	0.11
Bleams EB	1463.26	365.81	1460.04	762.25	136.38	0.00	2220.86	2111.70	0.659	1.19	2.00
Abram Clemens NB	264.24	66.06	261.47	124.25	1472.17	0.00	480.14	128.60	0.550	0.54	1.23
Bleams WB	736.58	184.15	736.04	1588.62	145.02	0.00	2214.93	2256.18	0.333	0.39	0.52

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	78.17	19.54	78.17	60.56	822.39	0.00	837.40	91.60	0.093	0.11	0.11
Bleams EB	1463.26	365.81	1463.19	764.04	136.52	0.00	2220.76	2111.70	0.659	2.00	2.01
Abram Clemens NB	264.24	66.06	264.12	124.41	1475.31	0.00	478.42	128.60	0.552	1.23	1.27
Bleams WB	736.58	184.15	736.58	1593.05	146.37	0.00	2214.00	2256.18	0.333	0.52	0.52

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	63.83	15.96	63.94	49.51	673.45	0.00	919.30	91.60	0.069	0.11	0.08
Bleams EB	1194.74	298.69	1197.94	625.77	111.62	0.00	2237.87	2111.69	0.534	2.01	1.21
Abram Clemens NB	215.76	53.94	218.57	101.75	1207.81	0.00	625.49	128.60	0.345	1.27	0.56
Bleams WB	601.42	150.35	601.95	1305.38	121.00	0.00	2231.42	2256.18	0.270	0.52	0.39

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	53.45	13.36	53.52	41.44	563.13	0.00	979.95	91.60	0.055	0.08	0.06
Bleams EB	1000.54	250.14	1002.01	523.21	93.45	0.00	2250.35	2111.69	0.445	1.21	0.85
Abram Clemens NB	180.68	45.17	181.55	85.16	1010.30	0.00	734.09	128.60	0.246	0.56	0.35
Bleams WB	503.66	125.91	504.00	1091.27	100.57	0.00	2245.45	2256.18	0.224	0.39	0.30

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.88	0.06	4.071	A	A
Bleams EB	12.23	0.82	3.008	A	A
Abram Clemens NB	4.89	0.33	6.764	A	A
Bleams WB	4.47	0.30	2.167	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.15	0.08	4.410	A	A
Bleams EB	17.48	1.17	3.613	A	A
Abram Clemens NB	7.83	0.52	9.132	A	A
Bleams WB	5.72	0.38	2.316	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.58	0.11	4.971	A	A
Bleams EB	28.83	1.92	4.947	A	A
Abram Clemens NB	17.12	1.14	17.075	C	B
Bleams WB	7.71	0.51	2.556	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.61	0.11	4.978	A	A
Bleams EB	30.09	2.01	4.989	A	A
Abram Clemens NB	18.81	1.25	17.612	C	B
Bleams WB	7.83	0.52	2.558	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.20	0.08	4.419	A	A
Bleams EB	18.70	1.25	3.645	A	A
Abram Clemens NB	8.86	0.59	9.353	A	A
Bleams WB	5.91	0.39	2.321	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.93	0.06	4.081	A	A
Bleams EB	12.93	0.86	3.030	A	A
Abram Clemens NB	5.36	0.36	6.853	A	A
Bleams WB	4.62	0.31	2.172	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.34	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.19	0.00	0.00	2.10	3.15			N/A	N/A
Abram Clemens NB	0.54	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.00	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.23	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.52	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.01	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.27	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.52	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.21	0.00	0.00	1.05	2.10			N/A	N/A
Abram Clemens NB	0.56	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.39	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.85	0.00	0.00	1.05	1.05			N/A	N/A
Abram Clemens NB	0.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	Commonwealth SB	53.45	981.36	0.054	0.00	0.00	0.06	0.88	(0.00)	4.071
1	Bleams EB	1000.54	2250.63	0.445	0.00	0.00	0.84	12.23	(0.00)	3.008
1	Abram Clemens NB	180.68	736.78	0.245	0.00	0.00	0.34	4.89	(0.00)	6.764
1	Bleams WB	503.66	2246.24	0.224	0.00	0.00	0.30	4.47	(0.00)	2.167
2	Commonwealth SB	63.83	920.74	0.069	0.00	0.06	0.08	1.15	(0.00)	4.410
2	Bleams EB	1194.74	2238.03	0.534	0.00	0.84	1.19	17.48	(0.00)	3.613
2	Abram Clemens NB	215.76	628.03	0.344	0.00	0.34	0.54	7.83	(0.00)	9.132
2	Bleams WB	601.42	2232.70	0.269	0.00	0.30	0.39	5.72	(0.00)	2.316
3	Commonwealth SB	78.17	838.41	0.093	0.00	0.08	0.11	1.58	(0.00)	4.971
3	Bleams EB	1463.26	2220.86	0.659	0.00	1.19	2.00	28.83	(0.00)	4.947
3	Abram Clemens NB	264.24	480.14	0.550	0.00	0.54	1.23	17.12	(0.00)	17.075
3	Bleams WB	736.58	2214.93	0.333	0.00	0.39	0.52	7.71	(0.00)	2.556
4	Commonwealth SB	78.17	837.40	0.093	0.00	0.11	0.11	1.61	(0.00)	4.978
4	Bleams EB	1463.26	2220.76	0.659	0.00	2.00	2.01	30.09	(0.00)	4.989
4	Abram Clemens NB	264.24	478.42	0.552	0.00	1.23	1.27	18.81	(0.00)	17.612
4	Bleams WB	736.58	2214.00	0.333	0.00	0.52	0.52	7.83	(0.00)	2.558
5	Commonwealth SB	63.83	919.30	0.069	0.00	0.11	0.08	1.20	(0.00)	4.419
5	Bleams EB	1194.74	2237.87	0.534	0.00	2.01	1.21	18.70	(0.00)	3.645
5	Abram Clemens NB	215.76	625.49	0.345	0.00	1.27	0.56	8.86	(0.00)	9.353
5	Bleams WB	601.42	2231.42	0.270	0.00	0.52	0.39	5.91	(0.00)	2.321
6	Commonwealth SB	53.45	979.95	0.055	0.00	0.08	0.06	0.93	(0.00)	4.081
6	Bleams EB	1000.54	2250.35	0.445	0.00	1.21	0.85	12.93	(0.00)	3.030
6	Abram Clemens NB	180.68	734.09	0.246	0.00	0.56	0.35	5.36	(0.00)	6.853
6	Bleams WB	503.66	2245.45	0.224	0.00	0.39	0.30	4.62	(0.00)	2.172

A5 - 95% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
95% - Dual E-W Single N-S		Yes		(D1)		100.000	95.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	48.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	881.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Commonwealth SB	36.14	36.14	N/A	N/A
1	Bleams EB	663.26	663.26	N/A	N/A
1	Abram Clemens NB	156.59	156.59	N/A	N/A
1	Bleams WB	1170.69	1170.69	N/A	N/A
2	Commonwealth SB	43.15	43.15	N/A	N/A
2	Bleams EB	792.00	792.00	N/A	N/A
2	Abram Clemens NB	186.99	186.99	N/A	N/A
2	Bleams WB	1397.91	1397.91	N/A	N/A
3	Commonwealth SB	52.85	52.85	N/A	N/A
3	Bleams EB	970.00	970.00	N/A	N/A
3	Abram Clemens NB	229.01	229.01	N/A	N/A
3	Bleams WB	1712.09	1712.09	N/A	N/A
4	Commonwealth SB	52.85	52.85	N/A	N/A
4	Bleams EB	970.00	970.00	N/A	N/A
4	Abram Clemens NB	229.01	229.01	N/A	N/A

4	Bleams WB	1712.09	1712.09	N/A	N/A
5	Commonwealth SB	43.15	43.15	N/A	N/A
5	Bleams EB	792.00	792.00	N/A	N/A
5	Abram Clemens NB	186.99	186.99	N/A	N/A
5	Bleams WB	1397.91	1397.91	N/A	N/A
6	Commonwealth SB	36.14	36.14	N/A	N/A
6	Bleams EB	663.26	663.26	N/A	N/A
6	Abram Clemens NB	156.59	156.59	N/A	N/A
6	Bleams WB	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	13.000	0.000	35.000
	2	13.000	0.000	102.000	766.000
	3	0.000	104.000	0.000	104.000
	4	88.000	1331.000	136.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.27	0.00	0.73
	2	0.01	0.00	0.12	0.87
	3	0.00	0.50	0.00	0.50
	4	0.06	0.86	0.09	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.16	13.22	0.19	B	44.05	66.07	10.37	9.42	0.12	10.37	9.42	0.579	1357.445
Bleams EB	0.44	3.11	0.84	A	808.42	1212.63	55.75	2.76	0.62	55.75	2.76	0.723	2436.345
Abram Clemens NB	0.29	6.66	0.42	A	190.86	286.30	27.03	5.66	0.30	27.03	5.66	0.579	1357.445
Bleams WB	0.77	7.34	3.44	A	1426.90	2140.34	185.17	5.19	2.06	185.18	5.19	0.723	2436.345
						3705.34	278.32	4.5068					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	36.14	9.03	35.89	75.76	1178.07	0.00	641.84	79.30	0.056	0.00	0.06
Bleams EB	663.26	165.82	661.49	1085.80	128.16	0.00	2226.51	2141.56	0.298	0.00	0.44
Abram Clemens NB	156.59	39.15	155.77	178.58	611.07	0.00	953.59	216.63	0.164	0.00	0.21
Bleams WB	1170.69	292.67	1166.18	679.20	87.65	0.00	2254.33	2218.43	0.519	0.00	1.13

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	43.15	10.79	43.02	90.65	1409.92	0.00	514.37	79.30	0.084	0.06	0.10
Bleams EB	792.00	198.00	791.44	1299.52	153.42	0.00	2209.16	2141.56	0.359	0.44	0.58
Abram Clemens NB	186.99	46.75	186.70	213.69	731.18	0.00	887.56	216.63	0.211	0.21	0.28
Bleams WB	1397.91	349.48	1395.55	812.85	105.03	0.00	2242.40	2218.43	0.623	1.13	1.72

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	52.85	13.21	52.48	110.81	1723.14	0.00	342.16	79.30	0.154	0.10	0.19
Bleams EB	970.00	242.50	969.01	1588.19	187.42	0.00	2185.81	2141.56	0.444	0.58	0.83
Abram Clemens NB	229.01	57.25	228.45	261.34	895.08	0.00	797.44	216.63	0.287	0.28	0.42
Bleams WB	1712.09	428.02	1705.42	995.01	128.52	0.00	2226.26	2218.43	0.769	1.72	3.38

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	52.85	13.21	52.84	111.19	1729.49	0.00	338.66	79.30	0.156	0.19	0.19
Bleams EB	970.00	242.50	969.99	1594.08	188.24	0.00	2185.24	2141.56	0.444	0.83	0.84
Abram Clemens NB	229.01	57.25	229.00	262.02	896.21	0.00	796.82	216.63	0.287	0.42	0.42
Bleams WB	1712.09	428.02	1711.86	996.40	128.81	0.00	2226.06	2218.43	0.769	3.38	3.44

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	43.15	10.79	43.53	91.19	1418.90	0.00	509.43	79.30	0.085	0.19	0.10
Bleams EB	792.00	198.00	792.98	1307.84	154.59	0.00	2208.36	2141.56	0.359	0.84	0.59
Abram Clemens NB	186.99	46.75	187.54	214.66	732.91	0.00	886.60	216.63	0.211	0.42	0.28
Bleams WB	1397.91	349.48	1404.62	814.98	105.47	0.00	2242.09	2218.43	0.623	3.44	1.76

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	36.14	9.03	36.28	76.19	1185.21	0.00	637.92	79.30	0.057	0.10	0.06
Bleams EB	663.26	165.82	663.83	1092.43	129.05	0.00	2225.89	2141.56	0.298	0.59	0.45
Abram Clemens NB	156.59	39.15	156.89	179.46	613.43	0.00	952.30	216.63	0.164	0.28	0.21
Bleams WB	1170.69	292.67	1173.16	682.08	88.24	0.00	2253.92	2218.43	0.519	1.76	1.14

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.91	0.06	6.235	A	A
Bleams EB	6.54	0.44	2.413	A	A
Abram Clemens NB	3.00	0.20	4.733	A	A
Bleams WB	16.39	1.09	3.460	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.39	0.09	8.018	A	A
Bleams EB	8.64	0.58	2.664	A	A
Abram Clemens NB	4.09	0.27	5.390	A	A
Bleams WB	24.94	1.66	4.451	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.71	0.18	13.031	B	B
Bleams EB	12.26	0.82	3.103	A	A
Abram Clemens NB	6.11	0.41	6.636	A	A
Bleams WB	47.53	3.17	7.166	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.86	0.19	13.224	B	B
Bleams EB	12.52	0.83	3.109	A	A
Abram Clemens NB	6.30	0.42	6.656	A	A
Bleams WB	51.24	3.42	7.342	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.52	0.10	8.119	A	A
Bleams EB	8.99	0.60	2.671	A	A
Abram Clemens NB	4.34	0.29	5.410	A	A
Bleams WB	27.47	1.83	4.548	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.98	0.07	6.283	A	A
Bleams EB	6.80	0.45	2.420	A	A
Abram Clemens NB	3.18	0.21	4.753	A	A
Bleams WB	17.59	1.17	3.507	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.13	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.58	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.72	0.00	0.00	3.15	5.25			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.83	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.38	0.00	0.00	0.00	4.20			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Commonwealth SB	0.19	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.84	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	3.44	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.28	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.76	0.00	0.00	3.15	5.25			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.21	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.14	0.00	0.00	2.10	3.15			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Commonwealth SB**	36.14	641.84	0.056	0.00	0.00	0.06	0.91	(0.00)	6.235
1	**Bleams EB**	663.26	2226.51	0.298	0.00	0.00	0.44	6.54	(0.00)	2.413
1	**Abram Clemens NB**	156.59	953.59	0.164	0.00	0.00	0.21	3.00	(0.00)	4.733

1	Bleams WB	1170.69	2254.33	0.519	0.00	0.00	1.13	16.39	(0.00)	3.460
2	Commonwealth SB	43.15	514.37	0.084	0.00	0.06	0.10	1.39	(0.00)	8.018
2	Bleams EB	792.00	2209.16	0.359	0.00	0.44	0.58	8.64	(0.00)	2.664
2	Abram Clemens NB	186.99	887.56	0.211	0.00	0.21	0.28	4.09	(0.00)	5.390
2	Bleams WB	1397.91	2242.40	0.623	0.00	1.13	1.72	24.94	(0.00)	4.451
3	Commonwealth SB	52.85	342.16	0.154	0.00	0.10	0.19	2.71	(0.00)	13.031
3	Bleams EB	970.00	2185.81	0.444	0.00	0.58	0.83	12.26	(0.00)	3.103
3	Abram Clemens NB	229.01	797.44	0.287	0.00	0.28	0.42	6.11	(0.00)	6.636
3	Bleams WB	1712.09	2226.26	0.769	0.00	1.72	3.38	47.53	(0.00)	7.166
4	Commonwealth SB	52.85	338.66	0.156	0.00	0.19	0.19	2.86	(0.00)	13.224
4	Bleams EB	970.00	2185.24	0.444	0.00	0.83	0.84	12.52	(0.00)	3.109
4	Abram Clemens NB	229.01	796.82	0.287	0.00	0.42	0.42	6.30	(0.00)	6.656
4	Bleams WB	1712.09	2226.06	0.769	0.00	3.38	3.44	51.24	(0.00)	7.342
5	Commonwealth SB	43.15	509.43	0.085	0.00	0.19	0.10	1.52	(0.00)	8.119
5	Bleams EB	792.00	2208.36	0.359	0.00	0.84	0.59	8.99	(0.00)	2.671
5	Abram Clemens NB	186.99	886.60	0.211	0.00	0.42	0.28	4.34	(0.00)	5.410
5	Bleams WB	1397.91	2242.09	0.623	0.00	3.44	1.76	27.47	(0.00)	4.548
6	Commonwealth SB	36.14	637.92	0.057	0.00	0.10	0.06	0.98	(0.00)	6.283
6	Bleams EB	663.26	2225.89	0.298	0.00	0.59	0.45	6.80	(0.00)	2.420
6	Abram Clemens NB	156.59	952.30	0.164	0.00	0.28	0.21	3.18	(0.00)	4.753
6	Bleams WB	1170.69	2253.92	0.519	0.00	1.76	1.14	17.59	(0.00)	3.507

A6 - 90% - Dual E-W Single N-S - D1 - 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, AM	2031	AM			Yes			07:45	09:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	71.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	1329.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	240.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	669.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	Commonwealth SB	53.45	53.45	N/A	N/A
1	Bleams EB	1000.54	1000.54	N/A	N/A
1	Abram Clemens NB	180.68	180.68	N/A	N/A
1	Bleams WB	503.66	503.66	N/A	N/A
2	Commonwealth SB	63.83	63.83	N/A	N/A
2	Bleams EB	1194.74	1194.74	N/A	N/A
2	Abram Clemens NB	215.76	215.76	N/A	N/A
2	Bleams WB	601.42	601.42	N/A	N/A
3	Commonwealth SB	78.17	78.17	N/A	N/A
3	Bleams EB	1463.26	1463.26	N/A	N/A
3	Abram Clemens NB	264.24	264.24	N/A	N/A
3	Bleams WB	736.58	736.58	N/A	N/A
4	Commonwealth SB	78.17	78.17	N/A	N/A
4	Bleams EB	1463.26	1463.26	N/A	N/A
4	Abram Clemens NB	264.24	264.24	N/A	N/A
4	Bleams WB	736.58	736.58	N/A	N/A
5	Commonwealth SB	63.83	63.83	N/A	N/A
5	Bleams EB	1194.74	1194.74	N/A	N/A
5	Abram Clemens NB	215.76	215.76	N/A	N/A
5	Bleams WB	601.42	601.42	N/A	N/A
6	Commonwealth SB	53.45	53.45	N/A	N/A
6	Bleams EB	1000.54	1000.54	N/A	N/A
6	Abram Clemens NB	180.68	180.68	N/A	N/A

6	Bleams WB	503.66	503.66	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.000	12.000	0.000	59.000
	2	13.000	0.000	48.000	1268.000
	3	0.000	120.000	0.000	120.000
	4	42.000	562.000	65.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.17	0.00	0.83
	2	0.01	0.00	0.04	0.95
	3	0.00	0.50	0.00	0.50
	4	0.06	0.84	0.10	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.10	5.28	0.11	A	65.15	97.73	7.80	4.79	0.09	7.80	4.79	0.579	1357.445
Bleams EB	0.70	5.90	2.37	A	1219.51	1829.27	137.72	4.52	1.53	137.73	4.52	0.723	2436.345
Abram Clemens NB	0.58	19.94	1.43	C	220.23	330.34	69.37	12.60	0.77	69.38	12.60	0.579	1357.445
Bleams WB	0.35	2.78	0.57	A	613.89	920.83	39.13	2.55	0.43	39.13	2.55	0.723	2436.345
						3178.17	254.02	4.7956					

Main Results

Main results: (7:45 AM-8:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	53.45	13.36	53.20	41.29	560.44	0.00	929.78	140.59	0.057	0.00	0.06
Bleams EB	1000.54	250.14	996.85	520.62	93.02	0.00	2132.19	1982.28	0.469	0.00	0.92
Abram Clemens NB	180.68	45.17	179.23	84.81	1005.06	0.00	698.18	165.60	0.259	0.00	0.36
Bleams WB	503.66	125.91	502.36	1084.92	99.37	0.00	2128.06	2126.22	0.237	0.00	0.32

Main results: (8:00 AM-8:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	63.83	15.96	63.75	49.40	670.75	0.00	872.32	140.59	0.073	0.06	0.08
Bleams EB	1194.74	298.69	1193.06	623.12	111.38	0.00	2120.24	1982.28	0.563	0.92	1.34
Abram Clemens NB	215.76	53.94	214.86	101.49	1202.95	0.00	595.10	165.60	0.363	0.36	0.59
Bleams WB	601.42	150.35	601.05	1298.71	119.10	0.00	2115.22	2126.22	0.284	0.32	0.42

Main results: (8:15 AM-8:30 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	78.17	19.54	78.05	60.48	820.31	0.00	794.41	140.59	0.098	0.08	0.11
Bleams EB	1463.26	365.81	1459.23	761.99	136.36	0.00	2103.98	1982.28	0.695	1.34	2.35
Abram Clemens NB	264.24	66.06	261.06	124.21	1471.38	0.00	455.28	165.60	0.580	0.59	1.38
Bleams WB	736.58	184.15	735.98	1587.64	144.80	0.00	2098.49	2126.22	0.351	0.42	0.57

Main results: (8:30 AM-8:45 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	78.17	19.54	78.17	60.55	822.37	0.00	793.34	140.59	0.099	0.11	0.11
Bleams EB	1463.26	365.81	1463.16	764.01	136.52	0.00	2103.88	1982.28	0.696	2.35	2.37
Abram Clemens NB	264.24	66.06	264.07	124.41	1475.27	0.00	453.25	165.60	0.583	1.38	1.43
Bleams WB	736.58	184.15	736.58	1593.00	146.35	0.00	2097.49	2126.22	0.351	0.57	0.57

Main results: (8:45 AM-9:00 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	63.83	15.96	63.95	49.52	673.72	0.00	870.77	140.59	0.073	0.11	0.08

Bleams EB	1194.74	298.69	1198.76	626.04	111.63	0.00	2120.08	1982.28	0.564	2.37	1.37
Abram Clemens NB	215.76	53.94	219.02	101.79	1208.60	0.00	592.16	165.60	0.364	1.43	0.61
Bleams WB	601.42	150.35	602.01	1306.39	121.23	0.00	2113.83	2126.22	0.285	0.57	0.42

Main results: (9:00 AM-9:15 AM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	53.45	13.36	53.53	41.45	563.21	0.00	928.34	140.59	0.058	0.08	0.06
Bleams EB	1000.54	250.14	1002.28	523.28	93.45	0.00	2131.90	1982.28	0.469	1.37	0.93
Abram Clemens NB	180.68	45.17	181.64	85.17	1010.56	0.00	695.32	165.60	0.260	0.61	0.37
Bleams WB	503.66	125.91	504.03	1091.58	100.63	0.00	2127.24	2126.22	0.237	0.42	0.33

Queueing Delay Results

Queueing Delay results: (7:45 AM-8:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.94	0.06	4.311	A	A
Bleams EB	13.46	0.90	3.318	A	A
Abram Clemens NB	5.23	0.35	7.263	A	A
Bleams WB	4.79	0.32	2.322	A	A

Queueing Delay results: (8:00 AM-8:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.22	0.08	4.674	A	A
Bleams EB	19.61	1.31	4.069	A	A
Abram Clemens NB	8.47	0.56	9.917	A	A
Bleams WB	6.16	0.41	2.496	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.68	0.11	5.277	A	A
Bleams EB	33.64	2.24	5.827	A	A
Abram Clemens NB	19.01	1.27	19.155	C	B
Bleams WB	8.35	0.56	2.772	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.71	0.11	5.284	A	A
Bleams EB	35.46	2.36	5.897	A	A
Abram Clemens NB	21.16	1.41	19.936	C	B
Bleams WB	8.49	0.57	2.776	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.28	0.09	4.687	A	A

Bleams EB	21.21	1.41	4.120	A	A
Abram Clemens NB	9.72	0.65	10.216	B	B
Bleams WB	6.37	0.42	2.502	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	0.98	0.07	4.322	A	A
Bleams EB	14.34	0.96	3.350	A	A
Abram Clemens NB	5.78	0.39	7.374	A	A
Bleams WB	4.96	0.33	2.330	A	A

Queue Variation Results

Queue Variation results: (7:45 AM-8:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.36	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.32	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:00 AM-8:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.34	0.00	0.00	2.10	4.20			N/A	N/A
Abram Clemens NB	0.59	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:15 AM-8:30 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.35	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	1.38	0.00	0.00	0.00	2.10			N/A	N/A
Bleams WB	0.57	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (8:30 AM-8:45 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.11	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	2.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Abram Clemens NB	1.43	0.00	0.00	0.00	3.15			N/A	N/A
Bleams WB	0.57	0.00	0.00	0.00	1.05			N/A	N/A

Queue Variation results: (8:45 AM-9:00 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.08	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	1.37	0.00	0.00	2.10	3.15			N/A	N/A
Abram Clemens NB	0.61	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	0.42	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (9:00 AM-9:15 AM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.06	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.93	0.00	0.00	1.05	2.10			N/A	N/A
Abram Clemens NB	0.37	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	0.33	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Commonwealth SB**	53.45	929.78	0.057	0.00	0.00	0.06	0.94	(0.00)	4.311
1	**Bleams EB**	1000.54	2132.19	0.469	0.00	0.00	0.92	13.46	(0.00)	3.318
1	**Abram Clemens NB**	180.68	698.18	0.259	0.00	0.00	0.36	5.23	(0.00)	7.263
1	**Bleams WB**	503.66	2128.06	0.237	0.00	0.00	0.32	4.79	(0.00)	2.322
2	**Commonwealth SB**	63.83	872.32	0.073	0.00	0.06	0.08	1.22	(0.00)	4.674
2	**Bleams EB**	1194.74	2120.24	0.563	0.00	0.92	1.34	19.61	(0.00)	4.069
2	**Abram Clemens NB**	215.76	595.10	0.363	0.00	0.36	0.59	8.47	(0.00)	9.917

2	Bleams WB	601.42	2115.22	0.284	0.00	0.32	0.42	6.16	(0.00)	2.496
3	Commonwealth SB	78.17	794.41	0.098	0.00	0.08	0.11	1.68	(0.00)	5.277
3	Bleams EB	1463.26	2103.98	0.695	0.00	1.34	2.35	33.64	(0.00)	5.827
3	Abram Clemens NB	264.24	455.28	0.580	0.00	0.59	1.38	19.01	(0.00)	19.155
3	Bleams WB	736.58	2098.49	0.351	0.00	0.42	0.57	8.35	(0.00)	2.772
4	Commonwealth SB	78.17	793.34	0.099	0.00	0.11	0.11	1.71	(0.00)	5.284
4	Bleams EB	1463.26	2103.88	0.696	0.00	2.35	2.37	35.46	(0.00)	5.897
4	Abram Clemens NB	264.24	453.25	0.583	0.00	1.38	1.43	21.16	(0.00)	19.936
4	Bleams WB	736.58	2097.49	0.351	0.00	0.57	0.57	8.49	(0.00)	2.776
5	Commonwealth SB	63.83	870.77	0.073	0.00	0.11	0.08	1.28	(0.00)	4.687
5	Bleams EB	1194.74	2120.08	0.564	0.00	2.37	1.37	21.21	(0.00)	4.120
5	Abram Clemens NB	215.76	592.16	0.364	0.00	1.43	0.61	9.72	(0.00)	10.216
5	Bleams WB	601.42	2113.83	0.285	0.00	0.57	0.42	6.37	(0.00)	2.502
6	Commonwealth SB	53.45	928.34	0.058	0.00	0.08	0.06	0.98	(0.00)	4.322
6	Bleams EB	1000.54	2131.90	0.469	0.00	1.37	0.93	14.34	(0.00)	3.350
6	Abram Clemens NB	180.68	695.32	0.260	0.00	0.61	0.37	5.78	(0.00)	7.374
6	Bleams WB	503.66	2127.24	0.237	0.00	0.42	0.33	4.96	(0.00)	2.330

A6 - 90% - Dual E-W Single N-S - D2 - 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
90% - Dual E-W Single N-S		Yes		(D1)		100.000	90.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031, PM	2031	PM			Yes			16:45	18:15	90	15	ONE HOUR

Roundabout Network

Roundabout Type(s)

ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	Bleams & Commonwealth-Abram Clemens	1,2,3,4	Standard			

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London

Right	Normal/unknown	((Mini-roundabouts only))	

Arms

Arms

ID	Name	Description
1	Commonwealth SB	
2	Bleams EB	
3	Abram Clemens NB	
4	Bleams WB	

Capacity Options

Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
Commonwealth SB	0.00	99999.00		0.00
Bleams EB	0.00	99999.00		0.00
Abram Clemens NB	0.00	99999.00		0.00
Bleams WB	0.00	99999.00		0.00

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00	
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00	
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00	

Pedestrian Crossings

Arm	Crossing Type
Commonwealth SB	None
Bleams EB	None
Abram Clemens NB	None
Bleams WB	None

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB		((calculated))	((calculated))	0.579	1357.445
Bleams EB		((calculated))	((calculated))	0.723	2436.345
Abram Clemens NB		((calculated))	((calculated))	0.579	1357.445
Bleams WB		((calculated))	((calculated))	0.723	2436.345

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over	Vehicle Mix Source	PCE Factor for a Truck	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry

	Time		Entry		(PCE)					
		Yes	Yes	Truck Percentages	2.00				Yes	Yes

Entry Flows

General Flows Data

Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
Commonwealth SB	ONE HOUR	Yes	48.00	100.000	N/A
Bleams EB	ONE HOUR	Yes	881.00	100.000	N/A
Abram Clemens NB	ONE HOUR	Yes	208.00	100.000	N/A
Bleams WB	ONE HOUR	Yes	1555.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	**Commonwealth SB**	36.14	36.14	N/A	N/A
1	**Bleams EB**	663.26	663.26	N/A	N/A
1	**Abram Clemens NB**	156.59	156.59	N/A	N/A
1	**Bleams WB**	1170.69	1170.69	N/A	N/A
2	**Commonwealth SB**	43.15	43.15	N/A	N/A
2	**Bleams EB**	792.00	792.00	N/A	N/A
2	**Abram Clemens NB**	186.99	186.99	N/A	N/A
2	**Bleams WB**	1397.91	1397.91	N/A	N/A
3	**Commonwealth SB**	52.85	52.85	N/A	N/A
3	**Bleams EB**	970.00	970.00	N/A	N/A
3	**Abram Clemens NB**	229.01	229.01	N/A	N/A
3	**Bleams WB**	1712.09	1712.09	N/A	N/A
4	**Commonwealth SB**	52.85	52.85	N/A	N/A
4	**Bleams EB**	970.00	970.00	N/A	N/A
4	**Abram Clemens NB**	229.01	229.01	N/A	N/A
4	**Bleams WB**	1712.09	1712.09	N/A	N/A
5	**Commonwealth SB**	43.15	43.15	N/A	N/A
5	**Bleams EB**	792.00	792.00	N/A	N/A
5	**Abram Clemens NB**	186.99	186.99	N/A	N/A
5	**Bleams WB**	1397.91	1397.91	N/A	N/A
6	**Commonwealth SB**	36.14	36.14	N/A	N/A
6	**Bleams EB**	663.26	663.26	N/A	N/A
6	**Abram Clemens NB**	156.59	156.59	N/A	N/A
6	**Bleams WB**	1170.69	1170.69	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
From		**1**	**2**	**3**	**4**
	1	0.000	13.000	0.000	35.000

	2	13.000	0.000	102.000	766.000
	3	0.000	104.000	0.000	104.000
	4	88.000	1331.000	136.000	0.000

Turning Proportions (PCE) - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.27	0.00	0.73
	2	0.01	0.00	0.12	0.87
	3	0.00	0.50	0.00	0.50
	4	0.06	0.86	0.09	0.00

Vehicle Mix

Average PCE Per Vehicle - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	1.050	1.050	1.050	1.050
	2	1.050	1.050	1.050	1.050
	3	1.050	1.050	1.050	1.050
	4	1.050	1.050	1.050	1.050

Truck Percentages - Bleams & Commonwealth- Abram Clemens (for whole period)

		To			
		1	2	3	4
From	1	5.000	5.000	5.000	5.000
	2	5.000	5.000	5.000	5.000
	3	5.000	5.000	5.000	5.000
	4	5.000	5.000	5.000	5.000

Results

Results Summary

Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
Commonwealth SB	0.16	14.10	0.20	B	44.05	66.07	11.00	9.99	0.12	11.00	9.99	0.579	1357.445
Bleams EB	0.47	3.43	0.92	A	808.42	1212.63	60.95	3.02	0.68	60.95	3.02	0.723	2436.345
Abram Clemens NB	0.30	7.19	0.45	A	190.86	286.30	29.01	6.08	0.32	29.01	6.08	0.579	1357.445
Bleams WB	0.81	9.49	4.41	A	1426.90	2140.34	223.97	6.28	2.49	224.00	6.28	0.723	2436.345
						3705.34	324.93	5.2615					

Main Results

Main results: (4:45 PM-5:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)

Commonwealth SB	36.14	9.03	35.87	75.72	1177.53	0.00	608.34	128.96	0.059	0.00	0.07
Bleams EB	663.26	165.82	661.34	1085.30	128.10	0.00	2109.36	2012.40	0.314	0.00	0.48
Abram Clemens NB	156.59	39.15	155.72	178.52	610.93	0.00	903.48	245.86	0.173	0.00	0.22
Bleams WB	1170.69	292.67	1165.64	679.03	87.62	0.00	2135.70	2093.41	0.548	0.00	1.26

Main results: (5:00 PM-5:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	43.15	10.79	43.01	90.62	1409.40	0.00	487.57	128.96	0.089	0.07	0.10
Bleams EB	792.00	198.00	791.38	1299.04	153.37	0.00	2092.92	2012.40	0.378	0.48	0.64
Abram Clemens NB	186.99	46.75	186.67	213.63	731.11	0.00	840.88	245.86	0.222	0.22	0.30
Bleams WB	1397.91	349.48	1395.01	812.77	105.01	0.00	2124.38	2093.41	0.658	1.26	1.99

Main results: (5:15 PM-5:30 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	52.85	13.21	52.45	110.66	1720.67	0.00	325.43	128.96	0.162	0.10	0.20
Bleams EB	970.00	242.50	968.87	1585.94	187.18	0.00	2070.92	2012.40	0.468	0.64	0.92
Abram Clemens NB	229.01	57.25	228.40	261.10	894.94	0.00	755.54	245.86	0.303	0.30	0.45
Bleams WB	1712.09	428.02	1702.83	994.84	128.50	0.00	2109.10	2093.41	0.812	1.99	4.30

Main results: (5:30 PM-5:45 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	52.85	13.21	52.83	111.18	1729.29	0.00	320.94	128.96	0.165	0.20	0.20
Bleams EB	970.00	242.50	969.98	1593.90	188.22	0.00	2070.24	2012.40	0.469	0.92	0.92
Abram Clemens NB	229.01	57.25	229.00	262.00	896.20	0.00	754.88	245.86	0.303	0.45	0.45
Bleams WB	1712.09	428.02	1711.65	996.39	128.81	0.00	2108.90	2093.41	0.812	4.30	4.41

Main results: (5:45 PM-6:00 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	43.15	10.79	43.55	91.35	1421.49	0.00	481.27	128.96	0.090	0.20	0.10
Bleams EB	792.00	198.00	793.12	1310.20	154.84	0.00	2091.96	2012.40	0.379	0.92	0.64
Abram Clemens NB	186.99	46.75	187.59	214.91	733.05	0.00	839.87	245.86	0.223	0.45	0.30
Bleams WB	1397.91	349.48	1407.33	815.14	105.50	0.00	2124.07	2093.41	0.658	4.41	2.05

Main results: (6:00 PM-6:15 PM)

Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
Commonwealth SB	36.14	9.03	36.29	76.22	1185.79	0.00	604.04	128.96	0.060	0.10	0.07
Bleams EB	663.26	165.82	663.90	1092.96	129.11	0.00	2108.70	2012.40	0.315	0.64	0.48
Abram Clemens NB	156.59	39.15	156.92	179.52	613.49	0.00	902.14	245.86	0.174	0.30	0.22
Bleams WB	1170.69	292.67	1173.76	682.16	88.26	0.00	2135.29	2093.41	0.548	2.05	1.29

Queueing Delay Results

Queueing Delay results: (4:45 PM-5:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

Commonwealth SB	0.96	0.06	6.600	A	A
Bleams EB	7.06	0.47	2.607	A	A
Abram Clemens NB	3.19	0.21	5.050	A	A
Bleams WB	18.30	1.22	3.876	A	A

Queueing Delay results: (5:00 PM-5:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.47	0.10	8.500	A	A
Bleams EB	9.40	0.63	2.902	A	A
Abram Clemens NB	4.37	0.29	5.775	A	A
Bleams WB	28.72	1.91	5.162	A	A

Queueing Delay results: (5:15 PM-5:30 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	2.87	0.19	13.828	B	B
Bleams EB	13.50	0.90	3.427	A	A
Abram Clemens NB	6.58	0.44	7.159	A	A
Bleams WB	59.18	3.95	9.100	A	A

Queueing Delay results: (5:30 PM-5:45 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	3.04	0.20	14.095	B	B
Bleams EB	13.81	0.92	3.434	A	A
Abram Clemens NB	6.80	0.45	7.187	A	A
Bleams WB	65.51	4.37	9.486	A	A

Queueing Delay results: (5:45 PM-6:00 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.62	0.11	8.644	A	A
Bleams EB	9.82	0.65	2.914	A	A
Abram Clemens NB	4.66	0.31	5.802	A	A
Bleams WB	32.41	2.16	5.340	A	A

Queueing Delay results: (6:00 PM-6:15 PM)

Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
Commonwealth SB	1.04	0.07	6.658	A	A
Bleams EB	7.36	0.49	2.618	A	A
Abram Clemens NB	3.40	0.23	5.074	A	A
Bleams WB	19.86	1.32	3.943	A	A

Queue Variation Results

Queue Variation results: (4:45 PM-5:00 PM)

Arm	Mean	Q05	Q50	Q90	Q95	Percentile	Marker	Probability Of Reaching	Probability Of Exactly

	(PCE)	(PCE)	(PCE)	(PCE)	(PCE)	Message	Message	Or Exceeding Marker	Reaching Marker
Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.26	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:00 PM-5:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.99	0.00	0.00	3.15	6.30			N/A	N/A

Queue Variation results: (5:15 PM-5:30 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.45	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	4.30	0.00	0.00	1.05	10.50			N/A	N/A

Queue Variation results: (5:30 PM-5:45 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.20	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.92	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.45	0.00	0.00	0.00	1.05			N/A	N/A
Bleams WB	4.41	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A

Queue Variation results: (5:45 PM-6:00 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
Commonwealth SB	0.10	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.64	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.30	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	2.05	0.00	0.00	4.20	6.30			N/A	N/A

Queue Variation results: (6:00 PM-6:15 PM)

Arm	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

Commonwealth SB	0.07	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams EB	0.48	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Abram Clemens NB	0.22	N/A	N/A	N/A	N/A	Percentiles could not be calculated		N/A	N/A
Bleams WB	1.29	0.00	0.00	2.10	4.20			N/A	N/A

Overview: Standard Roundabout Geometry

Standard Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
Commonwealth SB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams EB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345
Abram Clemens NB	3.50	4.50	30.00	20.00	40.00	25.00		0.579	1357.445
Bleams WB	7.00	8.00	30.00	20.00	55.00	25.00		0.723	2436.345

Overview: Time Segment Results

Time Segment Results

Time Segment	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**Commonwealth SB**	36.14	608.34	0.059	0.00	0.00	0.07	0.96	(0.00)	6.600
1	**Bleams EB**	663.26	2109.36	0.314	0.00	0.00	0.48	7.06	(0.00)	2.607
1	**Abram Clemens NB**	156.59	903.48	0.173	0.00	0.00	0.22	3.19	(0.00)	5.050
1	**Bleams WB**	1170.69	2135.70	0.548	0.00	0.00	1.26	18.30	(0.00)	3.876
2	**Commonwealth SB**	43.15	487.57	0.089	0.00	0.07	0.10	1.47	(0.00)	8.500
2	**Bleams EB**	792.00	2092.92	0.378	0.00	0.48	0.64	9.40	(0.00)	2.902
2	**Abram Clemens NB**	186.99	840.88	0.222	0.00	0.22	0.30	4.37	(0.00)	5.775
2	**Bleams WB**	1397.91	2124.38	0.658	0.00	1.26	1.99	28.72	(0.00)	5.162
3	**Commonwealth SB**	52.85	325.43	0.162	0.00	0.10	0.20	2.87	(0.00)	13.828
3	**Bleams EB**	970.00	2070.92	0.468	0.00	0.64	0.92	13.50	(0.00)	3.427
3	**Abram Clemens NB**	229.01	755.54	0.303	0.00	0.30	0.45	6.58	(0.00)	7.159
3	**Bleams WB**	1712.09	2109.10	0.812	0.00	1.99	4.30	59.18	(0.00)	9.100
4	**Commonwealth SB**	52.85	320.94	0.165	0.00	0.20	0.20	3.04	(0.00)	14.095
4	**Bleams EB**	970.00	2070.24	0.469	0.00	0.92	0.92	13.81	(0.00)	3.434
4	**Abram Clemens NB**	229.01	754.88	0.303	0.00	0.45	0.45	6.80	(0.00)	7.187
4	**Bleams WB**	1712.09	2108.90	0.812	0.00	4.30	4.41	65.51	(0.00)	9.486
5	**Commonwealth SB**	43.15	481.27	0.090	0.00	0.20	0.10	1.62	(0.00)	8.644
5	**Bleams EB**	792.00	2091.96	0.379	0.00	0.92	0.64	9.82	(0.00)	2.914

5	**Abram Clemens NB**	186.99	839.87	0.223	0.00	0.45	0.30	4.66	(0.00)	5.802
5	**Bleams WB**	1397.91	2124.07	0.658	0.00	4.41	2.05	32.41	(0.00)	5.340
6	**Commonwealth SB**	36.14	604.04	0.060	0.00	0.10	0.07	1.04	(0.00)	6.658
6	**Bleams EB**	663.26	2108.70	0.315	0.00	0.64	0.48	7.36	(0.00)	2.618
6	**Abram Clemens NB**	156.59	902.14	0.174	0.00	0.30	0.22	3.40	(0.00)	5.074
6	**Bleams WB**	1170.69	2135.29	0.548	0.00	2.05	1.29	19.86	(0.00)	3.943



Lane Group	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	41	719	793	757	705	70
Future Volume (vph)	41	719	793	757	705	70
Ideal Flow (vphpl)	1775	1750	1775	1900	1900	1750
Storage Length (m)	30.0	0.0	110.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.6		7.6			
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1672	1475	3243	1883	1883	1475
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1672	1475	3243	1883	1883	1475
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		98				32
Link Speed (k/h)	60			80	80	
Link Distance (m)	337.1			536.2	1410.1	
Travel Time (s)	20.2			24.1	63.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	719	793	757	705	70
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	719	793	757	705	70
Turn Type	Prot	pt+ov	Prot	NA	NA	Perm
Protected Phases	8	8 1	1	6	2	
Permitted Phases						2
Detector Phase	8	8 1	1	6	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0		11.0	24.0	24.0	24.0
Total Split (s)	25.0		26.0	65.0	39.0	39.0
Total Split (%)	27.8%		28.9%	72.2%	43.3%	43.3%
Maximum Green (s)	19.0		20.0	59.0	33.0	33.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0		4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	21.0	47.0	22.0	61.0	35.0	35.0
Actuated g/C Ratio	0.23	0.52	0.24	0.68	0.39	0.39
v/c Ratio	0.11	0.88	1.00	0.59	0.96	0.12
Control Delay	28.1	30.8	67.7	10.2	53.9	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	30.8	67.7	10.2	53.9	11.6

Lane Group	WBL	WBR	SEL	SET	NWT	NWR
LOS	C	C	E	B	D	B
Approach Delay	30.7			39.6	50.1	
Approach LOS	C			D	D	
Queue Length 50th (m)	5.6	92.3	~70.9	61.5	116.6	4.0
Queue Length 95th (m)	13.7	#169.6	#108.7	91.1	#187.8	12.2
Internal Link Dist (m)	313.1			512.2	1386.1	
Turn Bay Length (m)	30.0		110.0			30.0
Base Capacity (vph)	390	817	792	1276	732	593
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.88	1.00	0.59	0.96	0.12

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 40.1		Intersection LOS: D	
Intersection Capacity Utilization 92.1%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Trussler & Bleams



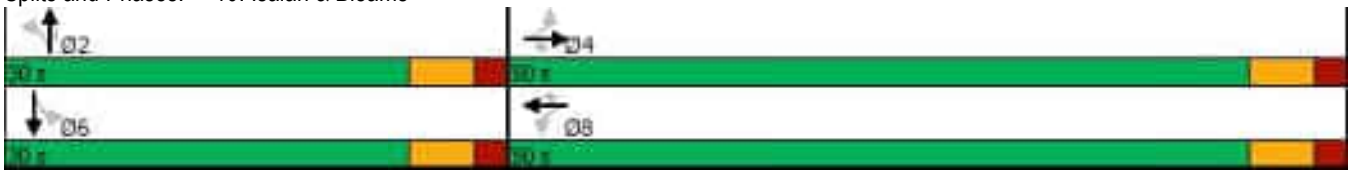


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Future Volume (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.936	
Flt Protected	0.950			0.950				0.950			0.974	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1401	0
Flt Permitted	0.351			0.362				0.771			0.790	
Satd. Flow (perm)	618	1883	1475	637	1883	1475	0	1261	1475	0	1136	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			90			131		50	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		209.7			579.9			229.9			213.8	
Travel Time (s)		12.6			34.8			16.6			15.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	69	618	101	219	636	109	87	0	131	55	0	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	618	101	219	636	109	0	87	131	0	105	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%	37.5%	
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0	44.0	24.0	24.0	24.0	24.0	24.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	35.8	35.8	35.8	35.8	35.8	35.8		12.2	12.2		12.1	
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.24	0.24		0.23	
v/c Ratio	0.16	0.47	0.10	0.50	0.49	0.10		0.29	0.29		0.35	
Control Delay	5.8	7.0	1.8	11.1	7.2	1.9		23.0	6.9		16.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	5.8	7.0	1.8	11.1	7.2	1.9		23.0	6.9		16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	A	A		C	A		B	
Approach Delay		6.3			7.5			13.3			16.0	
Approach LOS		A			A			B			B	
Queue Length 50th (m)	2.3	26.7	0.5	9.7	27.9	0.6		6.4	0.0		4.0	
Queue Length 95th (m)	8.0	59.0	4.8	32.3	61.5	5.2		20.7	11.8		18.1	
Internal Link Dist (m)		185.7			555.9			205.9			189.8	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	527	1606	1270	543	1606	1271		697	874		650	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.13	0.38	0.08	0.40	0.40	0.09		0.12	0.15		0.16	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 51.6			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 8.1		Intersection LOS: A	
Intersection Capacity Utilization 69.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 10: Isaiah & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	711	134	161	1056	141	120	0	113	54	0	13
Future Volume (vph)	28	711	134	161	1056	141	120	0	113	54	0	13
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.974	
Flt Protected	0.950			0.950				0.950			0.961	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1438	0
Flt Permitted	0.120			0.307				0.769			0.711	
Satd. Flow (perm)	211	1883	1475	540	1883	1475	0	1258	1475	0	1064	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			116			82			113		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		503.6			245.2			346.3			240.1	
Travel Time (s)		30.2			14.7			24.9			17.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	711	134	161	1056	141	120	0	113	54	0	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	711	134	161	1056	141	0	120	113	0	67	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	55.0	55.0	55.0	55.0	55.0	55.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	68.8%	68.8%	68.8%	68.8%	68.8%	68.8%	31.3%	31.3%	31.3%	31.3%	31.3%	
Maximum Green (s)	49.0	49.0	49.0	49.0	49.0	49.0	19.0	19.0	19.0	19.0	19.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	47.3	47.3	47.3	47.3	47.3	47.3		14.3	14.3		14.3	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68		0.21	0.21		0.21	
v/c Ratio	0.20	0.56	0.13	0.44	0.83	0.14		0.47	0.29		0.27	
Control Delay	9.3	8.5	1.8	10.8	16.7	2.7		31.4	7.4		15.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	9.3	8.5	1.8	10.8	16.7	2.7		31.4	7.4		15.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A		C	A		B	
Approach Delay		7.5			14.6			19.7			15.4	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	1.1	39.4	0.6	7.9	82.8	2.1		14.9	0.0		3.0	
Queue Length 95th (m)	5.9	84.4	6.3	26.4	#215.8	8.9		29.3	11.2		12.3	
Internal Link Dist (m)		479.6			221.2			322.3			216.1	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	156	1397	1124	400	1397	1116		384	529		353	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.18	0.51	0.12	0.40	0.76	0.13		0.31	0.21		0.19	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 69.7			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 12.6		Intersection LOS: B	
Intersection Capacity Utilization 81.1%		ICU Level of Service D	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Amand/Donnenwerth & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	766	102	136	1331	88	104	0	104	35	0	13
Future Volume (vph)	13	766	102	136	1331	88	104	0	104	35	0	13
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	0.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.963	
Flt Protected	0.950			0.950				0.950			0.965	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1428	0
Flt Permitted	0.072			0.300				0.812			0.744	
Satd. Flow (perm)	127	1883	1475	528	1883	1475	0	1328	1475	0	1101	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			42			104		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		324.0			232.5			369.9			194.8	
Travel Time (s)		19.4			14.0			26.6			14.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	13	766	102	136	1331	88	104	0	104	35	0	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	766	102	136	1331	88	0	104	104	0	48	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0	56.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0	50.0	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	56.3	56.3	56.3	56.3	56.3	56.3		13.7	13.7		13.6	
Actuated g/C Ratio	0.75	0.75	0.75	0.75	0.75	0.75		0.18	0.18		0.18	
v/c Ratio	0.14	0.54	0.09	0.34	0.94	0.08		0.43	0.29		0.21	
Control Delay	9.0	7.6	1.8	8.2	26.7	2.9		31.9	7.9		12.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	9.0	7.6	1.8	8.2	26.7	2.9		31.9	7.9		12.2	

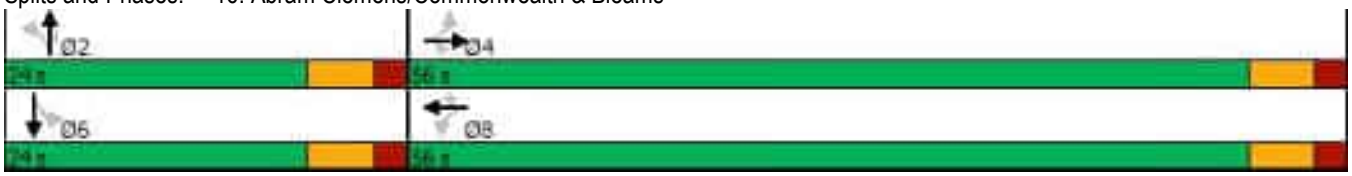
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	A	C	A		C	A		B	
Approach Delay		6.9			23.7			19.9			12.2	
Approach LOS		A			C			B			B	
Queue Length 50th (m)	0.5	42.6	0.6	6.0	~150.3	1.6		12.9	0.0		0.8	
Queue Length 95th (m)	3.6	91.6	5.4	20.2	#304.1	6.7		26.1	11.1		8.8	
Internal Link Dist (m)		300.0			208.5			345.9			170.8	
Turn Bay Length (m)	30.0		30.0			30.0			30.0			
Base Capacity (vph)	95	1420	1133	398	1420	1123		356	472		325	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.14	0.54	0.09	0.34	0.94	0.08		0.29	0.22		0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 74.6			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 94.2%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 16: Abram Clemens/Commonwealth & Bleams





Lane Group	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Traffic Volume (vph)	36	738	543	541	753	62
Future Volume (vph)	36	738	543	541	753	62
Ideal Flow (vphpl)	1775	1750	1775	1900	1900	1750
Storage Length (m)	30.0	0.0	110.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.6		7.6			
Lane Util. Factor	1.00	1.00	0.97	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1672	1475	3243	1883	1883	1475
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1672	1475	3243	1883	1883	1475
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		116				29
Link Speed (k/h)	60			80	80	
Link Distance (m)	337.1			536.2	1410.1	
Travel Time (s)	20.2			24.1	63.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	36	738	543	541	753	62
Shared Lane Traffic (%)						
Lane Group Flow (vph)	36	738	543	541	753	62
Turn Type	Prot	pt+ov	Prot	NA	NA	Perm
Protected Phases	8	8 1	1	6	2	
Permitted Phases						2
Detector Phase	8	8 1	1	6	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0		11.0	24.0	24.0	24.0
Total Split (s)	27.0		19.0	63.0	44.0	44.0
Total Split (%)	30.0%		21.1%	70.0%	48.9%	48.9%
Maximum Green (s)	21.0		13.0	57.0	38.0	38.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0		-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0		4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	23.0	42.0	15.0	57.4	38.3	38.3
Actuated g/C Ratio	0.26	0.48	0.17	0.65	0.43	0.43
v/c Ratio	0.08	0.97	0.99	0.44	0.92	0.09
Control Delay	26.2	47.1	73.9	9.0	42.3	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.2	47.1	73.9	9.0	42.3	9.5

Lane Group	WBL	WBR	SEL	SET	NWT	NWR
LOS	C	D	E	A	D	A
Approach Delay	46.2			41.5	39.8	
Approach LOS	D			D	D	
Queue Length 50th (m)	4.8	107.5	~49.2	40.0	116.6	3.1
Queue Length 95th (m)	12.0	#187.3	#81.8	59.5	#187.3	10.1
Internal Link Dist (m)	313.1			512.2	1386.1	
Turn Bay Length (m)	30.0		110.0			30.0
Base Capacity (vph)	435	762	550	1258	852	683
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.97	0.99	0.43	0.88	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 88.4			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.99			
Intersection Signal Delay: 42.3		Intersection LOS: D	
Intersection Capacity Utilization 95.9%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Trussler & Bleams



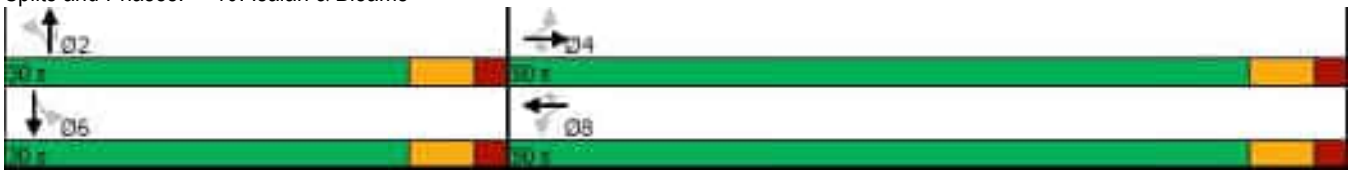


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Future Volume (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.963	
Flt Protected	0.950			0.950				0.950			0.965	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1428	0
Flt Permitted	0.338			0.325				0.698			0.723	
Satd. Flow (perm)	595	1883	1475	572	1883	1475	0	1142	1475	0	1070	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			56			211		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		209.7			579.9			229.9			213.8	
Travel Time (s)		12.6			34.8			16.6			15.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	19	578	39	77	562	60	100	0	211	126	0	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	578	39	77	562	60	0	100	211	0	174	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%	37.5%	
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0	44.0	24.0	24.0	24.0	24.0	24.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	23.4	23.4	23.4	23.4	23.4	23.4		13.9	13.9		13.9	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51	0.51		0.30	0.30		0.30	
v/c Ratio	0.06	0.60	0.05	0.26	0.59	0.08		0.29	0.36		0.49	
Control Delay	7.3	11.6	2.8	10.1	11.3	2.8		16.6	4.7		17.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	7.3	11.6	2.8	10.1	11.3	2.8		16.6	4.7		17.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	B	B	A		B	A		B	
Approach Delay		10.9			10.4			8.5			17.1	
Approach LOS		B			B			A			B	
Queue Length 50th (m)	0.6	26.5	0.0	2.8	25.5	0.2		5.3	0.0		7.4	
Queue Length 95th (m)	3.8	70.2	3.4	12.1	67.6	4.5		20.0	12.5		29.2	
Internal Link Dist (m)		185.7			555.9			205.9			189.8	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	543	1719	1350	522	1719	1351		696	981		668	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.03	0.34	0.03	0.15	0.33	0.04		0.14	0.22		0.26	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 45.9			
Natural Cycle: 50			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 10.9		Intersection LOS: B	
Intersection Capacity Utilization 66.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 10: Isaiah & Bleams





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1058	62	75	544	31	151	0	145	79	0	15
Future Volume (vph)	5	1058	62	75	544	31	151	0	145	79	0	15
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	30.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950				0.950			0.960	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1443	0
Flt Permitted	0.401			0.110				0.734			0.634	
Satd. Flow (perm)	706	1883	1475	194	1883	1475	0	1201	1475	0	953	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			41			122		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		503.6			245.2			346.3			240.1	
Travel Time (s)		30.2			14.7			24.9			17.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1058	62	75	544	31	151	0	145	79	0	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1058	62	75	544	31	0	151	145	0	94	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	55.0	55.0	55.0	55.0	55.0	55.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	68.8%	68.8%	68.8%	68.8%	68.8%	68.8%	31.3%	31.3%	31.3%	31.3%	31.3%	
Maximum Green (s)	49.0	49.0	49.0	49.0	49.0	49.0	19.0	19.0	19.0	19.0	19.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	49.2	49.2	49.2	49.2	49.2	49.2		16.0	16.0		16.0	
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67	0.67		0.22	0.22		0.22	
v/c Ratio	0.01	0.84	0.06	0.58	0.43	0.03		0.58	0.35		0.39	
Control Delay	5.2	18.2	2.8	31.3	7.5	1.5		35.5	9.5		20.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	5.2	18.2	2.8	31.3	7.5	1.5		35.5	9.5		20.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	C	A	A		D	A		C	
Approach Delay		17.3			9.9			22.8			20.7	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	0.2	95.5	0.9	4.8	30.3	0.0		19.4	2.6		6.3	
Queue Length 95th (m)	1.4	#216.7	4.8	#29.6	56.7	2.1		36.8	15.7		18.7	
Internal Link Dist (m)		479.6			221.2			322.3			216.1	
Turn Bay Length (m)	30.0		30.0	30.0		30.0			30.0			
Base Capacity (vph)	497	1326	1051	136	1326	1051		348	514		305	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.01	0.80	0.06	0.55	0.41	0.03		0.43	0.28		0.31	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 73.3			
Natural Cycle: 80			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 83.3%		ICU Level of Service E	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Amand/Donnenwerth & Bleams





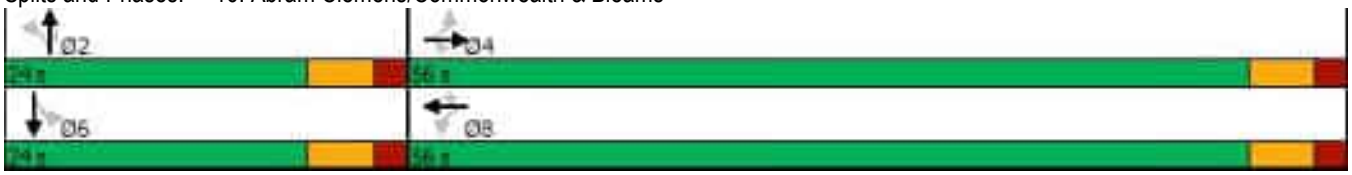
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	1268	48	65	562	42	120	0	120	59	0	12
Future Volume (vph)	13	1268	48	65	562	42	120	0	120	59	0	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1650	1650	1750	1550	1550	1550
Storage Length (m)	30.0		30.0	0.0		30.0	0.0		30.0	0.0		0.0
Storage Lanes	1		1	1		1	0		1	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.977	
Flt Protected	0.950			0.950				0.950			0.960	
Satd. Flow (prot)	1672	1883	1475	1672	1883	1475	0	1554	1475	0	1441	0
Flt Permitted	0.402			0.073				0.754			0.695	
Satd. Flow (perm)	707	1883	1475	128	1883	1475	0	1233	1475	0	1043	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			42			81		41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		324.0			232.5			369.9			194.8	
Travel Time (s)		19.4			14.0			26.6			14.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	13	1268	48	65	562	42	120	0	120	59	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1268	48	65	562	42	0	120	120	0	71	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0	56.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0	50.0	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		-2.0	-2.0		-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	
Act Effct Green (s)	54.9	54.9	54.9	54.9	54.9	54.9		14.6	14.6		14.6	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71		0.19	0.19		0.19	
v/c Ratio	0.03	0.95	0.05	0.72	0.42	0.04		0.52	0.35		0.31	
Control Delay	4.7	29.1	2.1	58.6	6.5	1.8		35.3	13.1		17.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	4.7	29.1	2.1	58.6	6.5	1.8		35.3	13.1		17.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	C	A	E	A	A		D	B		B	
Approach Delay		27.9			11.3			24.2			17.0	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	0.5	135.6	0.3	4.6	28.0	0.0		15.2	4.6		3.5	
Queue Length 95th (m)	2.4	#283.6	3.5	#18.8	57.1	3.0		30.0	17.1		13.6	
Internal Link Dist (m)		300.0			208.5			345.9			170.8	
Turn Bay Length (m)	30.0		30.0			30.0			30.0			
Base Capacity (vph)	500	1333	1056	90	1333	1056		318	441		300	
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	
Reduced v/c Ratio	0.03	0.95	0.05	0.72	0.42	0.04		0.38	0.27		0.24	

Intersection Summary

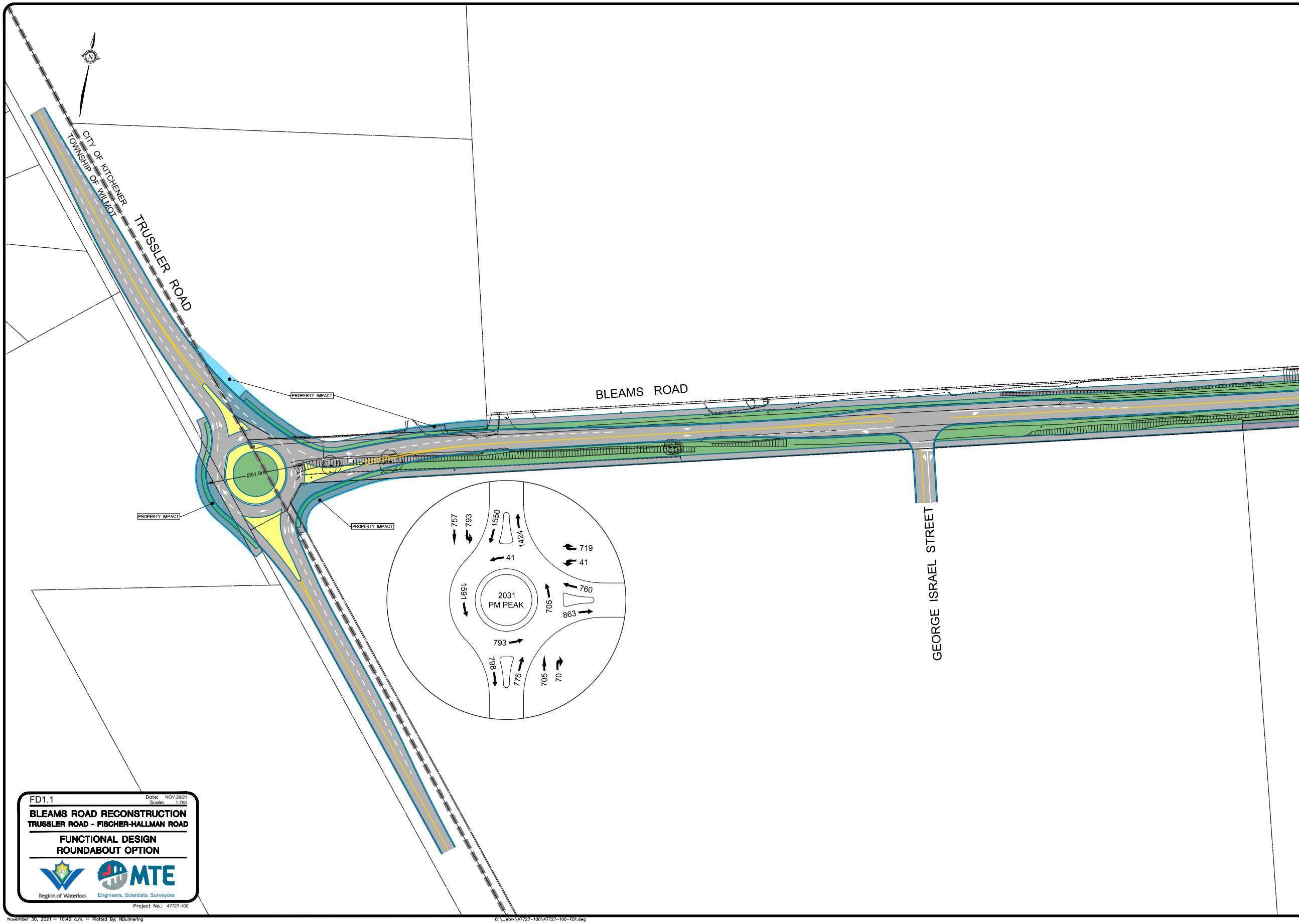
Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 77.6
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 22.4 Intersection LOS: C
Intersection Capacity Utilization 89.7% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 16: Abram Clemens/Commonwealth & Bleams



Appendix E

Functional Design Drawings


N
CITY OF KITCHENER
TOWNSHIP OF WILMOT
TRUSSLER ROAD
BLEAMS ROAD
GEORGE ISRAEL STREET
PROPERTY IMPACT
PROPERTY IMPACT
PROPERTY IMPACT
Ø51.9m
757
793
1550
1424
719
41
41
1591
2031
PM PEAK
705
760
863
793
798
775
705
70

FD1.1

Date: NOV.29/21
Scale: 1:750

BLEAMS ROAD RECONSTRUCTION

TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN

ROUNDABOUT OPTION

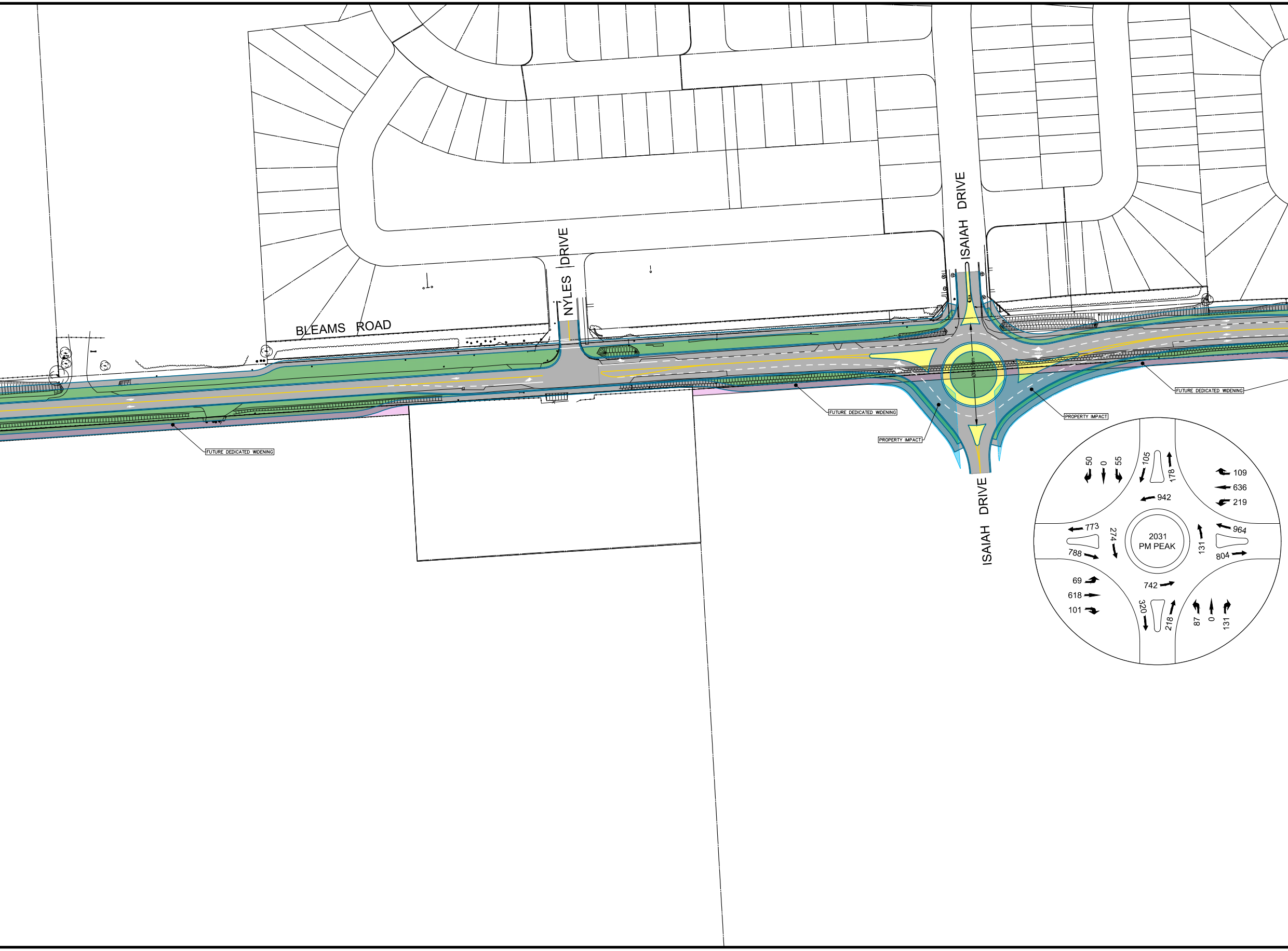
Region of Waterloo

Engineers, Scientists, Surveyors

Project No.: 47727-100

November 30, 2021 — 10:42 a.m. — Plotted By: NDulmering

C: _Work\47727-100\47727-100-FD1.dwg


BLEAMS ROAD
NYLES DRIVE
ISAIAH DRIVE
ISAIAH DRIVE
FUTURE DEDICATED WIDENING
FUTURE DEDICATED WIDENING
FUTURE DEDICATED WIDENING
PROPERTY IMPACT
PROPERTY IMPACT
2031
PM PEAK
50
0
55
105
178
109
636
219
942
773
788
274
131
964
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618
101
742
320
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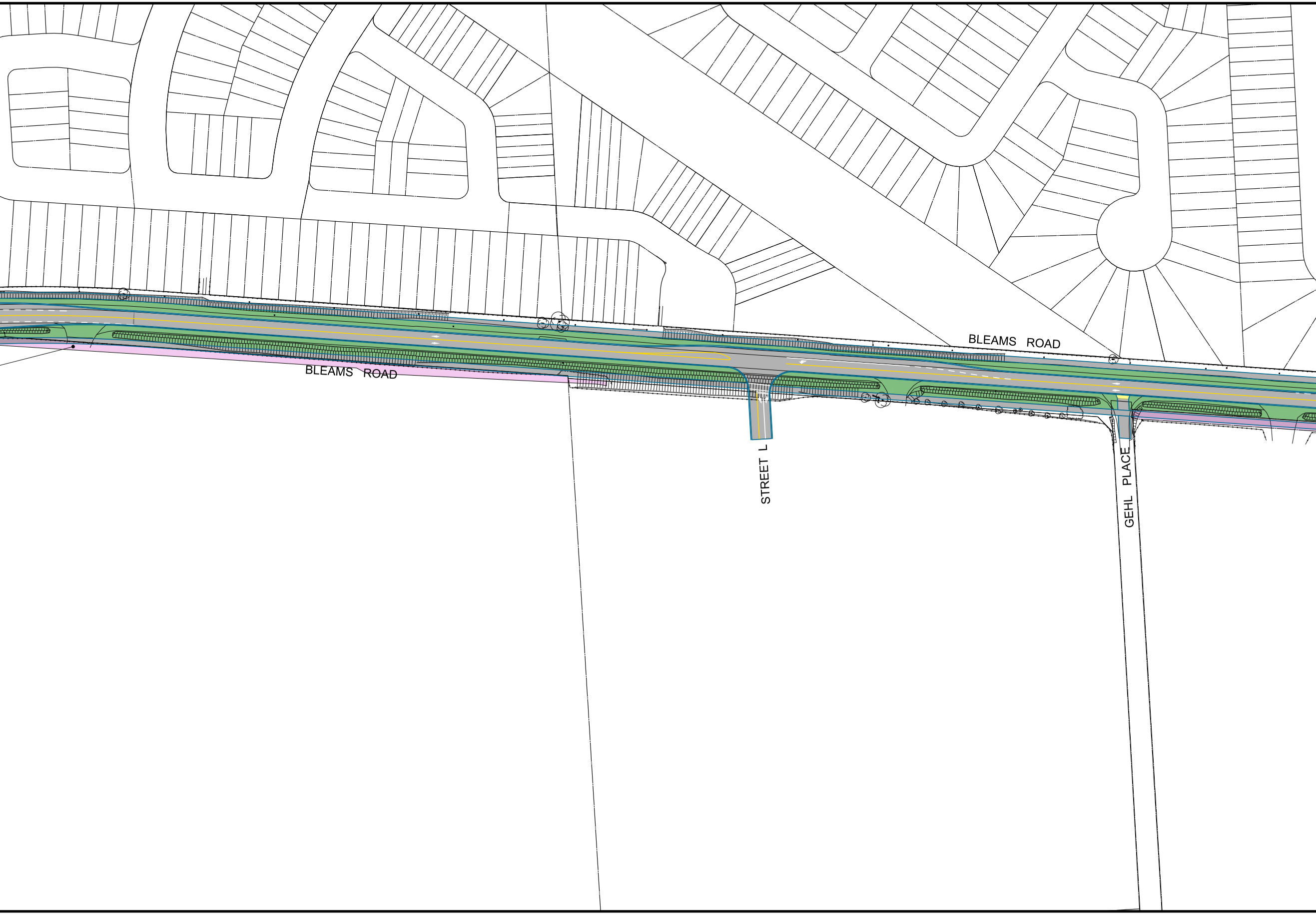
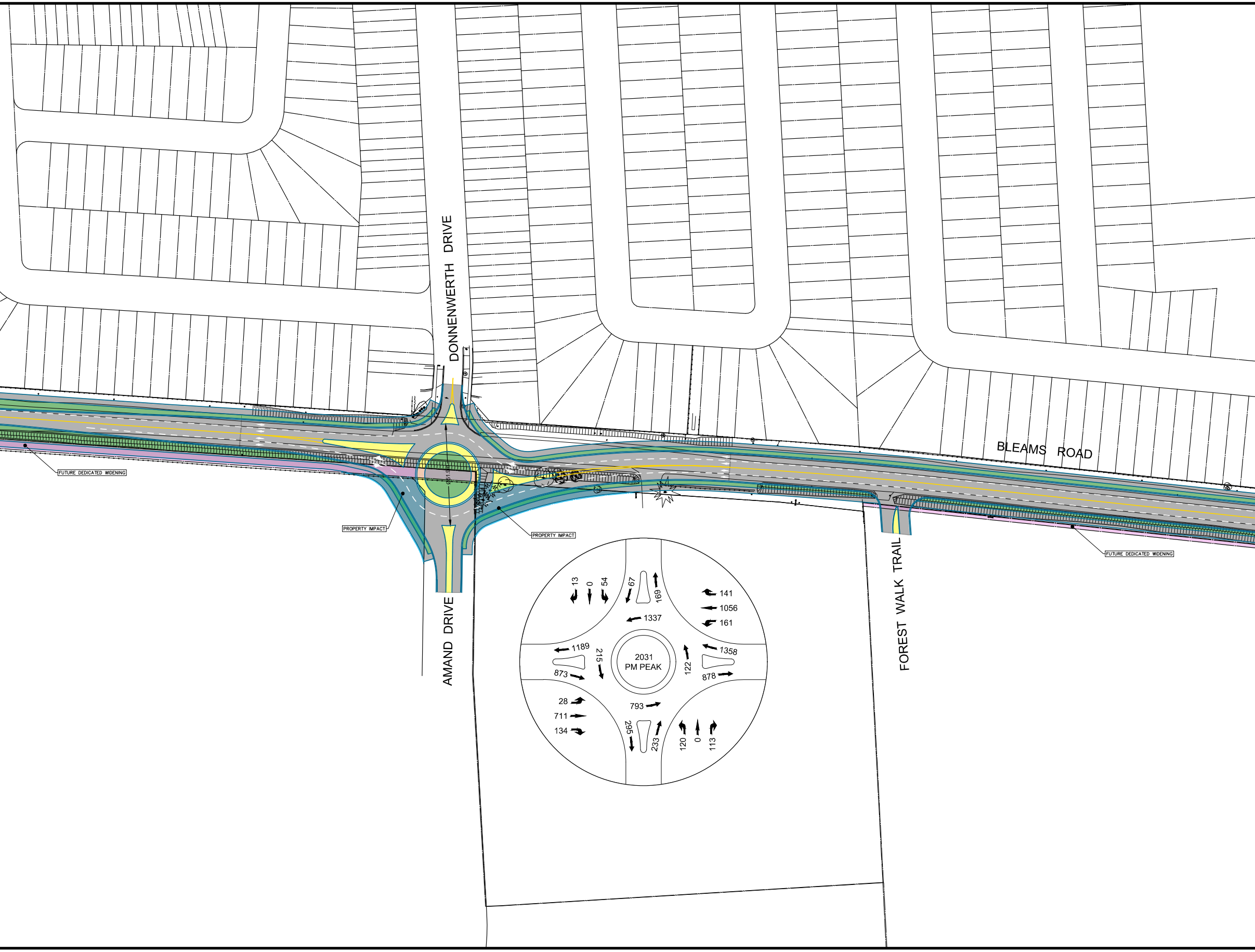
131


BLEAMS ROAD
BLEAMS ROAD
STREET L
GEHL PLACE


DONNENWERTH DRIVE
BLEAMS ROAD
AMAND DRIVE
FOREST WALK TRAIL
FUTURE DEDICATED WIDENING
FUTURE DEDICATED WIDENING
PROPERTY IMPACT
PROPERTY IMPACT
Ø51.9m
2031
PM PEAK
13
0
54
67
169
141
1056
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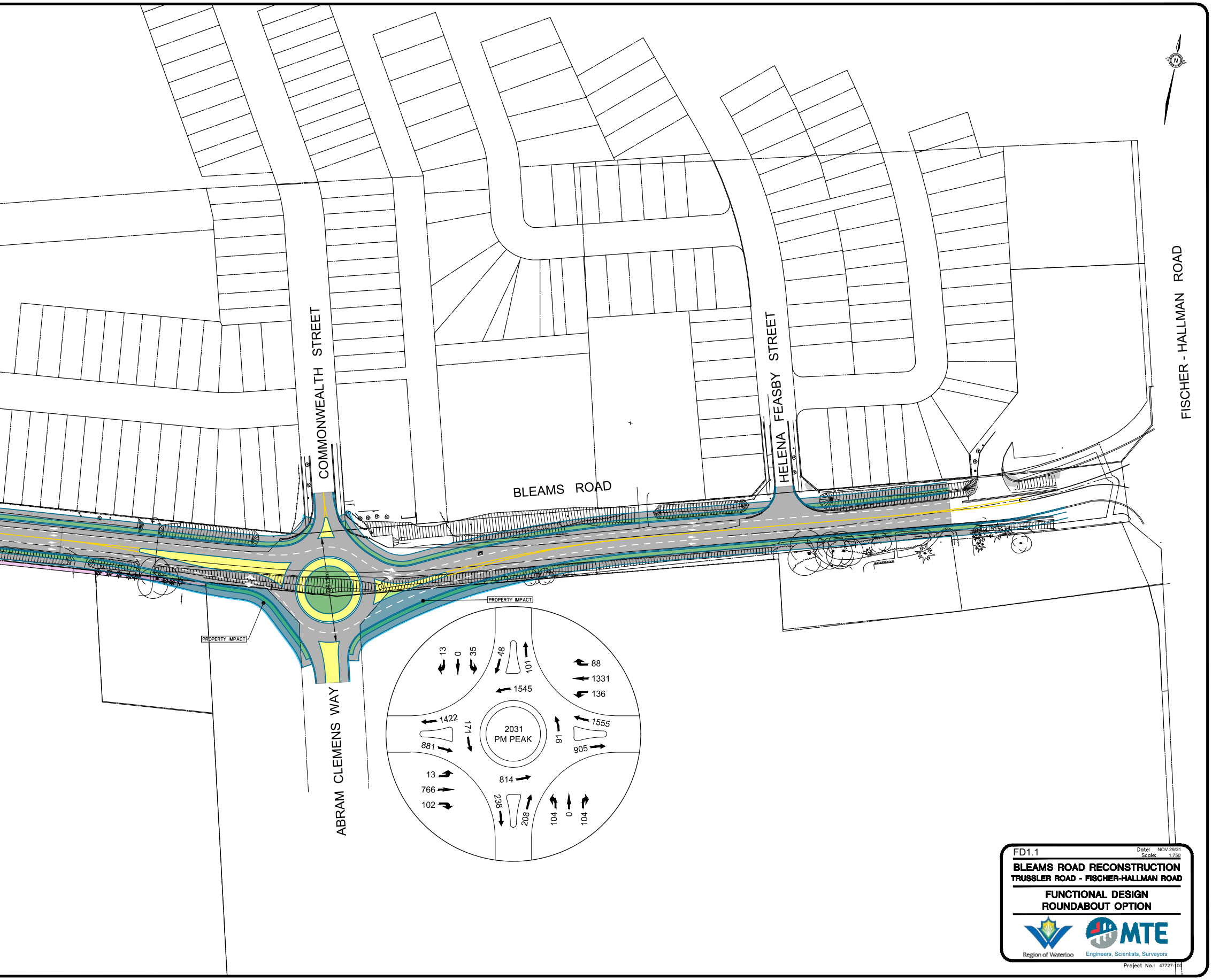
113


COMMONWEALTH STREET
HELENA FEASBY STREET
FISCHER - HALLMAN ROAD
BLEAMS ROAD
ABRAM CLEMENS WAY
PROPERTY IMPACT
PROPERTY IMPACT
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35
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101
88
1331
136
1545
1422
171
2031
PM PEAK
91
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881
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13
766
102
814
238
208
104
0
104

FD1.1

Date: NOV.29/21
Scale: 1:750

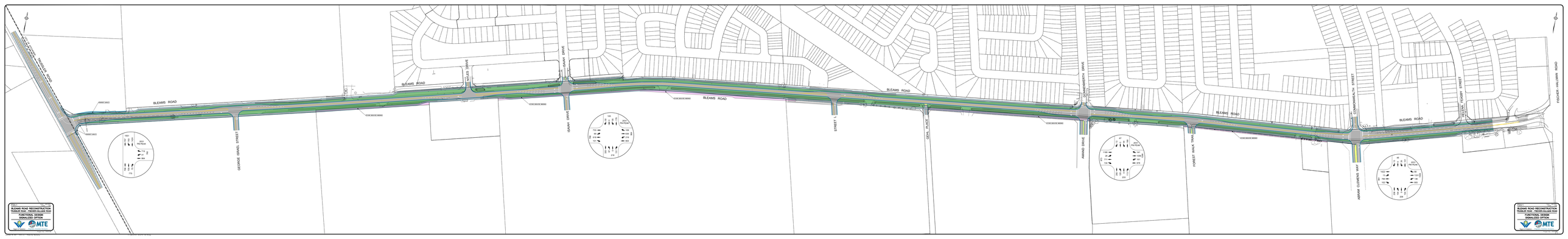
BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Region of Waterloo

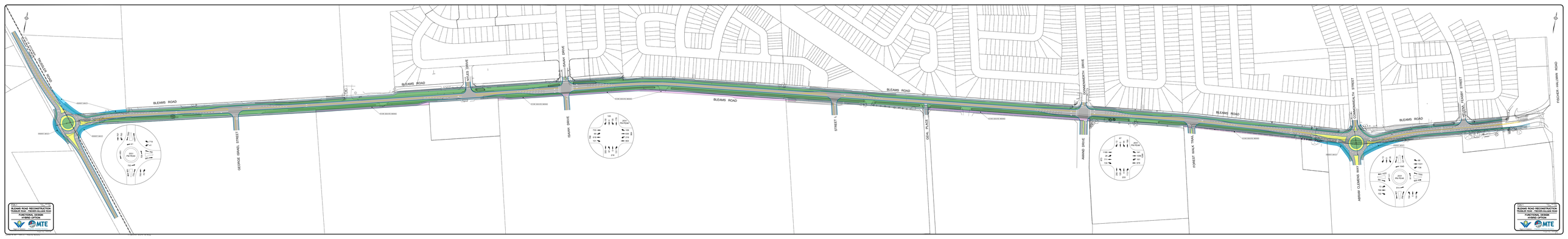
MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100



BLEAMS ROAD RECONSTRUCTION
TRAVELLER ROAD - FISCHER-HALLMAN ROAD
FUNCTIONAL DESIGN
SIGNALIZED OPTION

BLEAMS ROAD RECONSTRUCTION
TRAVELLER ROAD - FISCHER-HALLMAN ROAD
FUNCTIONAL DESIGN
SIGNALIZED OPTION



BLEAMS ROAD RECONSTRUCTION
TRAVELLER ROAD - FISCHER-HALLMAN ROAD
FUNCTIONAL DESIGN
HYBRID OPTION

BLEAMS ROAD RECONSTRUCTION
TRAVELLER ROAD - FISCHER-HALLMAN ROAD
FUNCTIONAL DESIGN
HYBRID OPTION

G.3.1 – PUBLIC CONSULTATION CENTRE No. 1 - Notice

Public Consultation

Bleams Road Improvements
West of Fischer-Hallman Road to Trussler Road, Kitchener

We want your feedback

Share your comments with us as we plan for active transportation and road improvements on Bleams Road in Kitchener (west of Fischer-Hallman Road to Trussler Road).

This virtual public consultation opportunity is open from **February 14 to March 7, 2022 at EngageWR.ca/bleams-rd**

Preliminary designs

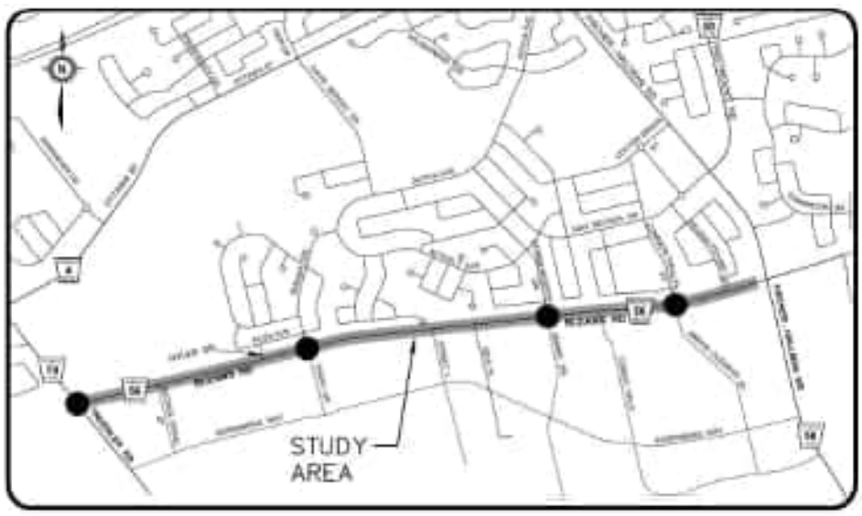
We have developed three design concepts for improvements along Bleams Road for your review and input. These preliminary designs outline intersections with either traffic signals, roundabouts or a hybrid concept that has signals at certain key intersections while roundabouts at others. You will also have further input into the type of pedstrian and cycling facilities along both sides of Bleams Road. We want to hear your comments and ideas on how we can make improvements for all modes of transportation.

Public consultation

Visit our Bleams Road project page at EngageWR.ca/bleams-rd and complete the online survey by March 7. Project documents, including frequently asked questions, are also available. If you have any additional questions about the project, please email us at droga@mte85.com or gproctor@regionofwaterloo.ca.

Project background:

This study will determine the need for improvements on Bleams Road, from just west of Fischer-Hallman Road to Trussler Road, to accommodate the development along Bleams Road.



Pedestrians, cyclists and motorists will be considered throughout the study to ensure safe and efficient crossings between developments on both sides of the roadway.

This study, technical expertise and your input, will help us determine which improvements are required and can be incorporated into the road design.

For more information contact:

Greg Proctor, C.E.T.
Region Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: 519-575-4729
gproctor@regionofwaterloo.ca

Dot Roga, C.E.T.
Manager, Municipal Division
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2L 3V3
Telephone: 519-743-6500 ext. 1269
droga@mte85.com

All comments and information received from individuals, stakeholder groups, and agencies regarding this project are collected to assist the Region of Waterloo in making a decision. Under the “Municipal Act”, personal information such as name, address, telephone number and property location that may be included in a submission becomes part of the public record.

Document Number: 3936142

G.3.2 – PUBLIC CONSULTATION CENTRE 1

Information Package

Information Package

Bleams Road Improvements
Just West of Fischer-Hallman Road to Trussler Road
City of Kitchener
Public Consultation Centre No. 1
Dates: Monday, February 14, 2022 – Monday, March 7, 2022
Online Review and Comment Period (https://www.engagewr.ca/bleams-rd)

What: The Region of Waterloo is undertaking a Municipal Class Environmental Assessment (EA) of Bleams Road to determine improvements to the corridor.

Where: Just west of Fischer-Hallman Road to Trussler Road, in the City of Kitchener.

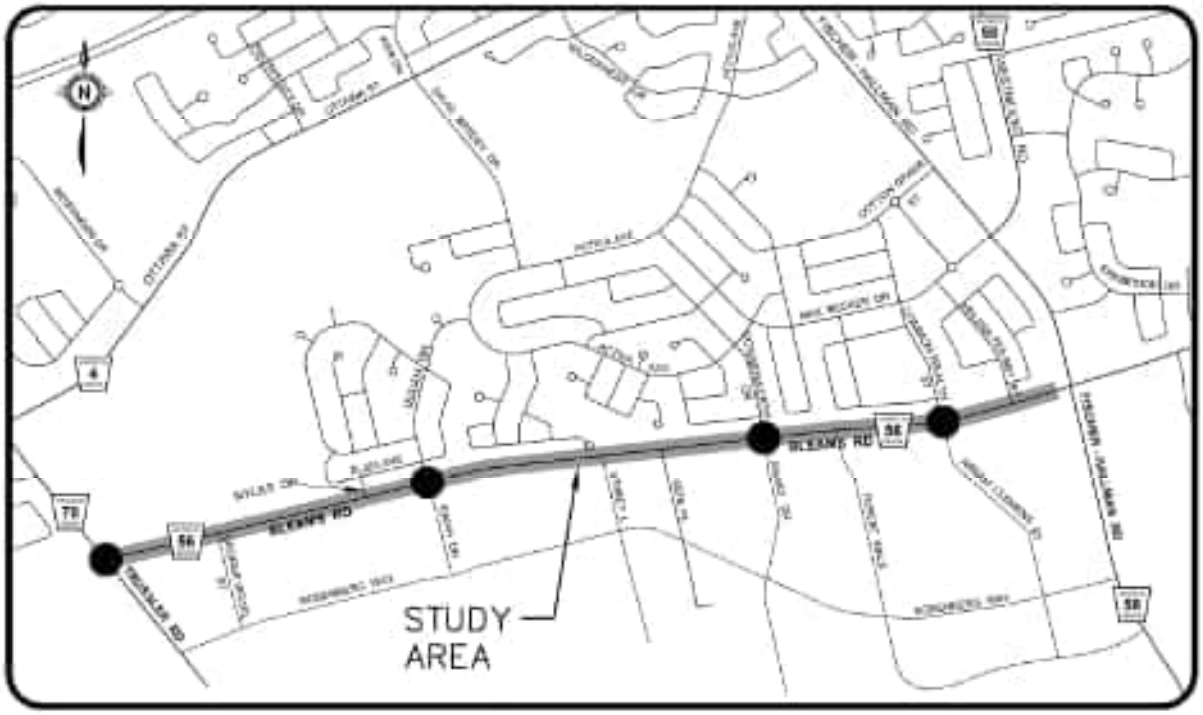
Why: To provide needed pavement reconstruction and road improvements for traffic, pedestrians, cyclists and transit along the corridor.

When: 2023 and 2024 Construction (tentative)

Who: Region of Waterloo Project Manager
Greg Proctor, C.E.T.
Phone: (519) 575-4729
Email: Gproctor@regionofwaterloo.ca

There is a comment sheet at the back of this package. Please fill it out and share your comments with us.

Key Plan



1. Why is the Region considering this project?

The section of Bleams Road from just west of Fischer-Hallman Road to Trussler Road is in fair to poor condition and is nearing the end of its useful life. With the substantial developments to the south, there is a need to reconstruct this section of Bleams Road and consideration will be given to the increased travel demands on the overall corridor. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians and cyclists along the corridor. This study will analyze traffic demands and recommend a solution that addresses all future transportation needs.

There are a number of needs driving this project, as follows:

i) Deteriorated Road Condition

The pavement condition on Bleams Road is in fair to poor condition. In general, the deterioration is simply due to the age of the asphalt combined with poor drainage. The proposed works would replace the deteriorated pavement and urbanize the roadway by removing the existing ditches and installing an underground storm sewer system that will outlet to adjacent developments along the south side of Bleams Road.

ii) Recent and Future Traffic Patterns

A study of the current and projected traffic patterns along Bleams Road, between Fischer-Hallman Road and Trussler Road, has determined that there is a need for improvements to Bleams Road to accommodate the recent and future intensification of land along both sides of Bleams Road.

A detailed evaluation of the existing and proposed streets that intersect Bleams Road has suggested a number of potential intersection improvements that could increase the capacity and safety of the corridor to meet future needs in the area while providing a balance with the needs of other corridor users.

iii) Pedestrian and Cycling Needs

Currently there are no pedestrian or cycling facilities on Bleams Road. The Region of Waterloo 2018 Transportation Master Plan identifies Bleams Road as having a "Future Boulevard Multi-Use Trail" on both sides. Accordingly, a multi-use trail is being considered on both the north and south sides of Bleams Road for the entire length from Fischer-Hallman Road to Trussler Road. A single-direction cycle track and sidewalk is also being considered as a potential alternative to the multi-use trail. Efficient and desirable interconnections for pedestrians and cyclists between proposed and existing developments on both sides of the roadway will be considered with the design.

2. Who is directing the project?

The planning and design for this project is being directed by a Project Team consisting of staff from the Region of Waterloo and the City of Kitchener including City of Kitchener Councillor Kelly Galloway-Sealock (Ward 5). The consulting engineering firm MTE Consultants Inc. has been retained by the Region of Waterloo to assist the Region in leading this Class EA Study and to provide planning, design and construction inspection and administration services.

3. How is this project being planned?

This project is being planned in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) process. The Municipal Class EA process is a planning and decision making process approved under the Environmental Assessment Act of Ontario used by municipalities to plan and implement public infrastructure projects to ensure that potential environmental, transportation, social/economic and cost impacts are considered before a project is approved. Consultation with the public, stakeholders, and federal and provincial agencies is required during the Class EA Study and development of planning and design alternatives and their potential impacts.

This Class EA Study is being completed as a Schedule 'C' Class EA project, which applies to larger, more complex projects with the potential for significant environmental impacts (natural, social, cultural and economic) and includes multiple opportunities for public input.

This project is currently in Phase 2 of the Class EA process and this initial Public Consultation is being held for members of the public to become aware of the project and to provide input into the project for further development of alternatives.

Please refer to **Appendix A** for more information about the Class Environmental Assessment process.

4. What is the purpose of this Public Consultation?

This Public Consultation is a forum to have interested groups and individuals learn about and provide input on:

a) The needs and opportunities for improvements on Bleams Road;

b) The project environment (natural, social, cultural/heritage, and economic);

c) The potential solutions for improvements that are being considered by the Project Team to date;

d) How the design alternatives for improvements will be developed and evaluated and how a preferred design alternative will be identified; and

e) Future public input opportunities planned.

Region and project consultant staff are available before, during, and after the Public Consultation period to answer any questions you may have. Contact information has been provided at the end of this information package.

5. Are active transportation upgrades or road widening being considered?

Yes, both active transportation upgrades and road widening are being considered in accordance with current Regional master plans and guidelines. The Context Sensitive Regional Transportation Corridor Design Guidelines (CDG) is a planning policy document that guides the design of Regional roads. The CDG identifies design parameters for necessary features within the road allowance such as vehicle lanes, cycling facilities, sidewalks, and boulevards. In accordance with the CDG, Bleams Road is identified as a "Neighborhood Connector - Avenue" with a desired right of way of 30 m, while the 2018 Transportation Master Plan (TMP) recommends the installation of multi-use trail (BMUT) on both sides of the roadway. Consideration of all road corridor users (pedestrians, cyclists and motorists) will ensure efficient and desirable interconnections between existing and proposed developments on both sides of the roadway.

A recent traffic study has examined the existing traffic volumes and patterns along with an in-depth analysis of the potential traffic volumes and travel patterns after full development of the lands along the south side of Bleams Road. This analysis has identified the need to widen Bleams Road to 4 through lanes in the section between Fischer-Hallman Road and Commonwealth Drive, while the remainder of Bleams Road, from Commonwealth Drive to Trussler Road can remain at 2 lanes, with localized improvements to accommodate the traffic movements at existing and proposed intersections.

At the current time no transit routes are anticipated to run along the Bleams Road corridor, but future routes will not be precluded with the proposed design.

6. What potential solutions have been considered so far, and which of these solutions will be further considered and developed into alternative design options moving forward?

The solutions for improvements considered by the Project Team so far are described in the list below. The Project Team has screened and evaluated each of these potential solutions and has made recommendations as described below. For a broader description of the potential solutions and the associated preliminary evaluation of each, please refer to **Appendix B.**

In reviewing the potential solutions, the Project Team considered the widening of Bleams Road to manage future traffic growth and forecasted intersection operational deficiencies, as well as adding active transportation facilities as the Region's primary objectives for the corridor.

1) **Do Nothing** – As part of any Class EA process, there is always a consideration of the "Do Nothing" alternative to assess what would happen if no action is taken to address the project concerns beyond typical restoration measures. In this case, the "Do Nothing" solution would involve reconstructing Bleams Road in its current two-lane rural cross-section with shoulders and roadside ditches. This solution was screened out because it does not satisfy the Region's primary objectives for the corridor. **Recommendation: Do not carry forward**

2) **Traffic signals** – The addition of traffic signals and auxiliary lanes to accommodate turning movements at certain intersections. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
Recommendation: Carry forward in conjunction with other solutions

3) **Roundabouts** – The Region uses a standard 'screening tool' for determining where roundabouts will be considered. Generally, roundabouts offer a potential alternative to expanding or installing signalized intersections and can be more effective in moving traffic, reducing delays, and improving safety in certain cases. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
Recommendation: Carry forward in conjunction with other solutions

4) **Traffic signals and roundabouts, hybrid version** – a design which constructs a roundabout at the west end of the project (Trussler Road) and one near the east end of the project (Commonwealth Drive/Abram Clemens Street). This is coupled with a traffic signal installation at the intersection of Donnenwerth Drive/Amand Drive and one at Isaiah Drive. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
Recommendation: Carry forward in conjunction with other solutions

5) **Widening Bleams Road from Fischer-Hallman Road to Commonwealth Drive /Abram Clemens Drive** – the projected volume of vehicular traffic has shown that Bleams Road from Fischer-Hallman Road to Commonwealth Drive /Abram Clemens Drive needs to be widened to 4 through lanes (approx. 15% of project length) while the remainder of the corridor (approx. 85% of project length) can remain as 2 lanes.
Recommendation: Carry forward in conjunction with other solutions

6) **Active Transportation Facilities** – Providing facilities for cyclists and pedestrians on Bleams Road from Fischer-Hallman Road to Trussler Road is considered a necessary component of the overall solution for this corridor. There are two options under consideration: a multi-use trail (two directional), or a single directional cycle track and sidewalk.
Recommendation: Carry forward

As the Class EA study moves forward, the alternative solutions selected for further consideration will be used to determine alternative design options for the corridor. The design options will be evaluated by the Project Team and presented at a future Public Consultation along with a Preferred Design Solution for review and comment.

7. How and when will the Project Team develop design alternatives?

Once feedback from the first Public Consultation is received, along with feedback from agencies and stakeholders, the Project Team will further refine and evaluate the design alternatives over the course of the winter and spring of 2022. The design alternatives including a preferred design alternative will be presented at a second Public Consultation, currently scheduled for spring 2022.

8. How will the Project Team evaluate design alternatives to establish a preferred design alternative?

Once the design alternatives are established by the Project Team they will be assessed against a set of evaluation criteria to determine which design alternative best addresses the project needs. The evaluation criteria will include the following:

Evaluation Criteria for Bleams Road Class Environmental Assessment Study	
Study Element	**Criteria**
1. Transportation Capacity, Operations & Safety	
Pedestrian Needs	How does the alternative service the expected pedestrian traffic needs?
Cycling Needs	How does the alternative serve the expected cycling traffic needs?

Transit Use	Although GRT is not expecting to use Bleams Road as a bus route, can the alternative accommodate a bus route should transit needs change?
Existing Traffic	How does the alternative serve the current volume of vehicular, pedestrian, transit and cycling traffic?
Forecasted Traffic / Transportation Network	Does the alternative accommodate the forecasted traffic to existing and future planned developments and properties? Will the alternative address the transportation network needs and be compatible with other Transportation Plans?
Safety	Does the alternative address identified traffic safety issues along the corridor or at specific locations?
Access Management	What effect will the alternative have on traffic access to properties fronting on Bleams Road?
2. Natural Environment	
Aquatic Habitat, Fisheries and Surface Water	How does the alternative affect the headwaters of Strasburg Creek?
Terrestrial Habitat / Vegetation	How would the alternative affect existing vegetation, i.e., trees, plants and woodlots?
Wellhead	What effect would the alternative have on the Mannheim wellfields and wellhead protection?
Wetlands	What impacts does the alternative have on any wetlands within the project area?
Wildlife	What are the effects of the alternative on wildlife within the project area, including Species-at-Risk (Endangered or Threatened species that receive habitat protection under the *Endangered Species Act*), Species of Conservation Concern (species listed as Special Concern under the *Endangered Species Act,* species with a conservation rank of S1 to S3, or SH, or federally Threatened or Endangered species), and locally significant species. ,
Property Contamination	Are there any known or potentially contaminated sites that require investigation and how would they affect the alternative?
3. Social Environment	
Heritage Impacts	What impact does the alternative have on Built Heritage Resources and Features and Cultural Heritage Landscapes?

Archaeological Impacts	What impact does the alternative have on archaeological features?
Cultural & Recreational	Are there any cultural or recreational institutions within the project area that would be affected by this alternative?
Business Impacts	How would the alternative affect existing businesses and how will businesses be affected during construction?
Construction Impacts	What are the impacts to local properties during construction?
Streetscaping	Can the alternative incorporate streetscaping features to maintain and enhance the character of the community?
Private Property Impacts	How does the alternative impact the residential and commercial properties along the corridor? How much property will be required, if any, for the alternative?
Climate Change	What effect would the alternative have on climate change?
Air Quality & Noise	What effect does the alternative have on air quality and noise levels within the project area?
4. Costs	
Utility Relocations / Conflicts	What would be the extent of impacts on existing utilities that must be relocated and/or protected to construct the alternative?
Initial Capital Cost	What is the initial capital cost of the alternative?
Life-Cycle	What is the total life-cycle cost of the alternative including the cost for construction, utility relocations, property acquisitions as well as ongoing operation and maintenance costs?

9. Where will roundabouts be considered on this project?

Where projected traffic volumes would warrant new or improved traffic control signals, roundabouts will also be considered. Based on a preliminary screening, it is currently anticipated that the following intersections on Bleams Road will be considered for a potential roundabout:

- **Trussler Road**
- **Isaiah Drive**
- **Donnenwerth Drive / Amand Drive**
- **Commonwealth Drive / Abram Clemens Drive**

Further analysis will be completed by the Project Team at the above locations to determine whether signalized intersection improvements or a roundabout are recommended as part of the

overall preferred design alternative to be presented at a second Public Consultation (currently scheduled for spring 2022)

10. What will happen at the intersections where roundabouts and traffic signals are not being considered?

Further analyses will be completed by the Project Team for those existing and proposed intersections along Bleams Road which are not being considered for a roundabout or traffic signal. This analyses will review the need for them to operate as a full-movement access with turning lanes or whether there is a need to restrict left-turn in and/or left-turn out movements. The Project Team will determine which improvements will be recommended as part of the overall preferred design alternative to be presented at a second Public Consultation (currently scheduled for spring 2022).

11. Will the posted speed limit be changed when Bleams Road is reconstructed?

Within the study limits, Bleams Road is currently posted at 70 km/h for most of the corridor length. In order to provide pedestrian crossing locations and permit appropriate crossing warning systems to be implemented, all pedestrian crossing locations must have a posted speed limit of 60 km/h or less.

12. Has the Project Team identified alternatives for active transportation facilities?

The Project Team has identified preliminary design alternatives that include a boulevard multi-use trail on each side of the road or a concrete sidewalk and an off-road separated cycling facility. These design alternatives and potentially others will be reviewed by the Project Team and recommended active transportation facilities will be included in the preferred design alternative to be presented at the second Public Consultation (currently planned for spring 2022).

13. How has the natural environment been considered for this project?

As part of the Municipal Class EA, an Environmental Impact Study (EIS) and Tree Preservation Plan (TPP) is being completed. This includes a comprehensive background information review, Species at Risk and Significant Wildlife Habitat screening exercises, and a scoped field inventory program, developed to include an assessment of the habitats and species potentially present within the Study Area. Inventories of wildlife and vegetation completed for the EIS and TPP include a tree inventory, review of site conditions for the Threatened Blanding's Turtle, bat habitat surveys, and an aquatic habitat characterization. In addition, all wildlife species observations will be recorded during field surveys.

The tree inventory consistent with the with the City of Kitchener's Tree Management Policy I-1160 (2002) and Tree Conservation By-Law (2010) was completed in January 2022. All trees ≥10cm Diameter at Breast Height (DBH) within the Study Area that were accessible (i.e. not on private lands) were inventoried and assessed for overall health and significance in order to develop

mitigation and protection plans for any trees to be retained which will be included in the final TPP. Where trees may be impacted or removed, a compensation strategy will be developed as part of the tree management and landscaping design.

14. Will an Archaeological Investigation be completed for this project?

A Stage 1 Archaeological Assessment has been started, which consists of comprehensive background research into the study area. This assessment will rely on a thorough examination of the archaeology, history, geography, and current land conditions within the study area. The examination will produce an inventory of known archeological sites within a limit of 1 km and all previous results within 50m of the study area. These known discoveries will be used to create a list of zones of archaeological potential.

Property inspections will be conducted by a MHSTCI-licensed field director to gain first hand knowledge of the geography. The aim of these site visits will be to identify areas of archaeological potential for Pre-Contact and Euro-Canadian sites and conclusively map all the areas with no potential. This will result in recommended actions for each area. These actions may include providing a recommendation that no further action is required, or recommendation that any potential areas of archaeological interested will proceed to a Stage 2 Archaeological Assessment.

15. How has the cultural/heritage environment been considered for this project?

The project team has reached out to the indigenous peoples with historical ties to the geography of the study area, the Six Nations of the Grand River, Mississaugas of the Credit First, and the Haudenosaunee Development Institute were invited to participate in the project. All three have expressed an interest in participating.

16. Has noise mitigation been considered for this project?

The Region has a Noise Policy used to determine when noise barriers, such as noise berms or walls, would be recommended as part of an upcoming project. Part B of the Region's Noise Policy applies when a road widening is being considered. For this project, Part B of the Region's Noise Policy would apply if Bleams Road is widened from two to four lanes, as currently being considered for the section from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive.

Part C of the Region's Noise Policy could be applied in those areas where noise barriers are not recommended under Part B of the Noise Policy. Under Part C, a noise barrier may be considered under certain circumstances, if property owners are willing to share in the cost of a noise attenuation.

A summary of Parts B and C of the Region's Noise Policy is included (**Appendix C**).

A noise study will be undertaken in early 2022 in accordance with Part 'B' of the Region's Noise Policy for Bleams Road in the section being considered by the Project Team for widening to 4 lanes

(just west of Fischer-Hallman Road to Commonwealth Drive. The noise study will be summarized at the second Public Consultation (currently scheduled for spring 2022).

17. Is any property required for the road improvements?

One of the goals of the planning and design process is to minimize the impact on adjacent properties and the need to acquire private property. An initial review of the existing Bleams Road road allowance indicates that there will be a need to acquire a significant amount of land to accommodate the proposed alternatives. It is currently proposed that the acquisition of the necessary land be from those properties that have not been developed yet along the south side of Bleams Road. There may also be a need for a small section of land on the north east and west side of intersection of Bleams and Trussler Road, if a roundabout is ultimately recommended for this location.

18. Who will be responsible for the winter maintenance of new multi-use trails, sidewalks and/or separated cycling facilities?

Maintenance of new active transportation facilities along regional roads with back-lotted properties is the responsibility of the municipality.

19. What is the estimated cost of this project?

The cost of this project will depend on the approved improvement alternative, as well as necessary infrastructure relocations, replacements, utility relocations, and property acquisitions. The Region's approved 2022 Transportation Capital Program currently has approximately $10 million budgeted for this project between 2022 to 2026.

20. What is the project schedule and what are the next steps for improvements on Bleams Road?

The Project Team will review the public comments received from this first Public Consultation along with any other stakeholder feedback to further develop the design alternatives and establish a preferred design alternative. The alternatives considered and the preferred design alternative will be presented at the second Public Consultation, which is tentatively scheduled for spring 2022. After the second Public Consultation, the Project Team will review the public comments and identify a Recommended Design Alternative to be brought forward to Regional Council for design approval.

Pending design approval by Regional Council, detailed design, property acquisitions and utility relocations will commence, followed by construction, which will be completed in stages. Construction is tentatively scheduled to start in 2023.

21. How will I receive further notification regarding this project?

Property owners and tenants abutting the project site and members who register through the Region's project website **(https://www.engagewr.ca/bleams-rd)** will receive all upcoming public correspondence, and will be notified of all future meetings.

22. How can I provide my comments?

In order to assist the Project Team in addressing any comments or concerns you might have regarding this project, we ask that you fill out the attached Comment Sheet and mail, fax, or email comments to the Project Team members listed below. Alternatively, you may provide your comments on the Region's Engage site at **https://www.engagewr.ca/bleams-rd**.

We thank you for your involvement and should you have any questions or concerns please contact one of the following:

Greg Proctor, C.E.T.
Region Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: (519) 575-4729
Fax : (519) 575-4430
Email : Gproctor@regionofwaterloo.ca

Dot Roga, C.E.T.
Manager, Municipal Division
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2L 3V3
Telephone: (519) 743-6500 ext. 1269
Email: droga@mte85.com

23. How can I view project information following the PCC?

All of the PCC display materials and other relative project information, notifications of upcoming meetings, and contact information are available for viewing at the Region of Waterloo municipal office as identified above. Alternatively, you may visit the Region's website at www.regionofwaterloo.ca or the Engage Waterloo Region site at www.engagewr.ca.

Appendix A – Municipal Class Environmental Assessment Process

Ontario Environmental Assessment Act

The purpose of the Ontario Environmental Assessment Act (EA Act) is to provide for "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment of Ontario". The term "environment" is applied broadly and includes the natural, social, cultural, built and economic components.

The key principles of successful environmental assessment planning include:

- Consultation with stakeholders and affected members of the public;
- Consideration of a reasonable range of practical alternatives;
- Assessment of the environmental impacts associated with each alternative;
- Systematic evaluation of alternatives; and,
- Clear documentation.

Municipal Class Environmental Assessment

The Municipal Class Environmental Assessment (Class EA) is a planning process approved under the Environmental Assessment Act that is used by municipalities to plan infrastructure enhancement projects while satisfying the requirements of the Environmental Assessment Act. Under the Class EA process, projects are planned in one of three ways depending on their scope, complexity and potential for adverse environmental impacts.

Schedule "A"

- Includes routine maintenance, operation and emergency activities.
- The Municipality can proceed with this work without further approval or public consultation.

Schedule "B"

- Includes projects with potential for some adverse environmental effects.
- These projects are subject to a screening process that includes consultation with directly affected public and agencies.

Schedule "C"

- Includes larger, more complex projects with the potential for significant environmental effects.
- These projects are subject to all phases of the Class Environmental Assessment and require a minimum of three (3) points of public contact.

Public Involvement

Members of the public that have a stake in the project are encouraged to provide comment throughout the Class Environmental Assessment process. For Schedule "C" projects there are a minimum of three (3) opportunities for contact. These opportunities typically include two Public

Consultation Centres and the Notice of Completion which includes a mandatory 30-day public review period to review the project documentation.

Class Environmental Assessment Process for Schedule "C" Projects

Change in Project Status – Appeal Provision

It is recommended that all stakeholders (including the proponent, public and review agencies) work together to determine the preferred means of addressing a problem or opportunity. If you have any concerns, you should discuss them with the proponent and try to resolve them. In the event that there are major issues which cannot be resolved, you may request the Minister of Environment by order to require a proponent to comply with Part II of the Environmental Assessment Act before proceeding with a proposed undertaking which has been subject to Class Environmental Assessment requirements. This is called a "Part II Order". The Minister will make one of the following decisions:

1. Deny the request (with or without conditions);
2. Refer the matter to mediation; or
3. Require the proponent to comply with Part II of the Environmental Assessment Act, ordering a full Environmental Assessment.

All stakeholders are urged to try to resolve issues since it is preferable for them to be resolved by the municipality in which a project is located, rather than at the provincial level.

To request a Part II Order, a person must send a written request to:

Minister of Environment
135 St. Clair Avenue West, Floor 12
Toronto, Ontario M4V 1P5

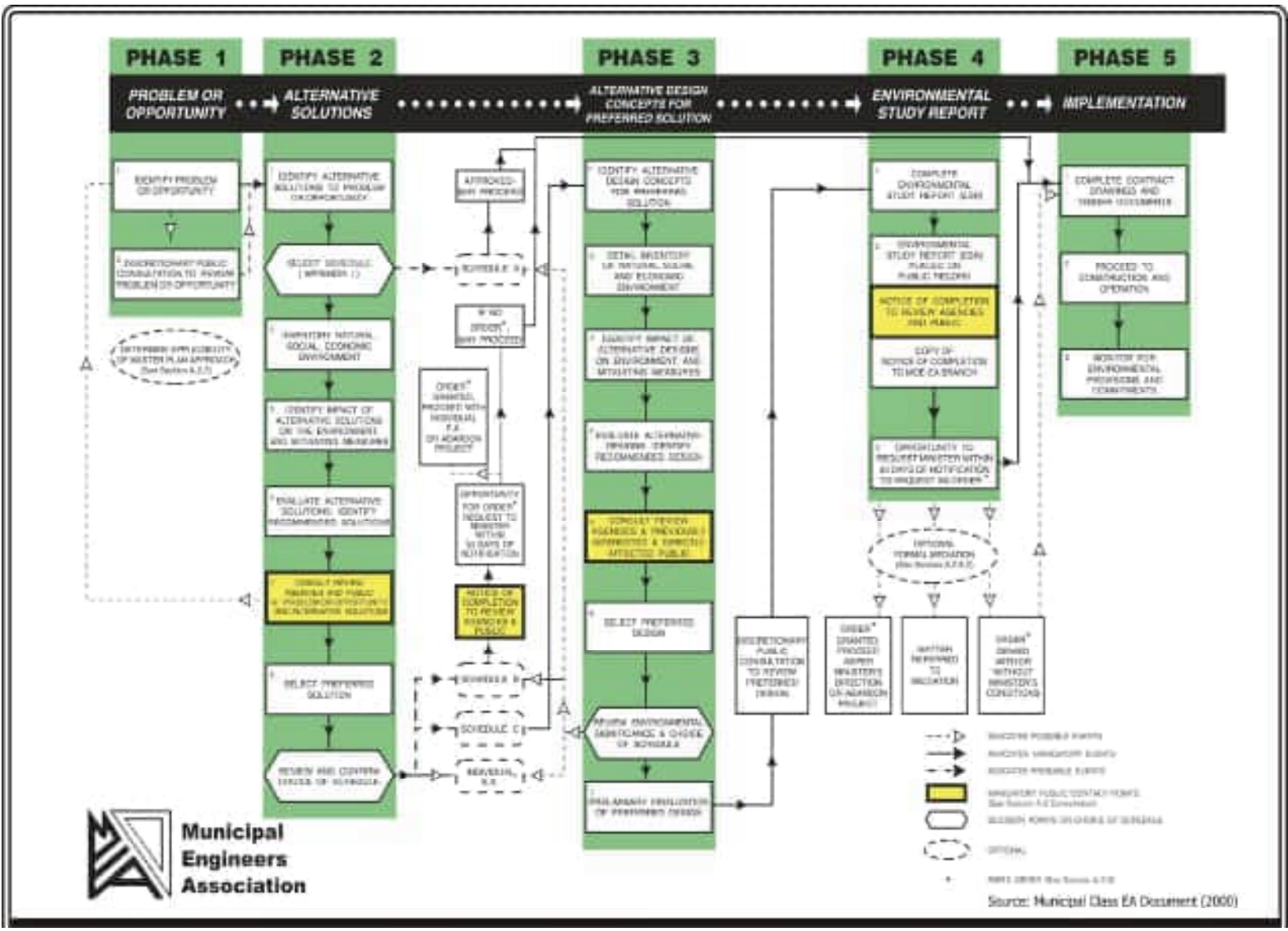
The request must address the following with respect to the identified concerns:

- Environmental Impacts and specific concerns;
- Adequacy of the planning and public consultation process;
- Involvement of the person in the planning process; and,
- Details of discussions held between the person and the proponent.

A process diagram depicting the Class Environmental Assessment process is included on the following page along with an indication of where we area with the current study process.

Appendix A

Municipal Engineers Association Class Environmental Assessment Flow Chart



Appendix B - Summary of the Alternative Solutions for the Bleams Road Corridor

Planning Alternatives	Description	Preliminary Evaluation	Preliminary Recommendation
Do Nothing	This solution identifies what would happen if no action is taken to address current deficiencies within the corridor, in both the short and long terms. This assessment provides a baseline to which other project alternatives may be measured.	The Transportation Study completed as part of this project found that there are existing capacity deficiencies on Bleams Road that the "Do Nothing" solution will not remedy.	Do not carry forward
Traffic Signals	This solution involves the installation of traffic signals and auxiliary/turning lanes to accommodate turning movements.	This alternative will be analyzed in further details as the introduction of a series of traffic signals provide effective traffic control at intersections, but may suffer from lower level of service for vehicles during peak periods, which result in large traffic queues.	Carry forward in conjunction with other solutions
Roundabouts	Roundabouts are characterized by their lack of traffic signals and a circulating roadway providing for continual traffic flow through the intersection. Roundabouts generally provide more traffic capacity than standard signalized intersections due to their ability to reduce delays.	This alternative will be analyzed in further detail as the introduction of a series of roundabouts may address or reduce traffic future delays and improve safety at intersections. Four intersections on Bleams Road will be analyzed for the suitability of roundabouts and in comparison to Intersection Improvements.	Carry forward in conjunction with other solutions
Traffic Signals and Roundabouts, Hybrid Version	This solution involves installing roundabouts along Bleams Road at Trussler Road and at Commonwealth Drive, while installing traffic signals at Isaiah Drive and Donnenwerth Drive/Amand Drive.	The effective use of both roundabouts and traffic signals along this corridor may satisfy the objectives of traffic control adequately.	Carry forward in conjunction with other solutions

Planning Alternatives	Description	Preliminary Evaluation	Preliminary Recommendation
Widening Bleams Road	Widening Bleams Road to 4 lanes in the short section from Fischer-Hallman Road to Commonwealth Drive/ Abram Clemens Drive.	The widening of Bleams Road in this section of the project will improve corridor capacity and address future congestion issues	Carry Forward in conjunction with other solutions
Active Transportation Facilities	Providing facilities for cyclists and pedestrians on Bleams Road in addition to efficient crossings and connections between the north and south side of the roadway.	Active Transportation Facilities are considered an essential component of this project and their design will be undertaken in conjunction with other improvements, such as, widening the east section of Bleams Road, along with roundabouts and/or traffic signals.	Carry Forward

Appendix C - Summary of Region Noise Policy

The Region's Noise Policy is made up of three Parts:

Part A: **New development** impacted by existing roads and railways.

Part B: **Existing development** impacted by proposed Regional road widenings.

Part C: **Existing development** impacted by noise from existing Regional roads.

Since there is no new development proposed, only **Parts B or C** may apply to this project.

The Bleams Road Class Environmental Assessment from just west of Fischer-Hallman Road to Trussler Road is proposing to:

- ✓ **Widen** Bleams Road from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive – therefore Part B applies to this section of Bleams Road; and
- ✓ **Reconstruct** Bleams Road only and maintain existing 2 lane "vehicle lane" configuration in all other areas.
    - Noise is calculated at a residence **outdoor living area** – typically defined as the backyard or patio within 3 metres of the rear wall of a residential unit.
    - Noise is calculated using a Ministry of the Environment, Conservation and Parks (MECP) model that calculates a 16-hour average noise level for the outdoor living area based on several factors, such as traffic volumes, distance from the outdoor living area to the centre of the road, and elevation differences between the outdoor living area to the centre of the road. The noise level used in the policy is not based on peak levels that may be recorded at a given location/time.

Part B of Region Noise Policy – Road Widening

The Region will consider designing and constructing a noise barrier if:

- ✓ The projected noise level in 10 years is calculated to exceed 65 dBa; or
- ✓ The projected noise level in 10 years is calculated to exceed 60 dBa and increase the existing noise level by 5dBa or more.

By constructing a noise barrier, projected noise is required to be calculated to be reduced to 60 dBa or less and reduced by 5dBa or more.

Part C of Region Noise Policy – No Road Widening – Complaint Driven

The Region will consider cost-sharing (50-50) noise barrier design and construction if:

- ✓ A resident raises a noise concern; and
- ✓ Existing noise levels are calculated to exceed 60dBa; and
- ✓ Two thirds (2/3) of affected property owners are in agreement to build noise barrier (based on rear yard property length) in accordance with Local Improvement Act; and
- ✓ All property owners pay 50% of cost of noise barrier based on length of wall installed at their property with payments charged over a period of ten (10) years (in accordance with Local Improvement Act).
- ✓ Residents may also decide to take other measures such as installing a privacy fence, air conditioning or window improvements at their own expense

Comment Sheet
Regional Municipality of Waterloo
Bleams Road Improvements
From Just West of Fischer-Hallman Road to Trussler Road
City of Kitchener

Please complete the survey so that your comments can be considered for this project.

Comments can be submitted on the Region's consultation page at **https://www.engagewr.ca/bleams-rd**, by March 7, 2022.

Comments can alternatively be submitted by filling out this comment sheet and returning it by mail or e-mail by March 7, 2022 to:

Greg Proctor, C.E.T
Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: (519) 575-4729
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Dot Roga, C.E.T
Manager, Municipal Division
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2L 3V3
Telephone: (519) 585-2255 ext. 63220
Fax: (519) 585-2269
Email: droga@mte85.com

Comments regarding this project:

_____
_____
_____
_____
_____
_____

Name: _____

Address: _____ Postal Code: _____

Phone: _____ Email: _____

Collection Notice:

All comments and information received from individuals, stakeholder groups, and agencies regarding this project are being collected to assist the Region of Waterloo in making a decision. Under the "Municipal Act", personal information such as name, address, telephone number and property location that may be included in a submission becomes part of the public record.

Additional Comments:

G.3.3 – PUBLIC CONSULTATION CENTRE 1

Presentation and Script

Region of Waterloo

Bleams Road Improvements Class EA

Public Consultation Centre #1

February 14, 2022



Hello, and thank you for attending this Public Information Centre for the Bleams Road Improvement Project.

Today we gather on the Traditional Territory of the Haudenosaunee, Anishinaabe, and Neutral Peoples. We recognize our responsibility to serve as stewards to the land and honour the original caretakers that came before us.

I'm Greg Proctor, a Project Manager at the Region of Waterloo.

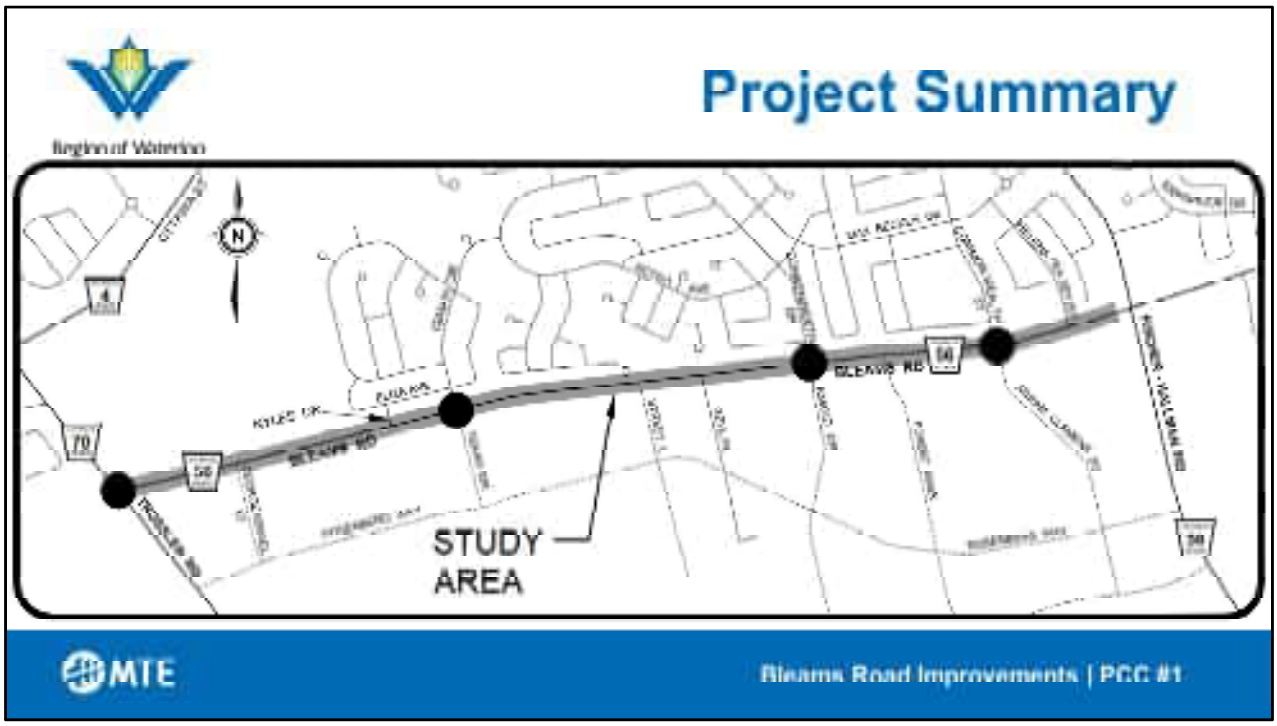
Today, we will update you on the options for upgrading Bleams Road.

This virtual meeting is our first public consultation meeting in line with the regulations under the Class EA, and the Region's strategic objectives to encourage public consultation.

All this information you are hearing about today is available on our EngageWR.ca site. Please subscribe to this page for future project updates and public consultation opportunities.

If you have a question at any time throughout this project, please send me an email at the information on this slide.

Your comments are encouraged and welcome, and we'll be collecting all of them for the Project Team to review and answer.

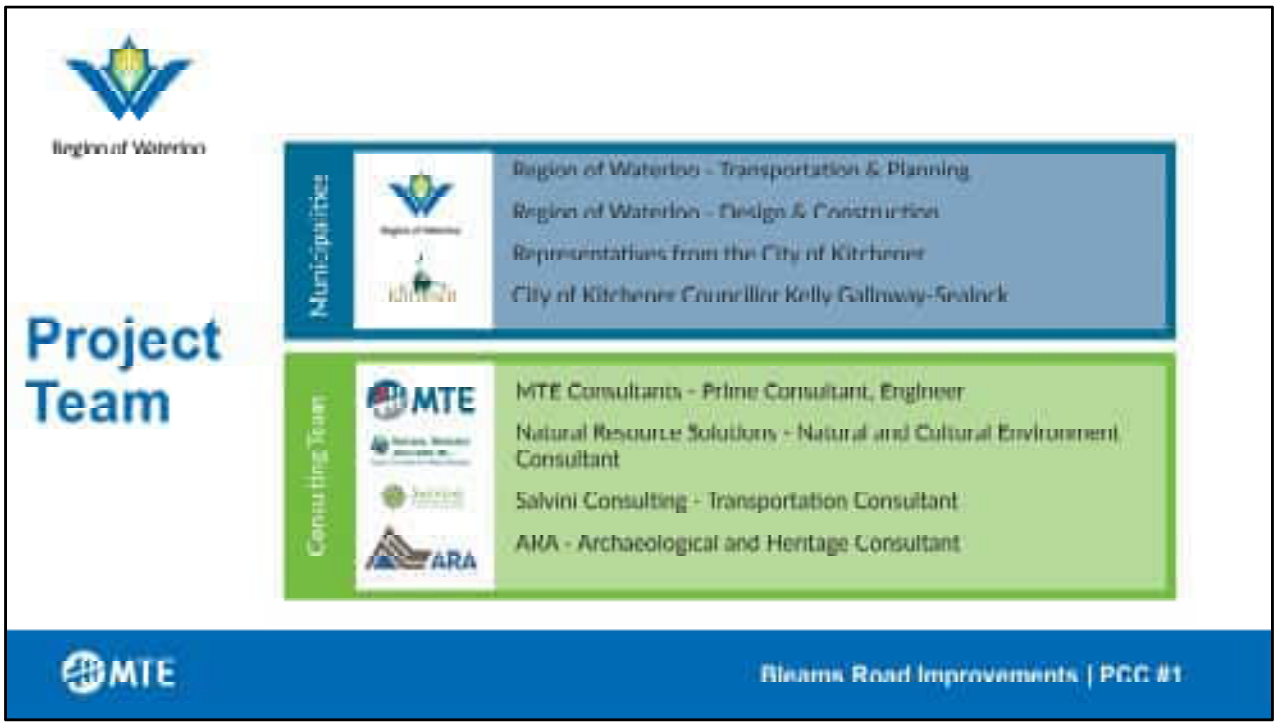


For anyone new to this project, I'll give a brief overview of the goals and objectives of this project and then turn over to our consultant team to share the update for today's conversation.

This study will look at what improvements are needed for Bleams Road to accommodate the existing and proposed development of the lands along this roadway.

We'll consider all road users such as pedestrians, cyclists and motorists throughout the study to ensure efficient and safe movement across and along this roadway.

As part of this study, we're considering all impacts through studies including a natural environment review, an archaeological investigation, traffic impact study and cultural heritage review.

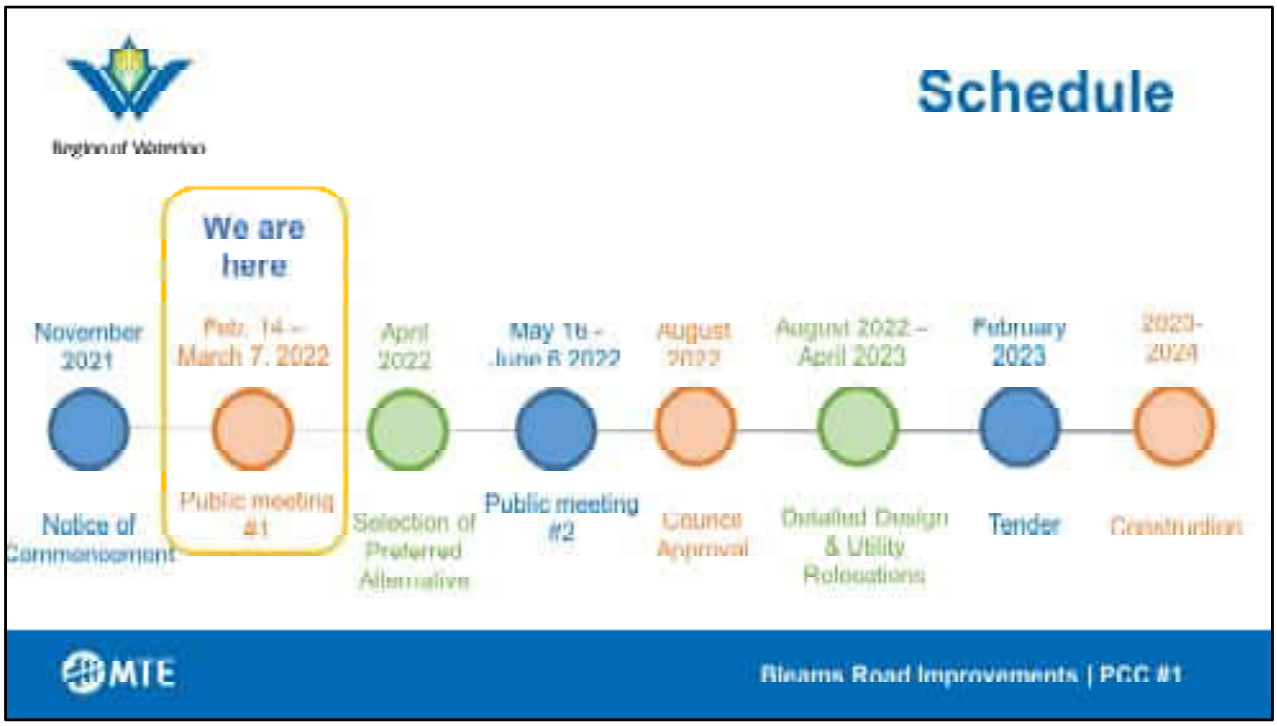


This is a Region of Waterloo project within the City of Kitchener.

Our project team includes transportation and planning representatives from the Region and the City, as well as Councillor Kelly Galloway-Sealock.

MTE is our consulting team on this project, and joining us today are Dot Roga and Nathan Duimering from MTE Consultants.

Dot is the Consultant Project Manager and Nathan is the Engineering Designer for the project.



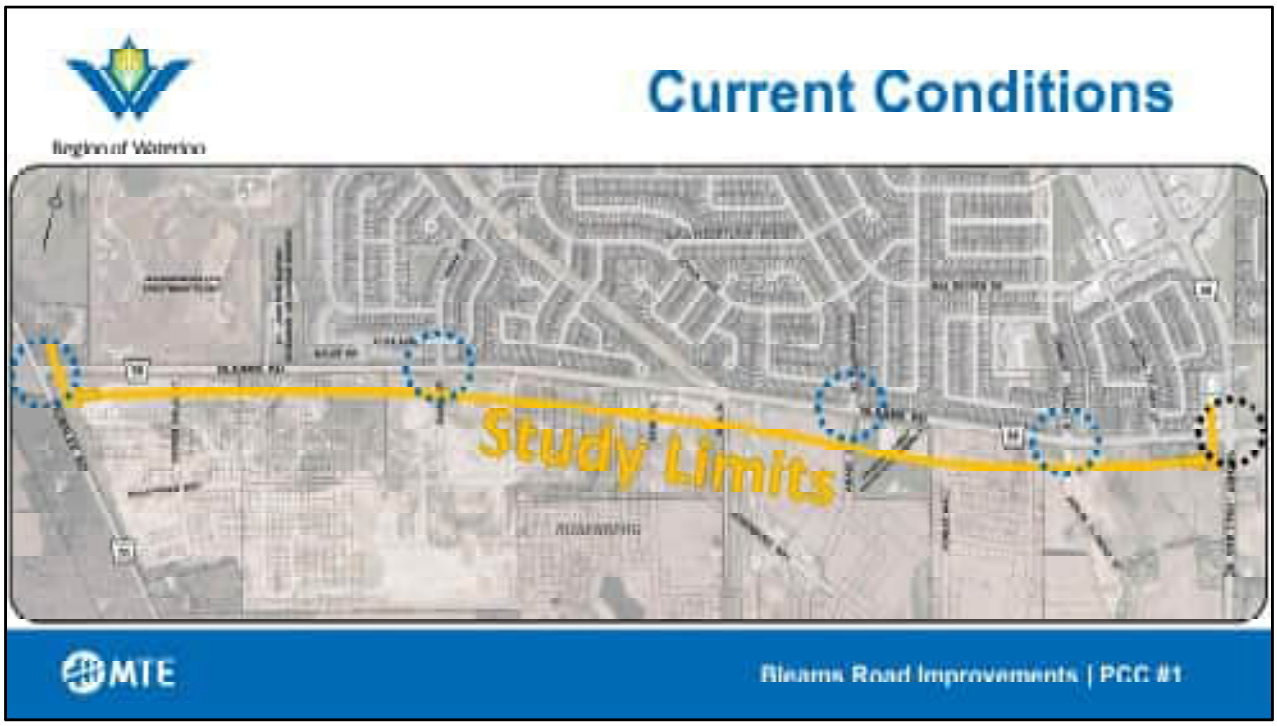
Thanks Greg!

Before we share the alternatives with you, I'd like to walk you through the project schedule.

As you can see by the slide, today we are asking for you comments as part of this public consultation meeting.
We'll share four alternatives that have been developed from the current study findings. After we collect comments, and continue with more technical studies, we'll develop a preferred alternative and bring that back to you at a second public consultation meeting proposed for May or June of this year.

Looking ahead, we'll take a recommendation to Council for approval in August, and if we get approval, detailed design will lead to the tender process and finally to construction around 2023/24.

And now , I'll turn things over to Nathan who will walk us through the four alternatives.



Thank you Dot!

Hello everyone.

Our project area is from just west of Fischer Hallman Road to Trussler Road.

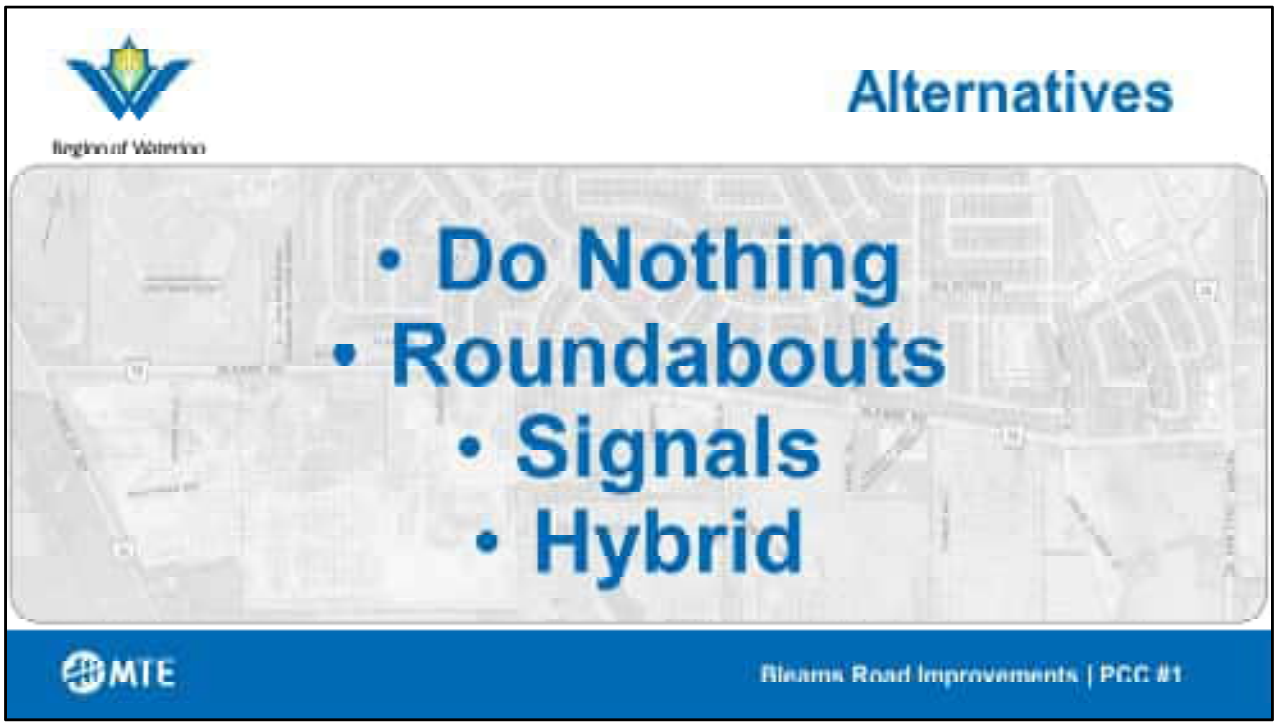
A new roundabout has been constructed at the intersection of Fischer Hallman Road and Bleams Road which has two lanes in each direction and our project picks up where that construction finished.

From that point, the corridor is quickly narrowed down to one lane in each direction to match the existing layout on Bleams road. Bleams road is currently a two lane rural collector road with the established Laurentian West neighbourhood to the north and the new Rosenberg neighbourhood to the south.

Through the various traffic studies carried out for the area, four intersections have been highlighted as requiring a higher level of traffic control than what is there currently—Commonwealth and Abram Clemens Street, Donnenwerth and Amand

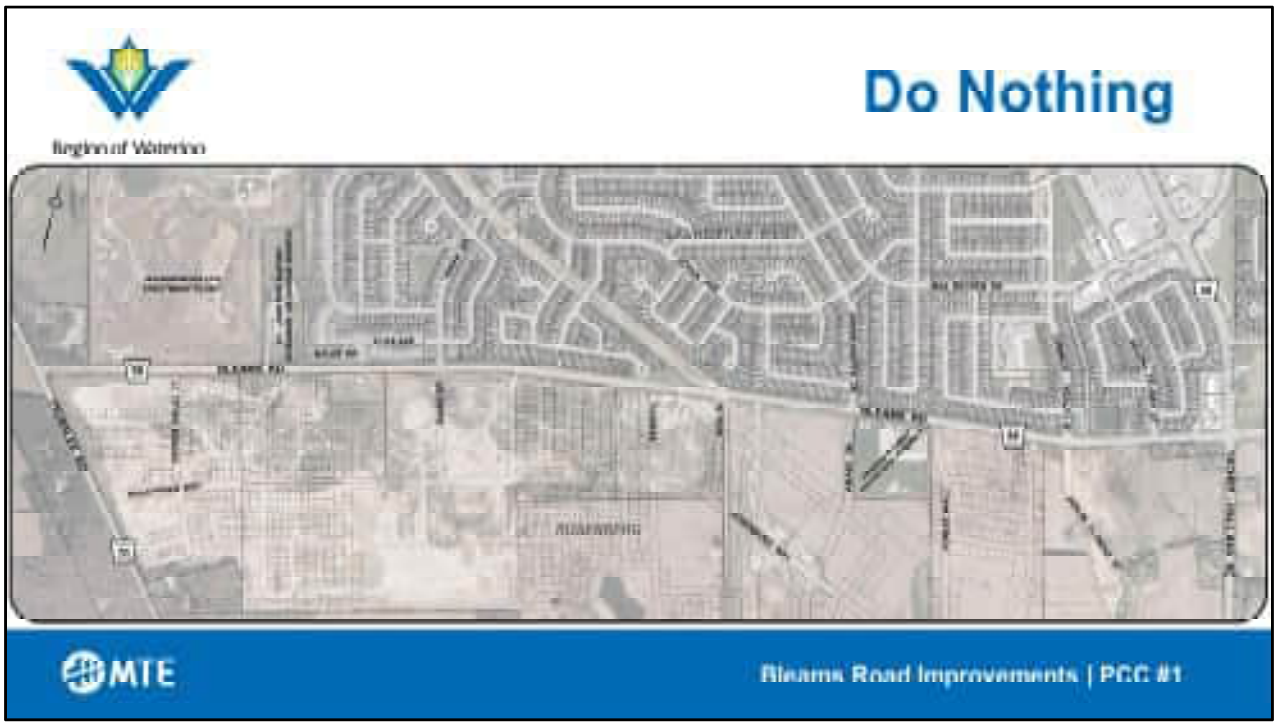
Drive, Isaiah Drive and Trussler.

These intersections were evaluated through Intersection Control Studies that look at the individual intersections as well as the functionality of the corridor as a whole.

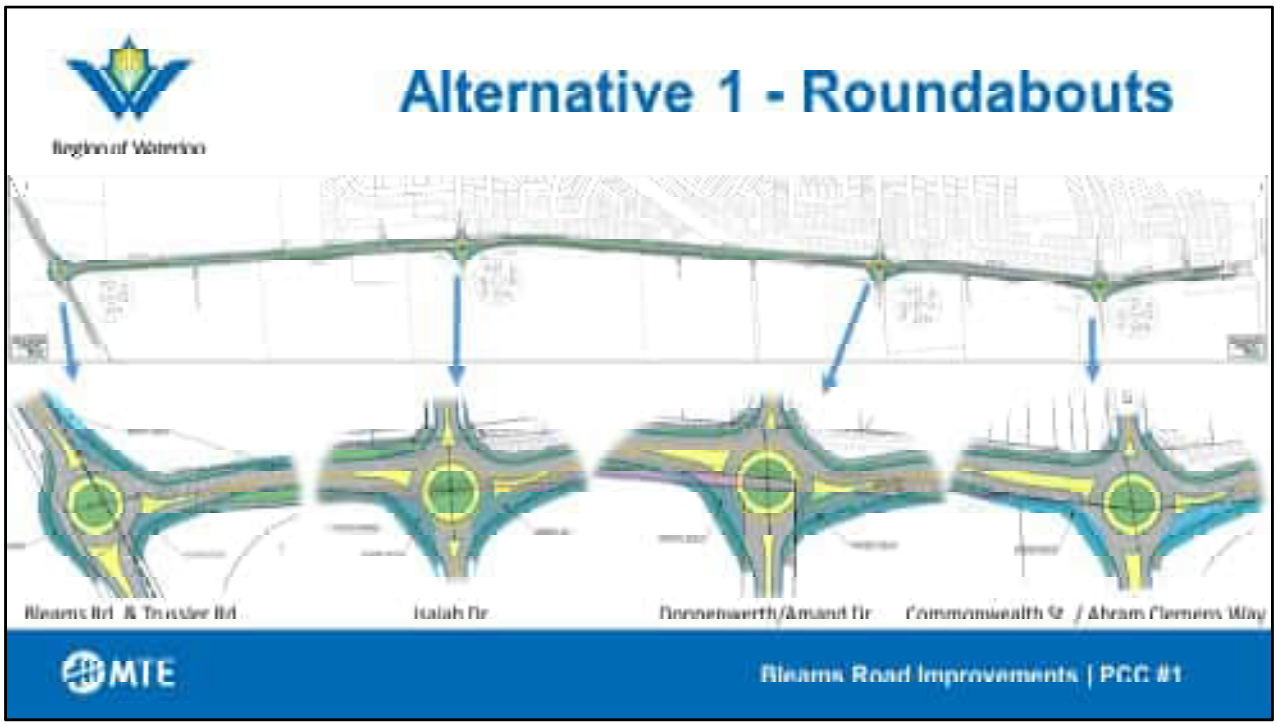


Through the intersection control process, the design team narrowed the options to the four that we are presenting to you today and asking for your feedback.

They are Do Nothing, Roundabouts at all four major intersections, Signals at all four intersections, and a Hybrid which has a roundabout at the two outer intersections and signals at the two central intersections. I will walk you through these options in more detail.



The first option that all studies consider is the Do Nothing option. In this case, we do not feel this is a viable alternative. The current asphalt surface is in poor condition, the capacity of the two lane road at the east end is limited and with the current developments coming on-line, the east end is forecasted to require a four lane cross section from Fischer Hallman Road to Commonwealth/Abram Clemens to handle the projected traffic load. The current road does not provide suitable facilities for active transportation—meaning walking, rolling, or cycling.



Alternative 1 - Roundabouts.

We start with a four-lane cross section between Fischer Hallman and Commonwealth Street/Abram Clemens Way. That roundabout would consist of four lanes on Bleams and two lanes on the side streets.

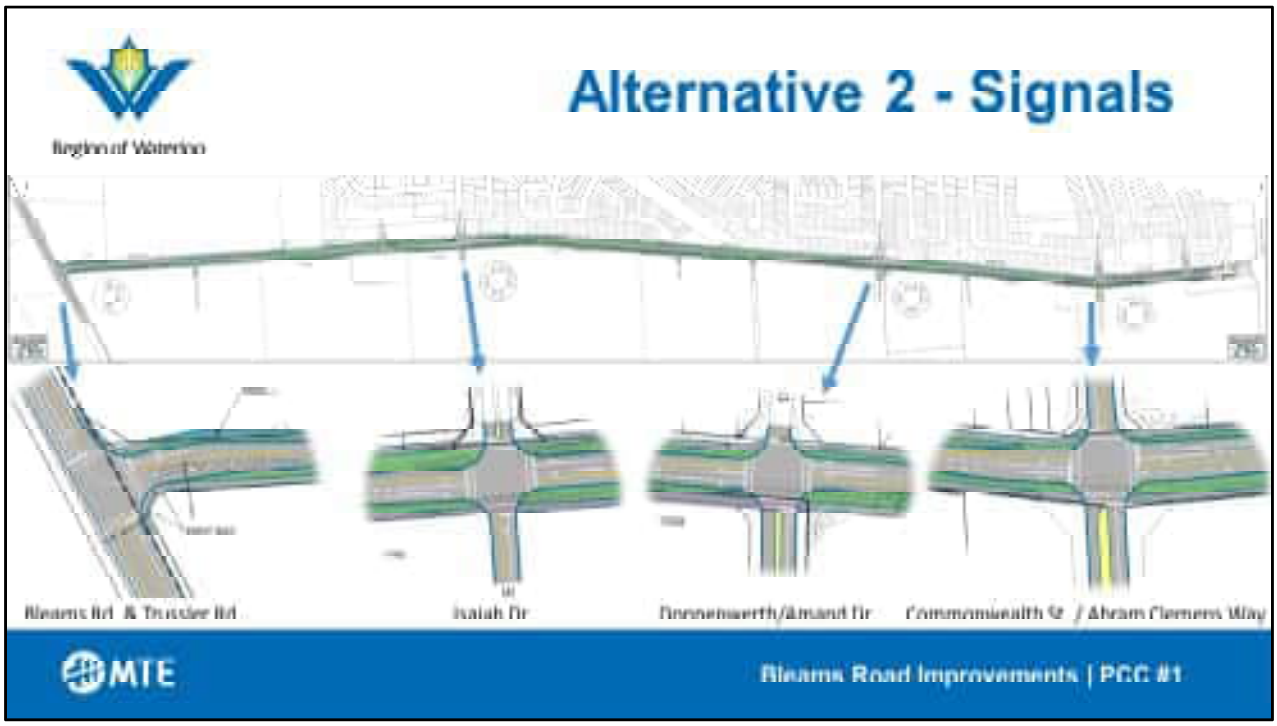
The four-lane section would be reduced to a two-lane section as we approach the Donnenwerth Drive/Amand Drive intersection. This roundabout, as well as Isaiah Drive roundabout, would be designed for four lanes on Bleams and two lanes on side streets but in the interim, the roundabout would be painted to be a single lane in all directions until volumes are such that four lanes on Bleams Road are required.

A left turn lane is proposed into one of the subdivision accesses currently controlled by a stop sign and labeled as Street L.

Right and left turn lanes are proposed to access Nyles Drive and George Israel Street.
Approaching the Trussler Road roundabout, Bleams would widen to two lanes, one

for right turning and one for left turning vehicles.

The Trussler road roundabout is proposed to have two lanes running south; one as a dedicated left and the other a through. Northbound will also have two lanes with a through and through/right lane.



Alternative 2 - Signals

The signalized version, similar to the roundabout version, will have four lanes from the roundabout at Fischer Hallman to the intersection with Commonwealth/Abram Clemens where two lanes will merge into dedicated right and left turn lanes and a single though lane.

West of the intersection, the road transitions into a two lane urban cross section with a single lane in each direction. A left turn lane will accommodate access to Forest Walk Trail.

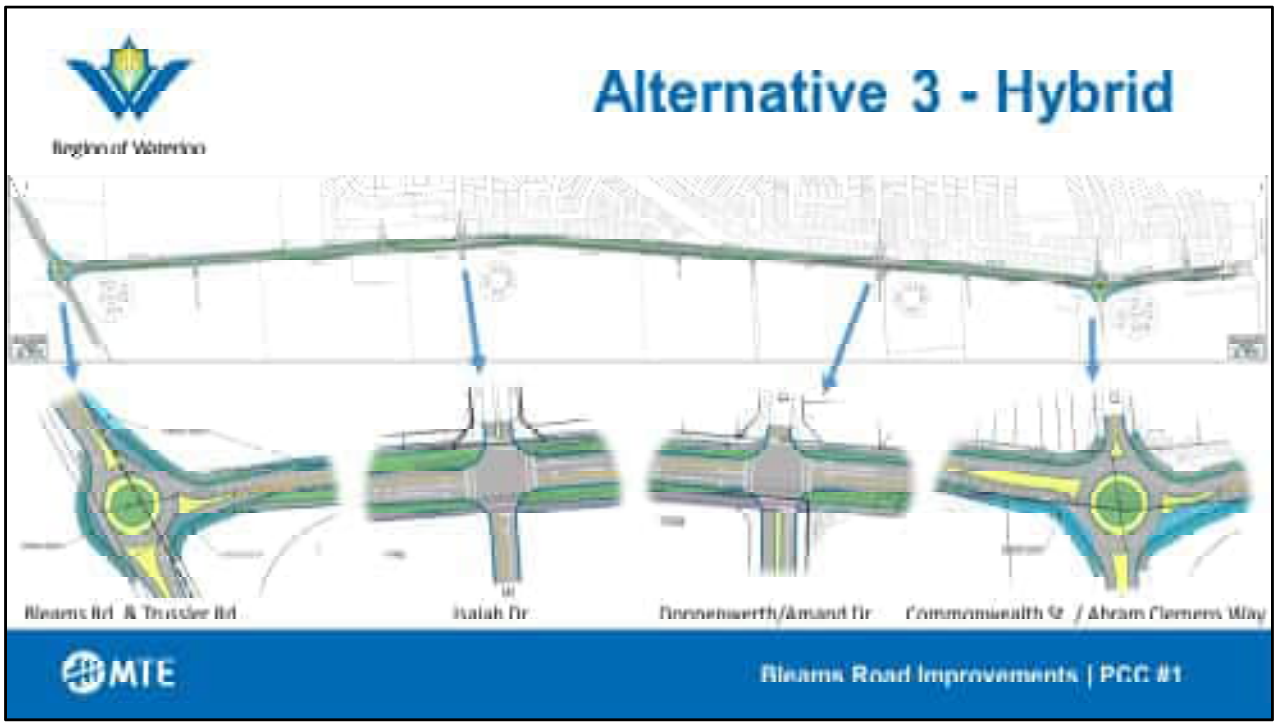
The Donnenwerth/ Amand intersection would include dedicated turn lanes and single through lane.

A left turn lane for Street L and a signalized intersection at Isaiah Drive with dedicated turn lanes.

As we travel west, turn lanes are planned for Nyles and George Israel Drive.

Approaching Trussler Road there would be a right turn lane and left turn lane.

Trussler road will have single through lanes in the north/south direction with a dedicated right turn lane for northbound traffic. And due to the projected peak hour volumes, a dual left turn lane onto Bleams Road is required.



Alternative 3 - Hybrid

In Alternative 3, we combine portions of the two previous alternatives with roundabouts proposed at the furthest east and west intersections, and signals at the two central intersections.

As with the roundabout option, we have four lanes west from Fischer Hallman to a roundabout at Commonwealth Street/Abram Clemens Way.

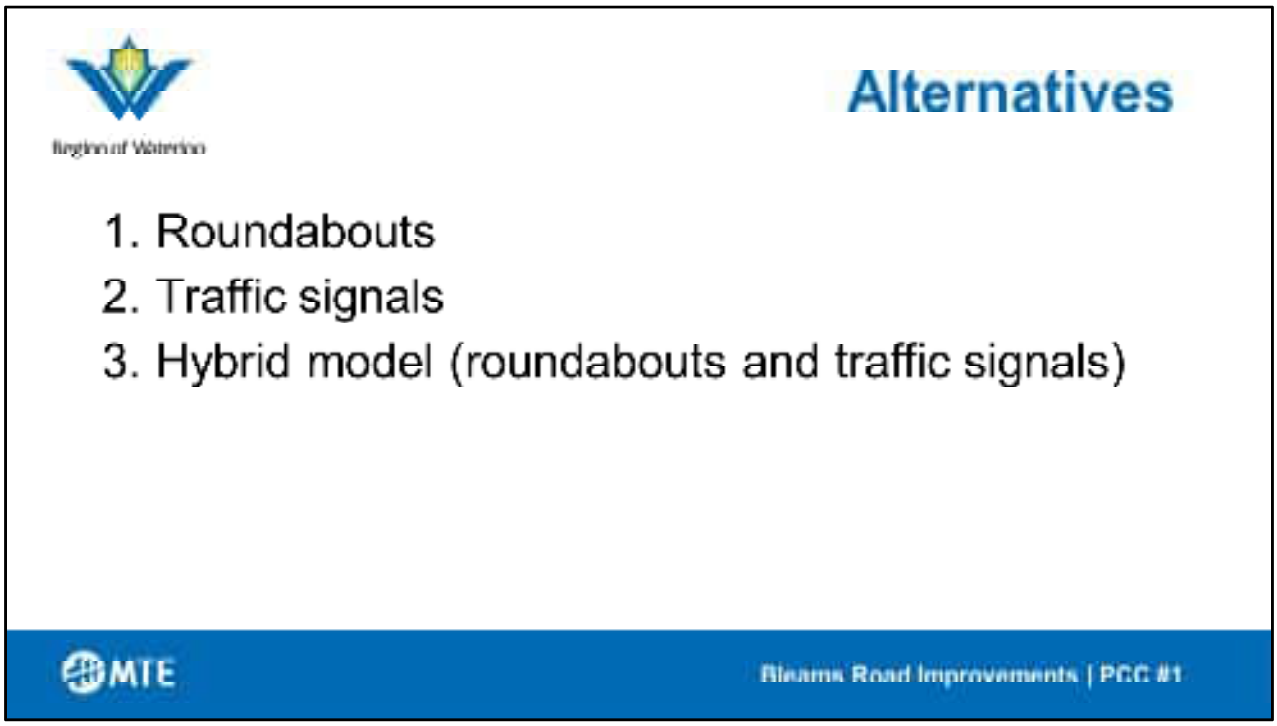
The road is then narrowed down to a two lane cross section with a left turn lane onto Forest Walk Trail.

A signalized intersection with full turn lanes is proposed at Donnenwerth/Amand Drive.

Bleams continues to the west with a two lane cross section with a left turn lane to access Street L and then another signalized intersection with full turn lanes at the Isaiah Drive intersection.

We continue with the two lane section with turn lanes to Nyles Drive and George Israel Street and then into a roundabout at the Trussler Intersection.

And now I'll pass it back to Dot



There are a number of pros and cons associated with each of the three alternatives presented.

The goal of this project is to try and balance the needs of all users.

In terms of active transportation, the Region's transportation master plan calls for multi-use trails along Bleams Road and it is therefore important to ensure that cyclists and pedestrians are accommodated in the intersection designs.

There are benefits to traffic signals in that the intersections can be designed to include cycling crossrides and dedicated bicycle signals to allow cyclists to access all cycling routes.

On the contrary, large and multi-lane roundabouts are shown to inhibit the desirability of using that intersection for walkers and cyclists with one example being that the Ontario Highway Traffic Act does not permit us to implement crossrides that allow cyclists to continue through that intersection without dismounting.

In terms of traffic operation, the roundabouts and the concept of continuous traffic flow are shown to perform better than traffic signals in terms of reducing vehicle delay. Roundabouts would also be expected to produce lower traffic speeds along the corridor,

and better performance in terms of long-term expectations for vehicle collisions and their associated costs.

Given the pros and cons of the individual roundabout and traffic signal intersection control options, it could be said that the hybrid corridor (or, Alternative 3) would provide the alternative that is somewhere in the middle between all the pros and cons of an exclusive roundabout corridor (Alternative 1) or an exclusive traffic signals corridor (Alternative 2).

And with that, I'm going to pass it on to Greg for final comments.



And that brings us to the end of our presentation.

Now, we'd like to hear from you. We have a survey on this project page at EngageWR. Please complete the survey to share your thoughts on the alternatives we have presented to you today. The survey is open until March 7.
Please subscribe to this page so you are automatically notified of upcoming consultation opportunities.

All comments and information provided become part of the review process and are being collected to assist the Region of Waterloo in completing the planning and design for this project. All submissions will become part of the public record files for this matter.

Thank you everyone for watching this presentation and we look forward to receiving your feedback.

G.3.4 – PUBLIC CONSULTATION CENTRE 1

FAQ

FAQ

Q1: Why is the Region of Waterloo undertaking this project?

A1: We are planning improvements to address the deteriorated roadway, accommodate increased vehicular traffic from recent and future development in the area, as well as to take the opportunity to include enhancements to the road such as cycling and pedestrian facilities.

Q2: What improvements will be made to Bleams Road?

A2: In addition to active transportation features, a comprehensive analysis of projected vehicle volumes on Bleams road has determined the need for improvements at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive. We are considering the option of traffic signals or roundabouts at these key intersections. The traffic analyses also identified the need to widen Bleams Road from two lanes to four lanes for the short section between Fischer-Hallman Road and Commonwealth Drive/Abram Clemens Drive. The remainder of the road would stay as two lanes.

Q3: How will the improvements accommodate active transportation?

A3: Providing facilities for cyclists and pedestrians on Bleams Road from Fischer-Hallman Road to Trussler Road is considered a necessary component of the overall solution for this corridor. There are two options under consideration: a multi-use trail (two directional), or a single directional cycle track and sidewalk. In addition, we are looking at easy and convenient connectivity between communities on both sides of the road.

Q4: How will traffic be accommodated during construction?

A4: Local access will be maintained at all times. However, there will be extended periods when through traffic will not be available for sections of Bleams Road. Where practical, alternate routing of traffic around the construction will be accomplished with detours. We understand the interruption to traffic will be inconvenient and we will try to minimize the length of road closures as much as possible.

Q5: How do the improvements relate to the objectives of the Regional Official Plan, the Regional Transportation Master Plan and the Context Sensitive Regional Transportation Corridor Design Guidelines?

A5: The Region's Official Plan gives direction that any new or reconstructed roads include all modes of transportation such as walking, cycling, cars and transit. By including these improvements to Bleams Road, this project supports the Regional Transportation Master Plan (RTMP) goals of optimizing our transportation system, promoting transportation choice and supporting sustainable development. The Context Sensitive Regional Transportation Corridor Design Guidelines (CDG) is a planning policy document that guides the design of Regional Roads. The CDG identifies design parameters for necessary features within road allowances such as vehicular lanes, cycling lanes, sidewalks and boulevards. According to the CDG, Bleams Road is classified as "Neighbourhood Connector - Avenue".

Q6: How is the natural environment being considered?

A6: As part of the Municipal Class EA, an Environmental Impact Study (EIS) and Tree Preservation Plan (TPP) is being completed. This includes a comprehensive background information review, Species at Risk and Significant Wildlife Habitat screening exercises, and a scoped field inventory program, developed to include an assessment of the habitats and species potentially present within the study area.

This EIS will analyze potential impacts of the alternative designs. An EIS report will be prepared to describe the findings and analysis.

Q7: How is the archaeological environment being considered?

A7: Archaeological assessments of the area have commenced in consultation with the Indigenous communities. Further investigations will take place prior to any construction activities that could impact the area.

Q8: What is the current timeline for construction?

A8: Construction is currently expected to start in 2023 and be completed by the end of 2024.

Q9: Will noise walls be constructed along Bleams Road adjacent to the existing residential properties on the north side?

A9: The Region has a Noise Policy used to determine when noise barriers, such as noise berms or walls, would be recommended as part of an upcoming project. Part B of the Region's Noise Policy applies when a road widening is being considered. For this project, Part B of the Region's Noise Policy would apply if Bleams Road is widened from two to four lanes, as currently being considered for the section from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive.

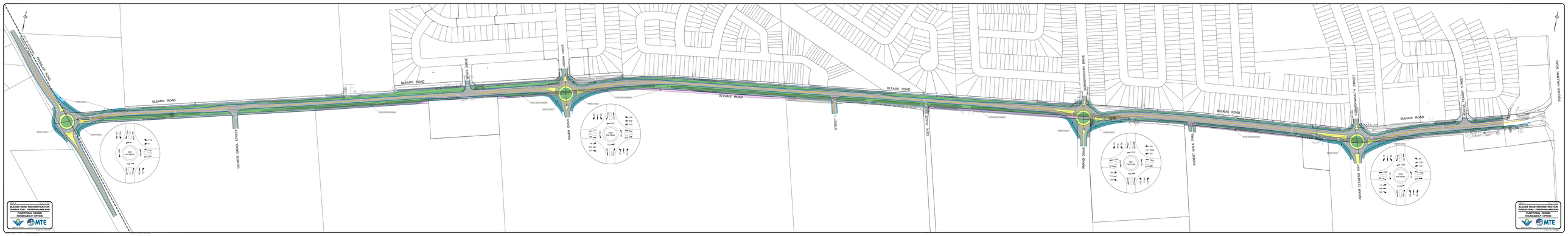
Part C of the Region's Noise Policy could be applied in those areas where noise barriers are not recommended under Part B of the Noise Policy. Under Part C, a noise barrier may be considered under certain circumstances, if property owners are willing to share in the cost of a noise attenuation.

A summary of Parts B and C of the Region's Noise Policy is posted under the Documents section on this project's page on the Engage website.

A noise study will be undertaken in early 2022 in accordance with Part 'B' of the Region's Noise Policy for Bleams Road in the section being considered for widening to four lanes (just west of Fischer-Hallman Road to Commonwealth Drive). The noise study will be summarized at the second public consultation, scheduled for spring 2022.

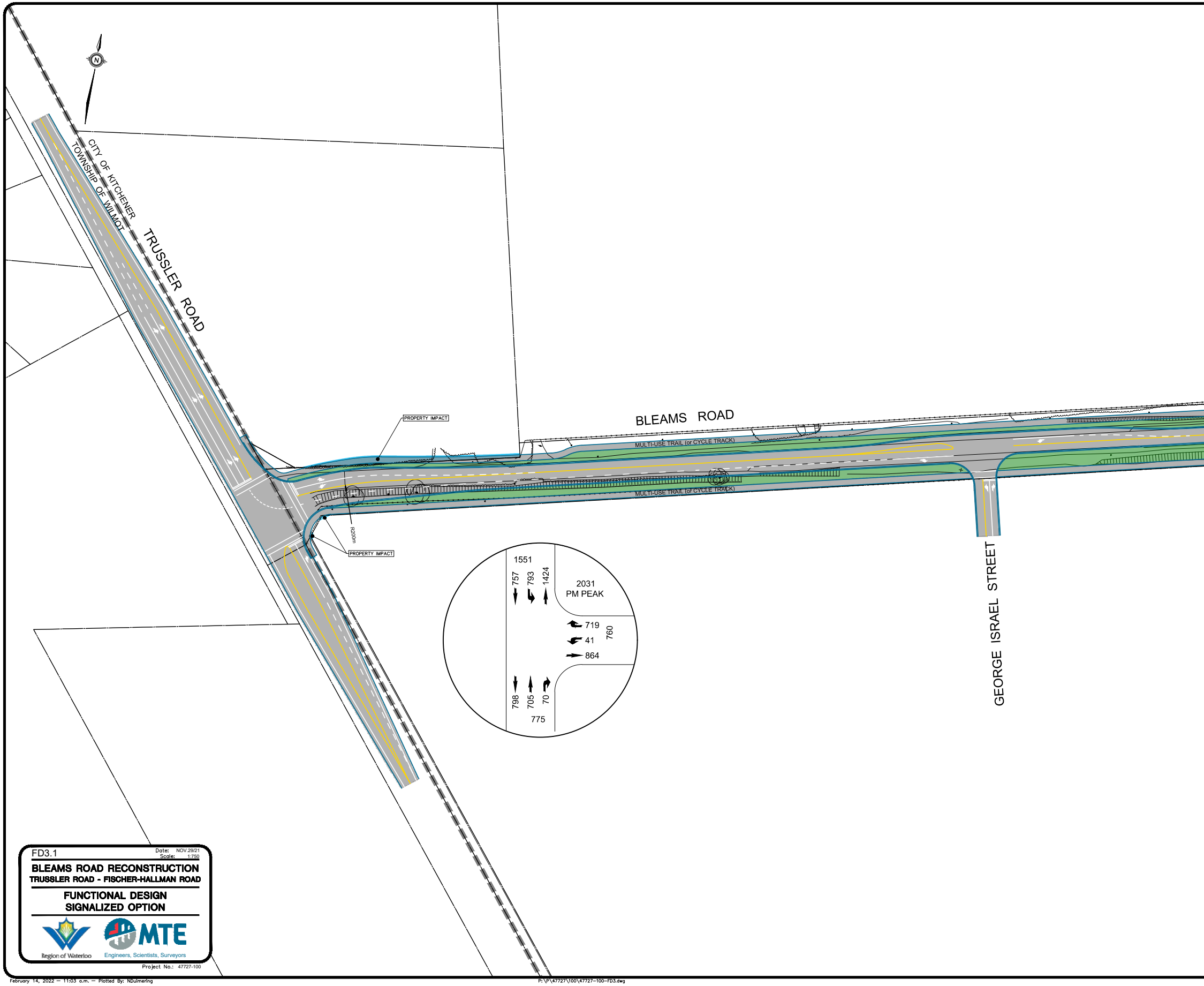
G.3.5 – PUBLIC CONSULTATION CENTRE 1

Alternative 1


TRAFALGAR ROAD
BLEAMS ROAD
GEORGE ISRAEL STREET
NICOLE DRIVE
ISAIAH DRIVE
STREET L
GIRL PLACE
AMADI DRIVE
FOREST WALK PARK
ABRAM CLEMENS WAY
COMMONWEALTH STREET
REGINA FAUSKI STREET
FISCHER-HALLMAN ROAD
2021 PM PEAK
2031 PM PEAK
BLEAMS ROAD RECONSTRUCTION
TRAFALGAR ROAD - FISCHER-HALLMAN ROAD
CLASS ENVIRONMENTAL ASSESSMENT
FUNCTIONAL DESIGN
DEVELOPMENT SECTION
MTE

G.3.6 – PUBLIC CONSULTATION CENTRE 1

Alternative 2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TOWNSHIP OF WILMOT
TRUSSLER ROAD
BLEAMS ROAD
PROPERTY IMPACT
MULTI-USE TRAIL (or CYCLE TRACK)
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PROPERTY IMPACT
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FD3.1

Date: NOV.29/21
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
SIGNALIZED OPTION

Region of Waterloo
Engineers, Scientists, Surveyors

Project No.: 47727-100

February 14, 2022 — 11:03 a.m. — Plotted By: NDulmering

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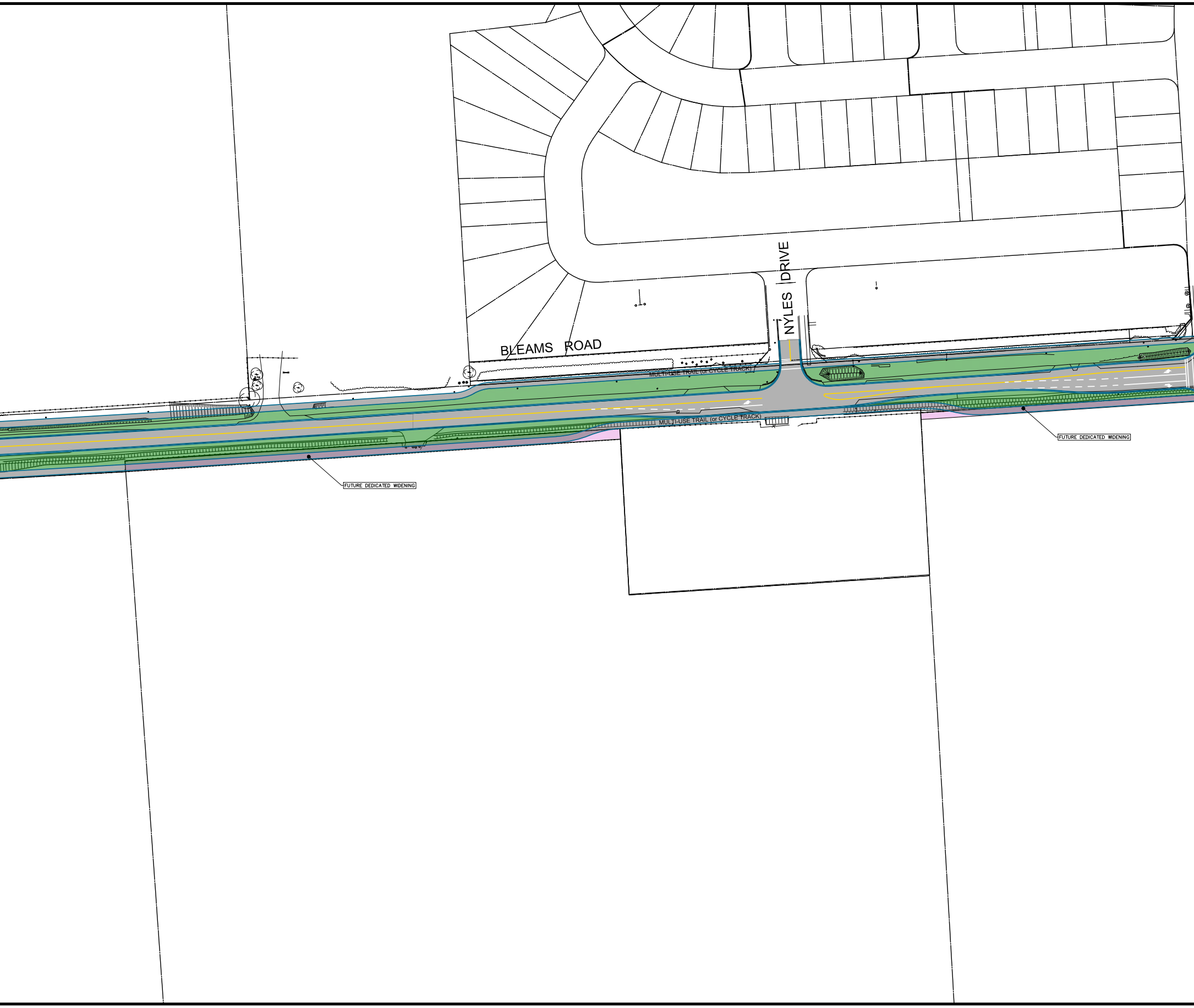
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FUTURE DEDICATED WIDENING


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BLEAMS ROAD
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MULTI-USE TRAIL (or CYCLE TRACK)
MULTI-USE TRAIL (or CYCLE TRACK)
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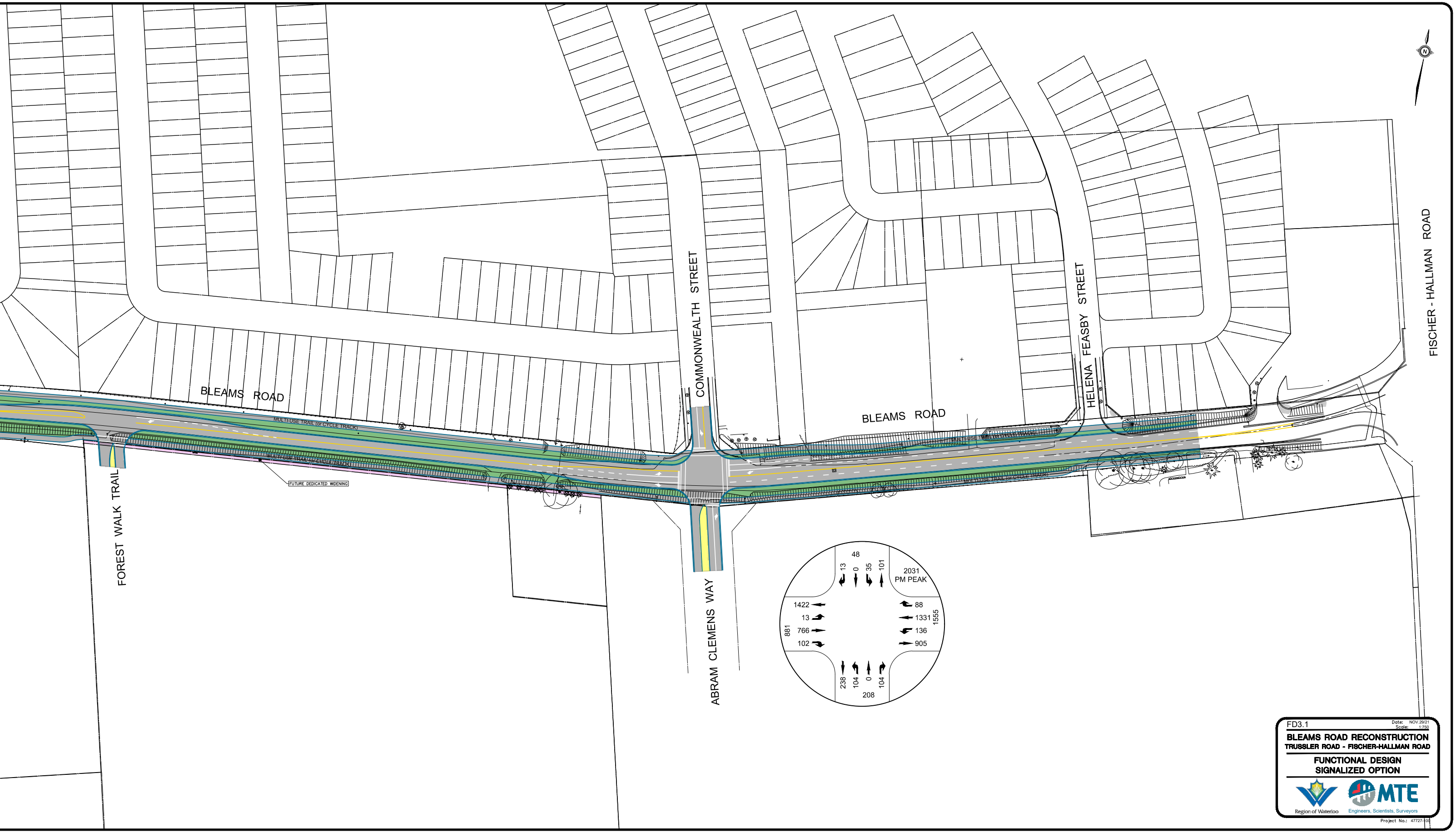
BLEAMS ROAD
BLEAMS ROAD
COMMONWEALTH STREET
HELENA FEASBY STREET
FISCHER - HALLMAN ROAD
FOREST WALK TRAIL
ABRAM CLEMENS WAY
MULTI-USE TRAIL (or CYCLE TRACK)
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Date: NOV.29/21
Scale: 1:750

BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

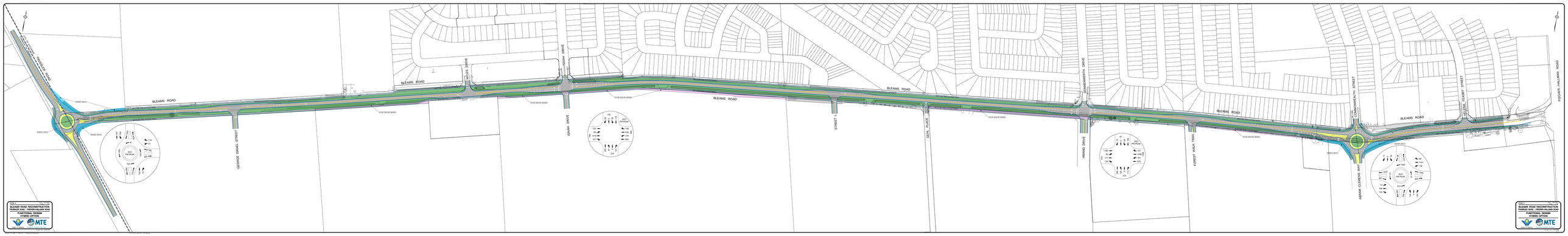
FUNCTIONAL DESIGN
SIGNALIZED OPTION

Region of Waterloo
MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100

G.3.7 – PUBLIC CONSULTATION CENTRE 1

Alternative 3



TOWN OF HALTON HILLS
BLEAMS ROAD RECONSTRUCTION
TRAFALGAR ROAD - FISCHER-HALLMAN ROAD
CLASS ENVIRONMENTAL ASSESSMENT
FUNCTIONAL DESIGN
LANE CONFIGURATION

MTE

G.4.1 – PUBLIC CONSULTATION CENTRE No. 2 - Notice

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Design and Construction
150 Frederick Street
Kitchener Ontario N2G 4J3 Canada
Telephone: 519-575-4400
TTY: 519-575-4608
Fax: 519-575-4430
www.regionofwaterloo.ca

Public Consultation #2
Bleams Road Improvements,
West of Fischer-Hallman Road to Trussler Road, Kitchener

August 15, 2022

Hello,

The Region of Waterloo is looking to improve Bleams Road from just west of Fischer-Hallman Road to Trussler Road in the City of Kitchener. In addition to removing the ditches and constructing storm sewers, this project addresses the deteriorating roadway, while also providing intersection improvements along with cycling and pedestrian facilities to accommodate development along Bleams Road. We expect construction to start in 2024 and take two years to complete.

After the first public consultation for this project (PCC#1), which was held from February 14 to March 7, 2022, the project team re-evaluated the possible solutions for road improvements along with the transportation/traffic analysis. The outcome of the review combined with input received from PCC#1 has resulted in a preferred design of four roundabouts on Bleams Road at each of the key intersections of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive.

Save the date!

We have scheduled a second virtual engagement opportunity from August 15 to September 12, 2022. At this second public consultation, you will be able to view information about the project as well as view and comment on the project team's preferred design. Please visit our engagewr.ca/bleams-rd project page to provide input and ask questions.

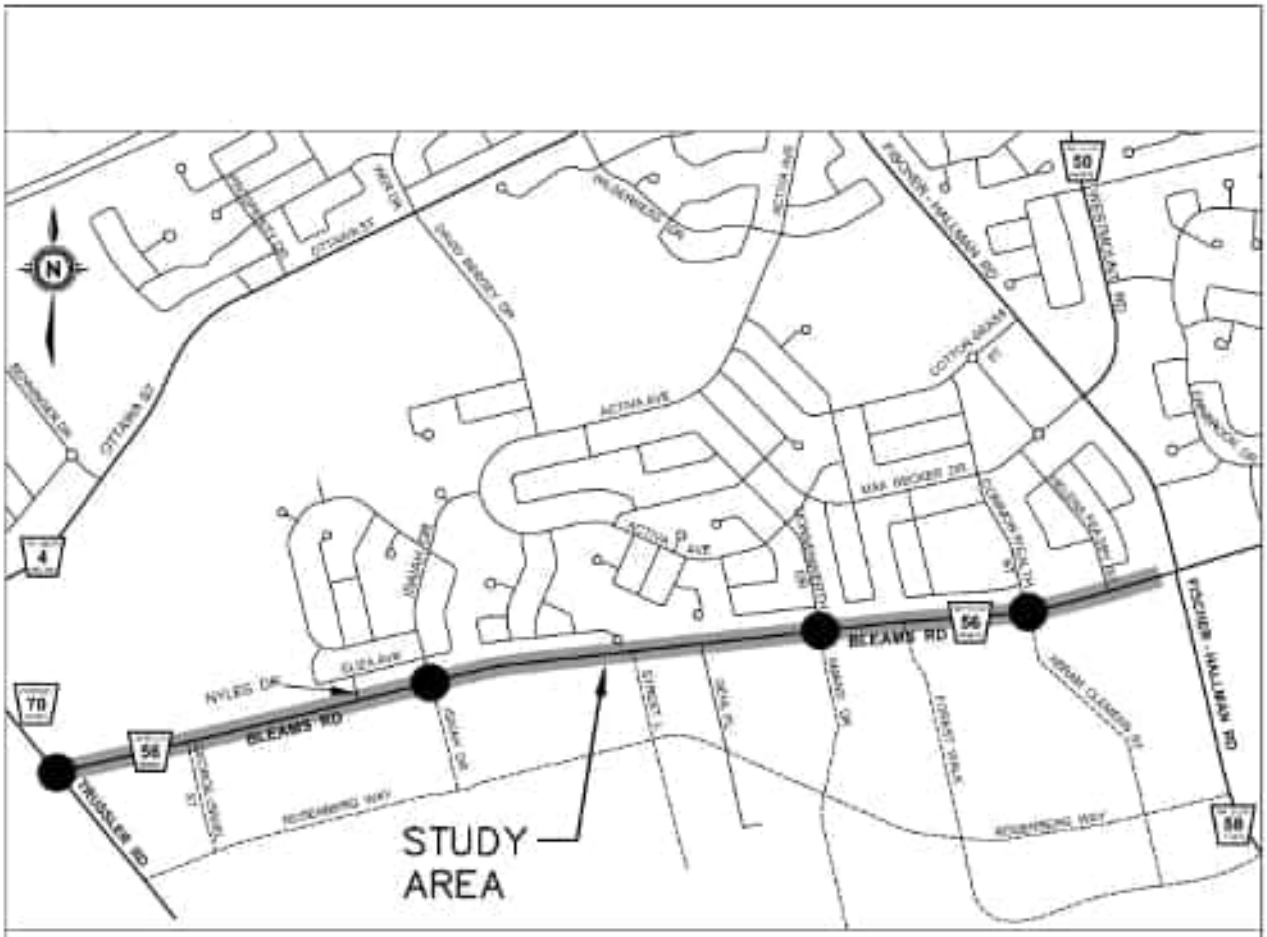
Please subscribe to our project page for updates and engagement notifications. You can contact us with any comments or questions as well.

Greg Proctor, C.E.T.
Project Manager
Region of Waterloo
519-575-4729
gproctor@regionofwaterloo.ca

OR

Dot Roga, C.E.T.
Manager, Municipal Division
MTE Consultants Inc.
519-743-6500 x 1269
droga@mte.com

We collect all comments and information regarding this project to assist the Region of Waterloo in making a decision. Under the Municipal Act, personal information, such as name, address, telephone number, and property location may be included in any report submissions and will become part of the public record in compliance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990.



Region of Waterloo

REGIONAL ROAD No. 56 (BLEAMS ROAD) FISCHER HALLMAN ROAD TO TRUSSLER ROAD ROAD IMPROVEMENTS

G.4.2 – PUBLIC CONSULTATION CENTRE 2

Information Package

Information Package

Bleams Road Improvements

From Just West of Fischer-Hallman Road to Trussler Road

City of Kitchener

Public Consultation Centre #2
August 15–September 12, 2022
online at engagewr.ca

What: The Region of Waterloo is planning improvements to the Bleams Road (Regional Road 56) corridor. This work will include a Schedule “C” Municipal Class Environmental Assessment (Class EA).

Where: Just west of Fischer-Hallman Road to Trussler Road, in the City of Kitchener.

Why: To provide needed pavement reconstruction and road improvements for traffic, pedestrians, and cyclists along the corridor.

When: 2024 and 2025 Construction (tentative)

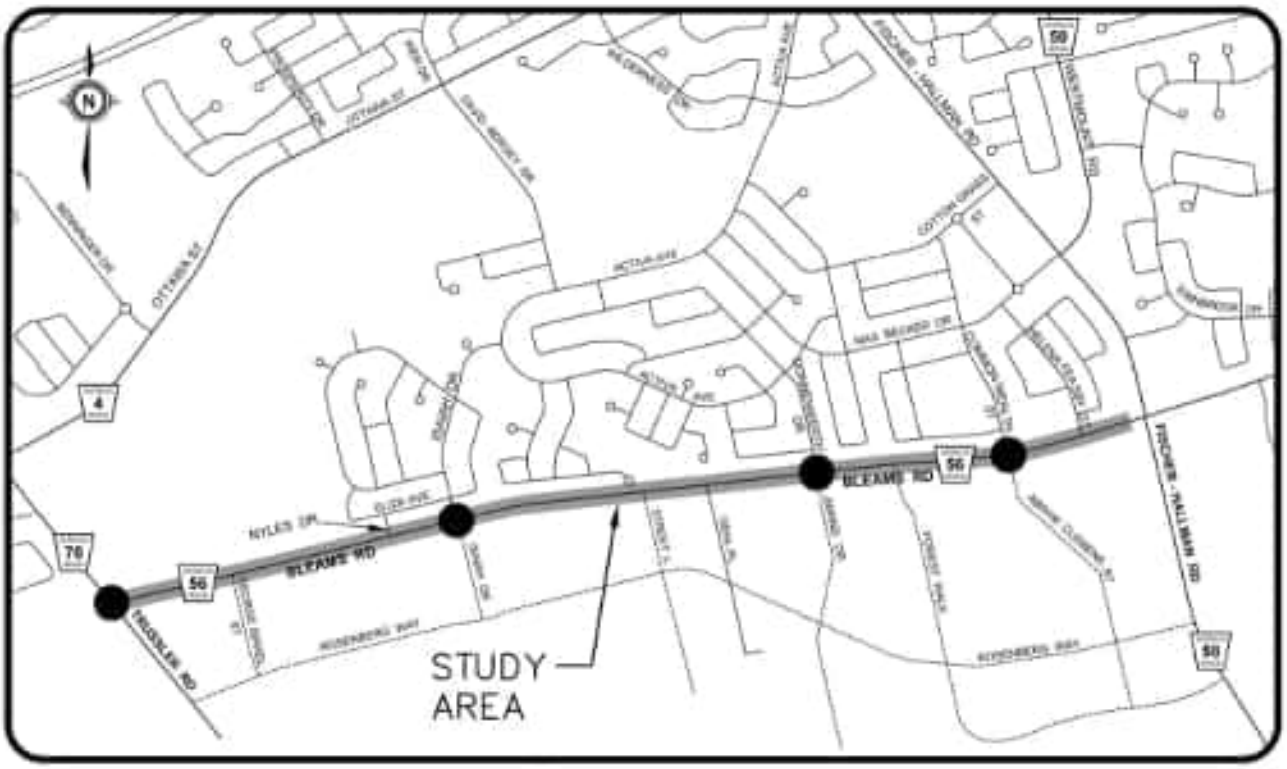
Who: Region of Waterloo Project Manager
Greg Proctor, C.E.T.
Phone : (519) 575-4729
GProctor@regionofwaterloo.ca

1. What is the purpose of this second public engagement opportunity? Public Consultation Centre (PCC)

At this PCC, the project team will present a preferred alternative to meet the improvement needs of Bleams Road. We will share the findings of the Environmental Assessment (EA) in terms of the improvement needs, what other solutions were considered, how we evaluated all alternative solutions to reach a preferred solution, and ask the public for their comments on the preferred solution.

Region and project consultant staff are available to answer any questions the public may have.

To complement this Class EA process, the Region of Waterloo will use its EngageWR engagement platform to help reach as many of the public as possible to get input on this project. Your comments will be considered by the project team in conjunction with all other relevant information in recommending a preferred alternative for this project.



2. What is a Class Environmental Assessment?

The Municipal Class EA is a planning and decision-making process approved under the Environmental Assessment Act that is used by municipalities to plan public infrastructure projects so that potential environmental impacts are considered before a project is approved. It requires consultation with the public, involved stakeholders and agencies to consider alternatives and their impacts on the project environment.

This project is being planned in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) Schedule "C" which applies to larger, more complex projects with the potential for significant environmental impacts (natural, social, cultural and economic) and requires multiple opportunities for public input.

For additional details regarding the Municipal Class EA process, please refer to Appendix A.

3. Who is directing this project?

The planning and design for this project is being directed by staff from the Region of Waterloo and City of Kitchener, including City of Kitchener (Ward 5) Councillor Kelly Galloway-Sealock. The Region of Waterloo has retained the consulting engineering firm MTE Consultants Inc. to assist the us in leading this Class EA Study, along with providing planning, design, construction, inspection and administration services.

4. Why is the Region considering this project?

The section of Bleams Road, from just west of Fischer-Hallman Road to Trussler Road, is in fair to poor condition, and is nearing the end of its useful life. With the substantial developments to the south, there is a need to reconstruct this section of Bleams Road and consider the increased travel demands on the overall corridor. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians and cyclists along the corridor. This study will analyze traffic demands and recommend a solution that addresses all future transportation needs.

The following needs are driving this project:

i) Deteriorated road condition

The pavement condition on Bleams Road is in fair to poor condition. In general, the deterioration is simply due to the age of the asphalt combined with poor drainage. The proposed works would replace the deteriorated pavement and urbanize the roadway by removing the existing ditches and installing an underground storm sewer system that will outlet to adjacent developments along the south side of Bleams Road.

ii) Recent and future traffic patterns

A study of the current and projected traffic patterns along Bleams Road, between Fischer-Hallman Road and Trussler Road, has determined that there is a need for improvements to Bleams Road to accommodate the recent and future intensification of land along both sides of Bleams Road. A detailed evaluation of the existing and proposed streets that intersect Bleams Road has suggested a number of potential intersection improvements that could increase the capacity and safety of the corridor to meet future needs in the area while providing a balance with the needs of other corridor users.

iii) Pedestrian and cycling needs

Currently there are no pedestrian or cycling facilities on Bleams Road. The Region of Waterloo 2018 Transportation Master Plan identifies Bleams Road as having a "Future Boulevard Multi-Use Trail" on both sides. Accordingly, a multi-use trail is being considered on both the north and south sides of Bleams Road for the entire length from Fischer-Hallman Road to Trussler Road. A single-direction cycle track and sidewalk is also being considered as a potential alternative to the multi-use trail. Efficient and desirable interconnections for pedestrians and cyclists between proposed and existing developments on both sides of the roadway will be considered with the design.

5. What work is complete on this project to date?

The project was initiated in 2020 with the first Public Consultation Centre (PCC#1) held online between February 14, 2022 and March 7, 2022, to provide information on the purpose of the Class EA study and need for improvements on Bleams Road. Comments received at PCC#1 generally supported the need for traffic, pedestrian and cyclist improvements along the corridor. Comments received from PCC#1 have been incorporated into the needs and opportunities of the project for the development of alternatives and evaluation of impacts.

In accordance with the Class EA, environmental studies were completed for the study area in order to identify areas of concern related to potential for impacts along the corridor. Environmental studies completed include: Traffic and Transportation; Archaeological; and a Noise review.

The Traffic and Transportation study prepared Peak hour and Average Annual Daily Traffic ("AADT") forecasts for 2031, which were then analyzed to develop a traffic forecast for the corridor.

The Archaeological Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential and previously assessed lands of no further concern. Areas that will require a Stage 2 assessment are limited to a two small areas on the south side of Bleams Road between Helena Feasby Street and Fischer-Hallman

Road, as well as one on the south side of Bleams near Gehl Place, and a triangular section of land on the south-east corner of the intersection of Bleams and Trussler Road.

6. Has road noise been assessed?

In accordance with the Region's Noise Policy, a noise review was conducted for the section of Bleams that will be widened from two lanes to four lanes (Fischer-Hallman Road to the just west of Commonwealth Street/Abram Clemens Street). Preliminary findings indicate that additional noise attenuation will not be required in this section of Bleams Road. After modeling the 10-year traffic increase there is an increase in the noise levels in this section, but it does not meet the Region's criteria for additional noise attenuation.

7. What alternatives have been developed for improvements on Bleams Road?

From the responses received during PCC#1, the public support of the three alternatives presented to improve four intersections on Bleams Road (Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive) is:

- **50 per cent support for roundabouts at all four intersections**
- **20 per cent support for all traffic signals at all four intersections**
- **30 per cent for the hybrid combination of signals and roundabouts**

The solutions for improvements considered by the project team so far are described in the list below. The project team has screened and evaluated each of these potential solutions and has made recommendations as described below. For a broader description of the potential solutions and the associated preliminary evaluation of each, please refer to Appendix B.

In reviewing the potential solutions, the project team considered the widening of Bleams Road to manage future traffic growth and forecasted intersection operational deficiencies, as well as adding active transportation facilities as the Region's primary objectives for the corridor.

A. **Do Nothing** – As part of any Class EA process, there is always a consideration of the "Do Nothing" alternative to assess what would happen if no action is taken to address the project concerns beyond typical restoration measures. In this case, the "Do Nothing" solution would involve reconstructing Bleams Road in its current two-lane rural cross-section with shoulders and roadside ditches. This solution was screened out because it does not satisfy the Region's primary objectives for the corridor.

Recommendation: Do not carry forward

B. **Traffic signals** – The addition of traffic signals and auxiliary lanes to accommodate turning movements at certain intersections. This solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.

Recommendation: Do not carry forward

C. **Roundabouts** – The Region uses a standard 'screening tool' for determining where roundabouts will be considered. Generally, roundabouts offer a potential alternative to expanding or installing signalized intersections and can be more effective in moving traffic, reducing delays, and improving safety in certain cases.

Recommendation: Carry forward as Preferred Alternative

D. **Traffic signals and roundabouts, hybrid version** – a design which constructs a roundabout at the west end of the project (Trussler Road) and one near the east end of the project (Commonwealth Drive/Abram Clemens Street). This is coupled with a traffic signal installation at the intersection of Donnenwerth Drive/Amand Drive and one at Isaiah Drive.

Recommendation: Do not carry forward

E. **Widening Bleams Road from Fischer-Hallman Road to Commonwealth Drive /Abram Clemens Drive** – the projected volume of vehicular traffic has shown that Bleams Road, from Fischer-Hallman Road to Commonwealth Drive /Abram Clemens Drive, needs to be widened to four through lanes (approx. 15 per cent of project length) while the remainder of the corridor (approx. 85 per cent of project length) can remain as two lanes**.**

Recommendation: Carry forward

F. **Active Transportation Facilities** – Providing facilities for cyclists and pedestrians on Bleams Road from Fischer-Hallman Road to Trussler Road is considered a necessary component of the overall solution for this corridor. There are two options under consideration: a multi-use trail (two directional), or a single directional cycle track and sidewalk. **Recommendation:**

Carry forward (require input at this PCC)

G. **Traffic Control at Side Streets**

Through analysis of intersection operations and anticipated safety performance, the project team has determined that Bleams Road should contain raised center medians between roundabout intersections throughout the section between Fischer-Hallman Road and Donnenwerth Drive/Amand Drive. The raised medians will mean that the existing stop-controlled intersection of Helena Feasby Street as well as the proposed Forestwalk Street will effectively operate to allow inbound and

outbound right-turns only; no left turns will be allowed in or out of these minor streets. Full access to those side streets will be provided to motorists through circulation of the appropriate adjacent roundabout(s). The following side streets will operate with full movements:

- George Israel Street (future street on south side of Bleams near Trussler)
- Nyles Drive
- Street L (future street on south side of Bleams just west of Gehl Place)

Recommendation: Carry forward in conjunction with the Preferred Alternative

8. How has the project team evaluated the design alternatives to establish a preferred design alternative?

The improvement alternatives have been assessed against a set of evaluation criteria by the project team to determine which alternative is "Preferred" and is considered to best address the needs and opportunities for improvement on Bleams Road. The evaluation criteria included the following:

1) **Technical**
   How well does the alternative manage traffic performance and network connectivity, transit access and pedestrian/cyclist needs?

2) **Natural Environment**
   What impact does the alternative have on the natural environment features such as trees and wetlands, wildlife, aquatic habitat, air quality and surface drainage?

3) **Socio-Cultural Environment**
   What impact does the alternative have on adjacent communities and properties (access, property acquisition), landscapes, archaeological or heritage resources and traffic noise?

4) **Costs**
   How do the alternatives compare for anticipated capital, operating and property acquisition costs?

Following PCC #1, the project team reviewed public input, as well as the various identified constraints, in order to finalize the evaluation of the alternatives

9. Has the project team identified a preferred alternative?

In consideration of the competing demands on the Bleams Corridor, and considering the public response from PCC#1, the project team has identified Alternative 1 – Roundabouts as the Preferred Alternative.

Some minor modifications have been made to Alternative 1, based on feedback received during PCC#1:

- The centre two roundabouts (Isaiah and Donnenwerth) are to be constructed as single-lane roundabouts on opening day. They will be designed to allow future expansion to multi-lane roundabouts. In the fullness of time the project team expects that auto traffic demands associated with the substantial planned growth in the area will require that these single lane roundabouts be converted to a two lane roundabout. Single lane roundabouts are more comfortable and safer for pedestrians, cyclists and auto traffic. Additionally, the growth planned to the south of Bleams Road will take a number of years to build out. A single lane roundabout in these two locations better meets the needs of all the users in the short term and supports the prioritization of walking and cycling through the intersection during the time when new residents are establishing travel patterns in the area. Before converting either of the single lane roundabouts to a two lane roundabout, some congestion for non-active users can be expected during the typical weekday morning and afternoon peak hours.

- We will acquire sufficient land for the ultimate (and interim) roundabout condition at all four locations. This includes sufficient land so that the roundabouts can be converted in the future with separate bike paths across the splitter islands alongside the pedestrian crossings. This conversion could then take place in the future if legislation changes to allow cross-rides at roundabouts.

This is subject to the additional comments received after this PCC#2, and additional agency comments.

At this point, there is a question of whether to proceed with multi-use trail, as outlined in the 2018 regional Transportation Master Plan, or a single-direction cycle track and sidewalk. This active transportation component will be run the length of the project, from Fischer-Hallman Road to Trussler Road, and will connect to adjacent road projects that will extend active transportation.

10. What happens when property is required for the approved alternative?

One of the goals of the planning and design process is to minimize the impact on adjacent properties and the need to acquire private property. An initial review of the existing Bleams Road allowance indicates that there will be a need to acquire a significant amount of land to accommodate the preferred alternative. It is currently recommended that the acquisition of the necessary land be from those properties that have not been developed yet along the south side of Bleams Road. There will also be a need for a small section of land on the north east and west side of the intersection of Bleams and Trussler Road.

11. How will existing trees be affected?

A tree assessment was completed in the spring of 2022 to inventory the various trees within the study area. Any potentially impacted trees will be reviewed as to their significance and health and a determination made if disturbance should and/or could be avoided. A streetscape design will be completed for planting of any new trees and any trees removed will be considered for replacement with nursery stock of a Region-approved native species on a two for one basis.

12. What are the next steps in the project?

After the second Public Consultation Centre, the project team will review the public and agency comments and identify a Recommended Design Alternative to be brought to Regional Council later in 2022 for design approval. Upon approval by Regional Council, detailed design, property acquisitions and utility relocations will commence, followed by construction, which will be completed in stages. Construction is tentatively scheduled to start in 2024 and be completed in 2025.

13. How will I receive further notification regarding this project?

Property owners and tenants abutting the project site and members who register through the Region's project engagement page (https://www.engagewr.ca/bleams-rd) will receive all upcoming information and meeting notifications.

14. How can I provide my comments at this stage?

In order to assist the project team in addressing any comments or concerns you might have regarding this project, we ask that you provide your comments on the Region's Engage site at https://www.engagewr.ca/bleams-rd, email comments to the project team members listed below, or complete the enclosed Comment Sheet and mail or fax it to us.

We thank you for your involvement and should you have any questions or concerns please contact one of the following:

Greg Proctor, C.E.T.
Region Project Manager
Region of Waterloo
150 Frederick treet, 6th Floor
Kitchener, ON N2G 4J3
Telephone: (519) 575-4729
Fax : (519) 575-4430
Email : Gproctor@regionofwaterloo.ca

Dot Roga, C.E.T.
Manager, Municipal Division
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2L 3V3
Telephone: (519) 743-6500 ext. 1269

Email: droga@mte85.com

15. How can I view project information following the PCC?

All of the PCC display materials and other relative project information, notifications of upcoming meetings, and contact information are available for viewing at the Region of Waterloo municipal office as identified above. Alternatively, you may visit the Region's website at www.regionofwaterloo.ca or the Engage Waterloo Region site at www.engagewr.ca.

Appendix A – Municipal Class Environmental Assessment Process
Ontario Environmental Assessment Act

The purpose of the Ontario Environmental Assessment Act (EA Act) is to provide for "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment of Ontario". The term "environment" is applied broadly and includes the natural, social, cultural, built and economic components.

The key principles of successful environmental assessment planning include:

- Consultation with stakeholders and affected members of the public;
- Consideration of a reasonable range of practical alternatives;
- Assessment of the environmental impacts associated with each alternative;
- Systematic evaluation of alternatives; and,
- Clear documentation.

Municipal Class Environmental Assessment

The Municipal Class Environmental Assessment (Class EA) is a planning process approved under the Environmental Assessment Act that is used by municipalities to plan infrastructure enhancement projects while satisfying the requirements of the Environmental Assessment Act. Under the Class EA process, projects are planned in one of three ways depending on their scope, complexity and potential for adverse environmental impacts.

Schedule "A"

- Includes routine maintenance, operation and emergency activities.
- The Municipality can proceed with this work without further approval or public consultation.

Schedule "B"

- Includes projects with potential for some adverse environmental effects.
- These projects are subject to a screening process that includes consultation with directly affected public and agencies.

Schedule "C"

- Includes larger, more complex projects with the potential for significant environmental effects.
- These projects are subject to all phases of the Class Environmental Assessment and require a minimum of three (3) points of public contact.

Public Involvement

Members of the public that have a stake in the project are encouraged to provide comment throughout the Class Environmental Assessment process. For Schedule "C" projects there are a minimum of three (3) opportunities for contact. These opportunities typically include two Public Consultation Centres and the Notice of Completion which includes a mandatory 30-day public review period to review the project documentation.

Class Environmental Assessment Process for Schedule "C" Projects
Change in Project Status – Appeal Provision

It is recommended that all stakeholders (including the proponent, public and review agencies) work together to determine the preferred means of addressing a problem or opportunity. If you have any concerns, you should discuss them with the proponent and

try to resolve them. In the event that there are major issues which cannot be resolved, you may request the Minister of Environment by order to require a proponent to comply with Part II of the Environmental Assessment Act before proceeding with a proposed undertaking which has been subject to Class Environmental Assessment requirements. This is called a "Part II Order". The Minister will make one of the following decisions:

1. Deny the request (with or without conditions);
2. Refer the matter to mediation; or
3. Require the proponent to comply with Part II of the Environmental Assessment Act, ordering a full Environmental Assessment.

All stakeholders are urged to try to resolve issues since it is preferable for them to be resolved by the municipality in which a project is located, rather than at the provincial level.

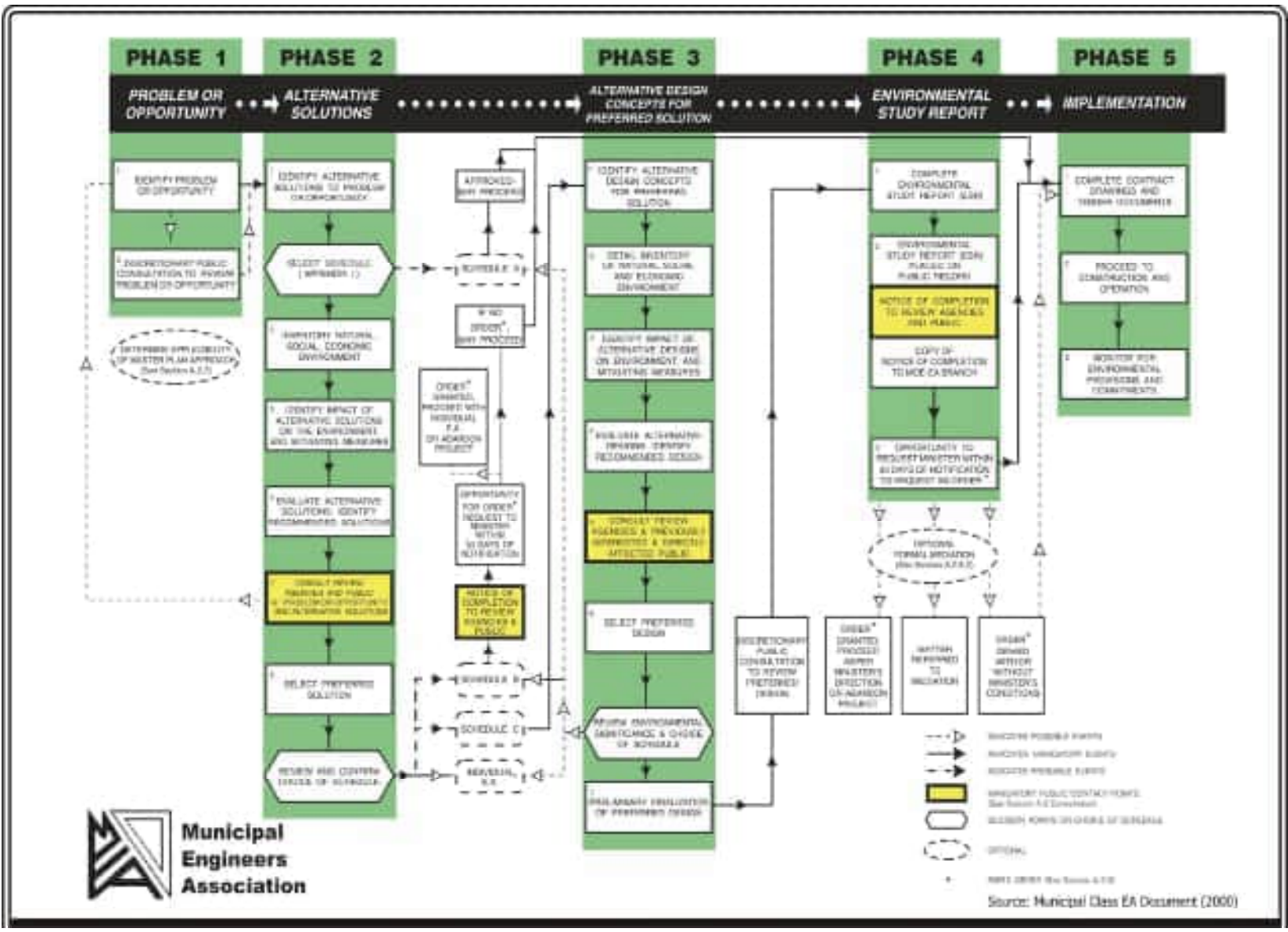
To request a Part II Order, a person must send a written request to:
Minister of Environment
135 St. Clair Avenue West
12th Floor
Toronto, Ontario M4V 1P5

The request must address the following with respect to the identified concerns:

- Environmental Impacts and specific concerns;
- Adequacy of the planning and public consultation process;
- Involvement of the person in the planning process; and,
- Details of discussions held between the person and the proponent.

A process diagram depicting the Class Environmental Assessment process is included on the following page along with an indication of where we area with the current study process.

Appendix A
Municipal Engineers Association Class Environmental Assessment Flow Chart



Preliminary Appendix B - Summary of the Alternative Solutions for the Bleams Road Corridor

Planning Alternatives	Description	Preliminary Evaluation	Recommendation
Do Nothing	This solution identifies what would happen if no action is taken to address current deficiencies within the corridor, in both the short and long terms. This assessment provides a baseline to which other project alternatives may be measured.	The Transportation Study completed as part of this project found that there are existing capacity deficiencies on Bleams Road that the "Do Nothing" solution will not remedy.	Do not carry forward
Traffic Signals	This solution involves the installation of traffic signals and auxiliary/turning lanes to accommodate turning movements.	This alternative will be analyzed in further details as the introduction of a series of traffic signals provide effective traffic control at intersections, but may suffer from lower level of service for vehicles during peak periods, which result in large traffic queues.	Do not carry forward
Roundabouts	Roundabouts are characterized by their lack of traffic signals and a circulating roadway providing for continual traffic flow through the intersection. Roundabouts generally provide more traffic capacity than standard signalized intersections due to their ability to reduce delays.	This alternative will be analyzed in further detail as the introduction of a series of roundabouts may address or reduce traffic future delays and improve safety at intersections. Four intersections on Bleams Road will be analyzed for the suitability of roundabouts and in comparison to Intersection Improvements.	**Preferred Alternative**
Traffic Signals and Roundabouts, Hybrid Version	This solution involves installing roundabouts along Bleams Road at Trussler Road and at Commonwealth Drive, while installing traffic signals at Isaiah Drive and Donnenwerth Drive/Amand Drive.	The effective use of both roundabouts and traffic signals along this corridor may satisfy the objectives of traffic control adequately.	Do not carry forward
Widen Bleams Road	Widening Bleams Road to 4 lanes in the short section from Fischer-Hallman Road to Commonwealth Drive/ Abram Clemens Drive.	The widening of Bleams Road in this section of the project will improve corridor capacity and address future congestion issues	**Carry Forward in conjunction with the Preferred Alternative**

Planning Alternatives	Description	Preliminary Evaluation	Recommendation
Active Transportation Facilities	Providing facilities for cyclists and pedestrians on Bleams Road in addition to efficient crossings and connections between the north and south side of the roadway.	Active Transportation Facilities are considered an essential component of this project and their design will be undertaken in conjunction with other improvements, such as, widening the east section of Bleams Road, along with roundabouts and/or traffic signals.	**Carry Forward in conjunction with the Preferred Alternative**

Appendix C - Summary of Region Noise Policy

The Region's Noise Policy is made up of three Parts:

Part A: **New development** impacted by existing roads and railways.

Part B: **Existing development** impacted by proposed Regional road widenings.

Part C: **Existing development** impacted by noise from existing Regional roads.

Since there is no new development proposed, only **Parts B or C** may apply to this project.

The Bleams Road Class Environmental Assessment from just west of Fischer-Hallman Road to Trussler Road is proposing to:

- ✓ **Widen** Bleams Road from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive – therefore Part B applies to this section of Bleams Road; and

- ✓ **Reconstruct** Bleams Road only and maintain existing 2 lane "vehicle lane" configuration in all other areas.

    - Noise is calculated at a residence **outdoor living area** – typically defined as the backyard or patio within 3 metres of the rear wall of a residential unit.

    - Noise is calculated using a Ministry of the Environment, Conservation and Parks (MECP) model that calculates a 16-hour average noise level for the outdoor living area based on several factors, such as traffic volumes, distance from the outdoor living area to the centre of the road, and elevation differences between the outdoor living area to the centre of the road. The noise level used in the policy is not based on peak levels that may be recorded at a given location/time.

Part B of Region Noise Policy – Road Widening

The Region will consider designing and constructing a noise barrier if:

- ✓ The projected noise level in 10 years is calculated to exceed 65 dBa; or

- ✓ The projected noise level in 10 years is calculated to exceed 60 dBa and increase the existing noise level by 5dBa or more.

By constructing a noise barrier, projected noise is required to be calculated to be reduced to 60 dBa or less and reduced by 5dBa or more.

Part C of Region Noise Policy – No Road Widening – Complaint Driven

The Region will consider cost-sharing (50-50) noise barrier design and construction if:

- ✓ A resident raises a noise concern; and

- ✓ Existing noise levels are calculated to exceed 60dBa; and
- ✓ Two thirds (2/3) of affected property owners are in agreement to build noise barrier (based on rear yard property length) in accordance with Local Improvement Act; and
- ✓ All property owners pay 50% of cost of noise barrier based on length of wall installed at their property with payments charged over a period of ten (10) years (in accordance with Local Improvement Act).
- ✓ Residents may also decide to take other measures such as installing a privacy fence, air conditioning or window improvements at their own expense

Comment Sheet
Regional Municipality of Waterloo
Bleams Road Reconstruction
From Just West of Fischer-Hallman Road to Trussler Road
City of Kitchener

Please complete the survey so that your comments can be considered for this project. Comments can be submitted on the Region's engagement page at **https://www.engagewr.ca/bleams-rd**, by September 12, 2022.
Comments can alternatively be submitted by filling out this comment sheet and returning it by mail or e-mail by September 12, 2022 to:

Greg Proctor, C.E.T
Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: 519-575-4729
Fax: 519-575-4430
Email: Gproctor@regionofwaterloo.ca

Dot Roga, C.E.T
Manager, Municipal Division
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2L 3V3
Telephone: 519-585-2255 ext. 63220
Fax: 519-585-2269
Email: droga@mte85.com

Comments regarding this project:

_____
_____
_____
_____
_____

Name: _____

Address: _____ Postal Code: _____

Phone: _____ Email: _____

Collection Notice:

All comments and information received from individuals, stakeholder groups, and agencies regarding this project are being collected to assist the Region of Waterloo in making a decision. Under the "Municipal Act", personal information such as name, address, telephone number and property location that may be included in a submission becomes part of the public record.

Additional Comments:

_____
_____
_____
_____
_____
_____
_____
_____

G.4.3 – PUBLIC CONSULTATION CENTRE 2

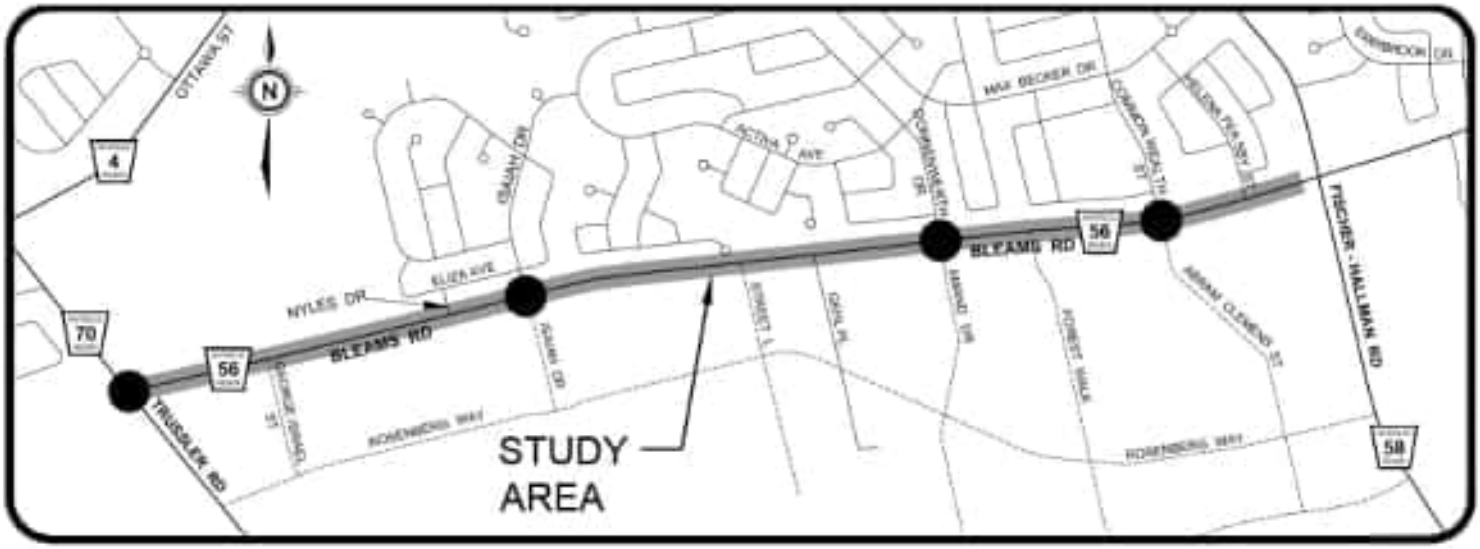
Summary of PCC1

Region of Waterloo

Public Consultation Centre #1
Summary

Bleams Road Intersection Improvements from Fischer-Hallman to Trussler Road, Class

Environmental Assessment, Schedule 'C' and Preliminary Design



MTE

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2. PCC Purpose and Objectives 2
3. Notifications 3
4. PCC #1 Details 4
5. Information Presented 5
6. Comments from the Public 6
7. Key Findings 6



1. Introduction

The Region of Waterloo, and their consultant MTE Consultants, are undertaking a Municipal Class Environmental Assessment (Class EA) Schedule 'C' Study, including preliminary design, for improvements to a 3.0-km section of Bleams Road from just west of Fischer-Hallman Road to Trussler Road, as shown in Figure 1 below.

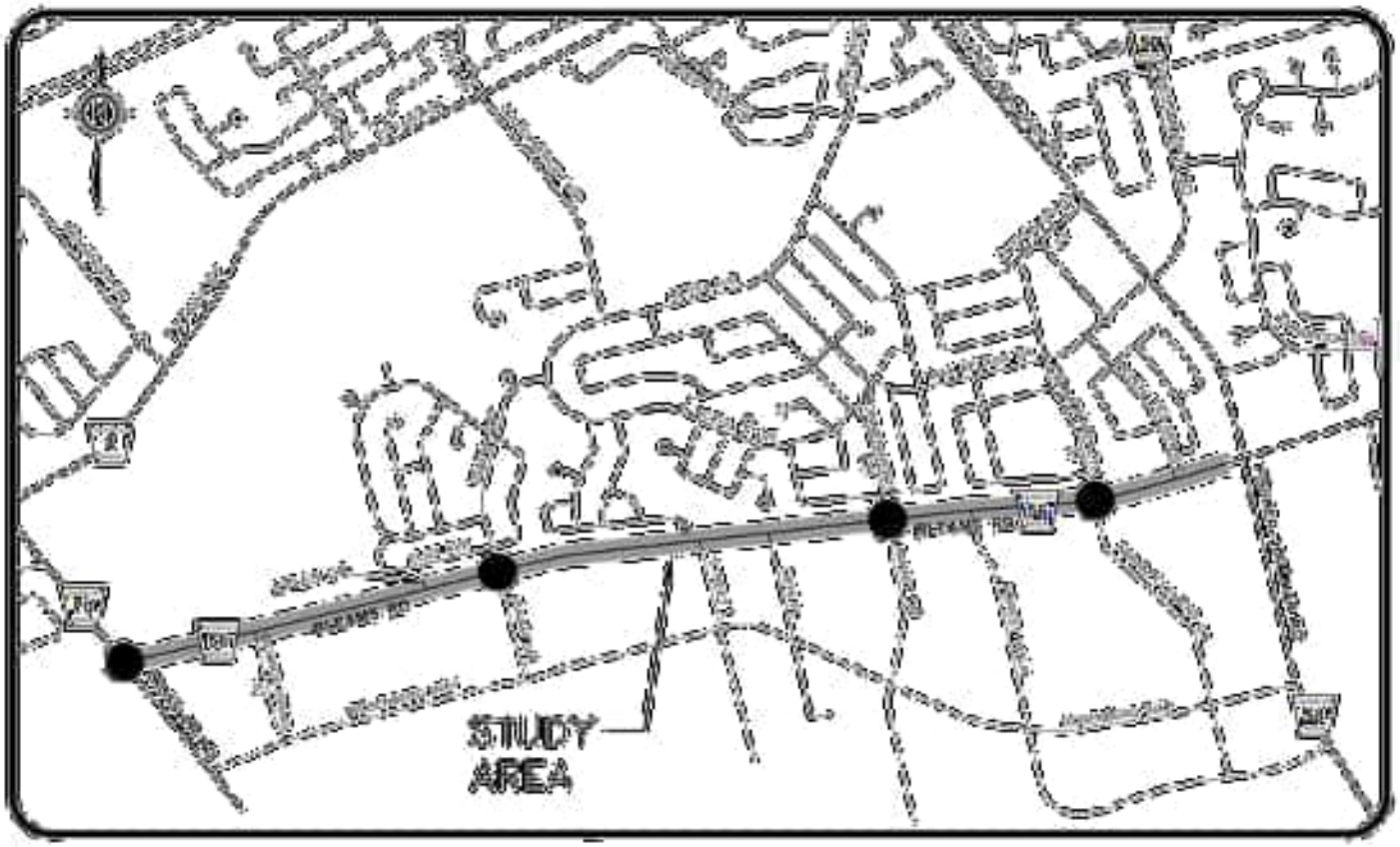


Figure 1 - Key Plan

The section of Bleams Road from just west of Fischer-Hallman Road to Trussler Road is in fair to poor condition and is nearing the end of its useful life. With the substantial developments to the south, there is a need to reconstruct this section of Bleams Road and consideration will be given to the increased travel demands on the overall corridor. The 2018 Regional Transportation Master Plan Update has also identified the need for active transportation improvements for pedestrians and cyclists along the corridor. This Study is analyzing traffic demands and will recommend a solution that addresses all future transportation needs.

There are a number of needs driving this project, as follows:

Deteriorated Road Condition

The pavement condition on Bleams Road is in fair to poor condition. In general, the deterioration is simply due to the age of the asphalt combined with poor drainage. The proposed works would replace the deteriorated pavement and urbanize the roadway by removing the existing ditches and installing an underground storm sewer system that will outlet to adjacent developments along the south side of Bleams Road.

Recent and Future Traffic Patterns

A study of the current and projected traffic patterns along Bleams Road, between Fischer-Hallman Road and Trussler Road, has determined that there is a need for improvements to Bleams Road to accommodate the recent and future intensification of land along both sides of Bleams Road. A detailed evaluation of the existing and proposed streets that intersect Bleams Road has suggested a number of potential intersection improvements that could increase the capacity and safety of the corridor to meet future needs in the area while providing a balance with the needs of other corridor users.

Pedestrian and Cycling Needs

Currently there are no pedestrian or cycling facilities on Bleams Road. The Region of Waterloo 2018 Transportation Master Plan identifies Bleams Road as having a "Future Boulevard Multi-Use Trail" on both sides. Accordingly, a multi-use trail is being considered on both the north and south sides of Bleams Road for the entire length from Fischer-Hallman Road to Trussler Road. A single-direction cycle track and sidewalk is also being considered as a potential alternative to the multi-use trail. Efficient and desirable interconnections for pedestrians and cyclists between proposed and existing developments on both sides of the roadway will be considered with the design.

2. PCC Purpose and Objectives

The purpose of this Public Consultation Centre (PCC) was to have interested stakeholders and the public learn about, and provide input on:

1. The needs and opportunities for improvements on Bleams Road
2. The project environment (natural, social, cultural/heritage, and economic)
3. The alternatives for improvements being considered by the Project Team
4. How the alternatives for improvements will be evaluated and how a preferred alternative will be selected
5. Future opportunities for public input

3. Notifications

The Notice of PCC #1 was published in The Waterloo Region Record on February 10, 2022, Kitchener Citizen February 2022 edition and New Hamburg Independent on February 16, 2022. Notices were also mailed to over 900 residents within and bordering the Study Area, and mailed to identified agency, stakeholder groups, and Indigenous community representatives on February 14, 2022.

All notices were posted on the Study's EngageWR webpage (https://www.engagewr.ca/bleams-rd). A snapshot of the webpage is in Figure 2.



Figure 2 - EngageWR Study Website

The PCC #1 notice invited all interested parties to participate in the Study and provided information on the:

- Study background.
- Study Process (subject to the requirements of the Class EA Schedule C process).
- Community Involvement:
  - The Region's website and the Study's EngageWR webpage.
  - How to actively participate in the Study through the virtual PCC and/or by requesting to be added to the project mailing list.
  - Comment period for virtual PCC #1.
- Contact information for the Region and consultant project leads.
- Accessibility requests.
- Respondent privacy as subject to the Freedom of Information and Protection of Privacy Act. The Region also used social media to advertise the PCC. This included Facebook, Twitter and Instagram.

4. PCC #1 Details

Due to the impacts of COVID-19 public meeting restrictions, PCC #1 was held online from February 14 to March 7, 2022 on the Study's EngageWR webpage (https://www.engagewr.ca/bleams-rd). The PCC was provided as an accessible video presentation, where interested parties could watch and listen to the 13 presentation boards.

Participants were encouraged to engage with the Project Team through a variety of means:

- PCC #1 Public Survey (focused on their Bleams Road experience).
- Visit the following weblink for more information: https://www.engagewr.ca/bleams-rd.
- Question and Answer page.
- Comment forms/emails.
- Contact detail for the Region and the consultant's Project Managers was provided for direct questions, requests to be added to the mailing list, or to request further information about the Study.

5. Information Presented

A video with presentation boards and voice over was used to present information about the Study. The boards provided an overview of the Study, including the Problem/ Opportunity, Study Area limits, the Class EA process being followed (Municipal Class EA, Schedule C), existing challenges and constraints, potential solutions including preliminary unit costs, and how the alternative design concepts will be evaluated. A summary of the boards presented is provided in Figure 3.

#	Board Title	Description of Board
1	Title Board	
2	Thank You and Contact Information	Thank you for participating and comment deadline and how to submit comments
3	Study Area	Key Plan of Study Area
4	Project Team	Details on the team members
5	Timeline	Timeline of the Study and the current stage
6	Current Conditions	Outlining the current conditions of Bleams Road
7	Alternatives	Outline the alternatives that will be considered at this stage
8	Option #1	Present the “Do Nothing” option
9	Option #2	Present the Roundabouts option
10	Option #3	Present the Signalized option
11	Option #4	Present the Hybrid option
12	Summary of Options	Present all of the pros and cons for the options under consideration
13	Contact Information	Re-state the deadline to comment for PCC #1 and provide information to participate

Figure 3 - Summary of Slides

6. Comments from the Public

Input from the public was collected through an online questionnaire survey and directly emailed comments.

The PCC #1 survey and submitted comments were conducted online through the Study's EngageWR webpage to collect information on where respondents reside, the frequency of their travel along the corridor, their concerns with the proposed alternatives, and their preferences for intersection controls.

In addition to approximately 1,200 page visits to the Study's EngageWR webpage during PCC #1, 181 PCC #1 online surveys were submitted. The list of survey questions, copies of the completed surveys will be included in the Environmental Study Report.

The eight questions were grouped by the main theme and summarized to get a clear indication of the public's perceived advantages and disadvantages of the three alternatives being contemplated for four street intersections with Bleams Road (four traffic signals alternative, four roundabouts alternative, or hybrid alternative with two roundabouts and two traffic signals).

7. Key Findings

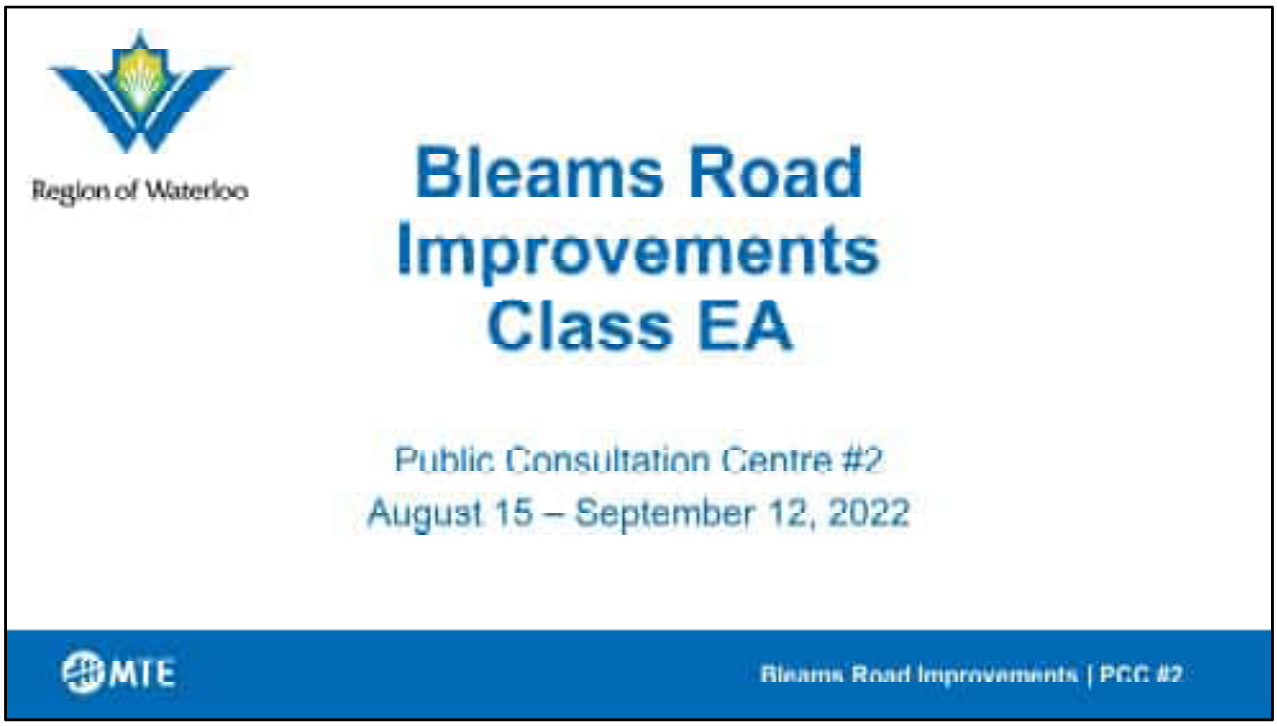
From the responses received, the public support for the three alternatives presented during PCC #1 to improve four intersections on Bleams Road (Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive) is:

- 50% support for roundabouts at all 4 intersections
- 20% support for all traffic signals at all 4 intersections
- 30% for the hybrid combination of signals and roundabouts

The Project Team met to discuss the results and the analysis presented above, and the results were included in the selection of the preferred alternative.

G.4.4 – PUBLIC CONSULTATION CENTRE 2

Presentation and Script

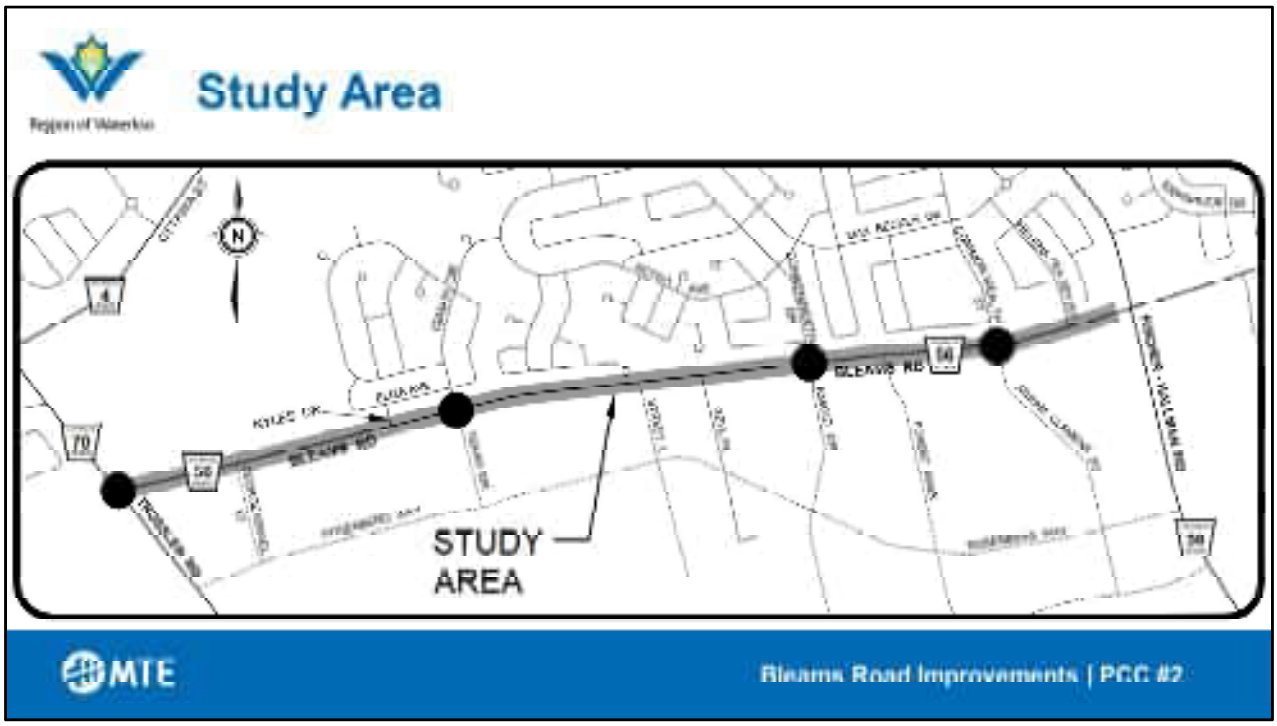


Hello, and thank you for attending this Consultation Centre for the Bleams Road Improvement Project.

Today we gather on the Traditional Territory of the Haudenosaunee (hoe-dee-no-SHOW-nee), Anishinaabe (An-ish-in-awb), and Neutral Peoples. We recognize our responsibility to serve as stewards to the land and honour the original caretakers that came before us.

I'm Dot Roga, the consultant Project Manager speaking on behalf of the Bleams Road project team.

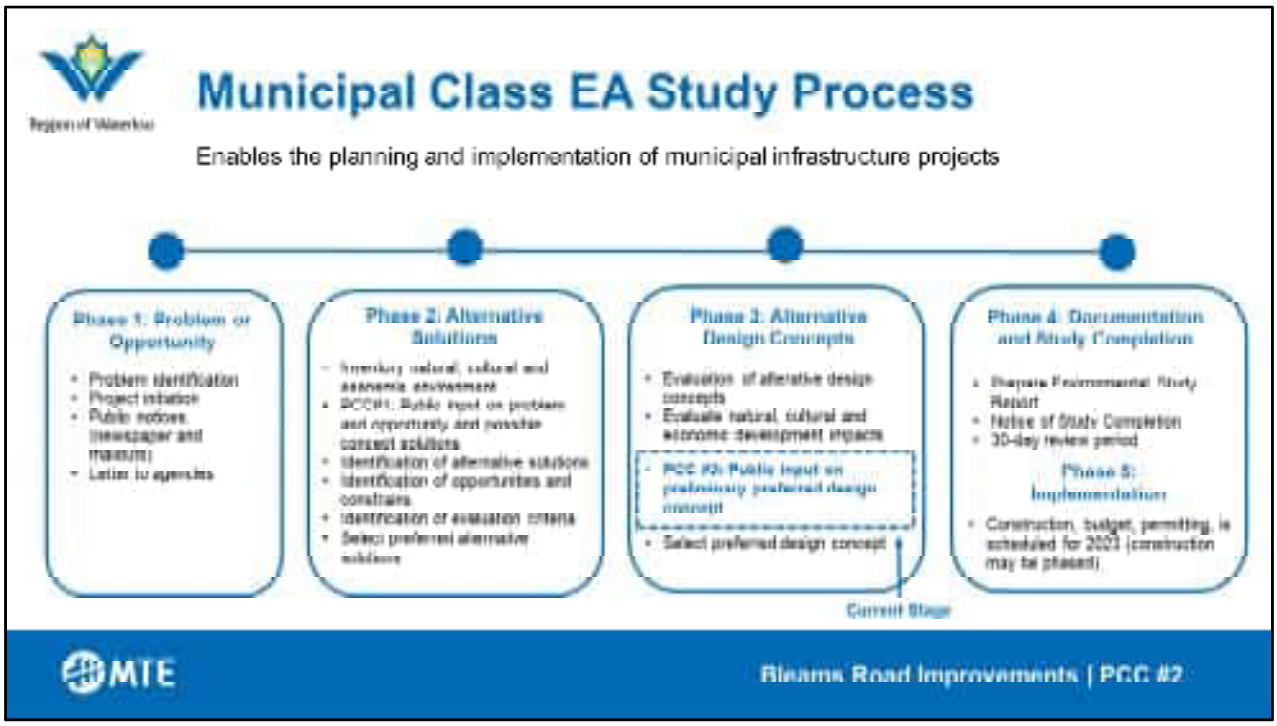
This is our second public consultation meeting in line with the regulations under the Class Environmental Assessment process, and the Region's strategic objectives to encourage public consultation.



In the first consultation centre held in February of this year, we presented the project as shown here. Improvements to the corridor and the intersections will support growth in the area. We received many comments from the first presentation, so thank you for your interest in the project. Today, we will talk a little more about the public comments received, the project team's discussions and our preferred alternative that we plan to move forward with.

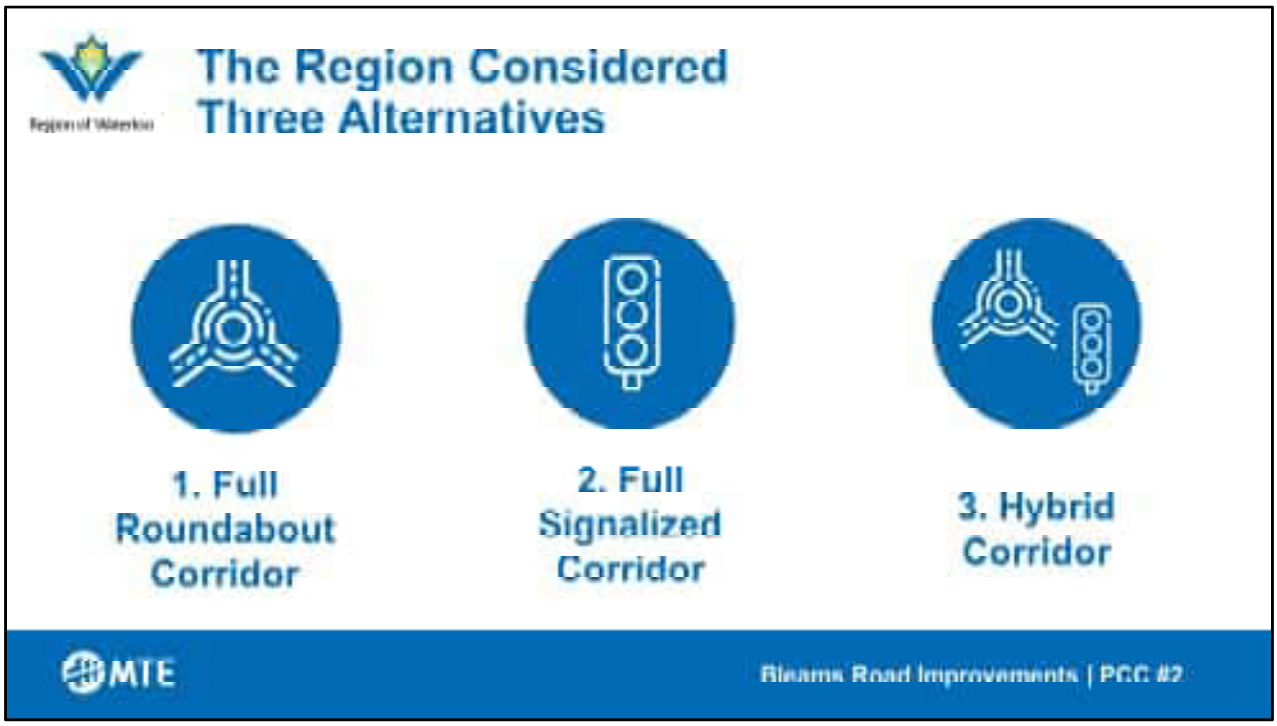
All of this information you are hearing about today is available on our EngageWR.ca site. If you haven't already, please subscribe to this page for future project updates and public consultation opportunities.

Your comments are encouraged and welcomed, and we'll be collecting all of them for the project team to review and answer.



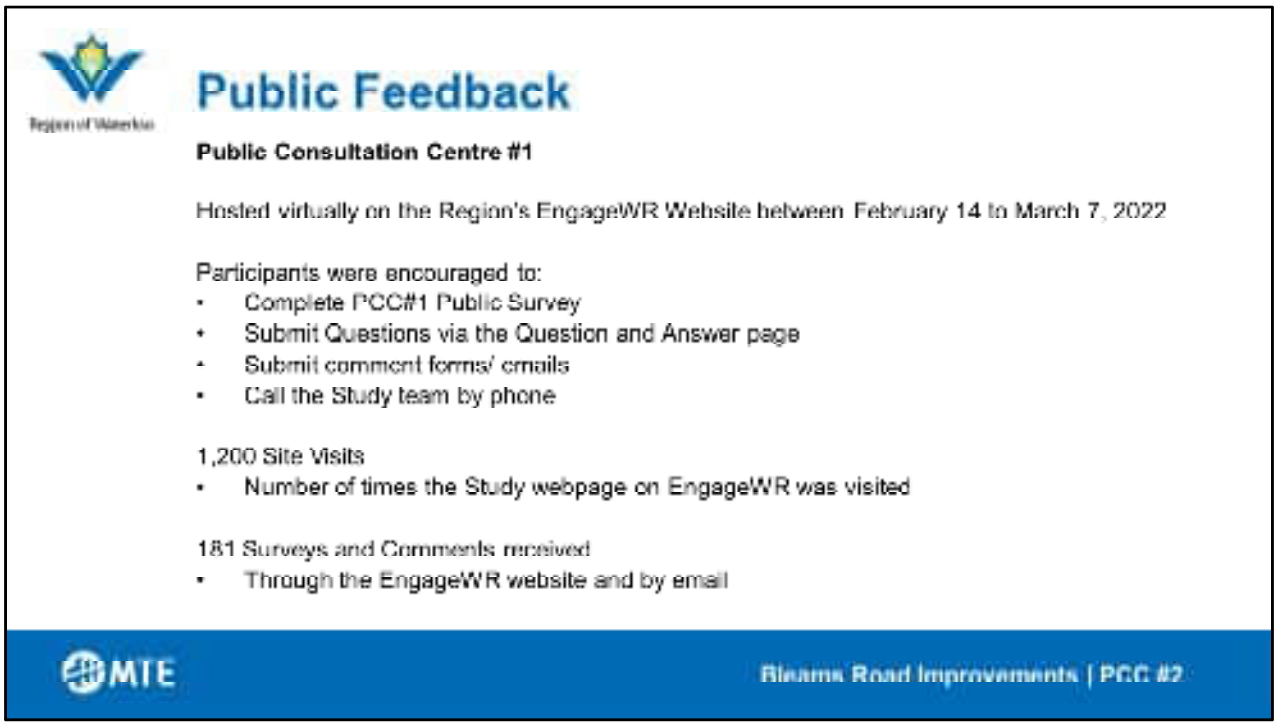
As part of the Environmental Assessment process, we have developed alternatives, presented them for public comment, and further evaluated the design concepts. We are now asking for public comment on the preferred design concept to move forward with.

The next step is to document all the supplementary studies completed, the functional alternatives considered and comments received. This information will form the Environmental Study Report which will be published for further review prior to proceeding with preliminary design of the preferred alternative.



The project team developed three alternatives for the corridor including a full roundabout corridor, a full signalized corridor and a hybrid corridor with a mix of both roundabouts and signalized intersections.

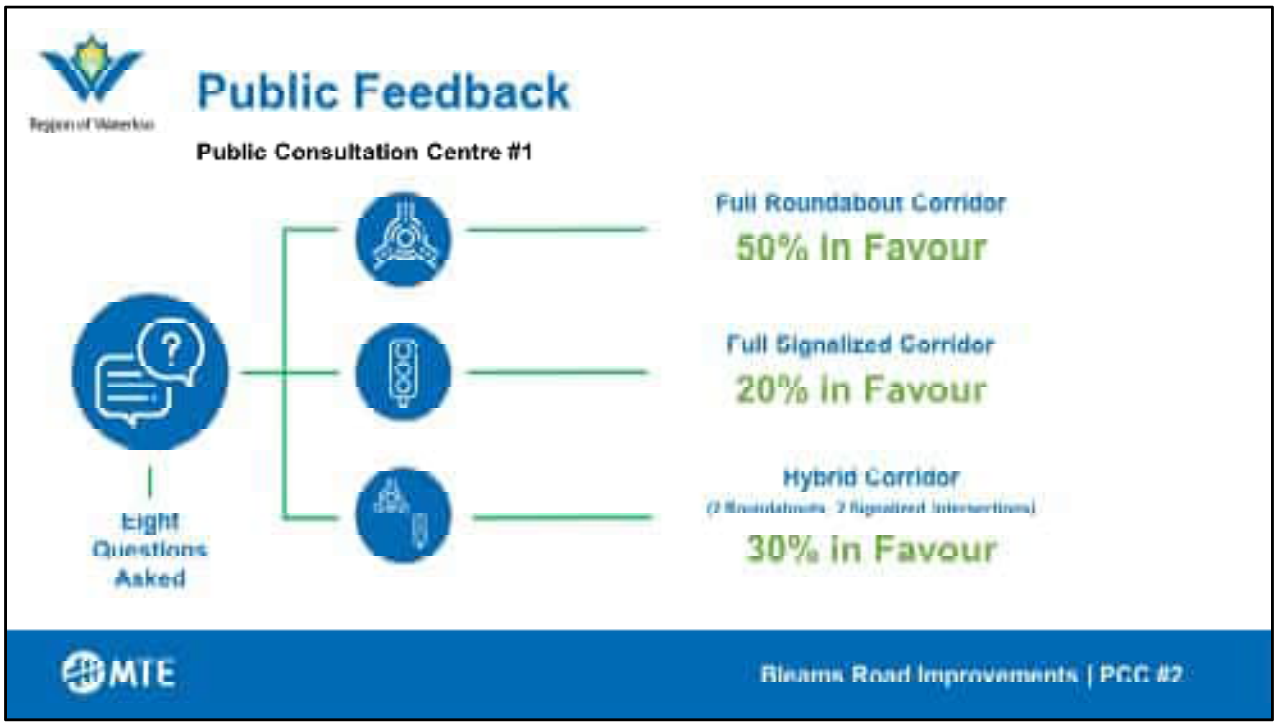
A conceptual design was prepared for each of the three options and presented to the community and stakeholders during the first consultation centre. Then the community and stakeholders were invited to provide comments and ask questions about the options presented.



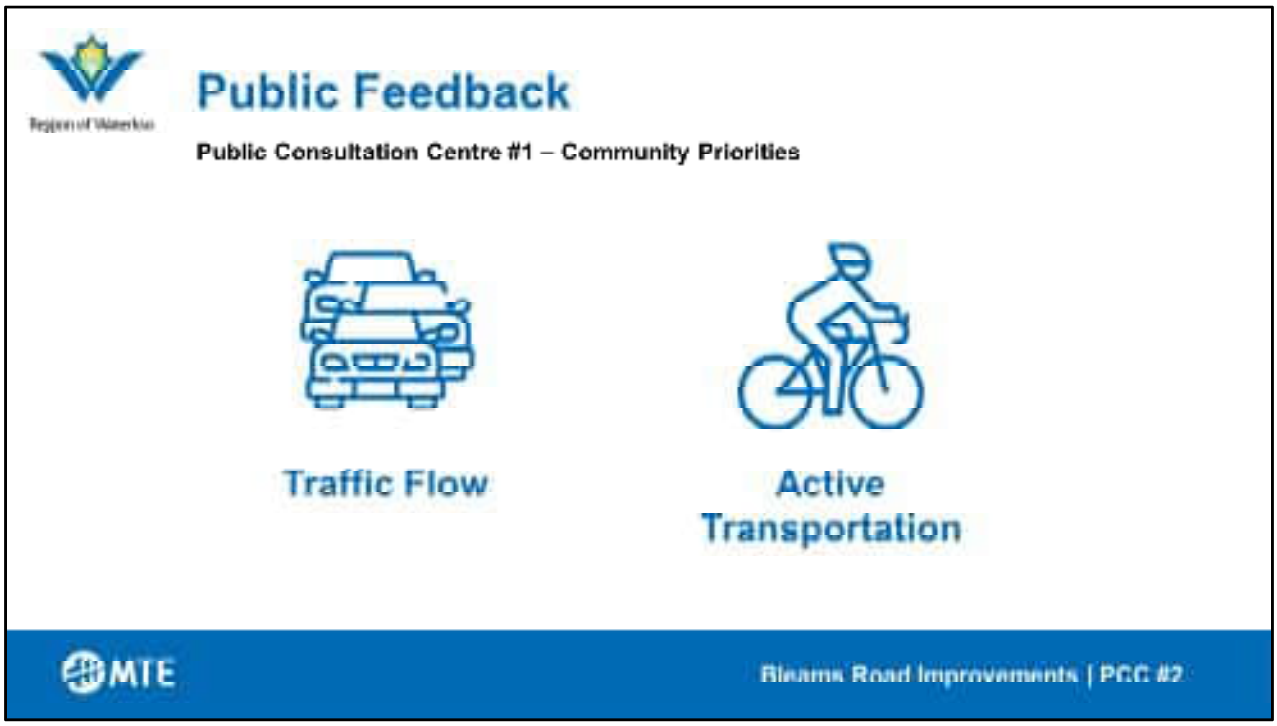
The first Public Consultation Centre was posted to the EngageWR website on February 14, 2022 and the comment period remained active until March 7, 2022.

A key component of the Class Environmental Assessment process is to consult with the community and stakeholders, and provide them with an opportunity to provide feedback on the proposed alternatives of project.

We were pleased with the level of engagement during the first consultation centre. The website logged approximately 1,200 visits and 181 people took the time to fill out the survey, provide comments and ask questions.



Public comments were generally in favour of a full roundabout corridor with 50% positive response, while 20% believe signals would be a better option and 30% believe the hybrid option was a good balance.



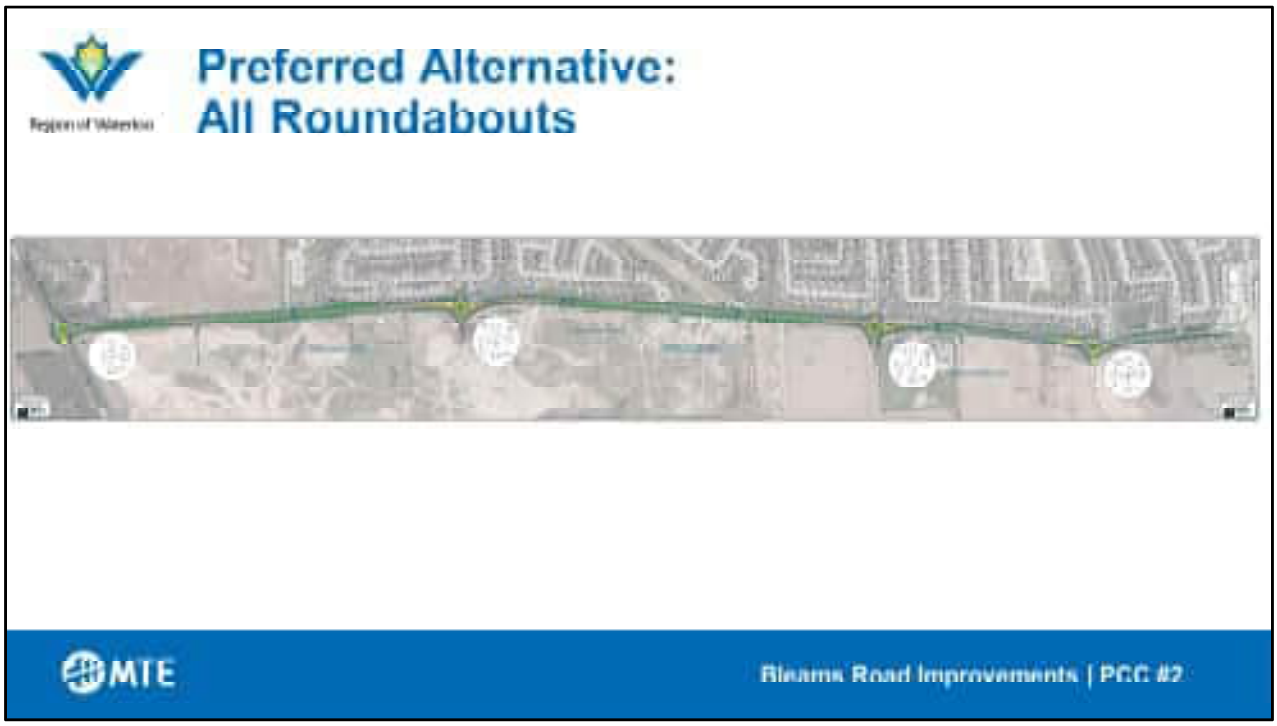
Review of the comments received showed that traffic flow and active transportation are the two highest priorities. The feedback from the public is in alignment with those of the project team. Everyone wants improved traffic flow, enhanced active transportation and a safe corridor.



Various studies were completed as part of this Environmental Assessment in order to evaluate the various alternatives. These included a Stage 1 archaeology and cultural heritage assessment, a Phase 1 Environmental Site Assessment, a Natural Environment Study, and a Noise Assessment in the areas where full travel lanes were added.

Result show that a Stage 2 archaeology assessment is required at 4 small areas noted during Stage 1. No species at risk or sensitive vegetation areas were noted during the Natural Environment Study.

The Intersection Control Study completed for each major intersection provides a comparative analysis of a roundabout intersection vs a signalized intersection. The analysis compares the life cycle cost, property acquisitions, level of service (traffic flow) of the corridor and intersections, etc.

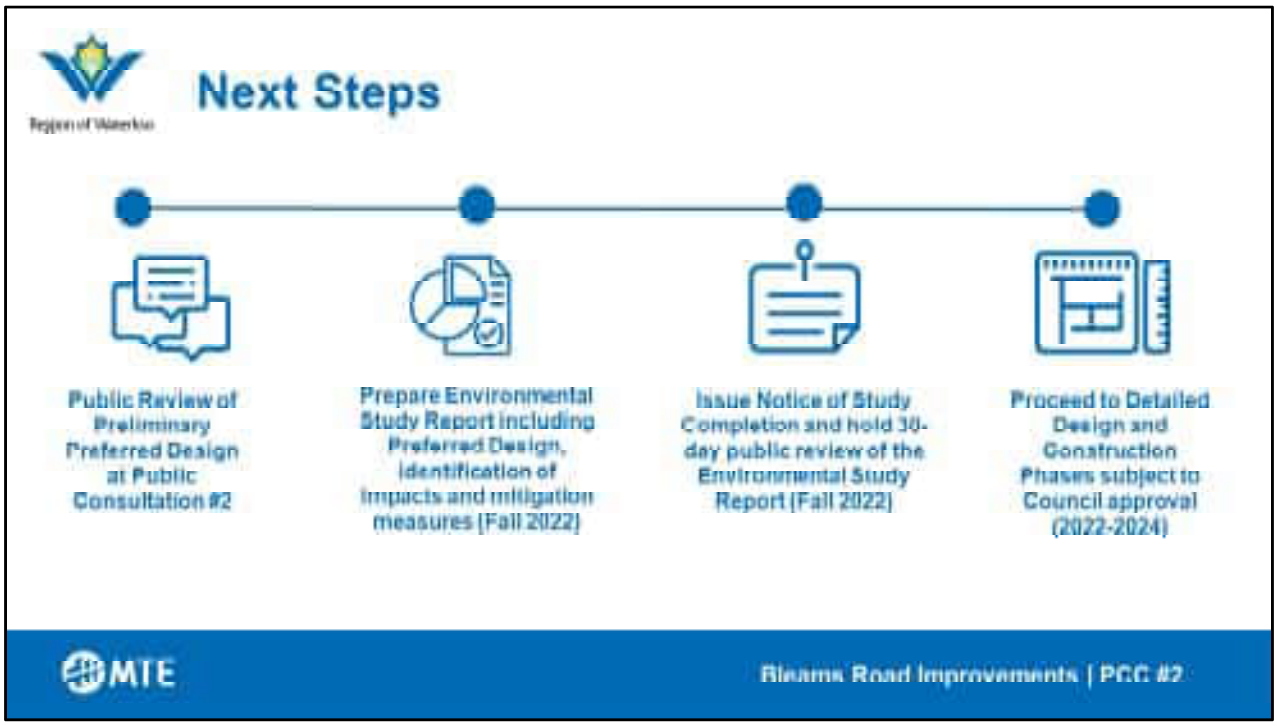


This is our preferred design alternative that we intend to move forward with to preliminary design. Please refer to the separate pdf file on the engage website for greater detail. Four roundabouts are planned along the corridor with a two lane roundabout at the east limit and single lane roundabouts for the balance of the corridor.

One of the most common concerns expressed by the public during PCC#1 when asked about a full roundabout corridor was the difficulty cyclists and pedestrians may experience when crossing multi-lane roundabouts. The preferred design alternative includes single-lane roundabouts at two locations to help alleviate some of those concerns.

A four lane cross section is proposed from the east limit between Fischer Hallman Road and Commonwealth Street/Abram Clemens Way. The remainder of the corridor will have a two lane cross section to Trussler Road. However, the roadway will be constructed with a raised centre median from Fischer Hallman Road to Amand Drive/Donnenwerth Drive. This raised median is being added to improve the safety and traffic flow of the corridor. With the addition of this raised median,

Helena Feasby Street and Forest Walk Trail will have right in/right out vehicle movements only.

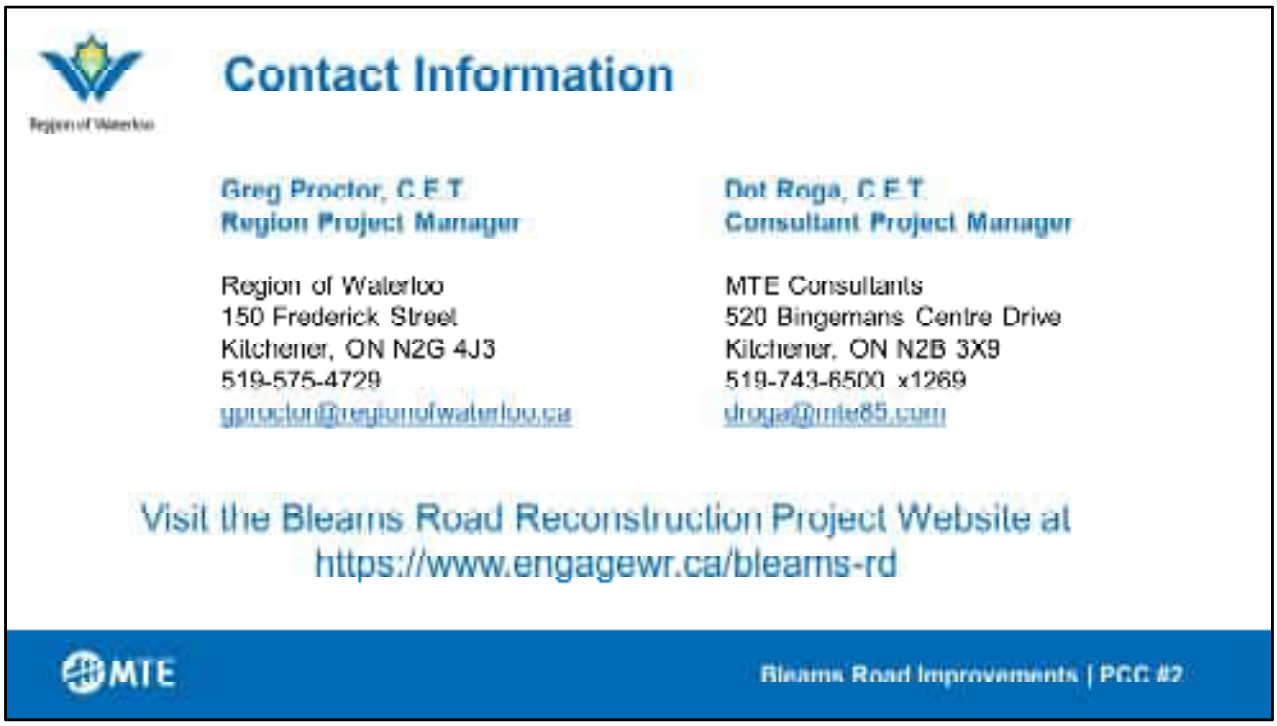


We are currently at the step in the Class Environmental Assessment process that involves presenting the preferred design to the community and stakeholders at a second public consultation centre.

Following the comment period associated with this consultation centre, we will prepare the Environmental Study Report for this project, which will summarize the process followed, the consultation that occurred, the studies completed and identify the impacts and mitigation measures.

Once it is completed, the report will be posted publicly for 30 days. During this time, the community and stakeholders will have an opportunity to review the report and provide any additional comments on the project.

After acceptance of the Environmental Study Report, the project can proceed to the detailed design phase and ultimately construction, which are both subject to council approval.



Thank you for taking the time to view this presentation.

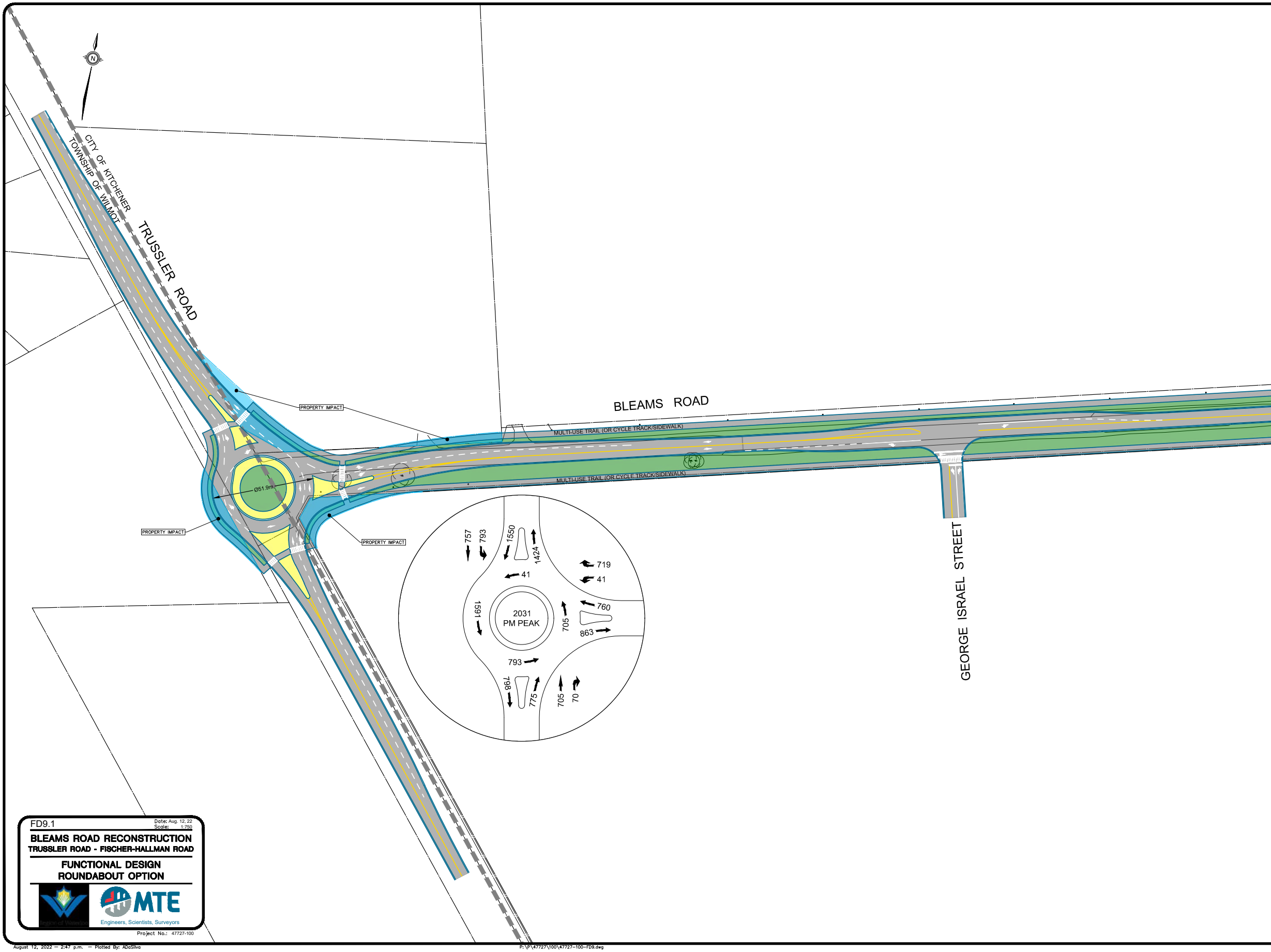
We would like to once again hear from you. We have a survey on this project page at EngageWR.ca. Please complete the survey to share your thoughts on the preferred option we have presented to you today. The survey is open until September 12.

All comments and information provided become part of the review process and are being collected to assist the Region of Waterloo in completing the planning and design for this project. All submissions will become part of the public record files for this matter.

Thank you everyone for watching this presentation and we look forward to receiving your feedback.

G.4.5 – PUBLIC CONSULTATION CENTRE 2

Preferred Alternative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FD9.1

Date: Aug. 12, 22
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Region of Waterloo
MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100

August 12, 2022 — 2:47 p.m. — Plotted By: ADaSilva

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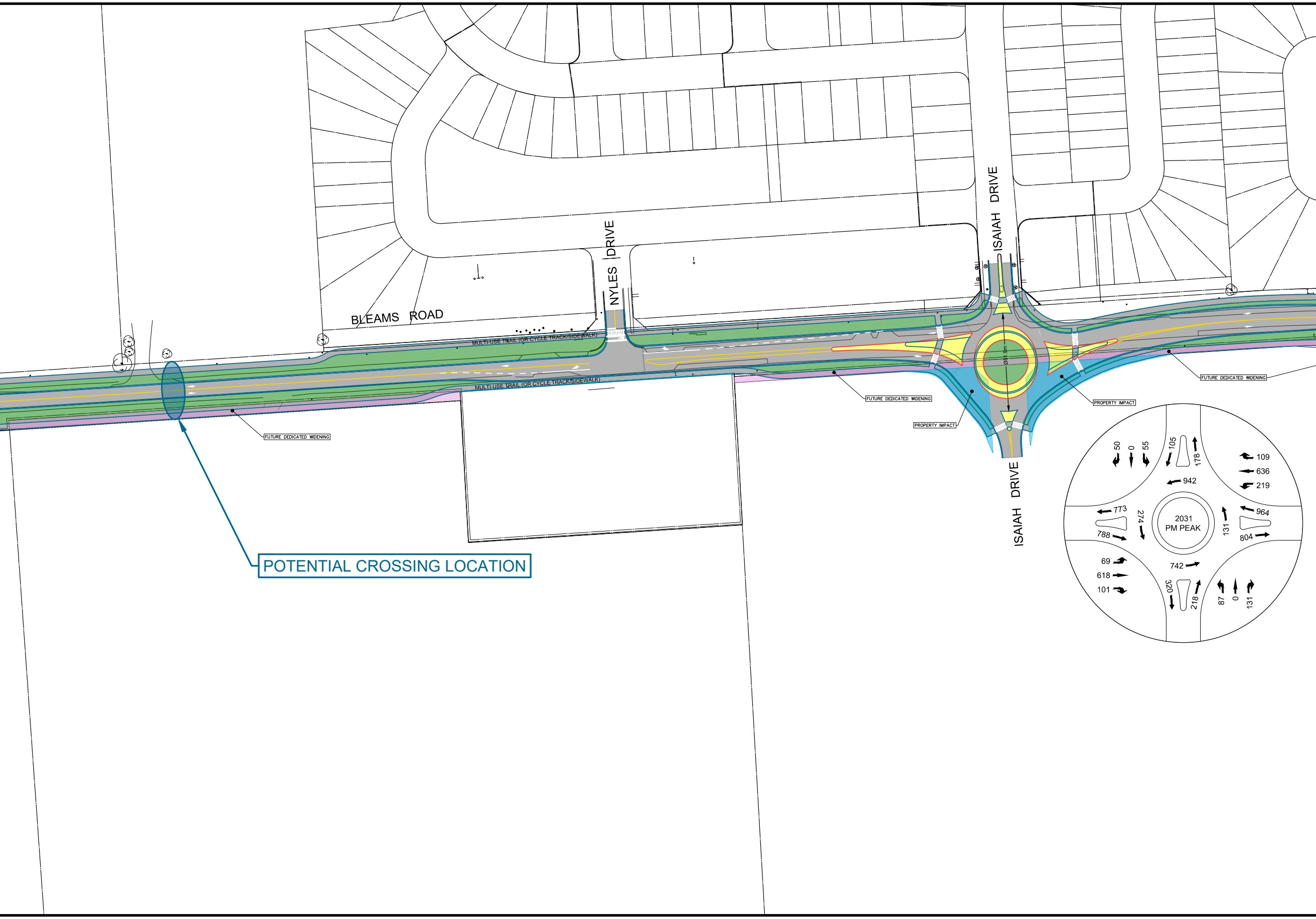
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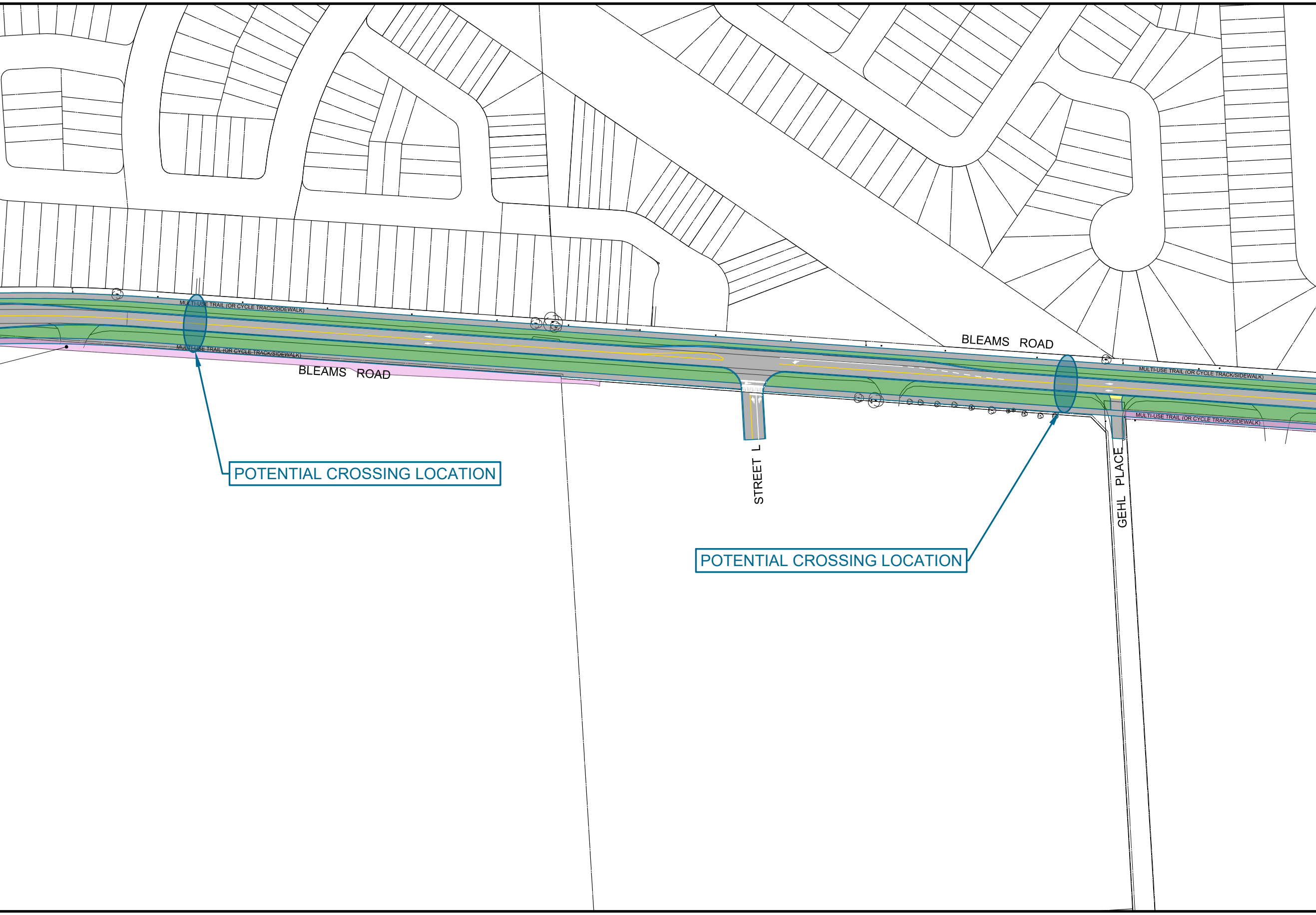
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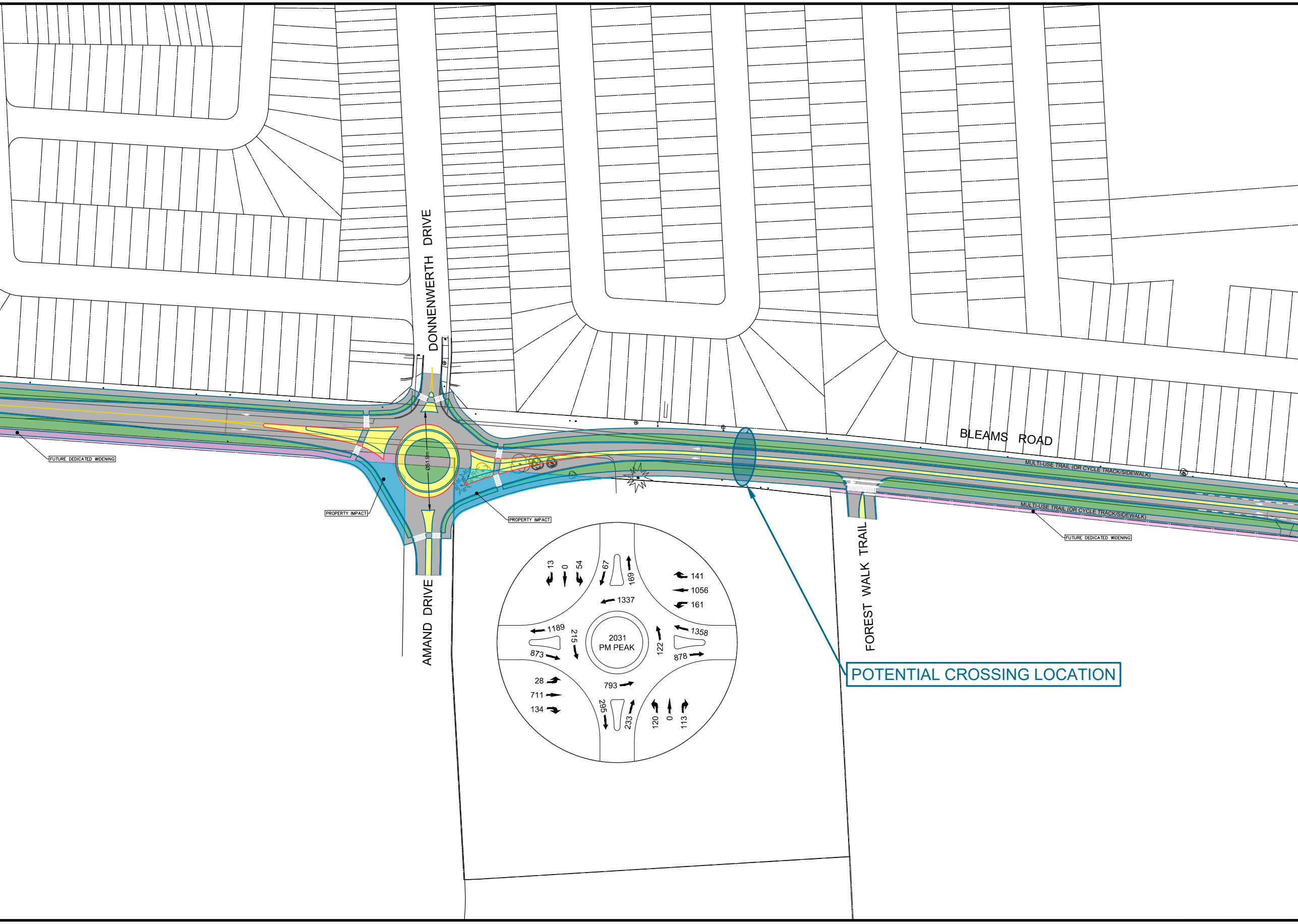
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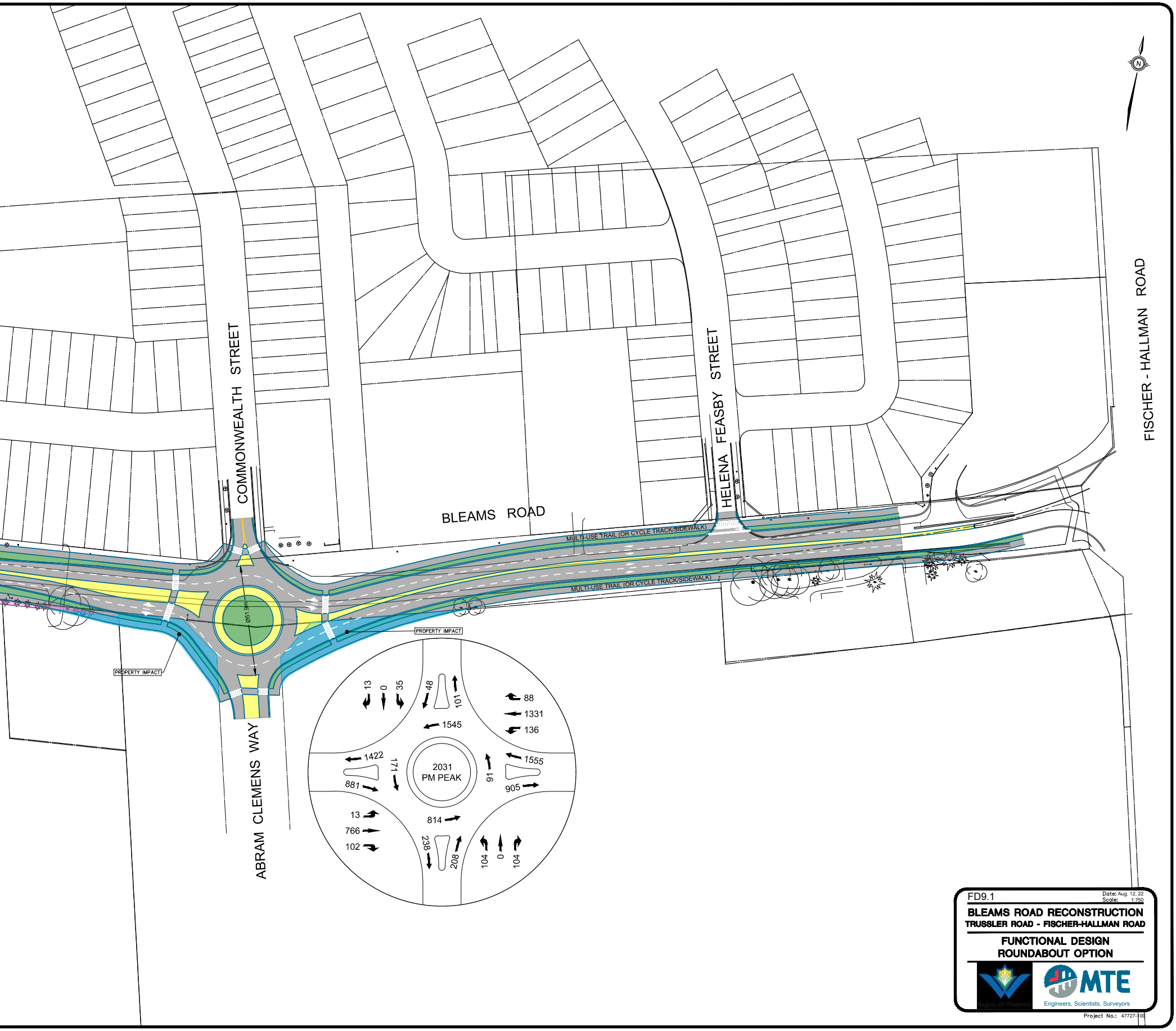
POTENTIAL CROSSING LOCATION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HELENA FEASBY STREET
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Date: Aug. 12, 22
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

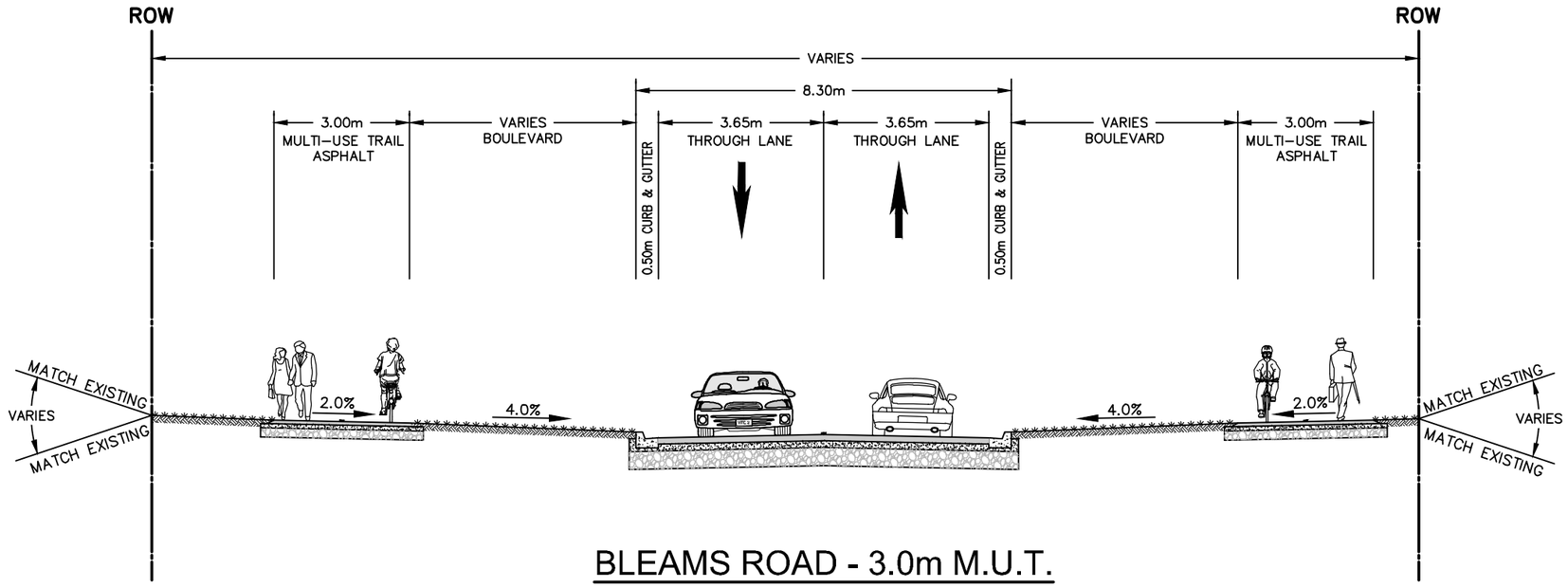
Region of Waterloo

MTE
Engineers, Scientists, Surveyors

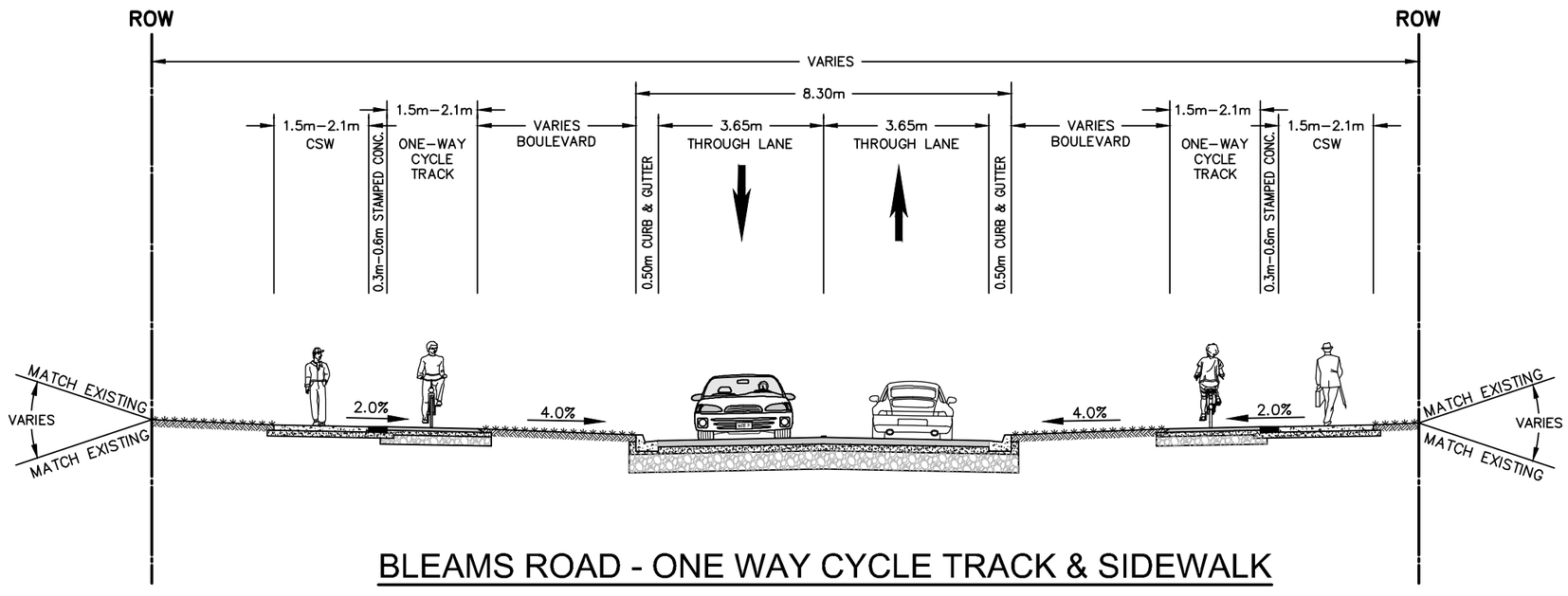
Project No.: 47727-100

G.4.6 – PUBLIC CONSULTATION CENTRE 2

Active Transportation Alternatives



BLEAMS ROAD - 3.0m M.U.T.



BLEAMS ROAD - ONE WAY CYCLE TRACK & SIDEWALK

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Date: Aug. 12, 22
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TYPICAL CROSS SECTIONS
BLEAMS ROAD

MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100

August 12, 2022 — 2:01 p.m. — Plotted By: ADaSilva

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G.4.7 – PUBLIC CONSULTATION CENTRE 2 FAQ

FAQ for PCC#2

Q1: Why is the Region of Waterloo undertaking this project?

A1: We are planning improvements to address the deteriorated roadway, accommodate increased vehicular traffic from recent and future development in the area, as well as to take the opportunity to include enhancements to the road such as cycling and pedestrian facilities.

Q2: What improvements will be made to Bleams Road?

A2: In addition to active transportation features, a comprehensive analysis of projected vehicle volumes on Bleams road has determined the need for improvements at each of the intersection along Bleams Road including Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive. The traffic analyses also identified the need to widen Bleams Road from two lanes to four lanes for the short section between Fischer-Hallman Road and Commonwealth Drive/Abram Clemens Drive. The remainder of the road would stay as two lanes.

From the responses received during PCC#1, the public support of the three alternatives presented to improve four intersections on Bleams Road (Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive) is:

- 50 per cent support for roundabouts at all four intersections
- 20 per cent support for traffic signals at all four intersections
- 30 per cent for a hybrid combination of signals and roundabouts

Based on the above, along with other technical considerations and the studies that were conducted, the project team has developed a preferred design, which has roundabouts at the four key intersections.

Q3: How will the improvements accommodate active transportation?

A3: Providing facilities for cyclists and pedestrians on Bleams Road from Fischer-Hallman Road to Trussler Road is considered a necessary component of the overall solution for this corridor. There are two options under consideration: a multi-use trail (two directional), or a single directional cycle track and sidewalk. In addition, we are looking at easy and convenient connectivity between communities on both sides of the road.

Q4: How will traffic be accommodated during construction?

A4: Local access will be maintained at all times. However, there will be extended periods when through traffic will not be available for sections of Bleams Road. Where practical, alternate routing of traffic around the construction will be accomplished with detours. We understand the interruption to traffic will be inconvenient and we will try to minimize the length of road closures as much as possible.

Q5: How is the natural environment being considered?

A5: As part of the Municipal Class EA, an Environmental Impact Study (EIS) and Tree Preservation Plan (TPP) are being completed. This work is still in progress.

To date there has been no evidence of existing Species at Risk or Significant Wildlife Habitat in our screening exercises, and a scoped field inventory program will be developed with the progressing design. The EIS will analyze potential impacts of the final designs. An EIS report will be prepared to describe the findings and analysis.

Q6: How is the archaeological environment being considered?

A6: In consultation with our Indigenous communities, a Stage 1 Archaeological assessment has been completed for Bleams Road within the project limits. The report identifies the need to complete a Stage 2 assessment on two small areas on the south side of Bleams Road between Helena Feasby Street and Fischer-Hallman Road, as well as one on the south side of Bleams near Gehl Place, and a triangular section of land on the south-east corner of the intersection of Bleams and Trussler Road.

Q7: What is the current timeline for construction?

A7: Construction is currently expected to start in 2024 and be completed by the end of 2025.

Q8: Will noise walls be constructed along Bleams Road adjacent to the existing residential properties on the north side?

A8: The Region has a Noise Policy which is used to determine when noise barriers, such as noise berms or walls, would be recommended as part of an upcoming project. For this project, Part B of the Region's Noise Policy applies since Bleams Road is proposed to be widened from two to four lanes for the section from just west of Fischer-Hallman Road to Commonwealth Drive/Abram Clemens Drive.

Part C of the Region's Noise Policy could be applied in those areas where noise barriers are not recommended under Part B of the Noise Policy. Under Part C, a noise barrier may be considered under certain circumstances, if property owners are willing to share in the cost of a noise attenuation.

In accordance with the Region's Noise Policy, a noise review was conducted for the section of Bleams that will be widened from two lanes to four lanes (Fischer-Hallman Road to just west of Commonwealth Street/Abram Clemens Street). Preliminary findings indicate that additional noise attenuation will not be required in this section of Bleams Road. After modeling the 10-year traffic increase there is an increase in the noise levels in this section, but it does not meet the Region's criteria for additional noise attenuation.

G.4.8 – PUBLIC CONSULTATION CENTRE 2

Summary of PCC2

Public Consultation Centre #2 Summary

Bleams Road Intersection Improvements, from just west of Fischer-Hallman Road to Trussler Road, City of Kitchener

The purpose of Public Consultation Centre #2 (PCC#2) was to:

- present the project team's preferred alternative design that meets the improvement needs of Bleams Road.
- Receive comments on the preferred solution.

The preferred design accommodates the needs of Bleams Road, while taking into account comments from the public and stakeholders, along with consideration of other technical studies, best practices, and the experience of those on the project team.

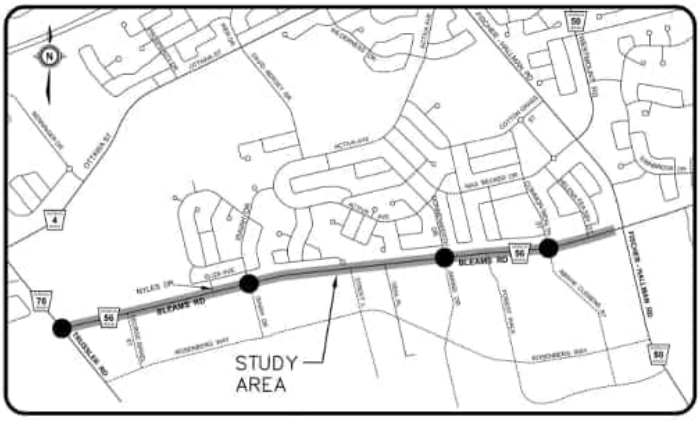

Figure 1 - Key Plan

During PCC #2, which ran from August 15 to September 12, 2022, there were 93 visitors, of which, 10 people responded to the survey questions and one visitor offered insights and suggestions relating to vehicle speeds at roundabouts. All of the responses received were in favour of the all-roundabout solution. However, some listed active transportation and crossings of the corridor as a concern. The project team was made aware of the above concerns and will take them into account during the detailed design of the Bleams Road improvements.

G.4.9 – PUBLIC CONSULTATION CENTRE 2

Letter advising of Report to Council

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Design and Construction
150 Frederick Street
Kitchener Ontario N2G 4J3 Canada
Telephone: 519-575-4400
TTY: 519-575-4608
Fax: 519-575-4430
www.regionofwaterloo.ca

Refer To:	File No:	Date:
Greg Proctor, 519-575-4729	5705	November 22, 2022

Re: December 6 — Planning and Works Committee Meeting
Recommended design for Bleams Road Improvements
(Fischer-Hallman Road to Trussler Road)

Regional staff will take a recommended design for improvements to Bleams Road to the December 6, 2022 Planning and Works Committee for review, and to Council for final approval on December 14, 2022.

The recommended design was the outcome of the technical studies conducted, best practices used in the industry, staff's expertise in road design and reconstruction, and public input from two public meetings.

The recommended design is included in the staff report and available to the public through the Committee agenda as of November 29, 2022.

The recommended design includes a number of improvements at different locations along the road including widening of Bleams Road from Fischer-Hallman Road to Commonwealth Street/Abram Clemens Street, extending raised medians, adding roundabouts, left-turn and right-turn lanes, a multi-use trail and new curbs and street lighting.

The recommended design also addresses public concerns we heard such as the need for efficient traffic flow, speeding, and safe pedestrian and cycling access.

Improvements to Bleams Road from just west of Fischer-Hallman Road to Trussler will also address interconnectivity between the existing and proposed land developments on the north and south side of Bleams Road, and prepare us to consider the future travel demands on the overall corridor.

Details on the recommended design and a summary of public input can also be found in the staff report and on the EngageWR project page. Construction is expected to start in 2024 and be completed in 2025 pending Council approval.

Anyone wishing to be a delegate at this Council meeting, can register in advance at 519-575-4400, or online at https://calendar.regionofwaterloo.ca/council/Detail/2022-12-06-0900-Planning-and-Works-Committee.

Yours truly,



Greg Proctor, C.E.T., Project Manager, Design and Construction

cc: Skylar Van Kruistum, P. Eng., Head, Transportation Rehabilitation

G.4.10 – PUBLIC CONSULTATION CENTRE 2

Report to Council

Region of Waterloo

Engineering and Environmental Services

Design and Construction

To:	**Planning and Works Committee**
Meeting Date:	**December 6, 2022**
Report Title:	Bleams Road (Regional Road #56) Improvements from Fischer-Hallman Road to Trussler Road

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1. Recommendation

That the Regional Municipality of Waterloo:

a) Approve the recommended design alternative for the Bleams Road (Regional Road #56) Improvements, from just west of Fischer-Hallman Road to Trussler Road, as outlined in Report EES-DCS-22-002 dated December 6, 2022; and

b) Direct staff to file the Notice of Completion for this Class Environmental Assessment Study by means of advertisements in local newspapers and mailings to adjacent property owners, tenants, and agencies, and place the Environmental Study Report on the public record for a period of 30 days.

2. Purpose / Issue:

Seek Council approval for the design alternative as prescribed by the Environmental Assessment Act and proceed to detailed design and construction, pending budget approval.

3. Strategic Plan:

This project supports Strategic Focus Area 2—Sustainable Transportation.
It will offer residents more choice in active transportation and improve road safety with a new multi-use trail and interconnections for pedestrians and cyclists.

4. Report Highlights:

The recommended design alternative for Bleams Road from Fischer-Hallman Road to Trussler Road meets the following Regional strategic priorities:.

- supports Active Transportation with multi-use trails on both sides of Bleams Road and interconnections for pedestrians and cyclists;
- provides access to new developments to support new homes;

- adds capacity for the travelling public;
- fulfills the asset management plan by addressing the poor road condition;
- improves storm water drainage and protects the groundwater aquifer by diverting run off to a controlled storm water facility;
- provides value for money by optimizing the life cycle cost of the asset;
- provides an opportunity during road construction to include redundancy for water pumped from the Grand River Hidden Valley Reservoir to the Mannheim Water Treatment Plant, which provides up to 25% of the Region's drinking water.

In addition to multi-use trails on both sides of Bleams Road, this project includes four roundabouts along Bleams Road within the project limits, widening to four lanes from Fischer-Hallman Road to Commonwealth Street, and raised centre medians for the section from Fischer-Hallman Road to Donnenwerth Drive/Amand Drive.

This project has approved budget for design in 2022, with forecasted funds in 2023, 2024 and 2025 to be refined through the budget process.

Please see Appendix A, B and C for more information.

5. Background:

Asset management data has shown that the pavement condition on Bleams Road is in fair to poor condition due to the age of the asphalt combined with poor drainage. This project will replace the deteriorated pavement and urbanize the roadway by removing the existing ditches and installing an underground storm sewer system.

Following the Region of Waterloo 2018 Transportation Master Plan, a multi-use trail is being recommended on both the north and south sides of Bleams Road from Fischer-Hallman Road to Trussler Road, with interconnections for pedestrians and cyclists between proposed and existing developments on both sides of the roadway.

A study of the current and projected traffic patterns along Bleams Road, between Fischer-Hallman Road and Trussler Road, determined the need to improve Bleams Road to accommodate the recent and future intensification of land use along both sides of Bleams road. This includes widening Bleams Road to four lanes from Fischer-Hallman Road to Commonwealth Street. After technical evaluation and public input, constructing four roundabouts along Bleams Road within the project limits was preferred over the traffic signal and hybrid (signals and roundabouts) alternatives. Raised centre medians for the section from Fischer-Hallman Road to Donnenwerth Drive/Amand Drive are included to improve safety by restricting left turns. Trees will be planted where there is sufficient space.

A noise review for the section from Fischer-Hallman Road to just west of Commonwealth Street/Abram Clemens Street was conducted due to the widening of the

road and concluded that additional noise attenuation will not be required in this section of Bleams Road.

A large portion of the Bleams Road project overlies the highly vulnerable drinking water protection areas for the Mannheim water supply wells and the project will need to include measures to protect the water quality from the application of road salts. The recommended design of this project includes the installation of a closed storm sewer to convey surface drainage out of the area of high vulnerability. Potential design concepts, such as clay lined boulevards and winter by-pass features in the adjacent storm water ponds will also be considered during detailed design.

This road project also provides an opportunity to construct a new raw watermain along this section of Bleams Road at the same time. Constructing the new watermain as part of the road construction project reduces overall costs due to construction efficiencies and reduces overall disruption due to construction. This new section of raw watermain is one part of a longer term plan to provide a second connection to ensure the security of the water supply between the Hidden Valley high lift pumping station and the Mannheim Water Treatment Plant by adding another watermain to convey water in the event that one of the watermains was out of service.

6. Area Municipality Communication and Public/Stakeholder Engagement:

Area Municipality Communication

The planning and design of this project included staff from the City of Kitchener.

Public/Stakeholder Engagement

Region staff met and consulted with the following stakeholder groups:

- First Nations
- Land developers.
- Property owners directly affected by land acquisitions.
- Region's Active Transportation Advisory Committee.

Region staff also consulted with the public in two Public Consultation Centres and communicated through EnageWR, newspaper ads, on-site signage boards, social media and mailed over 900 letters to area property owners, businesses, authorities and agencies.

The online survey during the first PCC received 181 responses:

- 50% supported roundabouts at all four intersections
- 30% supported the hybrid combination
- 20% supported traffic signals at all four intersections

The most common comments received from the first PCC included a desire for smooth vehicular traffic flow and good active transportation facilities.

The online survey during the second PCC received 10 responses, which were all generally in support of the Project Team Preferred Alternative of 4 roundabouts.

Public comments and project team responses are in Appendix D.

7. Financial Implications:

There are no direct financial impacts associated with this report. The conceptual design costs were included in 2022 Capital Budget. The current construction cost estimate for the road-related work is $16.6 million and will be included in the preliminary 2023-2032 Transportation Capital Program for consideration by Council. The estimated construction cost for the new raw watermain is $3.75 million and will be included in the preliminary 2023-2032 Water Services Capital Program. The timing of the construction is subject to receipt of all technical and financial approvals, completion of detailed design, relocation of utilities and land acquisition, and will be revised as necessary during the preparation of future Transportation Capital Programs.

8. Conclusion / Next Steps:

Subject to Regional Council approval of the Recommended Design Alternative, staff will file a Notice of Study Completion on the public record for a 30-day review period. Notice of filing will include newspaper advertisement, mailed and emailed notices, as well as posting notice on the Region and EngageWR websites. After the review period, detailed design and utility relocations are planned in 2023 followed by construction in 2024 and 2025.

9. Attachments:

Appendix A: Key Plan

Appendix B: Project Team Recommended Design Alternative (X-Sections)

Appendix C: Project Team Recommended Intersection Types and Median Location

Appendix D: Public Comments and Project Team Responses

Appendix E: Land Acquisition Requirements

Prepared By: **Greg Proctor**, Project Manager, Design and Construction

Skylar Van Kruistum, Head, Design and Construction

Reviewed By: **Phil Bauer**, Director, Design and Construction

Approved By: **Jennifer Rose**, Commissioner, Engineering and Environmental Services

Mathieu Goetzke, Commissioner, Transportation Services

G.5.1 – Public Comments and Responses

Email Questions

QUESTIONS THAT CAME THROUGH Email

I am responding to the letter sent out in regards to road improvements for future work on Bleams Road. I agree with the roundabouts on the three intersections that come onto Bleams Road. I feel the roundabouts are and excellent choice to keep speeds down to a safe condition. Traffic lights, special yellow lights tend to make people increase their speed to get thru before it turns red. My concern is the choice of a roundabout at Bleams and Trussler Road. I am sure you have done traffic studies and know the volume of traffic (including large trucks) that use that road daily. At this point, my concern arises. As you are aware, as you approach Trussler Road from Bleams, there is a hill blocking the view of the intersection. As of present, with the traffic lights, you can see the colored lights a long time before you see the intersection, allowing you to approach safely. During the construction phase, will that hill be eliminated, allowing a clear view in all directions for approaching traffic. As I am sure you are aware, it is a very isolated intersection with hills on both sides of Trussler Road and Bleams. Can you verify if this safety issue will be addressed in the future construction design. There is the potential for a very serious crash to happen if not.. Just wanted to inquire..

August 18, 2023

Hello Mr. *,

Yes, we are keenly aware of the hill at this location. We are examining the options of cutting the hill down and by how much along both Trussler and Bleams. We will make this safe.

please add the comments below to our list of comments.

Greg Proctor, August 19, 2022

Good afternoon Greg and Team,

Further to my message in February, I have reviewed the PIC information and discussed my initial concerns with xxx of Student Transportation Services of Waterloo Region (STSWR), who supports our region's active school travel initiatives.

The preference of the board is the hybrid option (Alternative 3) incorporating roundabout and signalized intersections along Bleams Road. As previously expressed, the Waterloo Catholic District School Board is planning to acquire land from Mattamy at Isaiah Drive / Rosenberg Way. This school's boundary has not yet been set, but it may include a portion of the existing development north of Bleams Road. This would mean that existing and future elementary school students would be expected to cross Bleams Road to access the new school site. A significant portion of the existing homes north of Bleams Road are within walking distance of this future school.

While there are several instances where roundabouts are located near secondary schools in the region, there are fewer occurrences where there are elementary schools

proximate to roundabouts. We know that there is an inherent lack of confidence of the safety of roundabouts for our youngest travellers. The result is that more students within walking distance of the new school will be driven, exacerbating parent traffic issues around the school.

We would encourage the Region and City to consider designing the Isaiah / Bleams intersection as a signalized intersection, to support the movement of pedestrians across Bleams Road. Should this not be possible, we ask that the roundabout be designed as single lane only. That illuminated flashing beacons be installed to alert drivers to pedestrians crossing the roundabout. Further, we would ask that the City proactively prioritize the placement of an adult school crossing guard at such time as the proposed school opens and it is confirmed that students will be required to cross Bleams Road.

March 18, 2022

Thank you xxx for the back up. We will discuss the points raised by you below and be back in touch.

Regards, Greg Proctor, March 18, 2022

Greg,

I came across the information on the Bleams Road improvements EA in the media today. I've visited the Engage site to glean additional information about the project. The WCDSB has an elementary school site reserved in the Mattamy plan generally located in the southwest quadrant of Bleams / Isaiah along the extension of Rosenberg Way.

Reviewing the available information, and possible future boundaries which would support the future school, I think we would prefer to see the Isaiah Drive intersection signalized vs. a roundabout. However, we would welcome the opportunity to review this matter further with the appropriate members of your project team and STSWR staff.

Please advise who we should coordinate a follow up call with on this matter.

Kind regards, February 16, 2022

Hello – thank you for your interest in this project.

At this point, we will add your comment about the preference for a signal at Isaiah to others that we will be collecting for review by the Project Team. However, if you would be able to provide some context around this preference, it would be appreciated.

Regards, Greg Proctor February 16, 2022

Hi Greg,

Nice speaking with you this morning - thanks again for the call. When you have a moment, please send along any drawings you may have so that we can take a look.

My full contact information can be found in my signature below.

Best, February 8, 2022

Hello,

Same to you. I look forward to working with you as well. Please find attached the three options we discussed. Please feel free to provide comments back to me. Our public consultation commences on Monday Feb 14 and is open for 3 weeks. You can access it through this link (https://www.engagewr.ca/bleams-rd).

Jim and Dot – please ensure that xxx is on our master mailing list. He represents the property on the north east quadrant of Bleams/Trussler, known as 808 Trussler.

Thanks, Greg Proctor, February 8, 2022

Hello Greg

We are the residents and property owners of xxx Bleams Rd, right next to xxx.

We are contacting you to let you know that we will want to develop our property and build an additional 10-20 units which will need servicing in the near future pending approvals. I am wondering if part of the reconstruction of Bleams any utilities can be brought onto our property side in order to accommodate the future development. We are in desperate need of internet.

Also would you be able to tell me if the intention is to make Bleams more pedestrian friendly and slow down traffic or is it the intention to make it more vehicle friendly and connect faster from one end to the other?

Obviously we would prefer the pedestrian friendly option with reduction in traffic speeds and noisy vehicles such as trucks.

Regards, 14 January 2022

Good morning,

Regarding your proposed redevelopment of the lands at 1385 Bleams Road, I have added staff onto this email who may be involved with your municipal servicing needs (water and sanitary). Also, I have attached a recent email from Richard Parent, which informed you of the access to Bleams Road requirements. This recent email is provided to assist in bringing those people added to this email up to speed with your proposed redevelopment.

As part of the upcoming Bleams Road improvements project, currently proposed for construction in 2023 and 2024, any municipal servicing within the Bleams Road corridor that has been approved by City of Kitchener and Region of Waterloo could potentially be included as part of Bleams Road improvement project. However, water and sanitary servicing needs for your site, along with an acceptable design need to be worked out with City of Kitchener staff and Region of Waterloo Water Services staff (Kevin and

Erin). Generally, if you receive approval in concept for extending municipal services to suit your needs, an engineering consultant will be required to complete the design.

Regarding your comment about needing internet out there, I suggest you contact one of the local communication providers such as Bell, Rogers, etc.

With the existing developments along the north side of Bleams Road, and the proposed developments along the south side, consideration is being given to the increased travel demands on this corridor, along with active transportation improvements for pedestrians and cyclists. We are looking for a solution that addresses all future transportation needs.

Regards, **Greg Proctor, 17 January 2022**

Hi ,

We spoke sometimes at the begging of this month.

I called you in behalf of St. John the Baptist Romanian Orthodox Church, which has its property right across future subdivision, at 2150 Bleams Rd.

Overall, we no objections regarding the application itself, however we would like to voice our concerns about future road traffic changes for Bleams Rd.

I understood that Bleams Rd being a regional road, it belongs to Region of Waterloo, which has jurisdiction over it and is responsible for any future developments.

Also I understood that you can pass onto Region of Waterloo our comments as well.

Here is what we would like to get, if possible:

1. A middle turning lane in front of our entrance. Even if the speed limit is reduced to 50kmh, pulling over into our property could pose a risk especially for our elderly parishioners

2. Additional street lights for our entrance. Bleams Rd has no street lights and even we have our lit sign, it is easy to miss the entrance especially when poor weather conditions.

3. Street signs at both ends of Bleams indicating direction to our church.

We have many people missing our church

due to the fact there is another Bleams Rd that belong to Mannhein, which is few hundred meters away from Kitchener's Bleams. #1 and #2 are obviously for safety reasons, Although #3 is for an easy access, at the end of the day, confused people can potentially be involved easier in a car accident

We appreciate your help in this matter.

best regards,

22 November 2018

Hello Mr. *;

I am the Project Manager assigned to the upcoming Bleams Road reconstruction project. The project limits are from Trussler Road to Fischer-Hallman, and it is currently scheduled for reconstruction in the year 2021. However, it is anticipated that this date for construction may be pushed further into the future to better align with the proposed developments in the area.

LEFT TURN LANE ON BLEAMS AT CHURCH
ACCESS - Although a left turn on Bleams Road at the church access is not currently included within the scope of the project, the Region will be pleased to evaluate whether a warrant for a left turn is met. To undertake this, the Region will need some information about the church such that an approximate number of vehicles trips can be determined and then an analyses/warrant calculated to see if a turn lane is warranted, based on current and projected traffic volumes on Bleams Road. If you could provide the following information about the church, we can let you know the result of the left turn warrant fairly quickly: - # seats - Square footage of the church - # parking spots

ADDITIONAL STREET LIGHTS AT CHURCH
ENTRANCE - at this point, luminaires have not been identified at this location. However, I will be further investigating the placement of luminaires along Bleams Road, and will keep you abreast of this.

STREET SIGNS AT BOTH ENDS OF BLEAMS
ROAD INDICATING DIRECTION TO CHURCH - the decision to allow the installation of these signs is left to Region of Waterloo Traffic Engineering staff. If agreeable with you, I think that the best way to review this request for signs to be installed, is to have you work directly with Traffic Engineering staff. I have included the names of Bob Henderson and Mike Jones on this email as they are likely the people you will work with on this issue.

Regards, Greg Proctor December 21, 2018

Hi Greg,
Thank you very much for reaching out to us so quickly.

We apologise for our late reply. We were very busy during this time.

In order for you to have a better understand of our needs, I need to give you some background regarding our property, nature of the buildings located on it and activities happening on a regular basis.

Our property has 10 acres on which we have 2 main structures:
- the church
- the banquet halls

-we have also a standard professional soccer field which is used by local leagues for official games.

See attached files for a better visual.

PARKING LOT:
Both buildings, as well as the soccer filed are sharing a parking lot with an official capacity of a 110 cars.

SEATING CAPACITY:

Church:
The church's main floor has a seating capacity of 140 people on pews, as well as approx 20-25 people on the choir's balcony. Altar servants can be between 2 and 10. The church's basement has also a bit over 100 seats.

The banquet complex has two halls:
-big one has a seating capacity of 350
-small one 120
-kitchen staff can be between 10-30 people depending on the function.

Activities:

- church:
Every week on Friday and Saturday, between 5-9pm we have night services which are attended by 40-100 people.
Every Sunday we have our Holy Liturgy which is our main weekly service. There is an overlapping with Sunday school too. Attendance for both the main floor and basement can be between 100 and 250. Average 150 Once a year, for the Easter midnight service we have 400-600. Obviously most of them are standing in the parking lot for approx 2-3h (depending on the weather)

-banquet hall:
We are using both rooms of our banquet complex for church events, our Romanian community events, as well as we are renting out the facility for third party events (weddings, parties, conferences, concerts, etc) We usually rent out the small room to events hosting 80-100 people and the big room for larger events hosting 200-350 people.
The activities are usually ramping up starting from Wednesday, when decoration and some cooking starts, reaching a peak on Friday and Saturday night when the event occurs

-soccer filed:
Although we try not to overlap soccer games or practices with church or halls activities, sometimes that is inevitable and our parking lot become too small for the demand. Average attendance for a game is 80-100 people, including the players.

As you can see due to overlapping of activities between church and banquet hall, especially on Fridays and Saturdays, and sometimes on Sundays, we get on a regular basis 120-150 cars on our property, which is beyond the current capacity. People are parking on the grass along the driveway, or sometimes right on Bleams rd too.

Therefore, by the end of 2020 we want to add at least 50-80 more parking spots on our property. We are planning an additional parking lot, either near the road by the gates, or behind the hall. We will make a decision this year.

I hope this info is suffice to build a solid case for us, that there is a clear and immediate need for an improved section of Bleams Rd beside our property.

In our opinion the road need to be improved in such way that incoming and outgoing traffic for our property will not impede ongoing Bleams, nor create additional hazard.

Thank you, 7 January 2019

Hello Mr. * - thank you for the details. Region staff will review the information and determine if a left turn lane warrant is met for this location. I will be back to you on the result in a few days.
Regards, Greg Proctor, 8 January 2019

Hi Greg,

It has been a while since we were in contact. I hope all goes well with you!

At the Romanian Orthodox Church St. John the Baptist located on 2150 Bleams rd, we just received the "Notice of Study Commencement" regarding Fisher-Hallman, Trussler and Bleams Rd traffic study, with a specific aim on Bleams rd.

Thank you for sharing this information and including us in the public consultation!

As previously stated in emails we exchanged back in 2019, we think that Region of Waterloo should take in consideration traffic improvement solutions around our property, included, but not limited to additional left-turning lane, lighting, proper signage.

Even now, when none of the adjacent land has not yet been developed and there is no traffic coming out from the area across of our property, due to road improvement on Fisher-Hallman, we noticed that entering and exiting our property it became a real challenge due to increased traffic on Bleams rd.

Thinking that future residential area will add more traffic, brings worries and concerns to us.

Please keep in mind that due to covid-19 we postponed some of the plans we had for our property, such as opening the soccer field to a larger audience and users.

Last year we spent approx $30k for the soccer field irrigation system and we are planning in 2022 to use it

Having said that, I hope you and your team will spend some time and review previously sent information pertaining 2150 Bleams rd property in and out traffic and take in consideration our concerns.

best regards, 21 December 2021

Good afternoon,

You are welcome for the information.

Regarding the inclusion of road improvements to Bleams Road at your access location, along with lighting and signage, each of these items are being examined shortly. I recognize that we previously had indicated that a left turn lane was not warranted, but we will review this again. I expect that I will be able to get back to you in a few weeks time.

Regards, Greg Proctor 23 December 2021

Mr. Greg Proctor,

I'd like to give some suggestions for the Bleams Rd Recon in Kitchener.

- Wide Sidewalks, lots of grass.

- No bike lanes. They'll be dangerous close to farm land / Also, no one in Williamsburg or Mannheim cares about them.

- Double yellow lines, instead of the boring single line we have all over KW.

- Paved shoulders or sidewalks. Please no gravel.

Thanks!, 8 December 2021

Good morning - thank you for your interest in this project. Your comments will be compiled with others that are received and consideration will be given, by the Project Team, to all comments when completing the study and subsequent roadway design.

Regards, Greg Proctor, 9 December 2021

Hi,

I got a "Notice of study commencement" from your office. I live at CommonWealth Crs, N2E4J9. I would like to know how I can register my concerns with your office. Is there any format in which I have to raise my concerns?
Regards, 7 December 2021

Good afternoon – thanks for your interest in the project. Yes, you can provide your comments by responding to this email and including those who are on it. Or, you can hold off until more information is provided regarding the road design (s) which are being contemplated. That will be in early February.

Regards

Greg Proctor, 7 December 2021

In response to the Notice of Study for Bleams Road Reconstruction, I have the following related environmental issue for your consideration: excessive noise and exhaust emissions.

I live at xxx Woodridge Drive in Mannheim, with my yard backing onto Trussler between Bleams and Knechtel. My issue, along with three neighbours on each side of my property is the is the intense and ongoing noise, especially from dump trucks traveling in both directions on Trussler. There is a "No Engine Brakes" sign just south of Bleams, but that is disregarded by most trucks. This truck traffic is bound to continue for the next few years at least, especially with the building construction and the Bleams reconstruction on the Kitchener side of Trussler. My request is for Noise Barriers to be erected on the west side of Trussler between Bleams and Knechtel. It does not seem fair that the seven property owners on the Township side of Trussler should have to bear the undesirable noise and traffic consequences of projects taking place on the Kitchener side. Thank you for your consideration.

7 December 2021

Good afternoon xxx, thank you for your interest in this project. Your comments will be compiled with others that are received for the Bleams Road Reconstruction project and consideration will be given, by the Project Team, to all comments when completing the study and subsequent roadway design.

However, as your comments generally pertain to the Trussler Road road allowance, I have copied my colleague, Justin Armstrong, who is the Region's Project Manager for the upcoming study and road works on Trussler Road.

Regarding your comment in relation to the truck non-compliance with the No Engine Brakes sign on Trussler Road south of Bleams, I have included my colleague Mike Jones from Transportation Engineering, for his information.

Regards, Greg Proctor 7 December 2021

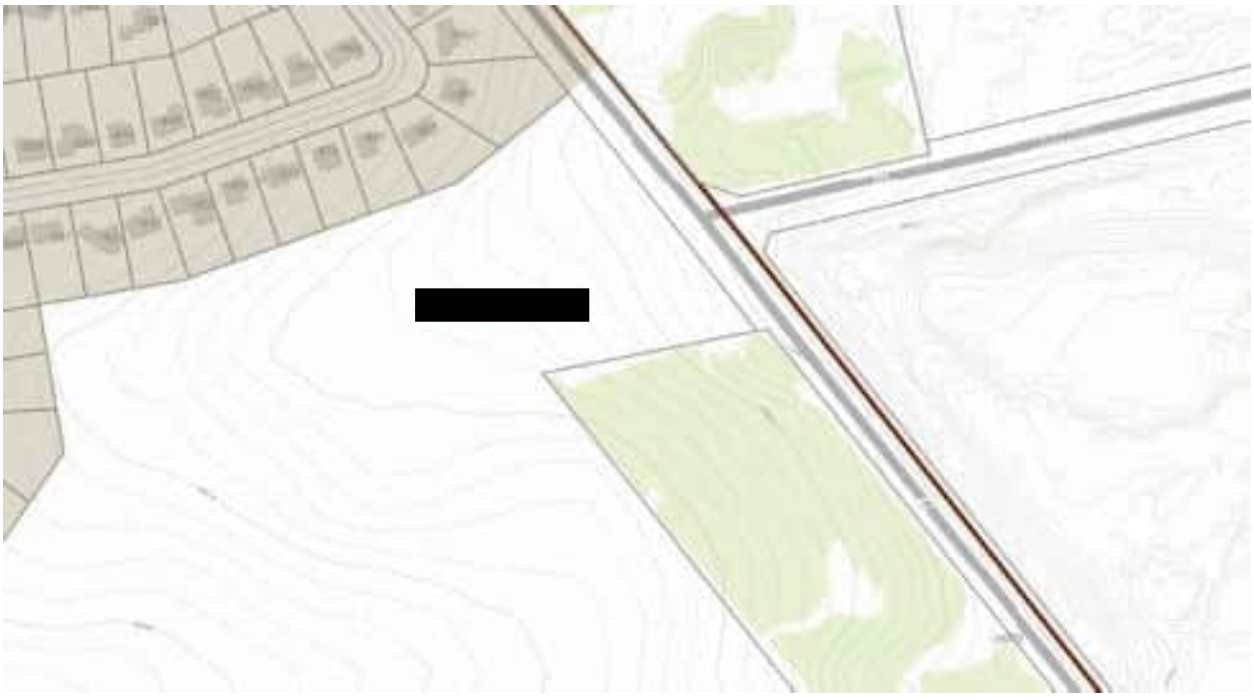
Telephone conversation

, 6 December 2021

I was contacted by xxxx the owner of the property on the west side of the intersection of Trussler/Bleams. He does not own a computer, so he wanted to register his support of the following:

- He is strongly in support of a roundabout at the intersection of Trussler/Bleams. So much so that he said that for our land needs, money was not a concern and he will provide it without any contest
- He is strongly in support of 4 lanes on Justin's Trussler Road project from Bleams to HWY 7/8

The image below shows his property location:



Greg Proctor, 6 December 2021

Hi Greg/Dot,

I am a resident on Isaiah Crescent backing into Bleams Road and I'm very excited to see this work coming to light. The road (Bleams Rd.) has became very busy lately where large transport trucks are often drive on the road. This has made the road very bumpy and noisy at times. Driving at night has been a challenge due to the inadequate lighting on the road. One thing I also noticed driving on Trussler road and turning on Bleams is the tight right turn at the intersection (maybe widening is an option or perhaps a right turn lane!). Just some thought for the project!

Thank you,

30 November 2021

Good morning,

I am Jim Redman and I work with Dot Roga, thank you for your interest in this project. Your comments will be compiled with others that are received and consideration will be given, by the Project Team, to all comments when completing the study and subsequent roadway design.

Regards, Jim Redman 1 December 2021

Hello Greg,

The only comment I will make is the following:

If you are driving on Bleams Road and need to cross over Fischer Hallman road in either direction during the morning or evening rush hour, you are going to wait a very long time. The bottleneck has only been made worse by the replacement of the lights with a roundabout.

If changes are not made, the increased intensification of that area will make the problem much worse and could cause bottlenecks on Fischer Hallman as well.

Regards,

30 November 2021

Good afternoon xxx – thank you for your interest in this project. Your comments will be compiled with others that are received and consideration will be given, by the Project Team, to all comments when completing the study and subsequent roadway design.

Regards

Greg Proctor, 30 November 2021

G.5.3 – Public Comments and Responses

PCC1

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the “hybrid” concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the “hybrid” concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
Traffic will be able to move more quickly and freely along Bleams without lights. Left turns will be much easier for drivers.	Any time there are pedestrians at roundabouts it can be difficult because they are hard to see on the other side (especially with plants/trees in the middle) and vehicles often don't slow down enough to safely navigate the roundabout.	Better for pedestrian crossing.	Traffic will not be able to move efficiently down Bleams with that much start/stop.	It may be an advantage for pedestrians crossings if the the intersections that have higher pedestrian traffic also have traffic signals.	It stop and start of this may impede the smooth flow of traffic.	I believe this is in the planning already but to re-state: multi-use trails on one or both sides of Bleams and safe ways for pedestrian traffic to cross Bleams (as in the plan for roundabouts, etc.).
Not having to wait to get off the side street.	If traffic is busy on Bleams, it will be tough for vehicles to enter off the side street.	Nothing.	Waiting for the lights to change.	I don’t see an advantage to this	Why would you mix signals and roundabouts other then to create gaps at the roundabouts but then make the other 2 streets wait longer.	I hope that a sound barrier will be installed the entire stretch. Come sit in our backyards and hear the noise. And not just a recommendation for air conditioners like when the Activa subdivision was built.
None.	Roundabouts are still not understood by many drivers in Waterloo Region and are a source of accidents and traffic slowdowns.	Known, manageable and well understood by drivers. If red-light cameras are also installed, it should reduce accidents there.	Depends on the timing put on each light. Also must allow enough time for seniors to walk across and be well-lit intersections.	The fewer roundabouts, the better.	Will be more disruptive to the driving patterns and confusing to many. Also, trucks have a lot of difficulties with roundabouts.	Widen it to allow a passing lane every 2 km.
Probably the best option. Traffic lights cause unnecessary idling.	How is active transportation going to receive priority through this corridor? Active transportation should ideally not have to stop at any time through the corridor.	Shouldn't even be entertained as an option.	Excessive turning lanes. Long term congestion. Aesthetically unappealing	Possibly addresses balance of active transport, but	I feel this just ignores that cycling/pedestrian bridges or continuous side walks could be used to give active transport priority, and provide traffic calming. To meet goals in Transform WR a fourth option that actually prioritizes active transport over the long term.	The region should be using Ottawa's protected intersection guide for cycling infrastructure at traffic signals.
Traffic will flow well, efficiently and effectively through the corridor, especially at peak times.	Roundabouts are not friendly to non motorized traffic.	More inclusive to pedestrian and bicycle traffic.	Significant slow downs at peak times.	A good mix of efficiency and inclusiveness.	Not as efficient as all roundabouts, especially during peak times.	
Less severe accidents, shorter trip times in off peak hours	Cyclists have to dismount	Less land used	High likely hood of severe accidents	reduced likelihood of severe accidents	Signals at lower traffic intersections are unnecessary and won't be respected	Don't allow unprotected lefts on any other entrance to Bleams. Require right turns only, they can turn around at the next traffic circle.
May eliminate backup on those streets during peak periods which aren't designed for lots of waiting vehicles. Likely to promote better grading at the Trussler intersection (versus traffic lights).	Uncertain of the need for 2 roundabouts at Donnenworth and Commmonwealth. Not certain it will curb excessive speeds on Bleams.	Much better for pedestrian access and mobility across Bleams or crossing those individual streets.	Too many lights in a small length, likely to see unnecessary stops unless very well timed.	Some mitigation of speed, some improvement for pedestrians and bike depending on execution.	Feels like a poor compromise solution overall.	Any solution should a) improve difficult grading and alignment at Trussler, b) reduce racing and speed overall on Bleams and c) not unduly encourage extra vehicle traffic onto Isaiah, it is already far too busy with construction, school bus and fast flow through to Activa.
Roundabout offer superior traffic flow is this suburban setting. At all times of the day/night.	Pedestrian walk way seems a little more high risk at roundabouts, but I do not think currently there is much pedestrian traffic along Bleams.	Only to regulate pedestrian traffic.	Traffic speeding and slowing to the timing of the lights. Waiting for a light to turn onto/off of Bleams in the middle of the night. Extra Light pollution. The choppy flow of driving, now just seeming like a city street and not a nice neighborhood. More cars idling on Bleams waiting for light to turn.	Few advantages. Other then providing pedestrian a perceived safer cross walk.	Breaking the flow of the drive through nice neighborhood. Cars idling as they wait for light to turn.	Roundabouts as we all have had to get used to them since their implementation in the city some years back has become the vastly superior intersection choice.
Drivers will be convenient.	For seniors and children, roundabout is not safe.	Seniors and children will be safe and easy to cross roads.	Drivers have to stop when they meet red traffic signal. I think this is not a challenge.			I like traffic signals, because it is safe for pedestrians.
Regulates the traffic on turns; fluent traffic and reduced speed when entering/exiting the roundabout.	No challenges	Regulates the traffic on turns.	Interrupted traffic and high speed on green lights; noise pollution	Just regulates the traffic	Where light are used , the traffic is interrupted, and promotes speeding on green light , noise pollution.	Keep the already existing green zone on the sides of the road
Advantageous - however the roundabouts need to be redesigned so that the pedestrian walk-ways are off-set from the traffic circles as it is a dangerous design where the drivers approaching the circle sometimes don't have line of sight of pedestrians crossing until they are approaching the circle.	More so improvements compared to what there is now. Trussler road may be challenging as large volume of traffic to contend with (double lanes recommended).	Would not see any advantages with traffic signals over traffic circles in these areas.	Would not see any advantages with traffic signals over traffic circles in these areas.	Would not see any advantages with traffic signals over traffic circles in these areas.	Would not see any advantages with traffic signals over traffic circles in these areas.	See comment on off-setting the pedestrian walk-ways away from the circles.
slowing down traffic for pedestrians, yet not impacting traffic flow as much as stoplights.	Our main usage of the donnenwerth / bleams intersection is crossing the street there to walk to church or to use the sports field on the other side of bleams with our 3 year old son a number of times per week. It would be nice to have a full stop crossing there like at a stop light instead of trusting people to give right of way to pedestrians when the enter or exit the round about.	Having a traffic signal at the corner of Donnenwerth and Bleams would allow more safety when walking across Bleams to access the Church sports field that is open to the community for usage most evenings and weekends.	I imagine a traffic signal would impede traffic flow more than a roundabout would.	trying to get the best of both worlds?	Having a traffic signal at the corner of Donnenwerth and Bleams would allow more safety when walking across Bleams to access the Church sports field that is open to the community for usage most evenings and weekends. I wonder if the round about and traffic signals at Donnenwerth and commonwealth could swap?	no
Roundabouts may solve the congestion issues at each intersection, they also help with the flow of traffic.	Too many roundabouts on such short stretch of road. Light are out of question.	None	Slowing down traffic flow completely	Lights are not needed on this stretch of road. They will make it harder to exit from the subdivisions and slow down the flow of traffic on Bleams.	Too short of a stretch to have combination of lights and roundabouts.	
Roundabouts will generally allow motor vehicle traffic to flow better, especially at the times of day when there is little traffic on this road.	Roundabouts are more challenging for pedestrians and cyclists to cross, particular at busy times of day. Some motorists still have difficulty navigating roundabouts correctly; I have already seen one accident at the Bleams and Fisher-Hallman roundabout in the few months that it has been open.	Crossing the intersection is usually safer for pedestrians and cyclists.	If the intersection has vehicle sensors, they can be difficult for cyclists to trigger (such as at the existing Bleams and Trussler intersection). When traffic is light, you sometimes have to wait longer to proceed through the intersection while you wait for the light to change.	This may make left turns between Trussler and Bleams easier as you will not need to wait for the signal to change or for an advance turn arrow.	Like in the all roundabout option, the roundabouts make it difficult for cyclists to turn from Bleams onto Trussler. I don't expect that many pedestrians would want to cross here, but on the weekend there are a lot of recreational cyclists on Trussler.	
will slow the traffic some what, concerning how fast some cars go	sometimes hard to get out at intersections	help with speed	lots of traffic at each light	help flow at end of roads	might be more backup of traffic	speed bumps or lower speed limit, too many cars go real fast
Flow of traffic, reduced/less severe accidents, manage speed.	Not much. As you mentioned in the youtube video perhaps pedestrian crossings.	Perhaps improved for pedestrian crossings?	Traffic build up from waiting for lights. Particularly at Trussler & Bleams - no matter what else is done, that intersection sees too much traffic at peak times for its current design (even at present, let alone once new developments to the south come onboard) and I would love to see a roundabout there.	As noted in #4, the most important area for a roundabout is the Trussler/Bleams. I prefer roundabouts at all locations, but this hybrid might appease if you have a lot of individuals against roundabouts.	Wait times of traffic leaving the communities during peak hours, could back traffic up into the residential street. Stoppage of traffic on Bleams for red lights which reduces traffic flow and makes it take longer relative to roundabouts.	I like the roundabout option; second to that I am ok with hybrid option. Please do not do the traffic light option - as noted there is already sometimes too much traffic at Bleams and Trussler during peak times even before we add on the new developments to the South.
My only concern is drivers still do not use them correctly	Pedestrian access,	Tends to reduce traffic congestion	Drivers will still make right hand turns without stopping, running yellow lights as well,most of the bad drivers live in these neighborhood	As stated in guestion five	As stated in question five	Pave the shoulders
None	Roundabouts need to have large swaths of land to function properly. Land is not available in adequate amounts for proper design. Favour traffic signals	Predictable traffic flow	None	None	See roundabout comment above	No
Traffic flow can be better. But most drivers don't know how to use them properly.	Too many in one space.	Traffic better controlled than a roundabout.	Traffic flow will not be as good as opposed to a roundabout.	Probably the best option.	Traffic flows might be okay, but probably the best option of the three.	
Roundabout are totally no no. There are always driving concerns. Better to apply Traffic lights	Padestrians, hit and trial method of guessing that a car is going straight or revolve around the rpundabout, low visibility, totally unsafe both for drivers and padestrians. Roundabouts covers lots of space, totally waste.	Traffic signals provide the clear picture that now its going to be red light, we can slow down. Padestrians can cross when they have crossing light on, traffic is well managed.	No challenge at all	Hybrid concept can be considered. But traffic lights make it clear about the yield of passing	Again, roundabouts lessen the visibility, its wastage of space. If lights have to be there, why roundabout?	
Better than what is in place now.	Perhaps traffic lights would be better at Trussler though. It's a very busy road. There would not be many breaks in the traffic for Bleams Rd traffic to enter the round about as it is a three-way junction.	Better option for Trussler & Bleams intersection. The other two roads can use round-abouts.	Not enough traffic for lights other than Trussler & Bleams.	none.	Bleams/Trussler should have lights as there is a lot of thru traffic on Trussler. There is not as much opportunity for Bleams Rd traffic to enter the Round About.	MUP' along Bleams Rd to connect the neighbourhoods to shopping areas along Fischer Hallman Rd. Very dangerous riding on the narrow roads currently.
Trussler Rd - none Others - minimal flow improvement	Trussler Rd - just does not fit in Others - width of lanes, number of lanes to accommodate growing number of vehicles on road. How are bicycles being accommodated?	Better for cyclists and pedestrians				
This will keep traffic moving as opposed to traffic lights.	The only issue is if the road gets too busy, similar to Ira Needles and Highland, it becomes difficult to enter the roundabout.	The only issue is if the road gets too busy, similar to Ira Needles and Highland, it becomes difficult to enter the roundabout. Traffic lights allow slow or hesitant drivers to use the intersection.	Traffic will slow down too much and there will be more congestion.	None	It would be ok but all roundabouts would be more ideal.	Do not add segregated bike lanes along Bleams or Fisher Hallman as they are under used and too expensive to build and maintain.
Would allow vehicles to safely travel that section of road. Current sight lines are poor at best for many of the existing intersections, with cars often failing to stop.	Could make it difficult for larger vehicles to travel that section of road.	Clear indication of actions required as intersection approaches.	Often takes significantly longer to get out of subdivision. Adds no real benefit over a roundabout for the amount of traffic on the section of road.	None. This seems like a poor option.	Isaiah and Donnenworth intersections are low volume. This would result in traffic backing up into the subdivision while waiting for a light.	Keep the signal at Trussler Road while adding in roundabouts at the low volume intersections. Make the roundabout large enough to properly travel. Improve sight lines at intersections - especially at Trussler Road.
none... both bleams and trussler are already busy, and going to be increasingly busy. all I see are long delays in one direction, just as with ira needles	accidents will shut down the whole road. pedestrians HATE roundabouts, they are risking their lives (drivers can't see around a roundabout until they are ready to exit the roundabout and then it can be too late.	traffic signals provide fair and consistent access to drivers in all directions. a stop light also means safer crossings for pedestrians.	none... traffic lights are far safer than roundabouts (except in the rare case of someone running a red light)	better than all roundabouts, but mixed stop and go will only infuriate the current state of angry selfish drivers	better than the other hybrid, because you need lights when traffic builds in all 4 directions (in a roundabout, one direction wins, and that frustrates drivers)	all lights... nothing wrong with that, especially if the lights are timed so you get green lights if you travel the speed limit, and red lights if you speed. if you use roundabouts, put the pedestrian crossings away from the roundabouts.
Those are perfect locations for roundabouts. They will keep the traffic moving.	No challenges	Slows the traffic down and impedes flow.	None	I think it will be confusing for drivers and pedestrians. I don't see the need for both.	Confusion, impediments to traffic flow.	Please I stall roundabouts. They are wonderful.
Best for future, since aria is growing very fast		No	Roads are narrow, which doesn't apply for the growing population	No		
Roundabouts provide better throughput at the intersections while making them safer for vehicles and shorter distances for pedestrians to cross.	People are not used to roundabouts, additionally there is a greater amount of land used.	People are used to traffic signals.	If Amand is ever connected to the south end of Amand this road will have a substantial amount of traffic. A roundabout at this location would be preferential to a signal. Lights also have more opportunities for collisions with cars and pedestrians. Drivers and pedestrians must look in far more directions to ensure the desired path is clear.	Cheaper than roundabouts while still providing roundabout volumes where warranted.	The Amand intersection should have a roundabout if Amand is ever to be connected to Amand south. The feeder road at Isiah on the south will likely not be used as much. This may even be a better location for a PXO signal than a standard signal.	Change the cross section of the road to an urban cross section.
I vote roundabouts						
Faster movement of turning traffic and slowed straight through traffic.	Many people still are not comfortable with roundabouts.	As a cyclist, I appreciated the lights put in at Trussler and Bleams because otherwise I could wait forever to turn left. It is a busy area and lights may move traffic better, when I think of how congested Trussler/Ira Needles gets at rush hour as vehicles are trying to move through the roundabouts.	It may be irritating at night if you have to wait at a red when the road is entirely clear.	I think a hybrid model might confuse or irritate some people. I think the only spot that really needs a light, at least now, is Bleams and Trussler.	Same as above.	Definitely a MUT or cycling path! I cycle along Bleams from Isaiah Drive to Trussler every day from early spring to late fall/winter and currently it is rather stressful. The road is very busy with vehicle traffic and there's no shoulder, plus the edge of the roadway is in poor condition. This short stretch to get out into the country is the worst part of my ride.
Controlled Traffic flow	none	none	unnecessary wait times at traffic signals	none	unnecessary traffic signal wait times at between bleams and trussler	min speed limit of 60 km
Zero advantages roundabouts are terrible. no one knows how to use them properly and that many certainly too many. not needed. Especially @ Trussler road	roundabouts are terrible. no one knows how to use them properly and that many of them is certainly too many. not needed. Especially @ Trussler road	slow down the race track that is bleams road.	That is too many lights in a short stretch of road. not needed at all intersections	no advantages	trussler should NOT have a roundabout. traffic lights just went in recently and are working very well.	drop the speed limit from 70 to 50. perhaps keep the lights at trussler and add a roundabout at donnenwerth. each intersection doesnt required lights or a roundabout.
Trussler road already has lots of roundabouts so that makes sense. The rest are too many.	That's too many roundabouts in a short distance.	none	traffic issues a plenty	none	none	4 lanes

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
I am a big supporter of roundabouts. I am ecstatic that the roundabout has finally been installed at Blain's in Fisher home in and it has made the traffic flow through that intersection more smoothly. I believe the small roads that end on bleems would benefit from roundabouts in the area. Well I do very much appreciate the traffic lights that were installed on trusler and bleems I do believe that around about at that location would be a benefit to traffic flow as well	As I previously stated I am a big fan of roundabouts although I do see that Isaiah Drive, Donnorworth Dr, Amand drive, Commonwealth Drive and Abram Clements Drive could potentially have difficulty with a roundabout if the traffic flow both directions on bleems was heavy. I do believe that currently trying to make a left on bleems is more difficult then it would be with a roundabout option even in heavy traffic.	Traffic lights are definitely one option for these roads that and on bleems. All of the above drives definitely have a difficulty at some specific high traffic times of the day making left hand turns	While the advantage of traffic lights would be the ability to turn left off of these roads I believe that the amount of time traffic would have to sit and wait for the light to turn would definitely be the challenge. I could see that people late at night would not wait for the light to turn and would benefit greatly from a round about instead		I'm not sure I see an advantage two mixing traffic signals and roundabouts. When you mix traffic signals and roundabouts you are going to have traffic back up into the roundabout and then both options will not work properly. That being said the only intersection I see an advantage to keeping traffic lights would be Trussler and bleems. Due to the Steep Hill and the lack of proper greeting I can see it would be difficult to put a roundabout there and keeping the traffic lights would be a an option.	
not having to wait for a light to change, safe and smooth flow of traffic	I prefer the round about model, I suspect the Fischer Hallman Bleams round about will have higher traffic.	may help those not comfortable using round abouts	drivers trying to make yellow/red lights, potential risk of colission	might slow traffic down	This will frustrate drivers and may encourage them to speed to catch a green light	median planters, ascetics
None	The distance between roundabouts are too short and the size of roundabouts will be too small to make safe travel. The cars on Bleams will come in too fast to really allow sideroad traffic from having a typical traffic circle advantage. Also having pedestrian traffic on the circles is a definite hazard. Pedestrians should never cross at a circle.	None	For the intersection at Bleams and Trussler a traffic circle could be more effective due to the low potential of pedestrian traffic as well as a continued flow especially outside of peak hours.	This is my preferred option because not one solution fits all intersections.	Not many. Intersections are safer for pedestrian traffic, however why there is a traffic circle proposed at Commonwealth is beyond me.	All roads should be designed for 4 lanes, large traffic circles, and where you do install them no pedestrian flow.
Better traffic flow.	Transport truck traffic, farm machinery access.	None	Proper turning lanes		Timing of lights to maintain traffic flow	
Better flow of traffic and less congestion	People learning how to use the roundabouts properly and safely. Issues for traffic if there are accidents in roundabout.	Slow down traffic	High congestion during peak commuting times.	Not sure	Not sure	
Cheap option	Uses too much land. Dangerous option for cyclists and pedestrians.	Safest option for all types of users.	Costly option	None	Using up too much land with roundabouts.	
None.	Too many roundabouts in a row. As a person who travels through multiple roundabouts every single day, I can honestly say that the vast majority of drivers don't use them properly.	This is a safer option. Less accidents with lights rather than roundabouts.	I don't think each of these intersections require a light or a roundabout.	None!	Way too many!!! This will make navigation and traffic backup worse. There is currently no traffic back up at any of these locations. Why change it?	Repave the road. Done. Nothing else. There is no traffic backup there. This is a waste of money for the Region.
Unnecessary	Bloated costs	Unnecessary	Bloated costs	Unnecessary	Bloated costs	Leave it alone. Traffic moves just fine along that stretch
Traffic flow would likely be better. The road would likely be less busy, as people would actively avoid driving through 5 roundabouts in a row, and instead choose a different route.	Concerns of pedestrian safety with all the nearby housing. Having a bunch of back to back roundabouts is annoying to drive through, despite it maybe providing a better traffic flow.	Traffic signals are familiar with all drivers, I have witnessed many drivers that don't seem to know how they are supposed to traverse roundabouts, and have heard others saying they avoid them because of this. Signals for pedestrians.	Peak traffic flow would likely not be as smooth.	As stated in the presentation, this model gets a kind of 'best of both worlds'. Roundabouts at the busiest intersections for traffic flow, traffic lights at the others.	I wonder if another option of a roundabout at Trussler road, and the rest being traffic lights should be considered. As a driver I don't mind when those major intersections of collector roads become roundabouts, but having smaller roundabouts to navigate between then just feels tedious	As I wrote in my earlier answer, I think maybe an option of Roundabout at Trussler-Bleams, with traffic signals controlling the other intersections should be considered.
Better traffic flow as it can be hard to see traffic on Bleams when pulling out of these side roads. And, will slow traffic down on Bleams.	Not sure if this will pose a problem with having bicycle traffic or sidewalks so residents can walk to stores	Sometimes it's hard to see traffic/pedestrians in a roundabout with trees/bushes in the middle of the roundabout, so you wouldn't get this with traffic signals	I would assume more expensive to maintain. More risk of collisions as people run yellow/red lights.	Not sure, I think you should go with one or the other	Traffic signals too close together can cause traffic jams. I'd be curious to review data for Ottawa St between Strasburg and Homer Watson. That seems to work? or not?	Sidewalks and bike lanes?
Continued flow of traffic. Less stop and go. Less noise pollution with Rev up of engines from a stop like at a light.	N/a	Smaller roads will have dedicated lights for turning etc.	Much more stop and start, greater capacity for accidents at a red.	Lights would be great for intersections equally as busy.		Dedicated turn lanes for roads.
The roundabout would be able to best handle any future traffic loads (if nearby areas developed) without having to modify the road and intersections again. The roundabouts will also provide natural areas of speed reduction (drivers slow down to turn through the roundabout), which should be helpful given that the area is a long, straight stretch of a mostly rural road.	Roundabouts can make crossings more difficult for pedestrians and cyclists.	The traffic signals would better facilitate pedestrian and cyclist crossings.	The traffic signals will cause poor traffic flow through the area. With all lights green going down Bleams Road, there is little inherent deterrence for speeding in the road infrastructure. The signals will also likely need future adjustments and maintenance (adjusting light timings, adding advanced turns, replacing signals, etc.).	With a mixture of intersection types, it may be easier for drivers to recognize and remember which streets are which in the area.	The variety of intersection types may increase project costs and complexity. If all of the intersections are of the same type, commonalities between them may make design time shorter and reduce costs.	Add natural features (plants, earth berms, etc.) along the road to reduce road noise for adjacent housing. Bury utility lines along Bleams Road to enhance the road aesthetics and allow for trees to be placed along the road (typically interfere with overhead wires). Ensure there is adequate space along the road given to pedestrians and cyclists. Also, have crossing islands periodically along the road due to the long distances between intersections.
Good idea for Isaiah, donnenwerth and commonwealth as it will keep traffic flowing	Not suitable for intersection of trussler road as visibility is significantly reduced coming from bleams.	If on sensor, could work for residential street intersections. Best choice for trussler road intersection as it is now!				
I would prefer that we have a mixture of signal and lights, the Roundabouts on Ottawa street, and ira needles are ridiculous given the traffic volumes. I would prefer only the inner sections have roundabouts and the major intersection on Trussler on the out markers have signals.	It would become a race track like on Ottawa and IRA Needles.	I would prefer a mix.	I would see that cyclists and pedestrian would benefit from traffic signals on the busiest parts.	I would like to see a hybrid with the outer streets having signals and the inner streets having roundabouts	I would like to see a hybrid with the outer streets having signals and the inner streets having roundabouts	Stop the bike lane nonsense on major arterial roads and develop a bike trails on secondary roads and rail corridors.
Same crap as you did on trussler. Leave the street alone. If anything run 2 lanes each way.	Traffic moving like crap.	Retards still know what each color means and things run well.	No challenges.	None. Just Street lights.	People are stupid, but they most likely understand Street lights.	Yes hire me not the woke, climate change, equality retards you employ now. I will show you how you expand cities and make them work.
speed safety	none	round about is better for flow	safety Roundabout is safer	none	safety	six lanes for future growth
Safety!- since this stretch of road can be long in parts a roundabout would provide safety over an intersection as it would force drivers to slow down before entering intersection reducing chance of serious accident. Living in this immediate area I have seen and been part of close calls as people inch into the intersection to make a turn not seeing those on the road coming at high speed. I fear that lights would be a higher risk for those who could run lights or not be paying full attention to lights. Traffic flow and environmental - less full stops and idling. I think the all roundabout option is the best and has my full support. Since moving from Brampton to KW 10 years ago, I have fully embraced the roundabouts as not only better flow but also much safer than intersections.	Pedestrians in the future for crossings although right now very underutilized for pedestrians.	Perhaps less construction delay initially?	Potential for more dangerous accidents, higher driver speeds on roadway. Longer delays due to red lights vs roundabout Bleams and trussler has a number of long delays already with the traffic lights, having a roundabout would be a significant improvement. Its also dangerous in the winter time with the Blindspot that occurs on trussler heading west when there is a red light and cars stopped on the Downhill section on bleams heading west just before the lights. The hill presents a blind spot and there is sometimes black ice on the Downhill. Roundabout would have better flow and less of a chance of stopped traffic backup that could lead to blind accident.	Good balanced approach compared to all stop lights.	Still have lower flow and safety issues as mentioned before at the top traffic light areas	Walking paths would be really nice for running and biking. The asphalt walking paths just installed on Ottawa street from trussler to sunrise plaza have been a great addition and feel much nicer than concrete slabs. Perhaps some trees on the south side to add a bit of shade to these paths would also be nice. Perhaps work on reducing the Blindspot area mentioned when heading west on bleams at downhill part right before the lights of bleams and trussler. Perhaps a longer lower grade hill approaching this intersection would help this issue.
Definitively a safety advantage, plus flow of traffic should not be impeded by a roundabout	Construction related challenges will occur. Traffic slowdowns/interruptions should be mitigated	Traffic signals only make sense if coupled with pressure plates to mitigate traffic flow	no real challenges except during the installation period.	I do not think it would be advantages to create this hybrid model. There is daily heavy traffic outflow from Isaiah/Donnenwerth/Amand drive.	Could cause unnecessary wait times for out flow traffic from either drive.	The expected increase in traffic flow would mandate Bleams road to become a major thoroughfare with two lanes each for inbound and outbound traffic
Keeps traffic flowing	None, I like roundabouts		Slows everything down!		Again, don't like traffic signals, slows traffic.	
More consistent traffic flow, less delays and fewer serious traffic collisions. Definitely in favour of roundabouts.	Public's lack of knowledge on how to use a round about.	Slow traffic down.	Slows traffic down and will more than likely cause congestion still. Especially if there are roundabouts feeding into Bleams road already.	No advantages. I am definitely not in favour of this.	Inconsistent traffic flow. Usually leads to more aggressive driving to "beat the light" which causes more accidents	Definitely make it 4 lanes wide.
Keeps traffic moving when stop lights allow traffic to back up	Would take up lot of land and traffic issues while construction is happening	Less construction issues	Need to have sensors so light does not go red when there is no traffic as at williamsburg rd and westmount , no traffic on williambusg keeps light on westmount green	Lights would need to have sensors to keep traffic on Trusslers going if no traffic waiting on side street		
None.	That is way too many roundabouts for that short stretch of a road. This will cause traffic backups during peak times.	These would be a great idea, provided detection loops are utilized to only change the lights where there are actually vehicles or pedestrians at the intersection.	Not needed at every one of these intersections. The intersection at Isaiah Drive is blind when coming over the hill from Trussler Rd.	This would provide a good balance to keep traffic flowing and reduce congestion.	Still a very short stretch of road to have so many lights and round abouts along.	Widen to 4 lanes with a centre turn lane.
Roundabouts are generally the answer for what would otherwise require traffic signals. Keeps traffic moving and lessens significantly the severity of a collision.	Trussler/Bleams should be a traffic signal co-ordinated with the one on Ottawa S.	see before	too many traffic signals	see earlier	see earlier	
	more traffic accidents, more speed	better idea - will make people slow down	back up of traffic	good idea - less accidents	problems - Trussler and Bleams NEEDS a light. In the winter, cars still drive too fast and slide into the intersection.	keep light at bleams and trussler - why add to cost?
No advantages. No more roundabouts; City buses, horse trailers and trucks are not able to stay in their lanes and create unnecessary hazards.	No more roundabouts. City buses, tractor trailers, city garbage trucks and people with trailers are unable to stay in their lanes while travelling the roundabout. The roundabout is more hazardous for cyclists and pedestrians trying to cross busy intersections. Roundabouts put more people in harm's way than traffic lights.	clear instructions for drivers easier for cyclists and pedestrians to cross roads	The region doesn't want to spend the money to create safe road conditions. It is more interested in woke traffic planning trends.	No advantage.	Use the same concept of traffic lights down the road. It is clear and be consistent. It is less distracting to drivers. Stop using roundabouts as a means of saving money.	Actual paved bike lanes.
keeps the traffic moving at Bleams and Trussler and also a roundabout at Ottawa and Trussler	only roundabout need it is at Bleams and Trussler should be no challenges	none	not necessary	none	none	two lanes,easy to dr too each roundabout,Trustler and Fischerhallman
An advantage is continuous traffic flow and reduction of traffic speed along Bleams Road. Thoughts should be given to the idea that people currently using Bleams as a "speedy shortcut" may begin to use Huron Road in the manner once the improvements are completed, creating further problems on Huron Road.		I don't see advantages to having the two traffic signals. I think it would be better to have continuous traffic flow with the four roundabouts.	The intersection of Bleams Road and Trussler Road is very busy and hectic, even with the existing traffic signal. I think a roundabout would serve this intersection better. I don't think having four traffic signals along a short stretch of road would be beneficial to anyone. I don't see how the volume of cyclers could compare to the number of drivers and walkers (once the residential community is completed).	As there will be additional residential neighborhoods in this area, it may be beneficial to have traffic signals at Isaiah and Donnenwerth/Amand to assist pedestrians, particularly children with crossing the busy intersection. They will likely be walking across Bleams to existing schools until schools are established in the new subdivisions.	Disruption of traffic flow and many signals within a short span of roadway.	Adding a pedestrian bridge or lighted crossing regardless of options, so that pedestrians, particularly children are safe crossing Bleams Road.
The aesthetic look of round about is preferable to me. I also believe they control traffic flow while keeping the speeds down which will be useful with the new Rosenburg subdivision being built.	I see no challenges with this approach right now. I am all for the roundabouts being installed.	None, i feel speeding would still be an issue on Bleams with this option	I believe Bleams would still have a speeding issue with traffic lights in this section. This creates noise and the potential for accidents which is not preferable as the traffic volume increases.	None	Similar to the second option, i believe not having roundabouts would lead to higher speeds and potential for accidents as traffic volume continues to increase.	N/A
Roundabouts improve the flow of traffic through an area. They tend to be safer with respect to vehicle collisions. Low probability of head-on or tee-bone collisions.	Pedestrians!! Roundabouts are not easily negotiated by pedestrians. Bicycle traffic also find roundabouts challenging. We need more bicycle lanes in the city. How can bicycles safely negotiate roundabout travel?	Much safer for bicycles and pedestrians!	Slower travel but other than that, no real concerns.	No additional comments.	No additional comments.	A totally separate bicycle lane is a must!!

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
Allows for consistent traffic flow onto Bleams Rd from residential streets.	Trussler Rd would be the greatest challenge for a roundabout due to the grade coming from Bleams Rd to the Trussler intersection. A Lighter intersection would be better unless major improvements are made to visibility and grade in that section of roadway.	I don't see any advantage to lights on these roadways.	Traffic lights would cause large traffic congestion on residential roads looking to access Bleams Rd.	I don't see Any advantage to this concept at these streets.	Hybrid models does not work at these streets as it doesn't allow for the roundabouts to do what they are designed to do with is constant and consistent traffic flow.	I would much prefer to see round a-bouts along this section of road as apposed to traffic lights.
The advantage of roundabouts is that traffic wishing to turn across Bleams can do so easily. It will also slow traffic with three roundabouts at housing entrances. A roundabout at Trussler and Bleams would ease a difficult traffic light junction.	The challenges are three in quick succession at Fischer-Hallman, Commonwealth and Donnenwerth.	Non-stop traffic signals so traffic will slow down. Intersections with traffic signals might be easier to add to Bleams and perhaps take less space.	Too many traffic signals in quick succession.			
continuous flow of traffic. No back up of traffic	Pedestrian road crossing	None	Way too much stopped traffic.	None	Any form of lights will cause traffic back log.	4 lanes
Smoother flow of traffic.	Road needs to be widened to allow 18 wheelers to negotiate the roundabouts.	None.	Too long to make a left turn onto bleams especially in rush hour traffic.	None.	Same as before.	Widen the road from Fischer hallman to trussler.
Better traffic flow			The area is already very busy and with more homes being built lights along Bleams will cause significant traffic back up. The slowing of traffic will cause more people to use routes through the subdivisions where many people walk.		Will cause too much disruption to the flow of traffic.	Walking paths
Better traffic movement. Better for the environment (less stop and go, less idling), lower cost	None	Slows traffic a bit better than roundabouts	Congestion, poor flow of traffic, higher costs, larger environmental impact	Keeps traffic flowing but still slowing it down.	None	Think round snouts would best serve those living in the area
The biggest advantage I see is traffic continuing to move as opposed to stopping at signaled intersections.	Pedestrian crossing could be an issue .	None.	Traffic backup and waiting at lights to get onto Bleams. I find the lights at trussler and bleams frustrating.	None	Again waiting at lights is frustrating. I forsee waiting for a green light to turn left onto bleams from isaiah with no traffic coming.	Pedestrian crosswalk at trail crossings. I assume there will be a trail at the hydro corridor.
Minimize traffic congestion and road rage. Active transportation routes and lower speeds. Good long term plan with less disruption caused by hydro etc.	School crossing?	More order to traffic.	More traffic jams caused by vehicles entering and leaving subdivisions on either side or bleams. Issues with speed and bikers not riding safely. Issues with traffic flow and increased accidents. Hydro outages.	Provides two exit areas were traffic will flow freely at slower speeds.	Traffic build up will be huge at lights which will lead to frustration and unsafe driving in roundabouts. Raceway down bleams when both lights are green.	Walk and ride sidewalks instead of bikes on the road.
Better flow of traffic when compared to stop lights	Less ideal/difficult to navigate for pedestrians and cyclists	Easier to navigate for cyclists and pedestrians	Poor flow of traffic	Great option	Same as previous	Lights
Flow of traffic will be better along Bleams Rd, and into and out of the subdivision on the north and south side. This is highly desirable as a commuter road into and out of the subdivisions. Traffic lights will cause too much of a backup in the subdivisions.	Not as much appeal for pedestrians crossing, but I doubt there will be a large demand for pedestrian crossing. It makes sense to have multiuse trails along Bleams Rd on both sides, but not a lot of reason to cross, with the exception of the retail at the corner of Bleams and Fischer Hallman.	The only advantage would be to pedestrians, but as I said before, there is not a lot of reason for pedestrians to cross over Bleams with the exception of the retail at Bleams and Fischer Hallman.	Far too much stop and go in the flow of traffic. This is a commuter corridor for these subdivisions and it is essential for the flow.	None. What you will gain with the traffic flow in the roundabouts will just be stymied by the traffic signals. Horrible back ups in the subdivisions.	Too many back ups of traffic in an essential commuter corridor.	Multi use trails for pedestrians and cyclists along both sides of Bleams to keep the cyclists off the road.
Keeps traffic moving with all roundabouts	None	None	Poor flow of traffic, having to stop and start. Can wait a long time for light to turn.	Bad idea	Wrecks flow of traffic.	With the expansion of housing in the area - definitely clearly labelled roundabouts would be best. Traffic lights and roundabouts are a poor.mix and inconsistent.
None	Dangerous for people walking especially children. Cars barely slowdown.	Cars are forced to stop at red lights for individuals walking.	Backlog of traffic as many lights close together.	Helps move traffic but allows areas for walkers to cross safely.	None	Sidewalks for both bikes and walkers. Street lights.
Plus. Easier to get onto bleams from subdivision	Minus. Every intersection is too much. Will slow the flow on bleams. Every other intersection would be sufficient. Main ones being Fischer Hellman, Isaiah, and trussler.	Easier to cross the street than roundabouts.	Will slow traffic. Way too close together. Cause back ups. On bleams	None	Too close	Double lane!!!!!, round abouts bit not too many, integrate a cross walk in all roundabouts, sidewalks/bike path!!!!! More trees/ bushes to line the streets so it looks prettier and hides the backs of properties.
This is my desired option at this time. Seems logical and should keep traffic flowing	Potential speed issues, lowered speed limit preferred	I don't see the benefit provided the roundabout is configured properly	Wait times at lights on off peak hours	I can appreciate the compromise, maybe if the intersections had smart IoT signaling it might reduce idle time	Ongoing maintenance costs of signal intersections, light pollution	Significant tree canopy, mix of maturity, but a real emphasis on as "natural" as possible given the heritage component.
None.	Stupid drivers that don't know how to navigate them.	Perfect traffic flow.. it's safe.	People running the red lights.	No comment.	No comment.	Two lanes of traffic each way. Bike lanes on each side. Side walks.
slows down traffic and easier to see oncoming cars from the side street (right now, I have to inch past the intersection to see beyond the side trees)	traffic - ie. Ira Needles roundabouts	controlled traffic movement, and easier to turn from the side streets onto a busy main road. Also might be safer for pedestrians and vehicles will tend to stop more for pedestrians than roundabouts.	a lot of waiting and backed up traffic. Turning left might be hard if there is no dedicated light or lane for them			dedicated multi-use pathway/bike lane and/or sidewalk
No advantages	Roundabouts are horrible people don't know how to drive in them. They back up traffic.	Traffic signals are easy to use and everyone knows how to use them.	None	None	The Traffic lights should be at the busier intersections. Roundabouts are not good at bug interactions people do not drive in the properly. They also back up traffic more when traffic is coming from one direction and you can't get in it.	The shouldn't be building all those houses there they are ruining the area. I have lived close by for 16 years now I want to leave because of all this new in needed construction.
No visible benefits since there's a lot of traffic through Trussler Road (traffic light is better), but minimal traffic through the other ones on the list.	Drivers don't know how to properly approach and pass through roundabouts so it's dangerous	See previous comment	See previous comment			Sidewalks
Good. Please make sure its not confusing round about like what we have now at fischer hallman and bleams. 2 lane in 2 lane out ..	As above	Can we stick to one thing only. Signals or roundabouts.. Not both ..	Not good ..	No hybrid pleasr		
More efficient traffic flow, safer intersections and crossings	Construction and road closures	Everyone knows how traffic lights work	Construction, road closures, inefficient traffic flow, deprioritized pedestrian traffic	None	Confusing, inefficient	Multi-use trails, no parking
Possibility of reduced speed pedestrians walking using this route Better traffic flow	If the street and round about is not made wide enough it could result in many car accidents like Ira Needles, disrupting wildlife and met increase risk of accident due to poor visibility around the roundabout, will likely cause more congestion once the speed is reduced as more people will start going this way	- Reduced speed a lot of people speed especially at night and in the morning on this section of bleams - more visibility of pedestrians - More visibility on wild life and opportunity to stop	- if the signal is not monitored or sensed may cause delays in traffic flow	- Better flow of traffic - pedestrians being able to cross safely	- only one I see is if the signal sensors do not predict traffic well and the lights don't not change accurately. Could cause a back log during peak travel times	- consider the wildlife, where is the displaced wild life going to go - wildlife/pedestrian bridges as the city grows we are losing a lot of valuable natural land
Flow of traffic will be faster for those travelling along bleams	It will be difficult to turn onto bleams from one of the smaller streets	Even flow of traffic from all directions	Bleams road could get really backed up this impacting the perpendicular main roads like Fischer hallman and trussler	Not sure	Some people still don't know how to use roundabouts and will speed through. Having traffic signals could cause fender benders if people are not paying attention in the roundabouts	Expand the lanes… roundabouts over traffic lights
I agree to put roundabouts at Trussler Rd, Donnenwerth Dr and Isaiah Dr, but Not to the other ones, it will be too many!	Too many roundabouts will drastically slow traffic, it should be only on main intersections like Trussler, Isaiah and Donnenwerth	No trafic lights, please!	Trafic will be abnormally slow!			Plant a lot of greenery, mature trees! Activa area-is very poor with greenery, streets are poorly planned, there are very little room for planting trees!
Much more smoother traffic flow	Not having clear and wide pedestrian walkway	No advantage	Delayed traffic	Round about is better to keep it consistent	It's confusing and can get challenging for some drivers	Keep it consistent and have wider walkways for pedestrians and lanes for cars. Roundabouts are better option as it gives smoother flow and has better pedestrian accessibility
I like the idea, keeps traffic moving	Construction time building them is difficult	Less accidents	They are needed		I think we need something and am happy with either	Widening it
Flow of driving	Pedestrian crossing. You need to implement some kind of flashing lights when people are crossing to worn the driver someone is crossing as drivers tens to accelerate on or after the round about.	We used to signals. More organized.	Accidents with left turns unless we setup time in the signals for drivers turning left only.	Make more sense and safe for pedestrians especially in the Commonwealth and Donnenwerth sections. Take into consideration people are now crossing from Donnenwerth cross Bleams to use the sport fields on the Church property.	Signals will make travel time longer but it will slow traffic that is going to the round abouts.	Do as many lanes as you can. This area is a huge development area. Traffic will be enormous. Don't repeat the mistake of Ira Needle.
Easier to make left turn with roundabout vs stop sign.	Many drivers do not know how to navigate round abouts	Ease of understanding for drivers and everyone gets a chance to go	Lots of stopping along that stretch of road.			More lights. It is very dark on Bleams Rd.
Slowdown of fast vehicles going from commonwealth to bleams	None	None	Increased wait times	Good time and less wait on less busy streets	None	Add lights on bleams road
There isn't a lot of traffic along that stretch despite the growing community. I don't see a benefit of roundabouts at this point.	Even though roundabouts are meant to slow and control traffic. They also distract drivers. It's much easier to pay attention to driving if you are driving in a straight line.	No benefit. Maybe for someone wanting to turn left out of those streets but there isn't that much traffic along that stretch so I don't think it's an issue at this point.	Sure. Now it will take 20min to drive that stretch.	None	Well you might start to make people angry here lol. This is crazy talk. We need a continuous flow, hybrid isn't it.	It would be nice to have better lighting on that stretch of road. When it's dark it's really dark.
No backlogs	People not do familiar with roundabouts might cause more accidents.	Safer traffic	Large traffic delays during rush hours	N/A	N/A	More lanes will be needed for traffic and please do not sacrifice car lanes for bicycle lanes. We live in Canada!!!!
Bleams and Trussler is a terrible intersection. A roundabout would definitely improve safety and flow of traffic.	None.	Traffic signals were terrible at Bleams and FH. They are terrible at Bleams and Trussler. The foot traffic on Bleams continues to be minimal. Let's do the roundabout. Far safer.				
It will keep traffic moving while naturally slowing down the overall speed of traffic.	It would be challenging during construction	I don't think there are many advantages to lights	It would cause backups on the side streets off of bleams.	I don't think there are advantages to this, it would still create backups on those side streets off if bleams	It would create backups on the side streets off of bleams	Expand it to 4 lanes
Roundabouts when built properly are good and keep traffic flowing	Well the roundabout at Fischer and bleams is so bad. The one side where there was not enough room to put a separate turning lane, but they still put three lanes there anyways is so bad. The lanes don't match up, no one is using it properly. If you build more like that forget it.	It's fine.	There will be a lot of left turning when the other side is done up. If the road isn't more lanes then you will be sitting there for one person to turn left.	Not sure	Depending how close they are, it will block up the roundabouts	Fix the roundabout at Fischer and bleams!!
Keeps the traffic flowing	Weather and slippery conditions	School traffic, easier to make a left	Many cars waiting at the lights and bright lights bothering those who live nearby	Best of both worlds	May be confusing for some	Please add a sidewalk
Roundabout are acceptable only if 2 lines on each way. Otherwise th we y are useless. Ira Needles model work	Traffic way too slow for a very high volume	What traffic signals are we talking?	What type of traffic signals are we talking?	No advantages	Confusing and slow to very slow traffic	Double the lines of traffic, copy the Ira Needles concept
						Please add multi-use trail and safe way to cross round-abouts
I think roundabouts are the way to go. Traffic can self regulate		Side streets are lower volume than beams and may benefit from red light on bleams to exit the community	Doesn't adjust to traffic flow. Waiting on side street for light to change. More maintenance and loss of signal in power outage			
Roundabouts keep the traffic moving well but at a slower speed. There's no idling at lights at an empty intersection and no one racing to 'beat' the lights.	Pedestrian crossing will be an issue if you place the to close to the roundabout as can be seen on Ira needles. This can remedied by placing them a suitable distance from the intersection.	Only benefit I can determine would be dedicated crossing times for pedestrians.	With the increase in lights will come and increase in speed and lack of driver awareness. This is most prevalent with motorist trying to turn right on red.	I would only like to see traffic signal further back from a roundabout to allow pedestrians to cross intersections safely. They would not run unless pressed by a pedestrian or cyclists wishing to cross.	A mix of the two could become overwhelming for all involved and look like an eye sore.	Pedestrian walkways on one side and dedicated cycle track on the other.
None. Leave it alone	Don't turn bleams into another ira needles. That stretch is already a mess.	Traffic lights are better. People respond to them better.	None. Better than roundabouts.			
Traffic will continue to move.	Might be tricky with the hill and visibility.	None	Visibility	Allows for easy pedestrian traffic where needed and flowing traffic where not a concern.	Figuring out where people would actually be walking.	
Ease of traffics flow! RoundAbouts are GREAT	Construction time, they take a very long time to make..		Will holdup traffic	Prefer roundabouts	Prefer roundabouts	Widening the road/maybe paving the shoulder…

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
Roundabouts keep traffic flowing and assist in vehicles being able to access Bleams Road more safely.			Although Bleams Road has evolved over the past couple of years into a road that is not as appealing to back on to as it was six years ago, having traffic signals at the corner of Isiah would make it incredibly unappealing!		Would not appreciate traffic signals at Isiah Drive as per my previous response.	
Having roundabouts at these intersections will make turning onto Bleams Road from the side streets easier during weekday rush hours.	I see no issues.	None	The distance between the intersections are too short and will create a lot of start/stops.	Not sure, I would prefer roundabouts at all 4 intersections	Not sure.	
Quick, easy and modern flow of traffic that abides by recent changes to the city, including the recent addition of a roundabout at Fischer Hallman/Bleams.	Outside of a select drivers who still are unsure how roundabouts work, none.	Always viewed traffic lights to be safer for pedestrians than the constant flow of traffic roundabouts provide.	Unnecessary traffic slow downs.			That hill you drive over while on Bleams heading towards Trussler, if it's all possible, smoothing it out. The length from the top of the hill to the lights at Trussler isn't very long so if there's a small backup of cars, some people slam on their breaks as they get to the top of the hill to avoid hitting the car they didn't know was in front of them.
None. Too many	I don't see any advantages to Four roundabouts. Perhaps only the higher traffic roads and funnel traffic differently to these	Again, too many traffic signals if everyone of these streets has a traffic signal. No advantage	There will be huge traffic buildup, stoppage and eventually avoidance leading to speed bumps and traffic calming measures on smaller streets in the area.	Smoother traffic patterns	I think it will hugely impact other smaller existing streets in the Williamsburg are. Work needs to be looked at in those areas as well, such as calming work and traffic lights for major arteries	None at the moment
Easy flow of traffic. Keeps cars moving, allowing for better flow through community.	None	No advantages.	Traffic is forced to stop, stopping and starting creates more noise pollution. The changing of lights creates unfavourable light pollution For surrounding properties.	None	Traffic doesn't flow easily. Creates lines of stopped traffic in front of homes. Light pollution, noise of cars starting and stopping.	Noise walls or berms for neighbours backing on to the road. FOR THE ENTIRE ROAD. This road is set to become extremely busy and saying no to a noise barrier because it's only a two lane road is ridiculous. The traffic will be dramatically increased for the entire road. Creating much more noise for homes and current no thought by the city to how the increased traffic in this community will affect homes. Affecting the right to enjoyment of one's property.
The new roundabout at Fisher-Hallman and Bleams works beautifully- no more long waits for lines of traffic to clear traffic lights. Really speeds things up.	A roundabout at Trussler and Bleams could be tricky- the sight lines are somewhat impacted if you are turning left from Trussler to Bleams because of the hill, especially if you are driving a small, low car.	Few advantages- lights encourage drivers to try to "beat the light"	The light at Trussler/Bleams works---- and allows residents in the Woodridge Drive area to have a break in traffic to turn north from Knechtel onto Trussler. A roundabout at Bleams, with the huge amount of traffic we see, will not give many openings in traffic to allow an easy entrance to go north from Knechtel.	None. A roundabout at Trussler is not a great idea. We are already impacted by hundreds of transport trucks racing down Trussler towards the expressway--- at least, a traffic light slows them down a bit. With a roundabout, it will be the Indy 500!! .	Way too many interruptions in traffic flow.	The wide walkways on Ottawa Street are fantastic and very well used.
Traffic will flow well	I don't see any challenges	None	Traffic signals aren't the best idea for this stretch as there will be too much stop and go with the lights. Roundabouts allow for better flow	None	None	
Traffic will continue to flow. It currently flows nicely and roundabouts are the best option to keep it flowing	Traffic will, get stopped at red lights for no reason and held, idling (producing emissions) for no reason. Drivers will get frustrated as they are accustomed to traffic flowing nicely along this road, and traffic lights will force a lot of start-stop traffic.	I see no advantages to traffic signals at these intersections. Just use roundabouts	Traffic idling for no reason. Drivers racing against yellow signals to get thru before it turns red	There are no advantages to traffic lights.	Drivers will race the lights to get thru them on yellow so they don't get forced to stop	If you must change traffic flow, use roundabouts so traffic can keep moving. This has been done in Waterloo along Columbia and that road flows nicely.
More fluid traffic flow	Keeping in mind that there will be a library below Bleams, there will be a lot of foot traffic coming down Commonwealth STREET, (not Drive as stated erroneously), I have concerns about pedestrians - many children - attempting to cross at a roundabout in that area.	I believe that a traffic light would be safer at Commonwealth and Abram Clemens, keeping in mind the number of pedestrians crossing through there.	I believe that roundabouts would be fine in any area with lower pedestrian traffic.	There should be no roundabout close to the library - obviously Commonwealth and Abram Clemens keeping in mind foot traffic.	I see no challenges if the proper intersections have lights (Commonwealth and any other high foot traffic area)	
I can see having one at Bleams and trussler but not the other side streets. The turning lanes seem to be working just fine at the moment. However it might slow traffic down.	I don't see many challenges other than potentially more work that needed.	Slow traffic down and if walk ways are put in it will allow for safer crosswalks.	Congestion	Pretty good solution. I don't see many advantages.	I dont see many challenges either	Walking paths. I often run down beams and it is not safe at the moment.
Roundabouts offer a consistent flow of traffic. They also prevent direct head on collisions.	When they are not built correctly and allow people to essentially go straight through without yielding or slowing down. Or when a stop light is installed near by causing a block in traffic flow and backing up the roundabout.	None	Many challenges. Reckless drivers running lights. Increased aggressive driving behavior because of the constant start/stop/race mentality. Longer and more dangerous turn times due to light timings. Longer waits on side streets for the lights to change.	none	many, it breaks the flow of traffic and causes a backup with no benefit.	remove the light at trussler and replace with round about.
Roundabouts work well and are efficient from the standpoint of continuous traffic flow. Also, fewer greenhouse gases are produced because there are no stops, idlings and starts. We've had roundabouts in the region for quite some time so citizens have become used to them and generally know how to navigate them.	Roundabouts present challenges for pedestrians and bicyclists. To counteract this, I suggest separated bike lanes and islands for safe pedestrian crossings. These islands should be located in a place where motorists can see and respond safely to bicyclists and pedestrians - not as part of the roundabout where motorists are focussed on traffic as they go through the roundabout.					I would suggest that active transportation also be considered as an essential way of getting around. Separated bike lanes, wide sidewalks and safe, convenient crosswalks and/or islands.
Less waiting time for red lights. Moves traffic along quicker	Could slow traffic down if adding one at each of those intersections. Maybe coukd only add to the busiest intersections?	Could potentially make left turns into bleams safer	Again will slow traffic	None, I don't like this idea	Traffic lights are annoying and more dangerous	Add a round about at bleams and trussler, it gets backed up with the light
Continuous traffic flow	Pedestrian and cyclist interaction if properly sized roadways for them are not accommodated	I think this would reduce driver speeds. Probably better safety measures for pedestrians and cyclists.	Traffic backup on the side roads trying to enter Bleams	I think the concept should be either all Option 1 or Option 2.	I think this option would cause traffic snarls beyond the Trussler and Fischer Hallman intersections.	I would like to see a separate, defined sidewalk and bicycle path. I am not in favour of bike lanes integrated on current roadways.
Traffic will generally flow smoothly down Bleams. This will also be an advantage for cyclists heading east (downhill) on Bleams, since they should be able to flow though traffic circles instead of stopping at lights.	None	Less disruption to Bleams traffic flow when there is little traffic on side streets (lights should stay green on Bleams). Safer for pedestrian traffic to cross Bleams.	Generally more disruptive to Bleams traffic flow.	Same as the all stoplight comments.		Dedicated bike lanes would be good. Due to the large hill, eastbound cyclists move fast, so a mixed-use pedestrian path probably isn't the safest option. A mixed-use path on the westbound side is probably OK.
A roundabout is a good idea, as long as it has at least 2 lanes. The high traffic volume on Trussler in both directions could seriously impede traffic exiting Bleams onto the roundabout, whether drivers are going left in the roundabout ot right onto Trussler. Backlog of traffic on Bleams could be huge.	Any of these streets that are not through streets (such as Bleams) would have same issue as stated above.	With traffic lights, all drivers would be able to move forward when their green light comes, regardless of traffic volume on Trussler.	Too much traffic on Bleams for the intersections to handle, resulting in traffic jams in both directions.	This would allow drivers to exit onto Bleams, with expected time delays.	Mixing the two concepts may not work well, since some of these streets are relatively close together along Bleams. The advantage of roundabouts increasing the flow of traffic may be negated by being forced to stop at a traffic light not too far down Bleams.	Speed limit on Bleams between F.H. And Trussler should be 50klm per hour.
I like it. Consistent for the neighborhood, discourages speeding, and heavy trucks. The situation at Bleams and Fischer Hellman with 3 lanes is brutal though, so I'd hope for better lane marking out the gate.	Lane markings are currently very poor. As is the snow clearing in the outside lane. Keeping it simple with 2 lanes and a wide mixed use trail (rather than turning lanes) would be helpful.	I like the idea of dedicated yellow push buttons for pedestrians and mobility assisted folks. But not for vehicles.	Who the hell wants traffic lights in residential areas these days?	I'm not sure. I'd prefer to see all-roundabouts	There's nothing more annoying that coming out of a roundabout and onto a red light. See Sunfish plaza for reference.	It's a nice rolling road .. would love to see a mixed use trail. Not sure a bike lane would help or just be a death trap for the many local kids.
Smoother traffic flow. The entire region is familiar with roundabouts.	Snow clearing, especially if bicycle lanes are present.	I do not see any advantages for this.	Slower traffic flow. Environmental impacts of idling to wait for the lights to change.	I do not see any advantages for this.	Slower traffic flow. Environmental impacts of idling to wait for the lights to change.	Ensure good street lighting and side walks.
Roundabouts keep traffic flowing. Less high speed collisions.	More low-speed collisions, a lot of Kitchener drivers don't seem to understand how roundabouts work.	Lights are easier for people to understand. Less chance of any collision occurring.	Slower traffic when you hit lights. Might have one car turning off of Donnenworth for example and be stuck on Bleams waiting for the light to change for just one car.	Really don't like the hybrid idea, as traffic can get bunched up I the roundabout possibly when the lights on Bleams are red.	Really don't like the hybrid idea, as traffic can get bunched up I the roundabout possibly when the lights on Bleams are red.	If roundabouts are implemented, reduce speed.
The more roundabouts the better in my opinion. They're faster and safer.	It will be important to ensure pedestrians are safe, always a challenge with roundabouts.	No advantage to me. That will way slow down my drive through to Trussler or back.	That would be way slower. For many years this has been my pleasant shortcut from my Country Hills neighbourhood to get to Trussler and down to University without all the stoplights of Westmount or Fischer-Hallman.	Better than all stoplights I suppose if a stoplight is necessary for school crossing or something like that.	To me stoplights along the route will just bunch up the traffic flow of the roundabouts instead of a consistent flow of traffic that all roundabouts affords.	Big shoulders for biking, and an efficient traffic flow to connect to Highway 8 to Stratford and Goderich area. I try to avoid Fischer-Hallman's shopping traffic so get on the highway at or beyond Trussler.
Not much	I'm worried about more accidents happening due to people not following roundabout rules	I think traffic lights will work better	.	I don't understand how this would work	See above	No
Yes roundabouts	Uneducated people	No traffic lights. Theyre ancient and provide no safety or efficiency	Literally the worst thing you can do is add traffic lights	Only roundabouts. People just need to educate themselves and itll all be fine. Roundabouts and street lights dont work well together. Ie bleams and fischer halman	Whats the point of having both literally makes 0 sense.	
Improved traffic flow with roundabout Vs lights.	None	None	Would impede traffic flow. One still may be required at Trussler	None	Traffic back up into roundabouts This is going to be a busy route with all the development. Any lights need to be tripped by vehicles on the side roads	Make it 4 lanes right away…. Unlike what you did with Ira Needles
I agree with roundabouts at every intersection except Bleams Rd and Trussler Rd. The flow and speed of traffic along with the visability on both Bleams Rd and Trussler Rd due to grade of the roads. Roundabouts at every intersection (with the exception of Bleams and Trussler) would allow anyone entering onto Bleams when traffic flow is minimal, easy and quick access.	The intersection at Trussler and Bleams has limited visibility and much higher traffic flow at not only peak times but continually thru out the day. It has become a major route for the bedroom communities of Ayr, New Dundee and Plattsville as well as access to the 401 via hwy 97. It should remain a traffic light controlled intersection	I don't feel the traffic flow on Bleams Rd warrenty traffic lights at intersections other then Trussler and Bleams Rd. I feel the traffic would be controllable efficency at all times of the day with roundabouts	I don't feel the traffic flow warrenty traffic lights. Traffic lights would have traffic sitting waiting for green lights when there is no oncoming traffic. I also feel drives would spped more trying to catch a green light or to run a yellow, whereas I feel roundabouts , if properly constructed would keep speeding to a minimal.	Bleams Rd is a fairly strict section of round. Traffic lights will slow traffic flow down and as I mentioned in previous question, people tend to speed up to catch a green light or to run a yellow light..	Mixture of traffic lights and roundabouts will cause traffic flow problems, speeding and noise as large trucks spped up and slow down. Bear in mind this road is directly in homeowners back yards	I would suggest the road be constructed as four lanes. The cost would increase the project now, but when it is necessary to do it in the future it will be minimal triple the cost..
Improve traffic flow as well reduce speeds along corridor	Bicycles or Pedestrians wishing to cross Bleams road		traffic congestion - vehicles speeding to make lights	allows pedestrians and bicycles to better cross Bleams road.	Adding lights in between a series of roundabouts causes frustration with drivers and traffic becomes travelling in packs which reduces the effectiveness of roundabouts.	Bleams road is being extended at the east end, a reference was made in your presentation to a "recent" traffic survey - however in the past 3 years there were a number of road construction projects (Trussler/Ottawa Rd, Fischer Hallman/Bleams) that forced commuters to find alternate routes from using this corridor. I fear that Bleams road will become a main east/west corridor in the south end of Kitchener, I question why Bleams should not be 4 lanes all the way to Trussler.
It would keep the flow of traffic going and would slow down the people who speed up Bleams every day.	Construction would cause delays and force more traffic onto my street (Helena Feasby St.)	Slow traffic down and give people a chance to turn onto Bleams roads especially when traffic is heavy.	None that I can think of.	Gives people a chance to turn onto the busy road at the lights while still having traffic flow from the roundabouts.	People not stopping for the lights (confusion about the mix of lights/roundabouts). Happens all the time at the flight after the roundabout on Fisher Hallman at the Food Basics	Turning lane for Helena Feasby St when coming from Fisher Hallman. We are the only road that doesn't have one and people tailgate and get aggressive when we have to slow down for the turn.
Roundabouts keep traffic moving. It's the best way for this large city. Get rid of lights which bog down traffic. Cars don't have to sit for 2-3 min idling which is causing more pollution.Be smart and install more roundabouts.	The only challenges are drivers that don't know how or don't care how to use them.If they are marked properly there shouldn't be a problem. It's the idiots that go too fast and don't look. I love roundabouts.	There are no advantages to traffic lights.	Traffic doesn't move. A waste of gas idling at lights.	What's a hybrid concept? Don't confuse ppl with this hybrid concept, whatever it is.		Keep it 4 lanes to keep traffic moving.

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
I feel roundabouts are better option than traffic lights, in order to keep traffic in all directions moving.	Acquiring land	Other than perhaps easier to install, none	Slowing down traffic on major artery (bleams) for lighter volume of traffic coming out of residential area.	Nine	Smooth sailing thru roundabout, only to be stopped by light at next intersection.	Should be 4 lanes all the way thru to trussler. With bleams being extended and I believe ultimately connected to river road, will become a much busier road, which I presume was considered I. Traffic study, but still seems odd not to wide. To 4 lanes all the way to trussler.
The movement of traffic as well increase site lines for cars and people	completing the work with limited interruptions to traffic	traffic signals are good for people not for cars, the roundabouts get cars to slow down and pay attention	rules being followed	no advantages to much change for cars and people	again no advantage	just increase site lines the road right now is dark and can be hard to see intersections
It keep traffic moving smoothly	It is too dangerous for pediastrians and cyclists to cross	More waiting at red lights	safer for more pedestrians and cyclists	There are distinct gaps created by the lights which makes round about use easier for all modes of transportation	none	Please add in bike lanes
Roundabouts will make it easier for people coming from these streets to get onto Bleams Road especially once the housing subdivision is built and traffic increases	These roundabouts need to be built with 2 lanes and please no trees in the center as this makes it impossible to see the traffic approaching	I do not see any advantages to traffic lights at these intersections. It will slow traffic on Bleams Road and create the situation of people racing through yellow lights and cause accidents.	Traffic lights will slow traffic on Bleams Road, making drivers impatient, going through yellow lights and once traffic increases with the new subdivision, it will frustrate a lot of drivers. Also stopping at numerous red lights contributes to air pollution through idling.	I do not see any advantages to a hybrid concept. All roundabouts like on Ira Needles to keep traffic flow moving is the best option.	It makes no sense to do a hybrid concept. Drivers will get impatient with traffic lights and the flow of traffic will slow considerably especially with the new subdivision traffic added to the mix.	There need to be street lights on Bleams for this section as it makes it difficult to see late at night.
Smooth traffic flow.	Speed disparity between Bleams and side streets may have a two-way stop effect.	Safer for pedestrians.	Potential for t-bone collisions, slow traffic flow might push people to drive through the subdivisions instead of the regional road as intended.	No advantage.		Properly maintain the road. The entrance from Bleams to Isaiah has been crumbling for years now.
Better traffic flow with reduced delays	causes too many issues for cyclists. Also, too few people in Waterloo Region (as well as visitors) know how to drive in roundabouts, especially multi-lane roundabouts as nobody signals and there is no traffic law enforcement	slows down traffic as too many drivers think that multilane regional roads mean that they can drive whatever speed they like	There are many drivers of sportscars, SUVs, pickup trucks that have no consideration of nearby residents (i.e. revving engines when stopped at traffic lights, loud music & bass on entertainment systems, rabbit starts at traffic lights hen light turns green) causing excess noise with no traffic law enforcement	same advantages as outlined in both of the previous concepts, just not to the same extent	same disadvantages as outlined in both of the previous concepts, just not to the same extent	- lower speed limit to 40 kmph as there is no way to ensure that there will be sufficient law enforcement to control speeds since many people drive 20kmph above posted limits - lobby provincial govermnent to change laws so that cyclists do not need to dismount to go through roundabouts - ensure that police enforce safe driving in roundabouts - change bylaws to force cyclists to use cycling lanes and prohibit them from riding on pedestrian walkways so that it is safe for pedestrians (particularly young children and elderly adults)
Less stoppage time and traffic interruptions	None	None	Traffic delays and congestion	None	Lights traffic and backup delayed travel	
Ideally it would provide better flow of traffic	Realistically no one knows how to properly use roundabouts. Entering, exiting, signaling. None of it. It's very frustrating. Also, when there's high volume of traffic, there's a lot of back log which would be better solved by traffic lights.	More people know how to use traffic lights.	None. It would be safer for pedestrians as there's a definite time for cars to stop which would allow people to cross safely		The light right before the roundabout at Fischer Hallman/Bleams doesn't make sense and when there is high volume, the cars are backed up from the roundabout to the light. Doesn't make sense	It would be nice to have a street light at Donnenwerth and Bleams. And possibly at the other entrances into the subdivision. Two lanes would be nice too. I really hope the speed limit isn't lowered but I'm assuming that it would be if there are going to be several roundabouts or lights installed
flow through of traffic based on traffic intensity and not random wait times	They need to be large enough to support a smooth movement of traffic. Not the tiny ones that we have at Max Becker or the Ira Needles ones but more like the Ottawa street one. If there are pedestrian crossings they need to be made either before or after the roundabouts. Pedestrian crossings in the middle of roundabouts are dangerous and very difficult to stop for without someone hitting you from behind if you suddenly brake. most people don't bother to check for traffic and just step in the roundabout crosswalk.	I don't see any	mostly just wait times increased. randomly waiting for a light to turn green even if a single car is passing in the opposing lane	for higher traffic areas, a roundabout is more suitable. i wouldn't choose a traffic signal	two systems of traffic management become frustrating. easier to stick to one system so we don't have to adapt to multiple ways of management. however they need to be large enough to accommodate traffic as stated before. if there isn't enough room for a larger roundabout then a traffic light would be better.	A wide asphalt side walk for bikers and pedestrians so driving lanes aren't overtaken by useless bicycle lanes that maybe one person uses out of the day. Or we have to spend our hard earned money on useless orange construction drums that need renting for 500K a month. The council better think hard about how to spend our tax dollars or say goodbye come next election. Larger sidewalks like the ones on FH- or Ottawa St. S are used widely and are safer for cyclists and pedestrians alike.
In my experience around the region, roundabouts work well and traffic moves fast without major back ups.	Safety for pedestrians - drivers don't look out for them enough.	none, prefer roundabouts	Huge back-ups of traffic.	Prefer roundabouts at all, so still not much advantage to lights - it takes longer to get out of left turn streets etc.	More traffic in areas with lights, less smooth driving experience.	Safer pedestrian crossings around Donnenworth, for students who walk to school daily around this busy intersection. Both traffic lights and roundabout crossings alone are still unsafe because drivers don't see pedestrians soon enough.
Advantages may include a safer environment for motorists, higher traffic throughput, and lower maintenances costs.	Challenges may include a more dangerous environment for pedestrians and cyclists crossing at the roundabout.	Advantages may include a safer environment for pedestrians and cyclists crossing at the intersection.	Challenges may include lower traffic throughput, more dangerous environment for motorists, higher maintenance.			heavily prioritize pedestrians and cyclists, make lanes narrower and create an environment where motorists feel unsafe driving at higher speeds.
Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Bleams Road should be used to quickly connect the East (Fischer-Hallman Road) with west (Trussler Road), and it should not be made a local road with lots of roundabouts and traffic lights. Stop signs from the local roads to access Bleams (as-is) should be fine.	Make 2 lanes per each way
	I already submitted but thought of another factor you need to be aware of. Heading north on Trussler, the intersection at Ottawa often gets backed up during evening rush hour all the way to or past Bleams; converting Bleams and Trussler to a roundabout would make even larger traffic jam backing up cars back on to Bleams (cars trying to make either right or left turn onto Trussler from Bleams would not get much chance except perhaps through zipper effect if other cars already in the roundabout are kind). The Ottawa intersection needs a separate left turn lane and perhaps also advance left turn and possibly longer light on the north-south path. (ideally it would become a roundabout, this was a huge missed opportunity when that intersection was redone a couple years ago). I'm in support of converting Bleams and Trussler to a roundabout but this issue from Ottawa-Trussler would need addressed to avoid even bigger traffic issues during peak times.					
I don't think one is needed at Isaiah since there's a turning lane there. But I love the idea of the one at commonwealth. It tricky turning left on Bleams after school.	Just that it will take forever to build	It will help with the after school flow for the one on commonwealth	That's too many lights. If they are timed bad, it will take forever to get through bleams all the way	We need a street light at Bleams and Helena Feasby!!!	Nor really sure what this means	Bleams would be great of it was 2 lanes each way. We NEED streetlight at Bleams and Helena Feasby. It's impossible to see the Helena Feasby turn at night. A turning lane turning right on Helena Feasby would have been helpful. Super disappointed that one wasn't made during the recent construction.
I do not see any advantage in such an expansive project, a regular traffic light will be better.	Increase of car accidents, use of more land to build a roundabout	Cheaper, safer, easy to build and manage.	None	None		No more roundabout in the region, there are too many and they have proved to be dangerous
Round abouts will keep the traffic moving.	Due to the high speed limit and the future library in the new development, pedestrian crossings with signals would be best. (The overhead ones, not traffic lights).	None	Slow moving traffic. More people turn left onto bleams In the morning than the other way and the roads onto bleams will be backed up with lights	No. One or the other.	Poor traffic movement	Place pedestrian crossings a bit further back from the round about so car can actually stop when they turn the corner. You can't see the pedestrians when turning left and leaving more room to stop will improve traffic flow. Add overhead lights at the main crossings that we'll be commonly used (near library for example) to increase visibility.
It would prevent people from speeding, but would also keep the track flowing.	I don't see any challenges.	I don't see any advantages.	Too many traffic lights in a short distance, doesn't keep traffic moving. Cars left idling while waiting for lights. Would be noisy.	I don't see any advantages.	Too many traffic lights, need to keep traffic flowing. Don't want traffic lights at Isaiah Drive at all.	Proper pedestrian walk-ways along Bleams road.
Roundabouts would be great and slow down traffic on Bleams.	None. Please do it.	Too much disruption for traffic flow. Especially if you use sensors.	Traffic lights at Trussler and Bleams are a must. Traffic coming from the west is difficult to see.			Expand to 4 lanes from Trussler to Fisher Hallman
None unless they aren't marked properly like fisherhallman and bleams	No	Less accidents than roundabouts	Longer wait	Defeats purpose of traffic flow	Either do 2 lights or 2 roundabouts	
lower speeds	traffic delays, congestion and backing up traffic at Trussler and Fischer Hallman roads	less disruption with construction and maintaining similar traffic flows as present	no challenges	reduce traffic speed with roundabouts and allow for traffic signals in between	challenges with bottle neck of traffic at Trussler and Fischer Hallman roads	please consider the significant disruption this will cause to those residing in these neighbourhoods during construction. We are still in the midst of a pandemic with many working from home. The ongoing disruption with noise and pollution is challenging at best.
Roundabouts keep the traffic flowing, are proven to be more cost effective and safer than lighted intersections and are not effected by power outages.	No challenges whatsoever. Drivers in the region are now used to roundabouts, so there is no learning curve as when they were first introduced.	None, slows traffic, gives an unbalanced higher right of way to the less travelled direction, are effected by power outages and are more costly to maintain.	During off peak, Bleams traffic will be waiting for lights to change when there are no cars present. Cost of installing and maintaining that number of traffic lights.	None, one of the other, traffic moves freely through the roundabouts and come to a halt at lighted intersections.	Synchronizing the lights. It seems to be a massive issue in the rest of the city/region, so why would it be any different on Bleams.	Please go with the roundabouts, I'm sick of sitting a lights when there is no one going in the cross direction.
I think roundabouts are great and feel these intersections are suitable.	Would have a concern if there is a school crossing in these roundabouts. Possibly something safer.	None, accept for pedestrian and cycling safety.				Bike lanes

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Apparently roundabouts help move cars so that is the advantage. It is better than sitting at a red light for a minute at midnight when there is no other traffic.	Roundabouts as I have seen in this region are dangerous for bikes and pedestrians. It seems people speed through roundabouts making it dangerous for all users. It is hard to get into the roundabout when driving, it is dangerous for pedestrians because they can be easily hit. I never see bikes in roundabouts and I would never bike through one. Pedestrian crossings are in the worst possible spot: A driver is trying to enter the roundabout and just about everyone is speeding. (At least that is how it seems to me.) So the driver's attention is fully engaged. The driver zips into the circle, moving fast because of speeders…then you slam on brakes because there is a pedestrian crossing the circle. A driver can't watch for oncoming cars in 2 lanes and turn the other way looking for pedestrians. Pedestrian crossings need to be away from the roundabouts. But I also get why they are placed where they are. Are roundabouts are terrible, terrible for pedestrians.	Good for pedestrians and bicyclists. At least better than roundabouts.	Will traffic pile up at rush hours? Is there a better way to do traffic lights? Can cars be sensed via radar (or some technology) and have the lights change as per actual traffic?	Better than all roundabouts. The traffic lights will be better for pedestrians and bicyclists.	The speed limit on Bleams is way too high to use roundabouts. A driver could not stop in time for pedestrian who is in the crossing. I can't imagine ever entering the roundabout when cars are whizzing through at 70 k/h. And they will (try).	Make it walkable please.
We are a little concerned with the trussler intersection being it's at the bottom of a hill when coming on Bleams.						We like the roundabout option.
Flow of traffic would generally be improved.	Would inhibit pedestrian use and safety would be a concern. Roundabouts work great with few cars. With many cars using they are still slowed down. Not that efficient as a result.	Safety factor for pedestrians as cars are forced to stop.	Can hinder flow of traffic with too many lights.	Adds roundabouts at the entrance but allows for safe use by pedestrians. A good compromise for cars and pedestrians to use.	A slower traffic flow but safety of pedestrians should trump traffic flow.	No
Roundabouts would be good at Isaiah, Amand, Abram Clemens with the limited coming out and going in to those streets	Trussler is busy road at rush hour times with moderate traffic at most times. It is a major route for people to get to the expressway. Carries a lot of gravel trucks and construction vehicles. The gravel pits on Bleams are going to be active for many years to come according to the posted signs showing yet to be mined. Trucks loaded heading for Trussler need a roundabout at Isaiah to keep their momentum up as they climb the hill but need a light at Trussler. Traffic needs to pause at Donnenworth to get the speed down but all others could be roundabouts as the road flattens.	Answered in the previous question	As in #3	As describe in previous	Signals at Donnenworth to slow traffic from Trussler	There needs to be a wide paved path on the north side for bike lanes plus pedestrian lanes separate from the roadway all the way from Fischer Hallman to the Romanian Church but only the north side. Truck traffic needs wide lanes and I think the road should be four lanes from Fischer Hallman to Trussler from the get go for these heavy loaded dump trucks with the road built to withstand the loads.
Roundabout are a great way to ensure traffic flies at an optimal rate. I think they are absolutely the way to go. Plus, with more roundabouts in the region, more and more drivers are getting experience with them and how to use them more correctly.	Roundabouts are definitely geared more toward vehicles than pedestrians. So pedestrian safety might be an issue. I would like to see roundabouts put in that have added amber strobe lights like pedestrian crosswalks have. When. A pedestrian approaches to cross, they push the button, activating the strobe lights. This really helps drivers know that someone is crossing, especially when it is dark out.	Slows and sometimes stops traffic completely. I don't see any benefit to traffic lights other than it halts traffic completely.	Increased travel time, plus it would make pedestrians have to wait for a light to change their way as opposed to being able to just cross if there is no traffic.	This "compromise" of having both would actually be worse than going one route or the other. It allows flow of traffic with roundabouts, but then stymies it with traffic lights.	Makes for a convoluted approach to traffic and pedestrian movement.	I take it you will be also expanding to two lanes in each direction. With the new development, let's not have an ira needles situation where you should have made it two full lanes in each direction from the get go, instead of having to add lanes after original construction. Let's get it right from the beginning. Also as I suggested, let's put amber strobe lights on the roundabouts to ensure visibility and safety for all.
Roundabouts work well and move traffic efficiently, they seem like a decent option for this area with the potential exception of Bleams at Donnenwerth	Presently there is no way for school children moving down Periwinkle to cross Donnenwerth other than walk all the way to Activa or cross at Bleams and Donnenwerth. If a roundabout is installed at Bleams and Donnenwerth (which are not pedestrian friendly) I think there needs to be a Pedestrian Crosswalk installed between Perriwinkle and the walking path leading from Donnenwerth to Copperleaf. Presently there are no good options for the many school age kids crossing Donnenwerth here, I walk with my daughter everyday this way and I fear for her and other kids safety crossing this street which kids are funnelled towards by way of various walking paths. I worry how a roundabout will affect this already precarious situation.	I would prefer roundabouts and there benefits with regard to collision speed and traffic fluidity, with the exception of perhaps Donnenwerth and Bleams where I am unsure whether traffic lights or a roundabout would be best with regard to pedestrian traffic funnelled to a dangerous crossing at Donnenwerth by way of existing walking paths.	Traffic would move more fluidly with roundabouts, with the exception of the above mentioned concerns at Bleams and Donnenwerth	This may be a good option with regard to pedestrian traffic to Williamsburg elementary and the potential of a future sidewalk along Bleams.	I am not sure I see a downside to this potential solution. It may address my concerns if there are lights and a crosswalk at Bleams and Donnenwerth.	
I hate roundabouts	People crossing , speed going thru, people don't know how to go thru	People crossing. safe especially kids	None	There are way to many people crossing on foot due to the conservation area. People driving don't pay attention!!	Pedestrian crossing especially kids	Give it a middle turning lane
movement of traffic is streamlined and flows more naturally.	I'm worried about visibility of seeing who is approaching in the round about. The current signal at least addresses this by stopping traffic and being elevated to be seen when cresting the hill.	None	Very traffic light heavy if done on the entire stretch. Why would streets not be off set so as to not create 4 way intersections at every meeting with Bleams?	Perhaps a more balanced approach to traffic flow if priority is given to traffic flowing through Bleams similar to how the intersection at Century hill or Thistledown (with Bleams) function.	Unsure	Shame not to ask about the cycling infrastructure or trails given the huge amount of space to accommodate it along this route. Please do keep the paths as a part of the plan and extended it down Bleams to reach Strasbourg Road as this is a great opportunity to build a feeder path system into the Kitchener Core.
Improved traffic flow. Less pollution since cars will not be stopped at red light idling.	None	May provide easier pedestrian crossing.	Waste time and more pollution when car sitting idling at extended red lights, especially when signal is not "smart with no AI" and changes to red for your car even though there are no cars coming the opposite roadway.	None	Confusion for drivers when not consistant with having only one type of traffic flow on same road	Dedicated shared asphalt bike and walking lane on both sides of Bleams (like have on Huron)
Roundabouts are great at the edge of town like this for allowing traffic to flow naturally.	As mentioned in the presentation the roundaouts we see in the region are quite poor for vulnerable road users. Cars travel too fast to reasonably yield to other traffic modes, due to the geometry of the intersections. I believe the solution is Dutch-style roundabouts, with restricted car space and with setback for protected bike and pedestrian crossings. Please consider a design like the Dutch-style roundabout being planned for Huron and Strasburg.	Good for Accessible Pedestrian Signals	Encourages too-high speeds during green lights. Can cause traffic to jam with increased volume.	Less roundabout fatigue than going through 4 in a row	Green lights will encourage high speeds in the main residential stretch	The Region has a chance to make Bleams a great active transportation corridor for city cyclists looking to access country roads. Please see if you can implement Dutch-style roundabouts and set a good example!
As a last resort, roundabouts are ok. I however do not like any green space used for this.	Holding up traffic is always a concern.	Traffic lights always hold up traffic but not as much green space used.	Holding up traffic	I suppose this would be ok	None	As always, roads need to be kept up by keeping pot holes and paved. More money needs to be spent on all roads. If the city wants more houses, then keep up the roads.
Traffic flows more freely.	No challenges	Safer	When not busy, wasted time waiting for green light.	Traffic flows more freely and safer with lights.	Wasted time when waiting for greenlight and in times with low volume of traffic.	Repave the road to fix the condition of the road and consider having two lanes at points of turning off Bleams road to reduce traffic slow down for through traffic travelling 70km/hr.
Less stopping	Pedestrians crossing	Safer Pedestrian crossing	More stopping for cars and traffic			
Honestly, I don't see any. I don't feel it makes traffic flow any better.	They take up a lot more room and are more dangerous for pedestrians. The way the city currently constructs them makes it difficult to see vehicles on the other side of the roundabout making it difficult to anticipate oncoming traffic and makes it impossible for people to walk across them. You essentially have to hope the cars will see you and stop. This is very tough even for drivers when the curve of the roundabout puts the crosswalk right behind the a-pillars of the vehicle making it hard to see people wanting to cross. I think it is confusing that they would build them to a larger scale and use paint to reduce the size in the interim. We've seen how poorly this can go at other roundabouts where they've built them to one size and then adjusted them later. The population also doesn't know how to use them properly. While accidents are less severe they seem to happen a lot more as people cut each other off and don't enter and exit the roundabouts properly. In my experience, they also don't slow people down. Drivers who would drive fast regardless, will go too quickly through roundabouts as well. As well, if one portion of the road is typically busier than the side portions, drivers can sometimes have to wait long periods of time for an opening to go through the roundabout, slowing them down and making them consider more risky driving methods to force their way into the roundabout and the flow of traffic. Roundabouts are also more hazardous for winter driving since they tend to be harder to plow and slippery since vehicles are always in a turn.	They make it easier for pedestrians to use the road and go between neighbourhoods. They guarantee drivers will get to move through the intersection at some point - with roundabouts you can sometimes wait long periods of time to move through it depending on what portion of the road has more traffic. They take less time to install and construct. Feel easier to plow and maintain in the winter. Would help make it easier to turn out onto Bleams road from the side streets. Sometimes with just the stop signs drivers can wait a long time for an opening to turn.	Can cause more severe accidents. Make people drive a bit faster (though people tend to drive fast on Bleams road already).	Would help create a better flow for the smaller intersections in-between where it can be tough to find an opening to turn onto Bleam road. Too many roundabouts is tiresome and exhausting - just look at ira needles. Having a combination would help lessen the burden and issues that a whole road of roundabouts comes with.	The lights can back up the roundabouts on either end when they are red. This currently happens now with the one they built at Fischer-Hallman and Bleams. Makes crossing for pedestrians only possible on the side streets and not the main intersections. People might not adjust their speed appropriately moving through the two types of intersections. *See previous comments about issues with roundabouts in general and the way the region currently constructs them from the first question. If they feel they want to include roundabouts in the city, more care needs to be taken when designing them so that they are safe for everyone not just vehicles. Europe has been designing them safely for years and know that separate crosswalks further up the road are the best way to allow pedestrians to cross the road safely. The region should take note and consider installing separate crosswalks away from the roundabouts, possibly with a button people could press for a flashing light so vehicles can see them better. There is something like this on Park Street that runs through Victoria Park. They should also stop creating humps and large greenery in the middle of the roundabouts. They re not supposed to be pretty. They need to function effectively and safely.	I believe until roundabouts are created properly and safely for everyone and drivers are properly educated on how to use them that traffic lights are the better option. Roundabouts are also not as easily maintained in the winter which is a major concern for me when accidents are more likely. I think regardless, expanding Bleams road to four lanes (two each way) is a good idea. Even four-way stops would be an improvement to start as the new neighbourhoods grow.
Reduce traffic and encourage drivers to slow down when goes through the roundabouts. This could reduce noise level to nearby homes on Bleams during rush hours.	No challenges but needs to be warning signs and lights around the roundabouts.	No advantage, this will increase traffic in the area with more subdivisions are being built in the area.	Create traffic on Bleams.	Prefer no traffic lights.	Prefer no traffic lights on Bleams as it will slow the commute down for some of the neighbours.	Increase lighting on the road.

Q1 - What advantages do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q2 - What challenges do you see with the concept that has a roundabout at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q3 - What advantages do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q4 - What challenges do you see with the concept that has traffic signals at the intersection of Bleams Road with each of Trussler Road, Isaiah Drive, Donnenwerth Drive/Amand Drive, and Commonwealth Drive/Abram Clemens Drive?	Q5 - What advantages do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q6 - What challenges do you see with the "hybrid" concept that has roundabouts at the intersection of Bleams Road with each of Trussler Road and Commonwealth Drive/Abram Clemens Drive while traffic signals at the intersection of Bleams Road with each of Isaiah Drive and Donnenwerth Drive/Amand Drive?	Q7 - Is there anything else you would suggest the Region should consider in improvements to Bleams Road?
Safer traffic. Definitely it needs one. I'm commuting daily Donnenwerth onto Bleams and am witness of increased and fast paced traffic. Cars coming from FisherHallman to Trussler are speeding and fast approaching, if we who wait on donnenwert to come onto bleams rd are not careful and patient looking both ways - we'd be swept on. The oncoming trafic from FisherHallman has no intention of slow down when a car is maybe trying to get onto bleams. Roundabout is needed at Donnenwerth & Bleams - one line would be enough. Thank you.	I don't know if you have space to make one, but definitely one is needed.	Safer traffic. Cars from FiserHallman are driving very fast and would not slow down to facilitate car from the side roads such as Donnenwerth, Commonwealth, ...	I see longer wait at the intersections if traffic signals are put vs. a roundabout.	They would enable safer traffic as any of those would force drivers to slow down and not drive as they're on highway 8 at least.	Since it is a not long road between FisherHallman and Trussler traffic lights could cause longer wait on these side roads. A roundabouts would be more beneficial.	Pedestrian sidewalk! Not having one currently is another issue now. With speeding cars from both ways it is very unsafe to walk on the side of Bleams road. Sidewalk is needed as much as a roundabout.
Maybe I will be able to cross Trussler as a pedestrian/cyclist, which is very difficult now with the new traffic light. (There is no pedestrian light so I am always waiting for gaps in traffic that never arrive).	The road is too steep! Merging from a bike lane to the roundabout (the way you have set things up at Ira Needles) is really stressful. Having a separated multi-use trail means that I have to get off and walk across each of these roundabouts instead of just cycling up and down the hill as I do now. When I am on my bicycle then roundabouts are awful when I am turning left -- the new one at Fischer-Hallman and Bleams is horrible. It is difficult to navigate for me, the crossing is not plowed, and half the time the cars don't stop. As the information package says, having a roundabout on Trussler is going to mean land appropriation.	Maybe there will be crosswalks and pedestrian signals.	Too many stops on such a steep road. There is a similar hill near Chicopee (Fairway road? going towards King?) which is so hard because of the light partway up the hill.	It depends on whether I can cycle straight through or I have to stop and walk my bike across these intersections.	I am unhappy that every single intersection will now require some kind of traffic light or roundabout. I used to cycle up Bleams because it was direct, and now it won't be. Whether those stops are roundabouts or traffic lights are not that relevant.	PLEASE have a shoulder on the road that is large enough to be a bike lane, with a painted line. I do not care whether you call this a bike lane or not. That is FAR preferable to the multi-use trail idea. The two way multi-use trails from Fischer-Hallman to Trussler on Ottawa are not as bad as other places, but they are still scary around the Sunrise Centre. Every interaction with a driveway is a danger zone, and the intersections going into the Sunrise Centre are awful. The same could happen on Bleams Road, depending on the amount of traffic on these residential roads. I would like to reiterate that the new roundabout on Bleams and Fischer-Hallman is not good at all when I am trying to turn left. I would also like you to carefully consider how STEEP Bleams Road is along this stretch. I am very slow when I go up the road and scarily fast when I go down it.
Roundabouts are great but they are tricky for cyclists as bike lanes tend to be merge into the street and drivers aren't really paying enough attention.			Roundabouts are better			
Roundabouts keep traffic moving so it would have a nice flow.	Roundabouts take up a lot of space and as a home owner bordering Bleams I am worried about losing property to facilitate the roundabout and the noise. Also, I don't think that roundabouts are great for pedestrian traffic. If you anticipate pedestrian usage I don't support roundabouts.	They take up less space so it may not encroach on the properties bordering Bleams as much. They are more pedestrian friendly which would be nice for accessing the walking trails in the new development	They slow down traffic and cause quite a bit of noise from idealing etc.	I don't see an advantage.	I don't like hybrid's personally. Either have all lights or all roundabouts. A hybrid feels to me like it causes backups when a light is red and the traffic from the roundabouts is freely flowing.	I know you are doing a noise study but I would implore you to include sound walls along bleams. I am located at 280 Purple Sage and we already can't sleep at night with the windows open because of the noise on Bleams. This is only going to increase and as much as I love my house it is a downside and makes me consider selling on a regular basis. I am also concerned about the on going environmental concerns with the amount of dust and debris we see from the construction sites across bleams from us. We can't enjoy our yard because the dust is so think it's hard to breath. How will that be addressed during construction?
Tussler road roundabout will be the most beneficial concept. However other roundabouts also will be beneficial.	Mostly it would be the area needed for such a plan and it will be only a single lane traffic.	There are no specific advantages compared to roundabouts at these points. Tussler road should be considered for roundabout.	Other than Tussler road, the other intersections can have traffic signals. The challenge would be traffic congestion control during peak hours.	This is my suggestion - Tussler road - Roundabout Other intersections traffic signals. This will reduce the congestion experienced at Tussler /bleams intersection	Challenges will be avoidance of congestion during peak hours	no
It allows vehicular traffic to more more efficiently	Pedestrian and cycling interactions with other traffic	It allows more standardized flow of all forms of traffic	Too much need for new infrastructure	Less construction time spent on completing infrastructure	The flow of traffic may not be as smooth with signals included?	Please make the road more usable for pedestrian and cycling users! Wider road, bike lanes, multi use trails - all are need to provide better usage for non-vehicle users.
Round about will be better than signal		Do not recommend traffic signal , may not be that much traffic at non peak hours		Better		Bike path should be provided . both sides needs walkway too
We believe that traffic signals would be preferred at Trussler Rd simply due to rush hour volumes. Left turns through a roundabout from Bleams onto Trussler would be almost impossible at rush hour.	Roundabouts ok at all intersections except Trussler	No advantage at all intersections except Trussler as traffic volumes do not warrant signals.	Signals at all intersections except Trussler would slow traffic flow due to unnecessary long waits for a light change.	None	Too many traffic signals slow down traffic unnecessarily at Isaiah Drive and Donnenwerth Drive/Amand Drive due to lesser traffic volumes.	Speed limit reduction to 60 km/h is great as long as it is enforced.
Better traffic flow and less delays from access roads	More difficult for pedestrians to cross the street and large vehicles like tractor trailers and dump trucks.	Better for pedestrians to cross the street and large vehicles	Impedes traffic flow and delays access to Bleams from side streets	It appears to be a cheaper option.	Impedes traffic flow and delays access to Bleams from some side streets.	The plan for the intersection of Bleams and Trussler needs to deal with site lines as approaching Trussler due to the nature of the hill in that area. It should have a major regrade to smooth out this hill for safety purposes.

G.5.4 – Public Comments and Responses

PCC2

PPC#2 Public Comments

Q1 - What do you like about the design concept being presented?	Q2 - What challenges do you see with the design concept being presented?	Q3 - What new information should we consider in our design?	Q4 - Please select which of the following options best describes your primary relationship with the project area (between Fischer-Hallman Road and Trussler Road))
I think the design is very efficient and seems to be a proven approach to improving similar streets around the Waterloo region.	I see no challenges and have no concerns with the current concept.	I'd like this road to end up with similar tree's and grass as soon on Ottawa street. Long term if will be a much more appealing route to travel. I would like to get details on what existing tree's may need to be removed as i have a fairly large one outside my back gate i would like to see stay or at least know it has to go well in advance.	1
I'm very happy that it is all roundabouts down the corridor. Also, having multi-use trails along Bleams will be SO great!	I have major concerns that dropping to single-lane from double-lane is going to cause issues with bottlenecking the traffic from both Trussler and Fischer-Hallman. Also, with all of the development along the corridor, it seems that there will be a need for expansion in the near future (as there was along Ira Needles) and doing it now would be far more cost and time effective.		2
Active transport. Mostly single lane each direction. Roundabouts are better than signalized intersections.	The active transit looks not super ideal. I think mixed use paths are just a little to narrow for mixed bike and walking, in peak times especially. Bi-directional multi use paths 4m wide would probably solve this. This may not be the highest traffic area for active transit, so maybe that would be a better note for places like the Iron Horse Trail.	the angle at which cars enter the roundabout	1
I like the use of roundabouts throughout and the strategic placement of turning lanes to help traffic flow. I like that	How will greenery be preserved along both sides of the roadway? Trees and other greenery block sound and view between the road and houses. They also makes the drive more pleasant.	Transit routes - this is missing from the design and needs to be considered. What routes will run along Bleams? Where will bus stops be located? How will traffic flow around stopped buses?	1
Improving this road	Safety of pedestrians and cyclists on these roundabouts	Higher level of safety	1
Multiple use lanes for cycling and walking. Median should improve safety. Overall design is good.	Need to slow traffic on Isaiah Drive, especially with increase in traffic that will be seen. This is becoming a serious situation. Crossing at roundabouts is a challenge and needs to be dealt with properly. Ideally would contruct 4 lanes initially versus 2 phases and disruptions.	Specific amendments to the Kitchener strategic plan.	1
It will allow for better traffic flow, specifically when turning onto bleams from one of the side streets and/or turning left off of bleams at high traffic times	Currently there is a considerable amount of cars parked on the side streets the roundabouts would enter onto, specifically Donnenwerth; this could create backups and/or accidents as people try and navigate around the parked cars when exiting roundabouts onto these side streets.	Street parking should be removed or limited to one side of the street for the side streets named in the plan. These streets will naturally see more traffic as the area grow and need to allow for proper traffic flow.	1
I'm pleased with the presented design, love the roundabouts and the accomodation to bikes and pedestrians, my concern is the proposed two lane section, in my view it must be all 4 lanes in order to eliminate bottlenecks, Bleams is a main artery road with truck traffic and future connection to highway 8 , motorists use it to leave and come in to town, and with over 3000 homes approved for bleams/trussler corner I don't see how 2 lanes are sufficient. We have already experienced a big blunder on Ira needles boulevard with a two lane opening that barely lasted one year, there is a second blunder on Ottawa st. Wilderness to Trussler please don't make a third one on Bleams road, if 4 lanes are not needed today they are needed once the proposed houses are built, let's keep in mind that we are not buildind for the present we are building for the future. Thanks... Frank Sestito.	None		1
I like the roundabouts to keep traffic flowing, and that you are building the single lane roundabouts to accommodate future widening to 2 lane roundabouts. I prefer the multi use trail rather than the single direction cycle path.	I feel that there will be pushback on the number of crossings along the corridor outside of the roundabouts that will impede traffic flow. I'm not sure why there are so many? Pedestrians are accustomed to crossing at intersections/roundabouts, so why are there so many crossings in between, when it appears that it's mostly residential neighbourhoods on either side of Bleams, with the businesses at the Fischer-Hallman end.	I work for the Fire Department, so I just want to ensure they get consulted about the raised median section and accessing those side streets. The majority of the neighbourhoods on the south side of Bleams will be covered by the Huron Rd station (Station 7), likely responding along Fischer-Hallman, which would require a left turn onto those streets off Bleams, or accessing via a different route. Also, the single lane design of the roundabouts will need to accommodate the size of the fire trucks. This has proved challenging at some other single lane roundabouts in other areas of the region.	1

PPC#2 Public Comments

Q1 - What do you like about the design concept being presented?	Q2 - What challenges do you see with the design concept being presented?	Q3 - What new information should we consider in our design?	Q4 - Please select which of the following options best describes your primary relationship with the project area (between Fischer-Hallman Road and Trussler Road))
I like to the concept of proposal to move with round about over the signal light. In addition to accommodate the bike lane for bike rider in the area.	I believe round about will serve the purported of moving traffic smooth, however it will be difficult to for senior citizens and kids to cross road across as there will be future expansion in the community including schools and garden. I like to see some sort of safe solution for senior and kids for everyday life to accommodate with round about traffic.	Life style accommodate for senior and little kids. I also like to see the new GRT bus rout connection to the city to accommodate needs of university students and individual with out vehicle to move effectively.	1

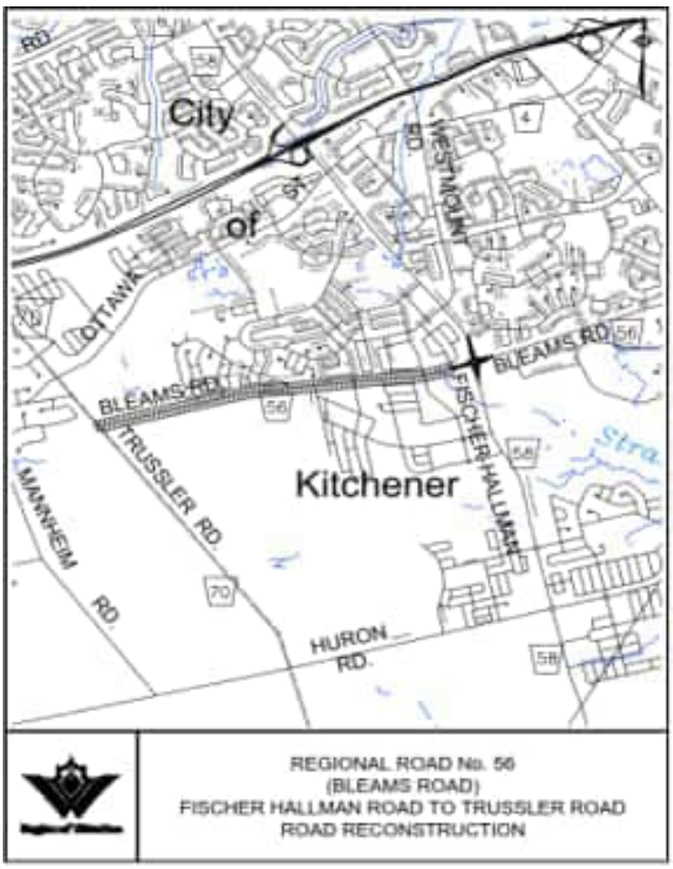
G.5.6 – Notice of Study Completion

NOTICE OF COMPLETION
Municipal Class Environmental Assessment
Bleams Road (Regional Road 56) Reconstruction
Fischer-Hallman Road to Trussler Road, Kitchener

The Region of Waterloo has undertaken a planning study on Bleams Road in accordance with the Ontario Environmental Assessment Act following the approved process for Schedule 'C' projects under the Municipal Class Environmental Assessment. This project addresses the deteriorated condition of Bleams Road, while accommodating current and future needs of the roadway and adjacent developments by including vehicle capacity and intersection improvements, and active transportation facilities. This project also improves storm water drainage and protects the groundwater aquifer by diverting run off to a controlled storm water facility.

The Recommended Design Alternative includes:

- Reconstruction of Bleams Road and urbanizing the roadway by removing ditches and installing an underground storm sewer system.
- Intalling a multi-use trail on both sides of Bleams Road.
- Widening Bleams Road to four lanes from Fischer-Hallman Road Road to Commonwealth Street/Abram Clemens Street.
- Constructing four roundabouts on Bleams Road at key intersections.
- Installing a raised median on Bleams Road from Fischer-Hallman Road to Donnenwerth Drive/Amand Drive.
- Installating a raw watermain**.**



By this notice, the Environmental Study Report is being placed on the public record for a 30-day review period in accordance with the requirements of the Municipal Class Environmental Assessment. Subject to comments received as a result of this notice and receipt of necessary approvals, the project may proceed to construction as scheduled.

The Environmental Study Report is available for review at https://www.engagewr.ca/bleams-rd or in person during regular business hours at the following locations:

The Regional Municipality of Waterloo Clerk's Office 150 Frederick Street, 2nd Floor Kitchener, Ontario	Forest Heights Library 251 Fischer-Hallman Road Kitchener, Ontario

Interested persons may provide written comments to the Region's Clerk's Department within 30 calendar days from the date of this notice. If concerns regarding this project cannot be resolved in discussion with the Region of Waterloo, a person or party may request that the Minister of the Environment, Conservation and Parks make an Order under Section 16 of the Environmental Assessment Act, if the nature of the concern falls within situations detailed at http://Ontario.ca/page/class-environmental-assessments-section-16-order .

Mr. Greg Proctor, C.E.T.
Project Manager
Regional Municipality of Waterloo
Transportation and Environmental Services
150 Frederick Street, 6th Floor
Kitchener, Ontario N2G 4J3
Telephone: (519) 575-4729
Facsimile: (519) 575-4430
Email: pgreg@region.waterloo.on.ca

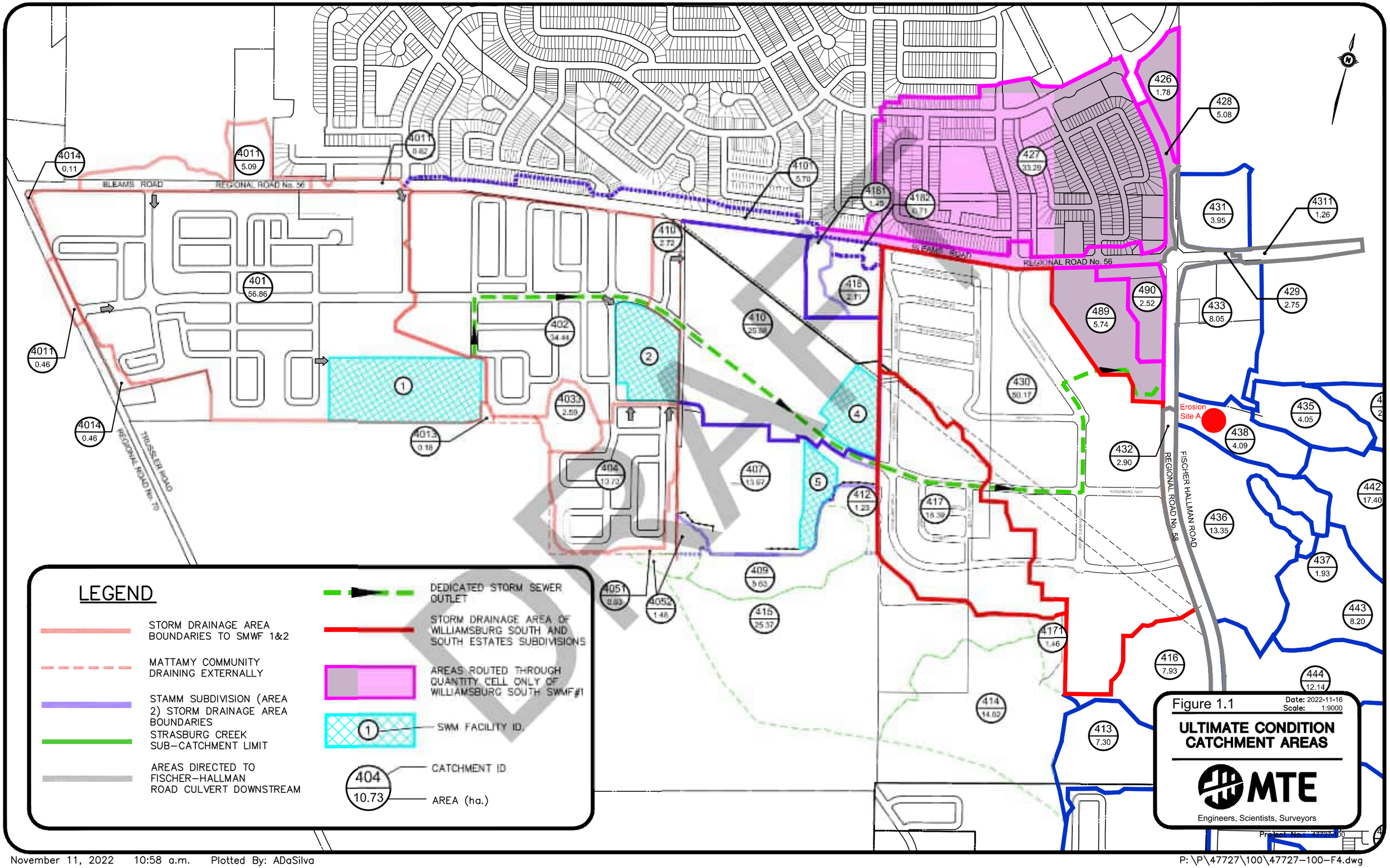
This notice dated May 2, 2023

All comments and information provided become part of the consultation process and are being collected to assist the Region of Waterloo in making a decision. All submissions will become part of the public record files for this matter. Personal information collected is under the authority of the Municipal Act, 2001 and in compliance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990. Questions about the collection of personal information should be directed to Greg Proctor, Project Manager at gproctor@regionofwaterloo.ca or 519 575-4729.

Document Number: 4289816

Appendix H

Catchment Areas



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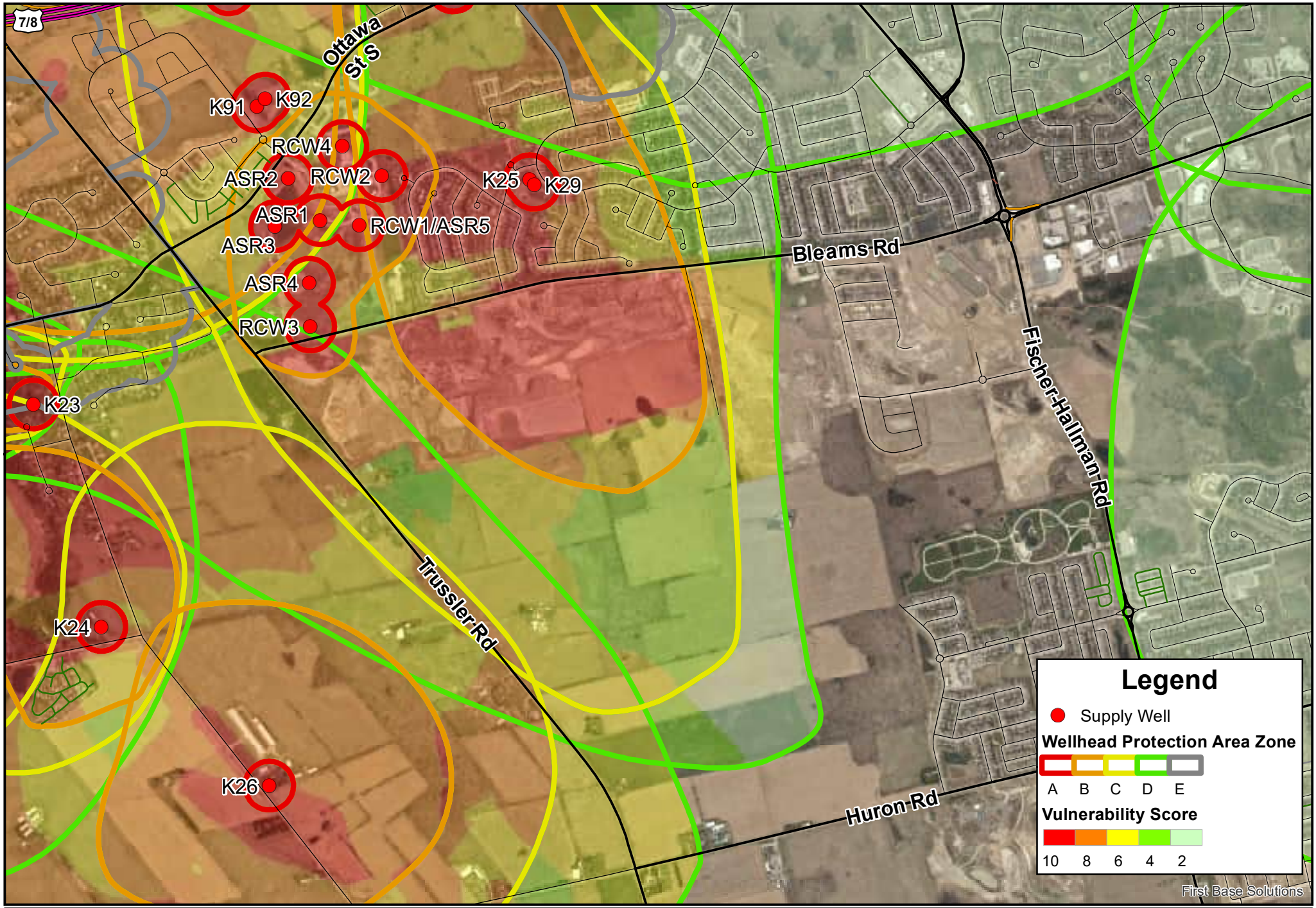
Appendix I

Groundwater



Produced by: Information Analyst (Hydrogeology)
Engineering and Environmental Services
150 Frederick Street
Kitchener, Ontario N2G 4J3
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Scale: 1:20000
Coordinate System: Nad 1983 UTM Zone 17N
Imagery: RMOW 2022

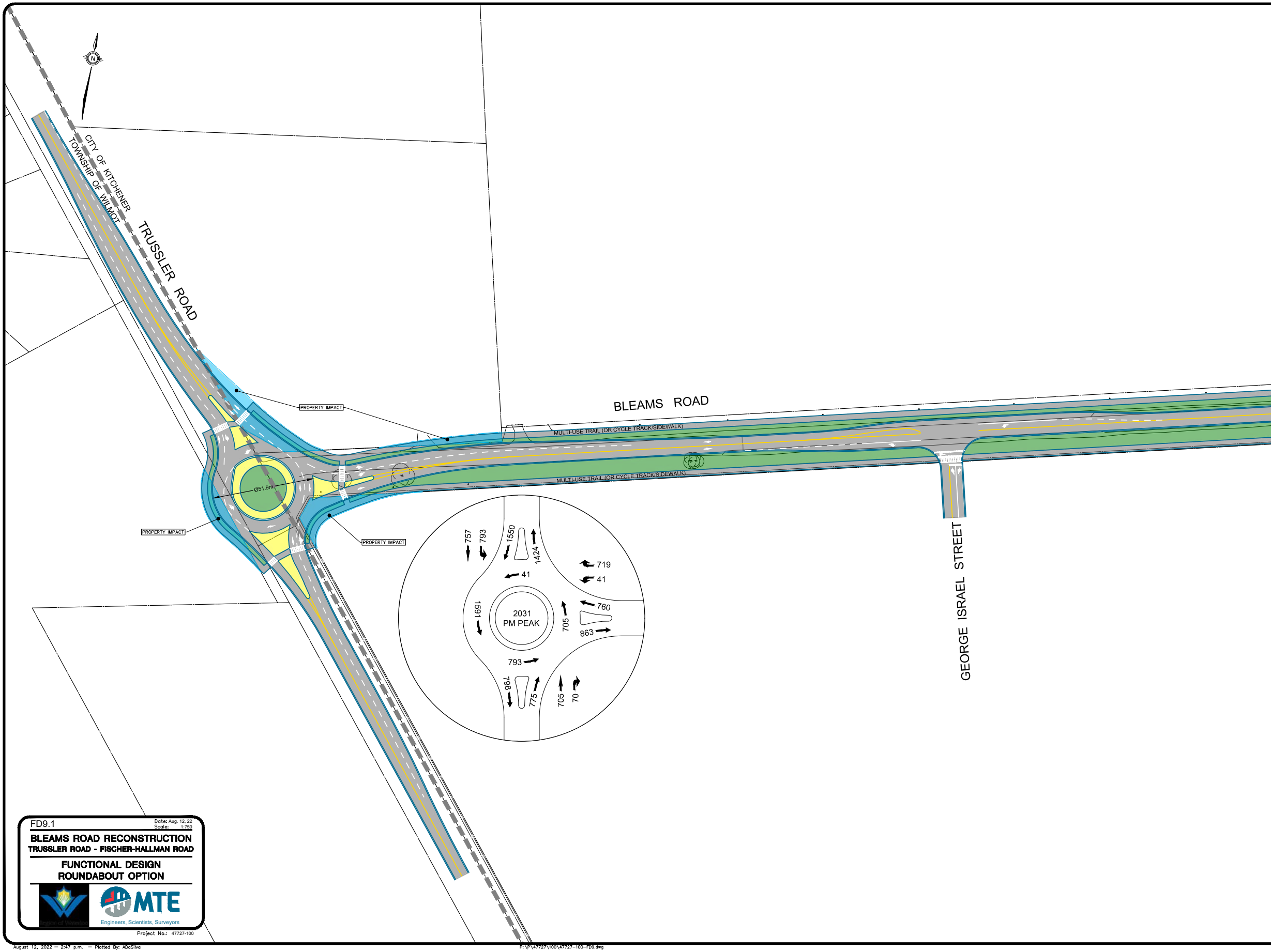
Wellhead Protection Area Zones and Vulnerability Scores

0 250 500 m

Region of Waterloo

Appendix J

Drawings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CITY OF KITCHENER
TOWNSHIP OF WILMOT
TRUSSLER ROAD
BLEAMS ROAD
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Date: Aug. 12, 22
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BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Region of Waterloo

MTE
Engineers, Scientists, Surveyors

Project No.: 47727-100

August 12, 2022 — 2:47 p.m. — Plotted By: ADaSilva

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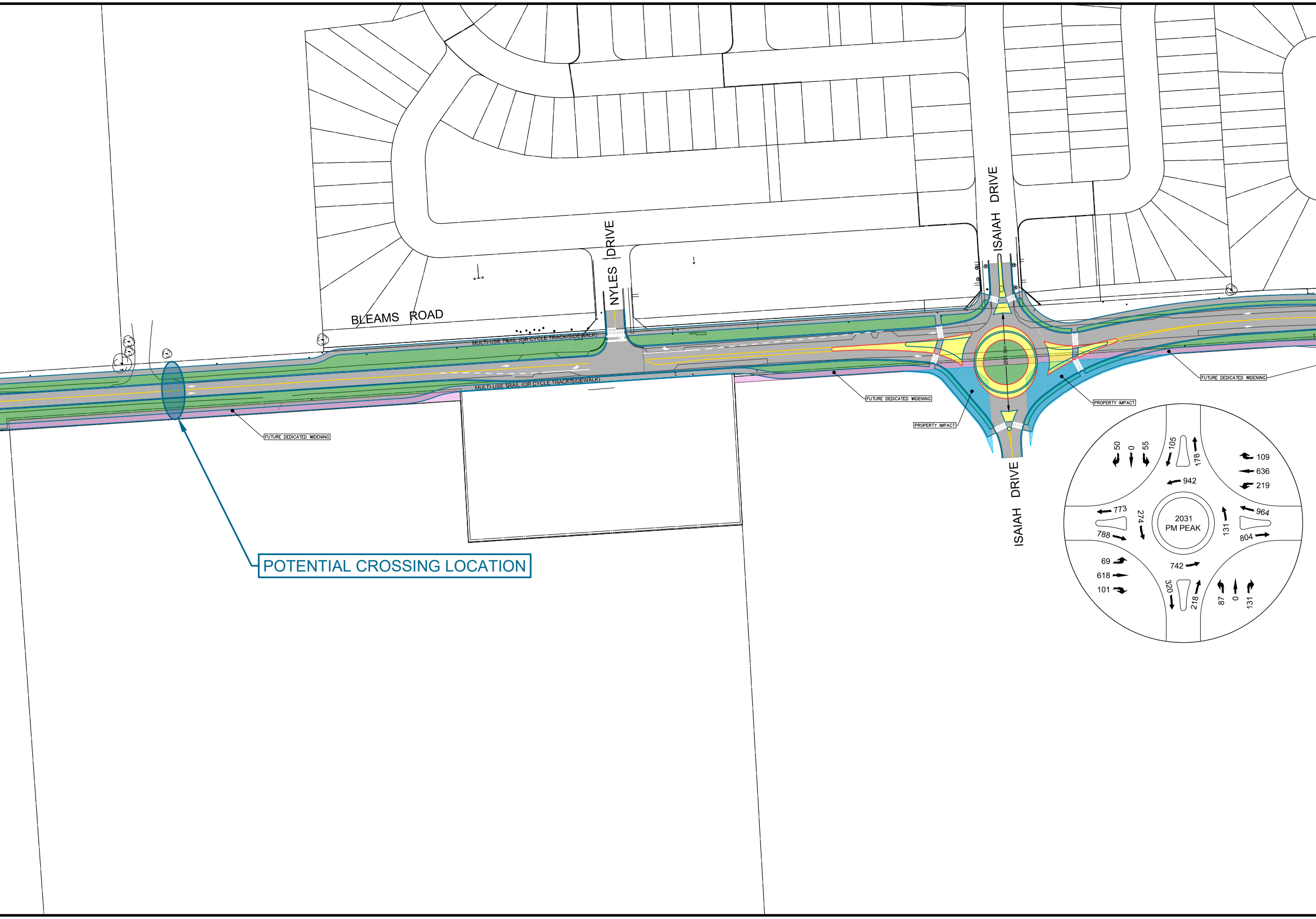
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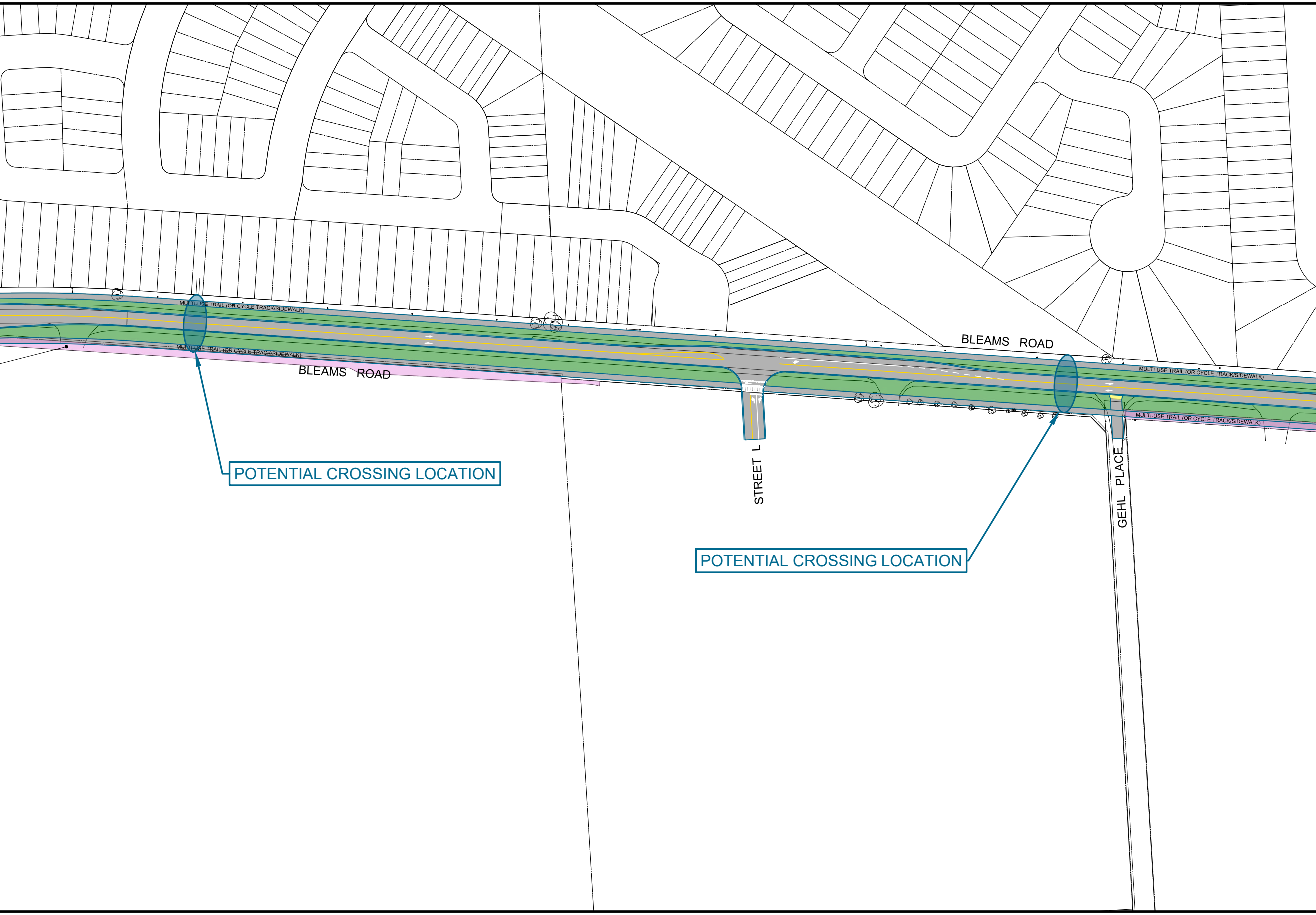
POTENTIAL CROSSING LOCATION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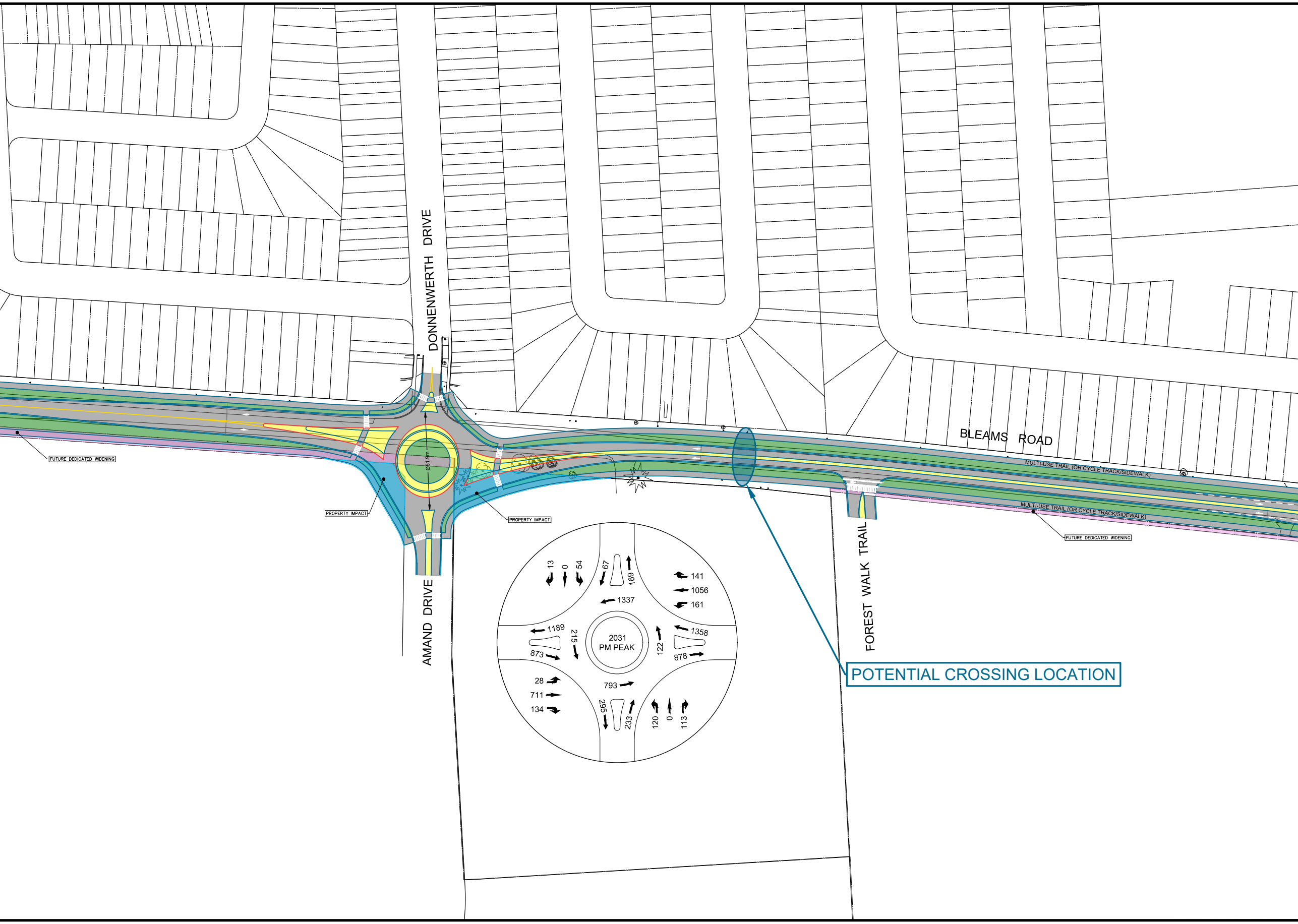
POTENTIAL CROSSING LOCATION

POTENTIAL CROSSING LOCATION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AMAND DRIVE
FOREST WALK TRAIL
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MULTI-USE TRAIL (OR CYCLE TRACK/SIDEWALK)
FUTURE DEDICATED WIDENING
POTENTIAL CROSSING LOCATION
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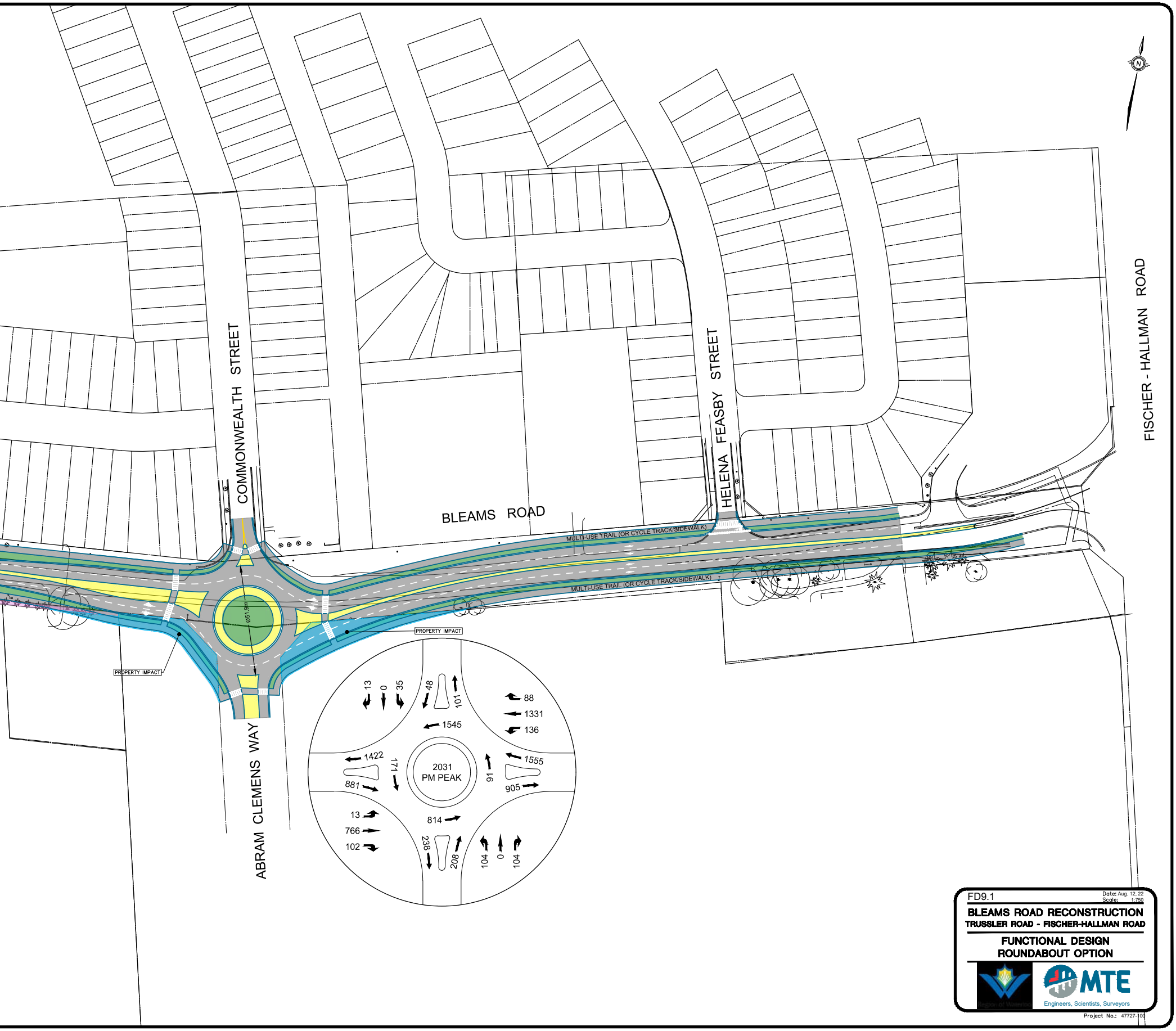
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COMMONWEALTH STREET
HELENA FEASBY STREET
FISCHER - HALLMAN ROAD
BLEAMS ROAD
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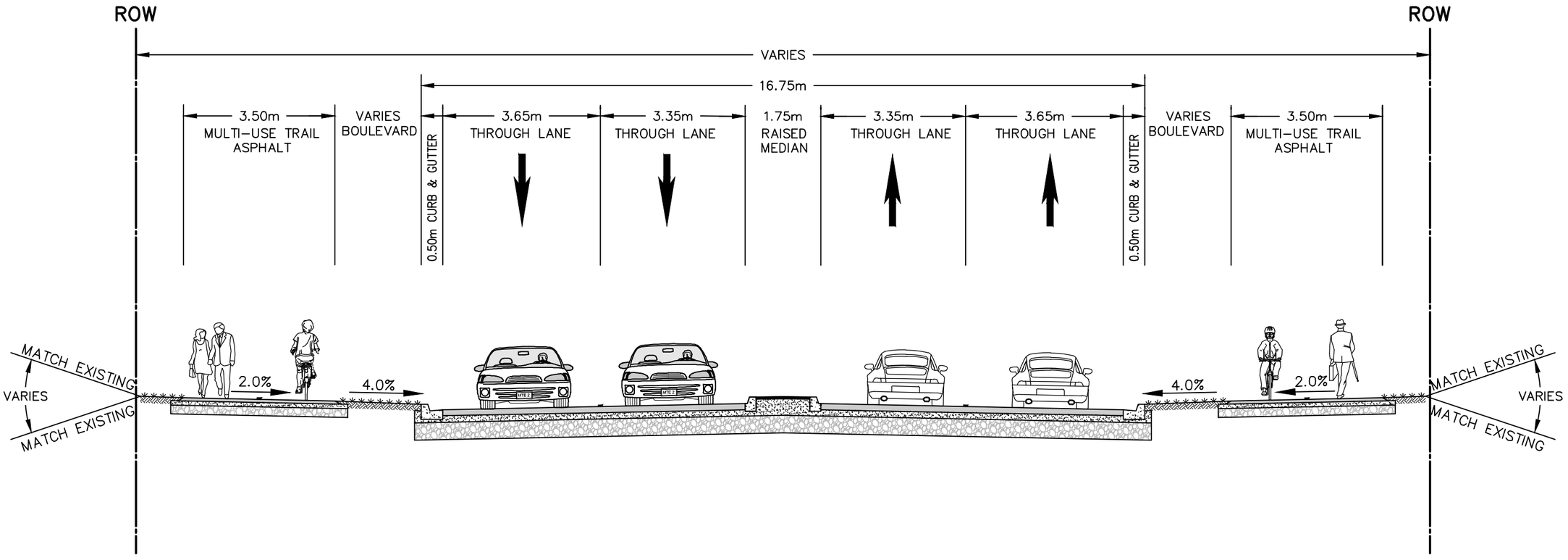
BLEAMS ROAD RECONSTRUCTION
TRUSSLER ROAD - FISCHER-HALLMAN ROAD

FUNCTIONAL DESIGN
ROUNDABOUT OPTION

Engineers, Scientists, Surveyors

Project No.: 47727-100

BLEAMS ROAD - FOUR LANE ROAD WITH A RAISED MEDIAN AND MULTI-USE TRAILS



FISCHER-HALLMAN ROAD TO COMMONWEALTH STREET/ ABRAM CLEMENS STREET

XS1.1

Date: Sep. 27, 22
Scale: 1:100

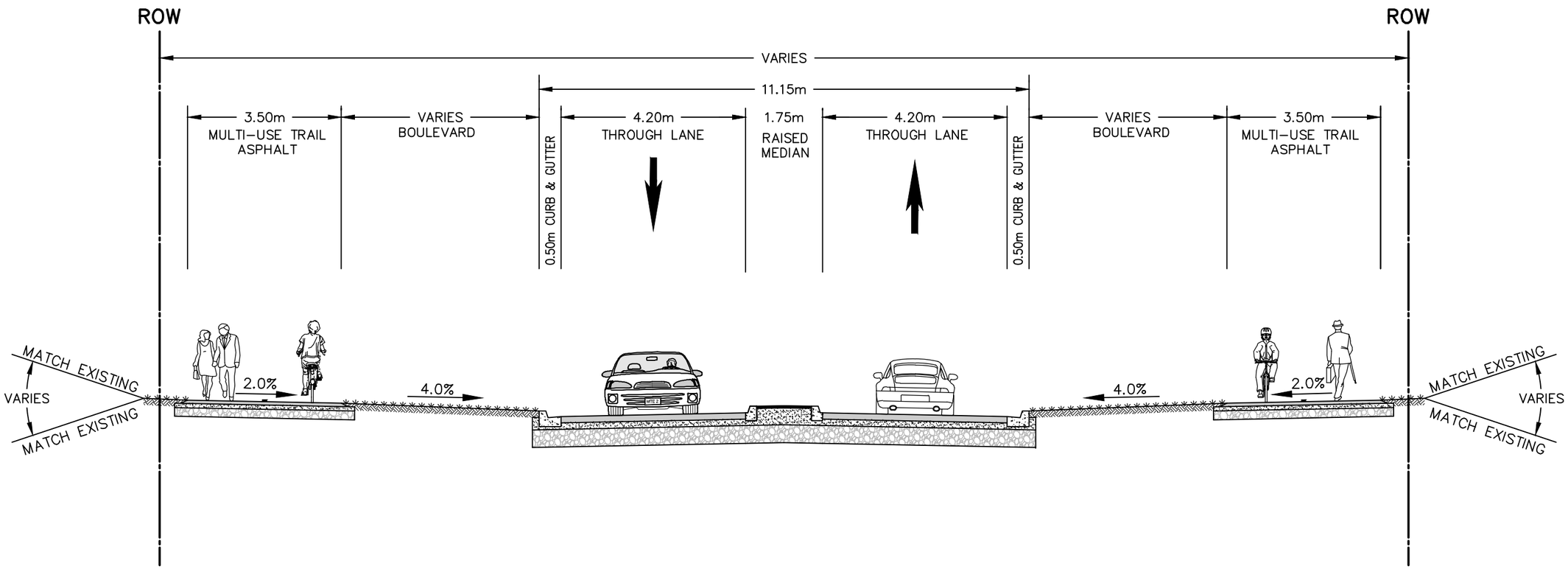
TYPICAL CROSS SECTION A
BLEAMS ROAD

Region of Waterloo

MTE Engineers, Scientists, Surveyors

Project No.: 47727-100

BLEAMS ROAD - TWO LANE ROAD WITH A RAISED MEDIAN AND MULTI-USE TRAILS



COMMONWEALTH STREET/ ABRAM CLEMENS STREET TO AMAND DRIVE/ DONNENWERTH DRIVE

XS1.2

Date: Sep. 28, 22
Scale: 1:100

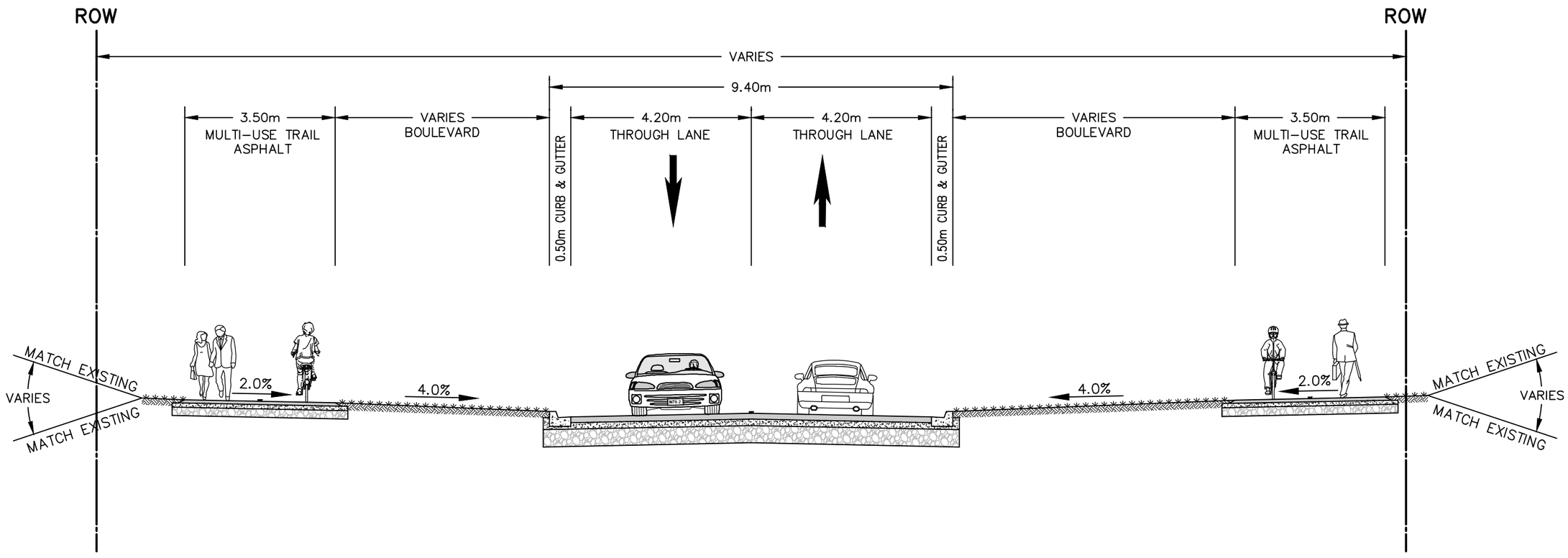
TYPICAL CROSS SECTION B
BLEAMS ROAD

Region of Waterloo

MTE Engineers, Scientists, Surveyors

Project No.: 47727-100

BLEAMS ROAD - TWO LANE ROAD WITH MULTI-USE TRAILS



AMAND DRIVE/ DONNENWERTH DRIVE TO TRUSSLER ROAD

XS1.3

Date: Sep. 28, 22
Scale: 1:100

TYPICAL CROSS SECTION C
BLEAMS ROAD

MTE
Engineers, Scientists, Surveyors

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