
FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

SCHLEGEL URBAN DEVELOPMENT CORP.

1065 LISTOWEL ROAD, ELMIRA
SOUTHWOOD 5 SUBDIVISION

Project No.: 2022-0374

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WALTERFEDY

SCHLEGEL URBAN DEVELOPMENTS CORP.

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1065 Listowel Road, Elmira – Southwood 5

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1.0 INTRODUCTION

WalterFedy has been retained by Schlegel Urban Developments to provide civil engineering services in support of a Zoning By-Law Amendment and Draft Plan of Subdivision for the lands located at 1065 Listowel Rd., Elmira, Ontario, hereafter referred to as the Site. Refer to Figure I for the location plan.

The purpose of this Functional Servicing and Stormwater Management Report is to provide a preliminary overview of how the development will be serviced, including water, sanitary, and storm connections to existing municipal infrastructure. The report will discuss the boundary servicing conditions and the capacity of the municipal system to accommodate the development. Storm sewer design, sanitary sewer design, and watermain sizing have been presented, demonstrating compliance with the Township of Woolwich and Region of Waterloo guidelines and criteria.

1.1 Background

The 18.85 ha development is located in Elmira, Ontario, and is bordered by Listowel Road to the south and existing residential to the east, west, and north. Lands immediately to the west and north form part of the Birdland developments, also known as Southwood 3 and Southwood 4 subdivisions. Existing residences to the east with frontage on Arthur Street South will remain.

The site generally drains from north-to-south towards Listowel Road. Along the northern limit of the site, at the terminus of Burlwood Drive, there is an existing stormwater management (SWM) facility capturing flows from South Parkwood Boulevard immediately to the north.

The site is zoned as Agricultural (A) in the Township Zoning By-Law. A Zoning By-Law Amendment will be required to permit the proposed development. The Draft Plan of Subdivision proposes a mix of residential densities comprised of low-density residential, street townhouses, multi-residential blocks, as well as open space uses and a stormwater management facility.



Figure I: Site Location

This report demonstrates that the Draft Plan for the Site can be developed with full municipal servicing and utilities in accordance with the standards of the applicable municipalities and related requirements of the various approval agencies/authorities.

The servicing strategies presented in this report are conceptual in nature; detailed engineering drawings will be submitted as part of the detailed engineering design process once the proposed Draft Plan has been approved.

1.2 Reference Reports and Drawings

The following were referenced in the preparation of this Functional Servicing and Stormwater Management Report.

1. Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS), Region of Waterloo and Area Municipalities, February 2023
2. Township of Woolwich Engineering Development and Infrastructure Manual, Township of Woolwich, March 2022.
3. Stormwater Management Planning and Design Manual, Ministry of the Environment (MOE), 2003
4. Design Guidelines for Drinking-Water Systems, Ministry of the Environment, Conservation and Parks, 2008
5. Design Guidelines for Sewage Works, Ministry of the Environment, Conservation and Parks, 2008
6. Source Protection Guidance Document Salt Impact Assessment, Region of Waterloo
7. Beneficial Practices Worksheet 2017, Region of Waterloo Water and Wastewater Services
8. Salt Application Best Practices for Winter Maintenance Contracts, Sustainable Technologies Evaluation Program
9. Water Supply for Public Fire Protection, Fire Underwriters Survey (FUS), 2020
10. St. Jacobs-Elmira Wastewater Treatment Master Plan, XCG, February 2013
11. Preliminary Hydrogeological Assessment – Proposed Residential Development, Pinchin, May 2025
12. Development Concept, Elmira Southwood Subdivision, GSP, April 2025
13. Phase Two Environmental Site Assessment, GHD, May 2024
14. Preliminary Geotechnical Investigation, Southwood 3, Arthur Street South and Listowel Road, LVM, May 2011
15. Tree Inventory and Preservation Plan, Natural Resource Solutions Inc., December 2024
16. Stage 1 and 2 Archeological Assessment, Parslow Heritage Consultancy Inc., November 2023
17. Southwood Park Subdivision – Phase II Elmira, Ontario Stormwater Management Report, The Walter Fedy Partnership, July 14, 1997

2.0 EXISTING INFORMATION

2.1 Land Use

The majority of the site has historically been used for agricultural purposes. There are trees and vegetation located with the Site in select locations.

2.2 Topography and Drainage

Under current conditions, an overflow outlet from a temporary stormwater management facility in the northern portion of the Site flows north-to-south towards Listowel Road. The Site has a general drainage pattern flowing from north-to-south. A constructed swale starts at an elevation of approximately 362.1 metres above sea level (MASL) with slopes ranging from 0.2% to 1.3% before reaching the southern property line and connecting to a ditch at 358.7 MASL. This ditch runs west-to-east along the northern side of Listowel Drive and eventually enters the municipal network through a ditch inlet.

Within the Site, runoff flows are directed towards the swale from the property boundary. The highest point is located at the northwestern corner at 364.53 MASL, while the lowest point is at the southeastern corner at 357.03 MASL. Surface runoff generally occurs via sheet flow towards the receiving channel.

Topographic surveys were completed as part of the previous Southwood 3 and Southwood 4 subdivisions owned by Birdland Development. Legal boundary information was obtained from a survey completed by Van Harten Surveying Inc. in December 2024.

2.3 Geotechnical and Hydrogeological Information

A preliminary geotechnical investigation was conducted by LVM in May 2011. A total of 11 boreholes were advanced on Site to depths between 6.2 and 6.6 m; the findings of the geotechnical investigation are summarized below:

- A topsoil layer ranging from 0.125 m – 0.8 m in thickness was found in all borehole locations. The topsoil layer was found to be comprised of dark brown silt with trace sand to dark brown silt with some sand and trace gravel.
- Silt and silt till were encountered at the Site with sand deposits in the northwestern corner at depths ranging from 0.125 m – 6.6 m.

Additionally, Pinchin completed a Preliminary Hydrogeological Investigation Report in May 2025, which identified shallow perched groundwater flow in the southeastern portion of the site. However, the groundwater levels observed in their shallow monitoring wells, screened within the till layer (Surficial Aquitard [SAT]), reflect a seasonally-perched condition that occurs temporarily in early spring. The long-term, stabilized groundwater table is located within the sand and gravel of the Upper Aquifer (UA), which underlies the SAT, at a depth of approximately 15 to 20 metres below grade.

For a more detailed review and discussion of specific grading, servicing, and road construction recommendations, reference can be made to the previously-noted geotechnical and hydrogeological reports.

2.4 Environmental Site Assessment

A Phase Two Environmental Site Assessment has been completed for the Site by GHD. The purpose of the report is to identify the existence of any Potentially Contaminating Activities (PCAs), and Areas of Potential Environmental Concern (APECs) associated with the Site. The assessment concluded there were no contaminants of concern identified in groundwater and there is no evidence of groundwater impacts related to any of the APECs identified at the Site.

For further information, reference can be made to the respective report.

2.5 Source Protection

The Site is located within the Grand River Source Protection Area. Based on the most recent information obtained from the MECP's Source Protection Information Atlas, the Site is classified as a Wellhead Protection Area (WHPA), Type "C", with a score of 4.

For context, a WHPA is an area around municipal wells where groundwater is extracted for drinking water. Type "C" represents an area where groundwater can reach the municipal well within two years of travel time. A vulnerability score is given to WHPAs by assigning significance to identified or potential activities that have been deemed threats to the drinking water sources, scoring is between 2 (lowest vulnerability) and 10 (highest vulnerability). A score of 4 is relatively low, meaning that this area has moderate-to-low susceptibility to contamination. Table 1 provides a summary of the source protection parameters that apply to the Site.

Table 1: Source Protection Details

Source Protection Area	Grand River
Water Quality	
Wellhead Protection Area	C, Score = 4
Wellhead Protection Area (WHPA-E):	No
Intake Protection Zone:	No
Issue Contributing Area:	No
Significant Groundwater Recharge Area:	No
Highly Vulnerable Aquifer:	No
Event Based Area:	No
Water Quantity	
Wellhead Protection Area Q1:	No
Wellhead Protection Area Q2:	No
Intake Protection Zone Q:	No

To ensure that the infrastructure proposed as part of this development does not become a significant threat in the future, the infrastructure is designed in accordance with MECP's *Design Guidelines for Sewage Works* to help ensure that the maximum expected service life is realized and to reduce the potential for incidences of failure.

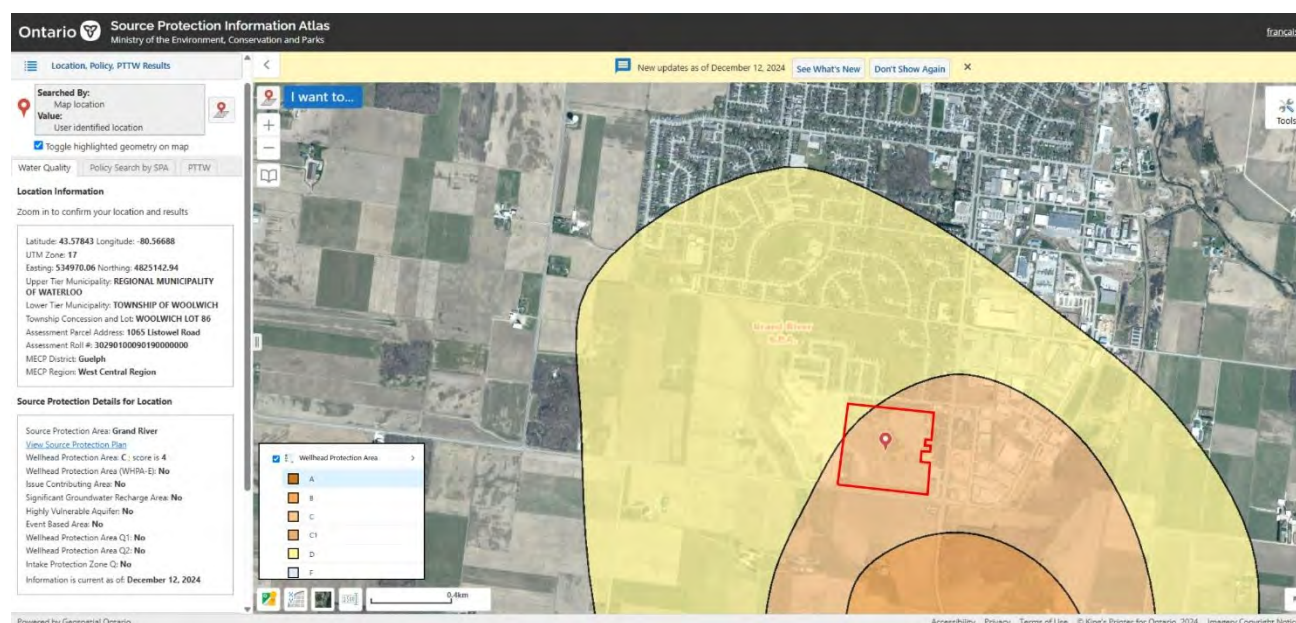


Figure II: Source Protection Area Capture, May 2025

2.6 Servicing and Utilities

The municipal infrastructure and utilities in the vicinity of the Site are summarized below and are shown on the conceptual servicing plan.

2.6.1 Water Servicing

The Growth Strategy and Master Servicing Study for the Elmira and St. Jacobs settlement areas, completed for the Township of Woolwich in 1992, indicates that the Southwood subdivision is in Pressure Zone 2 for which the pressures are maintained by the Township Road 19 Reservoir. Since Elmira is part of the Integrated Urban Supply, capacity constraints for water supply will not affect the ability to service the subject lands.

Water servicing for the subject lands will be provided through the extension of watermain off of street stubs to the west (Woodberry Crescent and Weymouth Street), the Burlwood Drive street stub from the north, and directly off of the 300-mm-diameter watermain on Listowel Road. Within the development, looping of the watermain will be provided through an internal network of local watermain at standard design depths and sizes to accommodate the proposed development.

2.6.2 Sanitary Servicing

There is a 375-mm-diameter sanitary sewer on Listowel Road, located at the southern limit of the Site. This sewer was extended to service the previous subdivision stages, Southwood 3 and 4. The design capacity and sizing of the sanitary sewer were originally designed to accommodate flows from the Site.

The Region of Waterloo produces the *Water and Wastewater Monitoring Report* to document the actual water demand, wastewater flows, water production, wastewater treatment capacities, development planning, and remaining capacity of the systems. The most recent report approved by Regional Council notes that, as of December 2023, there is capacity to service approximately 24,000 people with the present rated system capacity of 7,800 m³/d.

Inflow and infiltration are one of the causes of unusual flow variations and high wastewater per-capita flows at the Elmira Wastewater Treatment Plant (WWTP). The St. Jacobs – Elmira Wastewater Treatment Master Plan (February 2013) indicates that the WWTP is not expected to exceed its Certificate of Authorization average daily flow until 2031.

The subject lands are included in the servicing design of the Listowel Road Trunk Sanitary Sewer. A design flow for the subject lands equating to 996 people was used for the design and construction of the Listowel Road Trunk Sanitary Sewer. Local sewers within the development will be designed in accordance with the Township and DGSSMS guidelines.

2.6.3 Storm Servicing

The majority of the subject lands drains to the south towards Listowel Road. There is a roadside ditch which outlets to a storm sewer system located at the southeastern corner of the subject lands which conveys flows east across Arthur Street. The storm sewer located within the Listowel Road municipal right-of-way is the legal outlet for the proposed SWM facility. The outlet leads to an existing 825 mm diameter storm sewer that runs along Listowel Road and conveyed to the east side Arthur Street South. A single SWM facility will provide appropriate SWM measures for the development of the subject lands. The SWM strategy will also include low-impact development strategies and infiltration measures where opportunities exist. The SWM facility will be designed to control post-to-pre-development flows per the current GRCA and MECP standards, provide quality control, and adhere to the standards set forth in the above-noted criteria.

The subject lands will be designed with best management practices to minimize the use and infiltration of high-chloride stormwater runoff in accordance with Region of Waterloo guidelines. Using Region of Waterloo supplied data for road salt application rates, the chloride concentration in the groundwater will be below the reasonable use concept.

3.0 REVIEW AGENCIES

3.1 Township of Woolwich

The Township of Woolwich will be responsible for the review and approval of the Draft Plan of Subdivision, as well as preliminary servicing, grading, and SWM designs for the overall development.

3.2 Region of Waterloo

The Region of Waterloo will be responsible for the review and approval of the Draft Plan of Subdivision, as well as preliminary servicing, grading, and SWM designs for the overall development.

3.3 Other Utilities

The development will require review by other utility providers for the supply and installation of services including, but not limited to, hydro, gas, and telecommunications (cable and fiber). As such, drawings will be circulated to relevant agencies for their comment during detailed design.

4.0 GRADING AND DRAINAGE

4.1 Proposed Development

Utilizing the Draft Plan prepared by GSP, WalterFedy has prepared preliminary grading and servicing plans. The proponent proposes to develop the property into a residential subdivision which includes low-density residential (77-111 units), low-density/semi/towns (63-164 units), street townhouses (51-65 units), multi-residential (56-150 units), park land, and one stormwater management facility (SWMF).

4.2 Design Constraints and Procedures

Constraints in designing the road profiles and lot grading are:

- Maintain existing grades, where possible, to minimize grading and cut/fill quantities
- Minimize changes to the surface hydrology and hydrogeology of the area
- Match existing road and boundary elevations (i.e. Listowel Road, Weymouth Street, Woodberry Crescent, Burlwood Drive, property limits, etc.)
- Satisfy the Township of Woolwich's road design requirements for minimum and maximum road grades
- Where possible, satisfy the Township of Woolwich's minimum separations from the underside of footings to seasonally-high groundwater levels
- Provide major overland flow route(s) to the stormwater management facility for flows in excess of the storm sewer capacity
- Where possible, maintain adequate cover over storm and sanitary sewers and watermain
- Where possible, maintain existing limits of subwatersheds.

- Promote infiltration of rainwater runoff where feasible
- Protect existing environmental features (i.e. tree driplines, etc.) by adhering to “no-touch” zone buffer limits

4.3 Preliminary Overall Grading

Earth cuts up to 1.5 m and fills up to 2.0 m in depth are proposed throughout the Site in order to provide positive drainage for local services, and to address topographic/environmental constraints. The overall cut/fill operation is anticipated to require detailed planning/coordination to enhance infiltration opportunities (i.e. placement/exposure of permeable soils) throughout the Site where possible, with the intent of the area grading operation replicating existing drainage conditions using suitable engineering practices and procedures.

The proposed lot grading consists of grades ranging from 2.5% to a maximum of 5%, including 3:1 transitional slopes, in order to accommodate various grade changes within the Site (i.e., adjacent to SWM facility, surrounding protected tree buffer lines, and the road profiles for Listowel Road, Burlwood Drive, Weymouth Street, and Woodberry Crescent). The grading proposed maintains a minimum 0.6 m separation from the proposed underside of footings to groundwater elevations. The stabilized groundwater table beneath the site, located in the Upper Aquifer (UA) at approximately 15 to 21 m below grade, will not impact basement construction. However, to manage potential fluctuations in the perched water table, especially during the spring freshet (March to May), it is recommended that all basements be constructed with sump pumps. Given the low hydraulic conductivity of the silty sand and till, where seasonal perched water accumulates, sump pumps will be sufficient to manage and drain groundwater away from basements. The proposed grading is illustrated on drawings C200 to C203.

4.4 Preliminary Earthworks

During detailed design, the road profile and grading concept will be refined to reduce overall grading impacts for the proposed subdivision. Topsoil fill areas will be identified in order to minimize offsite removal of excess topsoil material. It is anticipated that earth cuts of up to 1.5 m will be required, as well as up to 2.0 m of earth fill in order to service the Site.

4.5 Preliminary Road Profiles

Preliminary road profiles were established for the Site based on the street configuration from the proposed Draft Plan dated April 23, 2025 (GSP). To satisfy the noted constraints, road profiles were designed in accordance with the Township of Woolwich’s road design criteria while matching the existing elevations of the perimeter road connections at Listowel Road, Burlwood Drive, Weymouth Street, and Woodberry Crescent. Roads have grades ranging from 0.7% to a maximum of 5%, which help maintain overland flow drainage routes to and from the SWM facility, while matching the existing topography where possible. The proposed centerline road elevations are illustrated on drawings C400 to C402.

5.0 SANITARY SERVICING

In accordance with the Township’s 2024 Development Charge Background Study and the Region of Waterloo DGSSMS, the sanitary flows from the subject development were calculated based on the various categories of residential units proposed for the development. In order to determine the conservative scenario for this development, the maximum population per proposed zoning was used to determine sanitary demand.

Table 2 provides a summary of the total domestic flow expected to be generated from the overall development.

Table 2: Proposed Sanitary Flow

Development Area	18.85 ha
Low Density Residential	
Number of Low Density Residential	111 units
Average Residential Daily Flow	305 L/c/d
Design Population Density	143 p/ha
Area of Development	4.45 ha
Design Population	636 persons
Average Daily Flow	2.25 L/s
Harmon's Peaking Factor	3.92
Extraneous Flows (Infiltration/Inflow)	0.25 L/s/ha
Total Peak Flow	9.91 L/s
Low Density/Semi/Towns	
Number of Street Townhouses	164 units
Average Residential Daily Flow	305 L/c/d
Design Population Density	143 p/ha
Area of Development	4.17 ha
Design Population	596 persons
Average Daily Flow	2.11 L/s
Harmon's Peaking Factor	3.93
Extraneous Flows (Infiltration/Inflow)	0.25 L/s/ha
Total Peak Flow	8.33 L/s
Street Townhomes	
Number of Multi-residential Units	65 units
Average Residential Daily Flow	305 L/c/d
Design Population Density	196 p/ha
Area of Development	1.38 ha
Design Population	270 persons
Average Daily Flow	0.95 L/s
Harmon's Peaking Factor	4.10
Extraneous Flows (Infiltration/Inflow)	0.25 L/s/ha
Total Peak Flow	4.26 L/s
Multi-Residential	
Number of Multi-residential Units	150 units
Average Residential Daily Flow	305 L/c/d
Design Population Density	196 p/ha
Area of Development	2.10 ha
Design Population	412 persons
Average Daily Flow	1.45 L/s
Harmon's Peaking Factor	4.02
Extraneous Flows (Infiltration/Inflow)	0.25 L/s/ha
Total Peak Flow	6.36 L/s
Total Residential Sanitary Peak Flow	28.87 L/s

The design population was calculated through a multiplication of the number of units proposed of each dwelling type by the prescribed population densities as per the Region's 2009 Land Budget.

The subject lands are included in the servicing design for the Listowel Road Trunk Sanitary Sewer. A design population of 996 people was originally used to size and construct the trunk sewer. The current development concept, prepared by GSP, proposes up to a maximum of 490 units; applying the prescribed population densities results in an estimated maximum population of 1915 people and a total design sanitary flow of 28.87 L/s as the upper limit. An updated capacity assessment was completed using the original 2019 Listowel Road sanitary design sheet. Updating the original estimated population value (996 people) with the estimated maximum population (1,915 people) results in a calculated residual capacity of 83%, compared to 77% under the original assumptions. This confirms that the existing 375 mm diameter trunk sewer along Listowel Road has sufficient capacity to accommodate the revised development scenario.

Please refer to Appendix B for the supporting sanitary design sheets.

It is proposed that the development be serviced by 200-mm-diameter sanitary services with a connection to the existing 375-mm-diameter sanitary sewer on Listowel Road, located at the southern limit of the site, as shown on Drawing C300.

5.1 Local Servicing

As previously noted, local 200-mm-diameter sanitary sewers will be extended throughout the Site and will be constructed at typical depths between 3.0 m and 5.0 m within the proposed rights-of-way, as shown on the Servicing Concept Plans.

All sewers within the project limits have been designed to provide a minimum full-flow velocity of 0.8 m/s to provide self-cleansing within the pipes. The sewers are also designed with a maximum full-flow velocity of 3.0 m/s to mitigate concerns for pipe displacement as a result of impact and erosion. These velocities have been calculated using the Chézy-Manning formula with a roughness coefficient of 0.013 in accordance with Township of Woolwich, Region of Waterloo DGSSMS, and MECP design criteria.

6.0 WATER SERVICING

The proposed subdivision will have three watermain connections from the existing and proposed infrastructure surrounding the Site. A connection to the existing 300-mm-diameter watermain on Listowel Road will be installed at the southern edge of the Site. A northern connection will also be provided to the existing 300-mm-diameter watermain stubs located at the Site's entrance from South Parkwood Boulevard. Connections will also be provided to the existing 200-mm-diameter watermain stubs located at the Site's entrances from Weymouth Street and Woodberry Crescent from the Southwood 4 subdivision located west of the subject lands.

6.1 Model Development and Design Criteria

As per the MECP drinking water guidelines, the water distribution system shall be designed to convey the greater of the combination of the maximum day demand and the fire demand or the peak hour demand based on the following criteria:

- The distribution system shall maintain a minimum pressure of 140 kPa (20 psi) under maximum day demands plus fire flow conditions.
- The normal operating pressure shall be between 350 to 481 kPa (50 to 70 psi), and not less than 275 kPa (40 psi).
- The maximum pressure in the distribution system shall not exceed 700 kPa (100 psi).

Watermain sizes will be selected to ensure that velocities in the maximum day plus fire scenario does not exceed 5 m/s and maintain a 0.8 m/s flushing velocity for cleaning and disinfection procedures. The watermain shall be designed to be installed within the road allowance per the Municipality's Typical Cross Section with a minimum cover of 1.8 m.

Individual service connections are to comply with the requirements of the *Safe Drinking Water Act, 2002, S.O. 2002, c. 32*.

The water distribution system was modelled in EPANET to understand pressures and velocities in the system. Refer to Appendix C for modelling results.

6.1.1 Region of Waterloo Modelling Information

Based on information provided by the Region of Waterloo, the Site is within the Elmira West pressure zone with a hydraulic grade line of 419.52 m above mean sea level for average day demand.

Hydraulic grade line information for the subdivision was based on modeling results provided by the Region of Waterloo and the hydrant flow test information from the neighbouring Southwood 4 subdivision. The hydraulic grade lines were obtained for the average day and maximum day, as well as data pertaining to a range of fire flow scenarios.

6.2 Domestic Water Demand

In accordance with the DGSSMS, the average residential demand for the proposed development was estimated using a demand of 225 L/cap/day. In order to determine the largest water demand possible for this development, the maximum population per proposed zoning was used to determine the domestic water demands.

A peaking factor of 3.75 was used to convert the average daily demand into a maximum day demand. This peaking factor is in accordance with the *Tri-City Water Distribution Masterplan*. A peaking factor of 3.75 was used to convert the average daily demand into the peak hourly demand in accordance with Table 3-1 of the MECP guidelines, for a design population between 1,001 and 2,000 persons.

Table 3: Anticipated Domestic Water Demand

Net Site Area	18.85 ha
Low Density Residential	
Number of Low-Density Residential Units	77-111 units
Area of Development	4.45 ha
Design Population Density	143 persons/ha
Design Population	636 persons
Low Density/Semi/Towns	
Number of Low Density/Semi/Town Units	63-164 units
Area of Development	4.17 ha
Design Population Density	143 persons/ha
Design Population	596 persons
Street Townhomes	
Number of Street Townhome Units	51-65 units
Area of Development	1.38 ha
Design Population Density	196 persons/ha
Design Population	270 persons
Multi-Residential	

Number of Multi-Residential Units	56-150 units
Area of Development	2.10 ha
Design Population Density	196 persons/ha
Design Population	412 persons
Total Design Population	1915 persons
Average Daily Residential Design Flow	225 L/person/day
Average Daily Residential Flow	4.97 L/s
Peak Hour Peaking Factor (MECP Table 3-1)	3.75
Peak Hourly Residential Flow	12.47 L/s
Maximum Day Peaking Factor (MECP Table 3-1)	2.50
Maximum Daily Residential Flow	18.70 L/s

6.3 Fire Flow Demand

In addition to the daily domestic water demand for the proposed development, fire flow demands were calculated to assess the adequacy of the proposed watermain system. The Region of Waterloo specifies that all fire flow requirements shall be determined in accordance with the current issue of Water Supply for Public Fire Protection published by the Fire Underwriters Survey (FUS), and the Ontario Building Code.

The fire flow targets utilized within the EPANET modeling of the Site are detailed in Table 4. In order to reflect the scenario in which the greatest available flow was provided to the proposed development, a looped system connecting to existing nodes on both Listowel Road and Timber Trail Road was modelled using information provided by the Region of Waterloo.

Table 4: Prescribed Fire Flow Targets

Land Use	Recommended Fire Flow Target (L/s)
Residential – Single	100
Residential - Townhomes	150
Residential – Multi	150

6.4 Modelling and Results

The model was run to optimize pipe sizes in the proposed subdivision according to the aforementioned design criteria. The subdivision pipe sizes were modelled as 200-mm-diameter feeders connecting to the 200-mm-diameter and 300-mm-diameter mains on Timber Trail Road and Listowel Road, respectively. In order to determine the maximum available flow that can be supported by the proposed system, a fire flow analysis was conducted within the system on PCSWMM.

In order to create the Maximum Day demand plus fire flow model, the demands noted in Table 2 were divided by the number of system nodes within each respective portion of the proposed development – the resulting products were then assigned to the system nodes within the model.

For this system in particular, there were 33 nodes that represent the proposed development within the EPANET model. For all nodes within the subject lands, the maximum day demand was set to a value of 0.378 (the product of the overall residential maximum day demand divided by the 33 nodes within the subject lands). This process was repeated in order to create the peak hourly demand model.

Additionally, a minimum constraint of 14.1 m (20 psi) was assigned to all nodes within the system. A specified target pressure analysis was then performed on the system. Under this analysis, the program computes the maximum available fire flow such that no nodes within the system drop below the minimum pressure constraint assigned to them.

It is noted that the fire flow analysis conducted considers the previously-assigned Maximum Day demand values that were assigned to the non-hydrant nodes in the model when determining the available fire flow at the hydrant nodes. The fire flow analysis tool utilized within the fire flow scenarios simulates a situation in which a hydrant within the system is required to provide the prescribed fire flow for a duration of 3 hours, under the prescribed system pressure constraints, within the modelled system. The fire flow analysis tool does not override the previously-prescribed demands assigned to the nodes within the system, instead it takes them into account when determining the maximum available fire flow at each hydrant node.

The results for select nodes, noted to be in key positions within the development (nodes with larger base demand values and nodes that are the furthest away from the subdivision's connections to the existing water mains), are presented in Table 5. Detailed results for all fire flow scenarios modelled are provided in Appendix C.

Table 5: MDD + Fire Flow Results for Key Nodes

Junction	Required Fire Flow (L/s)	Min. Residual Pressure (m)	Fire Flow Period (hours)	Available Fire Flow at Min. Residual Pressure (L/s)
J8	150	14.1	3.00	167.66
J18	150	14.1	3.00	175.04
J21	150	14.1	3.00	177.04

As illustrated on the modelling results shown above and provided within Appendix C, the proposed network is capable of providing adequate fire flow to the lands within the applicable pressure and velocity constraints.

6.5 Water Quality

The site will be serviced by a looped watermain to ensure that water quality is maintained through the elimination of stagnation and loss of chlorine residual within the system.

7.0 STORM SERVICING AND STORMWATER MANAGEMENT

Under post-development conditions, stormwater quantity, quality, and erosion control for the development will be provided by a SWM facility located to the south of the Site. The facility will be designed in accordance with MECP guidelines. The proposed development will include the construction of a municipal storm sewer system to convey minor system flows to the proposed SWM facility. The proposed storm sewer network will be sized to convey the Township of Woolwich's 5-year storm event. Major flows will be conveyed overland through the internal street network to the SWM facility.

7.1 Stormwater Management Criteria

This section provides the SWM requirements and design for the proposed SWM facility within the subject lands. A proposed storm sewer system will collect and convey the 5-year storm from the subject lands and external areas. The proposed road network will convey major system flows to the proposed SWM facility, which will outlet to Listowel Road.

Storm Servicing and SWM has been designed to service the entirety of the proposed development to satisfy stormwater management and storm sewer conveyance requirements.

The proposed SWM features incorporated into the development will be subject to the following criteria:

SWM Facility

- Quality Control – Provide an “Enhanced” (80% total suspended solids (TSS) removal) level of water quality protection per MECP guidelines.
- Erosion Control – Provide extended detention drawdown over a 24- to 48-hour period for the 25 mm (4-hour duration) Chicago Storm event outletting from the wet pond cell into the municipal ditch inlet.
- Quantity Control – Control post-development peak flow discharge to the receiving outlet to less than pre-development conditions for the 2-year to 100-year storm events and provide safe conveyance of the Regional storm event through the SWM facility. The Regional storm event is the Hurricane Hazel 48-hour event with a total depth of 285 mm.

7.2 Pre-Development Conditions

The project site encompasses 18.85 hectares of agricultural land. Historically, the site has been used for farmland and no water bodies (as defined by O. Reg. 153/04) are located on the Site as noted in the GHD ESA Phase Two report. The site is assumed to be farmland fields, and classified to be in Hydrologic Soil Group B, primarily underlain by Conestogo and Guelph Loam Soils (AgMaps). GHD provided the geologic study which indicates deposits of silty clay, silt, sand and gravel across the Site. A shallow, perched groundwater flow in the southeast was identified by Pinchin’s preliminary Hydrogeological Investigation Report. GHD has stated that the perched water is present only on a seasonal basis and likely representative of wet winter melt conditions within the lands, and not indicative of a true groundwater table.

Under pre-development conditions, a temporary SWM facility servicing the Southwood Park Subdivision – Phase 2 outlets to the subject lands. Flows from this SWM facility drain to the south towards Listowel Road. There is an existing roadside ditch which outlets to a storm sewer system located at the southeastern corner of the subject lands which conveys flows east across Arthur Street South. The storm sewer located within the Listowel Road municipal right-of-way is the legal outlet for the proposed SWM facility. The removal of the temporary SWM facility is proposed under the post-development conditions.

A single SWM facility will provide appropriate measures for the development of the subject lands. The SWM strategy will also include low-impact development strategies and infiltration measures where opportunities exist. The SWMF will be designed to control post-to-pre-development flows per the current GRCA and MECP standards, provide quality control, and adhere to the standards set forth in the above-noted criteria.

The post-development conditions were analyzed with the SWMHYMO hydrologic modeling program using a 4-hour, Chicago rainfall distribution. The Regional storm event used a 24-hour rainfall event.

Hydrologic modeling schematics, parameters, and SWMHYMO input/output files are included in Appendix D. The pre-development conditions were separated into two catchment areas shown in Appendix D. Catchment 100 is based on original pre-development conditions established in the Southwood Park Subdivision Phase II Stormwater Management Report (July 1997). The pre-development peak flows for each of the outlet locations, as well as the total for the subject site, are shown in Table 7. These flows will be compared with the post-development results. It is noted that, under pre-development conditions, the catchment areas include the undeveloped site area along with the lands that are directed to the temporary SWM facility for Southwood Park Subdivision - Phase 2.

Table 6: Pre-Development Catchment Areas

Catchment ID	Description	Outlet	Area (ha)
100	External Drainage Area of Southwood Phase II	Listowel Road	7.86
200	Northeastern portion of the Site	Listowel Road	16.62
Total			24.48

Table 7: Pre-Development Peak Flows (m³/s) From Subject Lands to Outlet

Storm Event	Outlet - Temporary SWMF- Listowel Road Ditch
25 mm	0.120
2-Year	0.276
5-Year	0.535
10-Year	0.749
25-Year	1.054
50-Year	1.315
100-Year	1.591
250-Year	2.603

7.3 Post-Development Conditions

Under post-development conditions, the subject lands will be developed into a residential subdivision. The proposed conditions drainage areas are shown in Appendix D. Hydrologic modeling schematic parameters, and SWMHYMO input/output files for post-development conditions are included in Appendix D. A summary of the catchments and their drainage areas is provided in Table 8.

The proposed development will be serviced by a SWM facility for all storm events up to and including the Regional design storm event. The SWM facility will incorporate an MECP wet pond facility that will provide quality control and extended detention prior to releasing flows into the ditch inlet catch basin. This inlet connects to the municipal network via an 825-mm-diameter pipe that flows towards Arthur Street South.

Under proposed conditions, the developed area will drain via the designed minor and major drainage networks to the proposed SWM facility. The minor system enters the SWM facility via a proposed 1350-mm-diameter inlet at the northwestern corner of the pond. Flows from the inlet enter the sediment forebay, which has been sized according to the guidelines provided in the MOE (now the MECP) Stormwater Management Planning and Design Manual; design calculations are provided in Appendix D. The active and inactive storage volumes in the wet pond were designed to exceed the MOE minimum requirements to provide “Enhanced” water quality and quantity treatment and to meet the allowable peak flow discharge criteria. The performance of the proposed pond is summarized in Table 9. Catchments 401 and 402 minor flows will drain to the SWM facility located in Southwood 4. Major storms will be conveyed via overland flows towards catchment 301 and ultimately to the SWM facility in Block 26.

Due to capacity constraints within the Burlwood Drive pipe segment to the SWM facility, runoff in excess of 6.849 m³/s will be directed to the overland flow route on the northeastern end of the SWM facility. Major flows will pass through an easement which outlets directly to the main cell of the SWM facility from the southeastern corner of Street One. A hydraulic analysis was done for the channel under the Regional Storm event, which produced a peak inflow to the pond of 14.012 m³/s. The overland flow channel saw a flow depth of 0.176 m during the Regional Storm event, which is within the requirements set by the Township of Woolwich’s Engineering Development and Infrastructure Manual. A summary of the analysis is provided in Appendix D.

Downstream municipal networks were analyzed with the additional discharge from the proposed SWM facility and were determined to have sufficient capacities to route flows from the 2-year up to the 100-year design storm events.

Table 8: Post-Development Catchment Areas

Catchment ID	Description	Outlet	Area (ha)
201	Main portion of proposed subdivision	Listowel Road	18.26
301	Existing Residential Development from Southwood 3	Listowel Road	4.91
302	Existing Residential Development from Southwood 3	Listowel Road	0.58
303	Existing Residential Development from Southwood 3	Listowel Road	0.73
401	Existing Residential Development from Southwood 3	Listowel Road	1.54
402	Existing Residential Development from Southwood 4 Phase 1A	Listowel Road	0.36
Total			26.38

7.3.1 SWM Block Design

The SWM block is 1.98 ha in size. The proposed facility will outlet to the Listowel Drive outfall which leads to the municipal storm sewer network via a 190-mm-diameter pipe. Table 9 summarizes the basic operating levels, volumes, and outlet controls within the proposed facility. Detailed stage-storage-discharge information is provided in Appendix D. The low-flow quality control orifice will be serviced by a reversed-slope pipe extending into the permanent pool of the pond. The remaining quantity control will be achieved by a 10-m-wide weir with a sill elevation of 358.80 m.

Table 9: SWMF Operating Levels

Stage	Elevation (m)	Active Volume (m ³)	Cumulative Volume (m ³)
Bottom of Forebay	354.45	0	0
Bottom of Wet Cell	354.45	0	0
Permanent Pool	355.95	0	9,551
Extended Detention (25 mm)	356.45	4,730	14,240
Overflow Weir Sill	358.50	32,932	42,483
Top of Pond	358.80	38,222	47,773
Outlet Controls:	One – 190-mm-diameter low-flow orifice (quality) at elev. 355.95 m		
	Two – 400-mm-diameter orifices (quantity) at elev. 356.45 m		
	10-m-long weir at elev. 358.50 m		

The proposed SWM facility will be constructed as a wet pond that will provide an Enhanced (80% TSS removal) level of water quality protection per MECP guidelines for the catchment areas from which it receives flow. The facility will include a permanent pool with forebay and extended detention drawdown for the 25 mm storm event. Table 10 summarizes the water quality control design features of the SWM facility. Detailed calculations and design sheets are included in Appendix D. It is noted that catchments 401 and 402 were omitted from water quality area calculations as minor flows are directed to an existing SWM facility offsite as designed.

Table 10: SWM Facility – Summary of Water Quality Control

Component	Required	Provided
Protection Level	Enhanced (80% long-term TSS removal)	
Drainage Area for Quality Control	23.09 ha	
Percent Impervious	76%	
Req'd MECP Water Quality Unit Volume	234.93 m³/ha	
Permanent Pool Volume		
Permanent Pool (Required unit volume = 235 m³/ha) ^A	4500 m³	9550 m³
Permanent Pool Depth	1.0 – 2.0 m	1.5 m
Extended Detention Volume/Control		
Extended Detention Volume (Based on 25 mm storm) ^B	4,690 m³	4,730 m³ (elev. 356.45 m)
Drawdown time for Erosion Control	24 – 48 hours	46 hours
Orifice Diameter (Water Quality)	---	190 mm dia. (invert 355.95 m)
Forebay Length	40 m	75 m

^A Permanent Pool Volume = Total required volume, less 40 m³/s/ha

^B MECP minimum requirement is 40 m³/ha, but 25 mm storm volume governs

The SWM facility includes a sediment drying area within the block area. The sediment drying area is sufficient to store the sediment volume from the bottom 0.5 m of the forebay

The results of the SWMHYMO modeling are presented in Table 11. The analysis shows a significant attenuation of the uncontrolled peak flows entering the SWM facility with all storm events.

Table 11: SWM Facility – Peak Flows and Storage Volume Summary

Storm Event	Inflow (m ³ /s)	Controlled Outflow to Listowel Road Ditch (m ³ /s)	Req'd Active Storage Volume (m ³)	Ponding Elevation (m)
25 mm	3.240	0.050	4,690.000	356.45
2-year	4.915	0.114	6,898.000	356.66
5-year	6.849	0.292	8,983.000	356.83
10-year	8.524	0.407	10,640.000	356.97
25-year	10.044	0.525	13,010.000	357.16
50-year	11.513	0.600	14,970.000	357.32
100-year	13.008	0.666	16,990.000	357.47
250-year	3.824	1.971	35,420.000	358.72

Table 12 compares the total pre- and post-development peak flow rates from the subject lands. The results show that, under post-development conditions, there will be a reduction in total peak flows compared to pre-development conditions. In addition, the existing 825 mm diameter storm sewer outlet receiving the SWM facility discharge has sufficient capacity for the facility flows plus runoff from the Listowel Road right-of-way (see Appendix D).

Table 12: Comparison of Total Peak Flows from Subject Lands (m³/s)

Storm Event	Pre-Development Conditions ^A	Post-Development Conditions
25 mm	0.120	0.050
2-year	0.276	0.114
5-year	0.535	0.292
10-year	0.749	0.407
25-year	1.054	0.525
50-year	1.315	0.600
100-year	1.591	0.666
250-year	2.603	1.971

^A Table 7

7.4 Water Balance

The geotechnical information indicates that the majority of the site is underlain by clay, silty clay and clayey silt. The hydrogeological investigation indicated an infiltration rate of 4×10^{-6} cm/s for a silt till sample that was tested. The clay stratus would have lower infiltration rates. Once a factor of safety is applied, design infiltration rates would be less than 5 mm/hr. Given the extent of the low-permeability soil conditions, it is concluded that infiltration is not significant, and the subject lands are not a significant source of groundwater recharge. As such, the implementation of lot-level infiltration measures is not deemed necessary and have not been proposed. This approach would be consistent with the previous phases which did not implement lot level infiltration measures. A preliminary water balance was prepared for the pre- and post-development conditions (see Appendix E) that shows a 11,173 m³ infiltration deficit under post-development conditions with no supplemental infiltration measures.

7.5 Reasonable Use Concept

The subject lands will be designed with best management practices to minimize the use and infiltration of high-chloride stormwater runoff in accordance with Region of Waterloo guidelines. Using Region of Waterloo supplied data for road salt application rates, the chloride concentration in the groundwater will be below the reasonable use criteria concept.

The MECP's Reasonable Use Criteria (RUC) have been implemented as a means of assessing allowable levels of contaminants in groundwater. These criteria factor in both the background concentrations of a contaminant as well as the reasonable use of groundwater on an adjacent property, setting limits that prevent significant, adverse effects on the usage of groundwater on the neighbouring property.

The RUC is established to be the concentration of contaminants leaving the site boundary that does not exceed the background plus a percentage increase of the difference between the drinking water standard and the background concentration. The Ontario Drinking Water Standards (ODWS) for chloride of 250 mg/L, generally defines the upper limit of acceptability. The RUC concentration is calculated using the following equation:

$$C_m = C_b + x (C_r - C_b)$$

Where:

- C_m = Maximum allowable concentration at the property boundary (mg/L)
- C_b = Existing background groundwater concentration (mg/L) (assumed to be 15 mg/L)
- x = A constant that reduces contamination to a level that the MECP considers negligible.
- x = 0.5 for non-health-related parameters
- C_r = Ontario Drinking Water Standard (ODWS) for chloride = 250 mg/L

Based on the above, the calculated maximum reasonable use criteria for chlorides (C_m) is **132.5 mg/L**.

7.6 Chloride Assessment

To quantify the potential impacts on the existing groundwater quality as a result of winter salting operations, a mass balance analysis was completed that included salting of the proposed municipal roads and the private parking/driveway areas on the Site Plan blocks. For the purposes of this analysis, only the 18.26 ha area comprised of the proposed development rights-of-way and residential lots will be considered. The remaining areas will remain in an existing condition post-development and will not be subject to winter salting or the introduction of additional chlorides into the groundwater.

7.6.1 Municipal Roads

The proposed Draft Plan includes the construction of approximately 2183 m of municipal rights-of-way. The proposed roads are considered local roads.

Winter maintenance for the proposed roads will be the responsibility of the City of Elmira. Salt application data for municipal roads is provided in the 2003 Region of Waterloo Study entitled: *Road Salt Management and Chloride Reduction Study Phase 2: Evaluation of Chloride Reduction Options* (Stantec Consulting Ltd., 2003). Salt application rates per kilometre of 2-lane municipal roads are as follows:

- Primary Roads: 44 tonnes / 2-lane km
- Secondary Roads: 22 tonnes / 2-lane km
- Local Roads: 2.2 tonnes / 2-lane km

For roadways, it was assumed that 30% of the applied salt load will infiltrate through adjacent boulevard areas due to splash-over from the road or overspray from the salt trucks.

7.6.2 Private Site Parking/Driveways

Salt application rates for private parking lots can be highly variable. Information from the *Upper Cedar Creek Scoped Subwatershed Study* (Matrix, 2019) indicated a range of salt applications for commercial properties ranging from 15 to 22 tonnes/salted ha/year. An assumed loading rate of 50 g/m²/event at 37 events occurring annually will be used to calculate salt application across the site.

Similar to the rights-of-way, it was assumed that 30% of applied salt load could potential infiltrate through adjacent landscaped areas due to overspray and splash-over.

7.6.3 Infiltration Volume

The Preliminary Hydrogeological Assessment performed by Pinchin (*Preliminary Hydrogeological Assessment – May 2025*) for the subject lands determined a pre-development annual infiltration rate of 175 mm/year. For the 18.85 ha site development area under consideration, that equates to a pre-development infiltration volume of 31,955 m³ per year. Table 13 summarizes the potential post-development infiltration volume from the development based on the land usage assumptions for the lots and rights-of-way.

Table 13: Post-Development Site Infiltration Summary

Surface	Total Area (ha)	Annual Infiltration Depth (mm)	Annual Infiltration Volume (m ³)
Proposed Development Area (85% imp)	18.85	59.3	11,173

7.6.4 Mass Balance Analysis

Based on the salt loading rates and assumptions provided above, the salt loading and estimated chloride concentration resulting from development is summarized in Table 14.

Table 14: Unadjusted Chloride Assessment

Location / Area	Length of Road (km)	Parking Areas (ha)	Annual Salt Application ¹	Total Annual Salt Load (tonnes)	Total Annual Chloride Load ² (tonnes)
Local Roads	2.18		2.2	4.80	
Site Parking		0.7	15	10.50	
Total Annual Salt Load				15.30	
Total Annual Salt Infiltrated (30%)				4.59	2.78
Total Annual Infiltration Volume (m ³)					11,173
Chloride Concentration from Proposed Development based on Infiltration Rate (mg/L)					248.89

Notes:

1. Either listed in tonnes/2-lane km for roads or g/m²/event @ 37 events per year in accordance with the Source Protection Guidance – *Salt Impact Assessment (Region of Waterloo)*. Parking lots 15 tonnes/ha.
2. Chloride accounts for 60.6% of Sodium Chloride

The assessment in Table 14 assumed no adjustment in the application rate of de-icing salt over the assumed areas to be treated within the individual site. It is also assumed that 30% of salt applied to the municipal rights-of-way would infiltrate to groundwater and 30% of the salt load applied to the site parking/driveway areas that require treatment would be captured and infiltrated. The results indicate a chloride concentration of 248.89 mg/L, which is above the RUC criterion of 132.5 mg/L.

7.7 Mitigative Measures

Results from Table 14 show that the chloride concentration is above the RUC limit, mitigative measures will still benefit water quality from the runoff of the Site. As the individual Site Plans are prepared, the surface asphalt should be reviewed for the level of treatment that may be required. For example, as shown in Table 15, by using the same capture and infiltration ratios but introducing a 4:1 sand-salt mixture to any parking lot areas in place of a typical road salt, the resulting chloride concentration is reduced to 120.75 mg/L, complying with the RUC criteria.

Table 15: Adjusted Chloride Assessment

Location / Area	Length of Road	Parking Areas	Annual Salt Application ¹	Total Annual Salt Load	Total Annual Chloride Load ²
	(km)	(ha)		(tonnes)	(tonnes)
Local Roads	2.18		2.2	4.80	
Site Parking (assume 4:1 salt-sand mix)		0.7	3.75 (15/4)	2.63	
Total Annual Salt Load				7.43	
Total Annual Salt Infiltrated (30%)				2.23	1.35
Total Annual Infiltration Volume (m ³)					11,173
Chloride Concentration from Proposed Development based on Infiltration Rate (mg/L)					120.75

Notes:

1. Either listed in tonnes/2-lane km for roads or g/m²/event @ 37 events per year in accordance with the Source Protection Guidance – Salt Impact Assessment (Region of Waterloo). Parking lots 15 tonnes/ha.
2. Chloride accounts for 60.6% of Sodium Chloride

Alternative methods can reduce the chloride loading to acceptable levels; the use of beet juice brine in combination with the application of salt should also be explored as the Site Plans are developed.

Given the proposed development is currently seeking Draft Plan Approval, it is proposed that a Salt Management Plan be a condition of approval for all residential lots within the proposed development subject to the Site Plan Approval process.

For detailed chloride assessment calculations, please refer to Appendix E.

7.7.1 Salt Management Plans

For the proposed residential lots, snow removal and ice control will likely be undertaken by private winter maintenance Contractors. The purpose of the Salt Management Plan will be to reduce the impact of all winter maintenance activities involving salting practices on the surface water and groundwater resources. The Salt Management Plan should outline operational practices and strategies for three main areas of concern: general salt use, salt storage, and snow storage/disposal. Appendix E contains a copy of the Region of Waterloo's *Winter Maintenance for Multi-Residential and Commercial Properties* worksheet. Appendix E also contains the Sustainable Technologies Evaluation Program's *Salt Application Best Practices for Winter Maintenance Contracts*, along with the Region of Waterloo's *Salt Impact Assessment Guidance Document* which provides additional information and guidance. As previously noted, due to the infiltration requirements for the development in general, special consideration will need to be given to the use of alternative de-icing agents as well as targeted and limited use of salts and de-icing agents. Specific site features should be reviewed such as minimizing runoff directed from salted areas to infiltration features as much as possible during the development of the Site Plan.

8.0 EROSION AND SEDIMENT CONTROL

In order to control erosion and transportation of sediment offsite, an erosion and sediment control strategy will be developed during the final design and implemented during the construction process. This plan will focus on the protection of downstream receivers, namely the existing trees and neighbouring properties.

8.1 Preliminary Erosion and Sediment Control Plan

The details of the Erosion and Sediment Control Plan will be provided with the submission of the pre-grading application and/or final design submission for development applications, and will be based on the preliminary erosion and sediment control measures recommended herein. It is recommended that the Erosion and Sediment Control Plan incorporate the following measures:

- Erect heavy-duty silt fences prior to grading or construction adjacent to the woodlot areas, and existing road rights-of-way that are down-gradient along the perimeter of the property to protect adjacent and downstream areas from the migration of sediment in any overland flow (in consultation with the environmental Consultant).
- Erect additional (tiered) silt fence along minor down-gradient slope areas.
- Provide sediment control basins sized to accommodate 250 m³/ha of sediment storage at key locations during grading or construction operations in addition to the proposed SWM facility locations. These facilities shall be relocated as operations proceed to always mitigate sediment transfer.
- Provide erosion control berms/swales in appropriate/critical areas to divert flows to temporary storage locations (sedimentation basins).
- Provide a construction entrance feature ('mud mat') to minimize the offsite transport of sediment from construction vehicles. A road sweeping regimen will also be developed.
- Install temporary rock check dams in swales, where appropriate, to help attenuate flows and encourage sediment deposition.
- Install erosion control matting on all steep (greater than 3:1) slopes.
- Stabilize all disturbed areas according to OPSS 572.
- During construction, all catchbasins are to be sealed until roads are paved to prevent sediment deposition in the catchbasin sumps and conveyance of silt to the SWM facility.
- An Erosion Control Implementation Schedule will be included with the Detailed Erosion and Sedimentation Control Plan prepared in conjunction with the pre-grading application and/or final engineering design.

To ensure the effectiveness of the various erosion and sediment control measures, an appropriate inspection and maintenance program is necessary. The inspection activities during construction will include:

- Inspections of the erosion and sediment controls bi-weekly and after each significant rainfall event (greater than 25 mm).
- Inspections should include all silt fence installations, sediment traps and basins, outlets, and vegetation.

All erosion and sediment control measures will be removed at the end of construction.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented in this report, it is concluded that:

- The proposed Site can be adequately serviced through both existing and planned municipal infrastructure (sanitary, storm, and watermain) and utilities (gas/hydro/cable).
- Municipal servicing and roadworks can be constructed in accordance with the Township of Woolwich and MECP standards.
- Stormwater management measures can be provided in accordance with various agency guidelines.

- Streets within the Subdivision will be constructed to the Township of Woolwich Design Standards.
- A 200-mm-diameter municipal sanitary sewer will be installed within the proposed rights-of-way to service the development. The Site will connect and outlet to the existing 375-mm-diameter sewer located on Listowel Road.
- The proposed water distribution network, consisting of 200-mm-diameter feeders, will connect to the 200-mm and 300-mm-diameter mains on Timber Trail Road and Listowel Road, respectively, to service the Site.
- Pipe sizes are such that velocities in all watermains are generally less than 5 m/s under fire flow conditions and meet fire flow requirements of 150 L/s for all proposed residential blocks.
- The construction of a SWM facility can effectively provide an Enhanced (80% TSS removal) level of water quality protection for the proposed development areas. Moreover, runoff from the 25 mm storm event can be detained and released over a 24-to-48-hour period to mitigate stream erosion.
- Sufficient storage volume is available in the proposed SWM facility to reduce overall post-development peak flows from the subject lands to less than pre-development levels. Post-development peak flows will be reduced to less than pre-development conditions and the Regional storm event can be safely conveyed through the SWM facility.
- A municipal storm sewer system can be sized to convey the 5-year minor system flows to the proposed SWM facility with major flows routed via the internal road network to overland flow inlets into the SWM facility.
- Erosion control measures will be required and will be reviewed and designed during the detailed design stage.
- The Engineer/Designer hereby certifies that the proposed lot drainage and/or grading plan(s) have been designed in accordance with drainage common law in Ontario, sound engineering principles and the Ontario Building Code Articles, such as but not limited to 9.14.6.1 and 9.15.4.6. The Engineer/Designer ensures artificially collected and/or surface drainage will not adversely affect adjacent properties.

Based on the above conclusions the following recommendation can be made:

- That this report be circulated to the previously identified approval authorities in support of the Draft Plan Approval Application,

All of which is respectfully submitted,

WALTERFEDY



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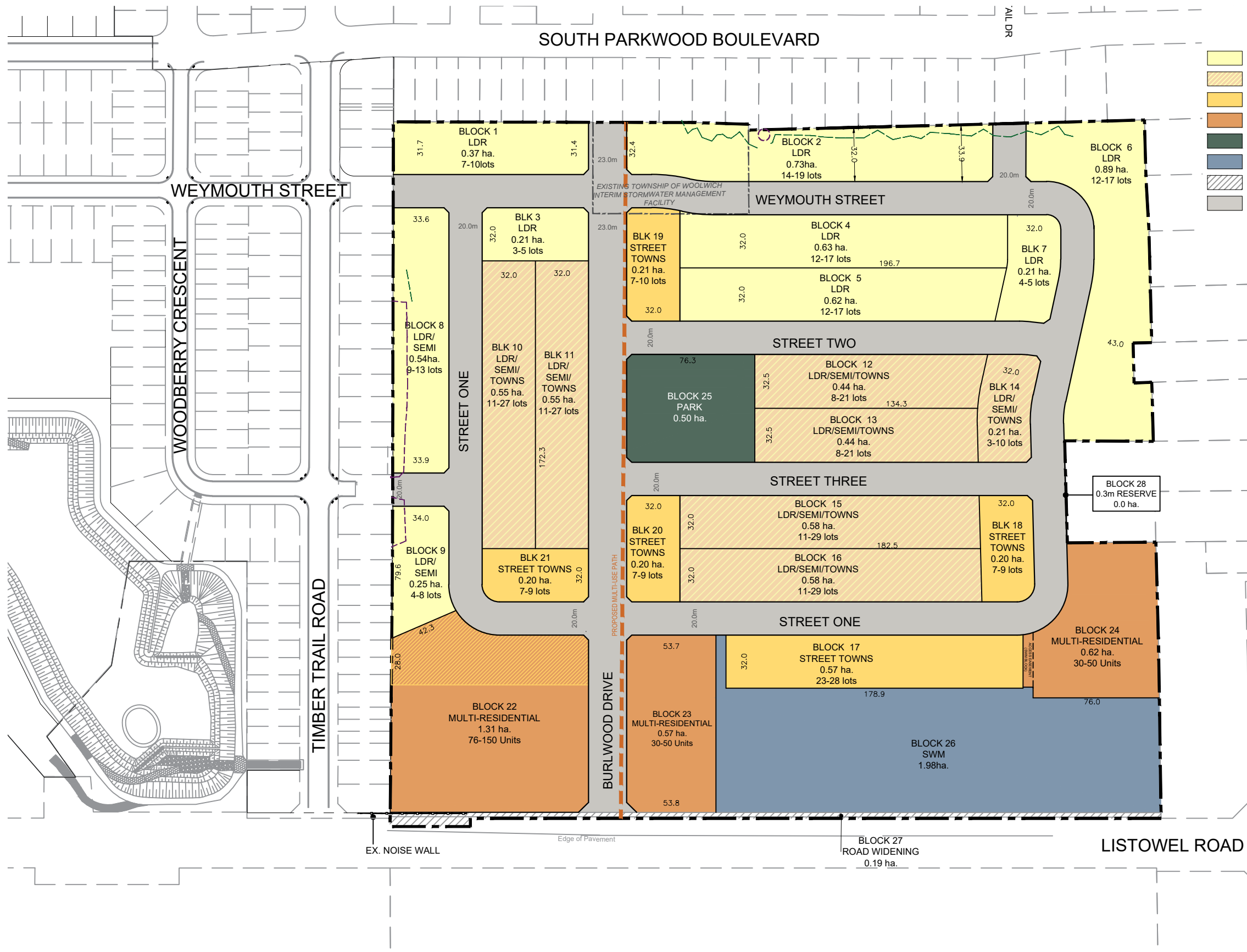
A handwritten signature in black ink, appearing to read "C. Mahoney".

Circe Mahoney, E.I.T.
Water Resources EIT, Civil

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APPENDIX A

Development Concept - GSP



LAND USE SCHEDULE			
USE	BLOCKS	AREA	UNITS
LOW DENSITY RESIDENTIAL	1-9	4.45	77-111
LOW DENSITY/SEMI/TOWNS	10-16	4.17	63-164
STREET TOWNHOUSE	17-21	1.38	51-65
MULTI-RESIDENTIAL	22-24	2.1	136-250
PARK	25	0.50	
STORMWATER MANAGEMENT	26	1.98	
ROAD WIDENING	27	0.19	
ROW		4.50	
TOTAL		18.85	327-590

Tree Root Line

Tree Drip Line

DEVELOPMENT CONCEPT

ELMIRA SOUTHWOOD SUBDIVSION, WOOLWICH

0204060100

Meters

NOTE: This concept should be considered as a preliminary demonstration model that illustrates an 'order of magnitude' development scenario for the site. The number of units, floor area and parking supply are approximate and subject to more detailed design as well as municipal planning approvals.

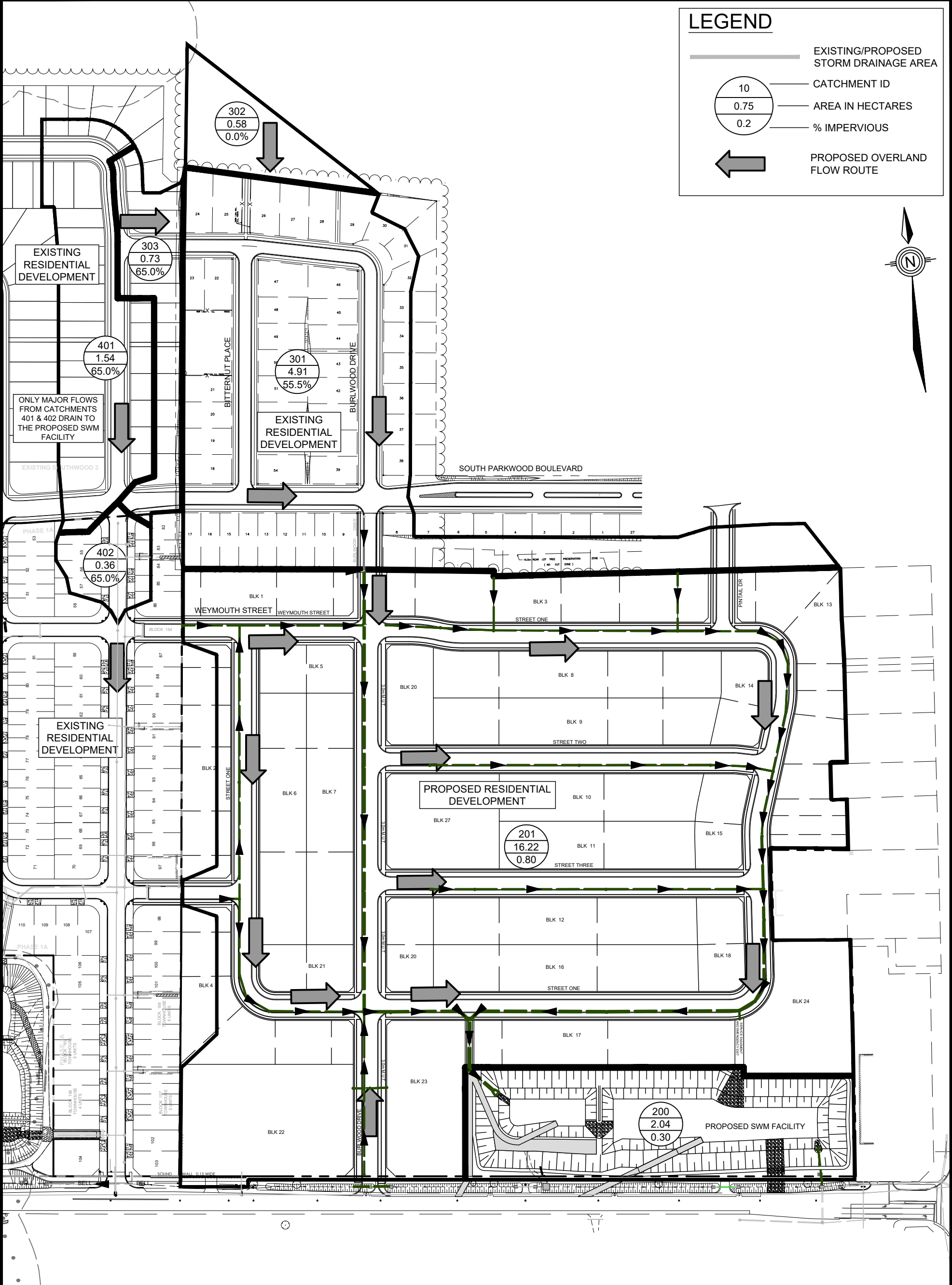
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APPENDIX B

Sewer Design Sheets

WALTERFEDY																			
Project:	Southwood 5							Storm Parameters		STORM SEWER DESIGN CALCULATIONS									
Project No:	2022-0374-10							A	875.1										
Date:	05-Jun-25							B	7.641	Design Frequency	5-yr	Maximum Permitted Full Flow Velocity (m/s)						6	
Designed By:	JBM	Checked By:	EMW/MN					C	0.762	Manning's 'n'	0.013	Minimum Permitted Full Flow Velocity (m/s)						0.8	
	Pipe Data			Drainage Area				Time		Design Flow		Pipe Flow							Remarks
	From	To	Length (m)	Area (ha)	C	AC	ΣAC	Inlet (min)	System (min)	I (mm/hr)	Q (L/s)	Diameter (mm)	Slope (%)	Q _{FULL} (L/s)	Q/Q _{FULL}	V _{FULL} (m/s)	V (m/s)	Flow Time (min)	
	1	2	630	6.22	0.7	4.354	4.354	10	10	98.22	1187.94	900	0.50%	1280.08	0.93	2.01	2.29	4.59	No Surge
	2	3	722	16.22	0.8	12.976	12.976	10	10	98.22	3540.34	1350	0.50%	3774.11	0.94	2.64	3.00	4.01	No Surge
	3	4	10	0.01	0.5	0.005	12.981		14.59	82.34	2968.98	1350	0.50%	3774.11	0.79	2.64	2.92	0.06	No Surge
						0.000	0.000		14.65	82.18	0.00								



PROJECT:
SOUTHWOOD 5
1065 LISTOWEL ROAD, ELMIRA, ON

TITLE:
PROPOSED DRAINAGE AREA PLAN STORM SYSTEM

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DRAWN BY: JBM	PROJECT NO.: 2022-0374-10
CHECKED BY: EMW/MN	FILE: 2022-0374-10_PR_CATCHMENT_STM
SHEET NO.:	

3.0

Project: 1065 Listowel Road, Elmira - Southwood 5										Design Data		Persons Per Unit (PPU)		SANITARY SEWER DESIGN CALCULATIONS																									
Project No: 2022-0374-10														Residential				Commercial				Industrial				Institutional													
Date: 6/6/2025										Min. Velocity		0.80		m/s		Houses		3.25		Peaking Factor		Harmon		Peaking Factor		2.5		Peaking Factor		2.5		Peaking Factor		1.5					
Designed By: EW										Max. Velocity		3.0		m/s		Unspecified		3.05																					
Checked By: MN										Manning's 'n'		0.013				Townhouses		2.44		Avg. Daily Flow		0.0035 L/s/p		Avg. Daily Flow		0.95 L/s/ha		Avg. Daily Flow		0.4 L/s/ha		Avg. Daily Flow		2.5 L/s/ha					
										Infiltration		0.25		L/s/ha		Multi-Res		2.11																					
Pipe Data										Residential										Cumulative				Commercial				Industrial				Institutional				Total C+I+I Flow (L/s)			
		From	To	Length (m)	Area ID	Area (ha)	Single	Street Townhouse	Multi-Residential	Density p/ha	Population (people)	Area (ha)	Population (people)	Peak Factor	Peak Flow (L/s)	Area ID	Area (ha)	Total Area (ha)	Area ID	Area (ha)	Total Area (ha)	Area ID	Area (ha)	Total Area (ha)	Area ID	Area (ha)	Total Area (ha)												
1065 Listowel Road (Southwood 5)	Low Density Residential					4.45	111				143	636		3.92	2.25															9.91									
	Low Density/Semi/Towns					4.17		164			143	596		3.93	2.11															8.33									
	Street Townhomes					1.38		65			196	270		4.10	0.95															4.26									
	Multi-Residential					2.10			150		196	412		4.02	1.45															6.36									
	Overall Site											1915																		28.87									

[1] Population taken from the landowner's estimated number of beds for facility
[2] Persons Per Unit were taken from The Region of Waterloo's Water and Wastewater Monitoring Report 2024

Project: Southwood 4 Subdivision				Design Data			SANITARY SEWER DESIGN CALCULATIONS												Southwood 4		Count	PPU	People	Gingerich Lands		Southwood 5				
Project No: 2017-0283-10				Min. Velocity	0.6	m/s	Residential				Commercial				Industrial				Institutional				Single Detatched	209	3.25	679	Area (ha)	100.2	Area (ha)	18.1
Date: 2019.02.11				Max. Velocity	3.0	m/s	Peaking Factor				Peaking Factor				Peaking Factor				Peaking Factor				Semi-Detatched	52	3.25	169	Density (ppha)	55	Density (ppha)	55
Designed By: DRF				Manning's 'n'	0.013		Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Townhouse	106	2.44	259	People	5511	People	996
Checked By: DAS				Infiltration	0.15	l/s/ha	Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Apartment	185	1.77	327	Area (ha)	100.2	Area (ha)	18.1
																							Area (ha)	26.16	ha	1434				
Pipe Data				Residential			Cumulative Residential			Commercial		Industrial		Institutional		Infiltration			Design Data			Design Check								
From	To	Length	Area	Units	Density	Population	Area	Population	Peak Factor	Area	Total Area	Area	Total Area	Area	Total Area	Area	Total Area	Area	Total Area	Total Flow	Diameter	Slope	V _{FULL}	Q _{FULL}	Q/Q _{FULL}	Q < Q _{FULL}	V > V _{MIN}	V<V _{MAX}		
		(m)	(ha)		(ppu)	(people)	(ha)	(people)		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(mm)	(%)	(m/s)	(L/s)						
Trunk Network Along Listowel Road From Timber Trail To Arthur St. From Southwood 4 and Gingerich Lands	MH49A	MH50A	86.2	126.360		6945	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	126.360	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH50A	MH51A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH51A	MH52A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH52A	MH53A	85.2	0.000	996 people estimated as part of Listowel Road sanitary upgrades in 2019	0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH53A	MH54A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE					
	MH54A	621	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE					
Southwood 5	621	620	64.4	18.100		996	144.460	7941	3.053	0.00	0.00	0.00	0.00	0.00	0.00	18.100	144.460	107.26	375	0.64	1.27	139.93	0.77	TRUE	TRUE	TRUE				

Project: Soutwood 5 Subdivision				Design Data			SANITARY SEWER DESIGN CALCULATIONS												Southwood 4			Count	PPU	People	Gingerich Lands		Southwood 5			
Project No: 2017-0283-10				Min. Velocity	0.6	m/s	Residential				Commercial				Industrial				Institutional				Single Detatched	209	3.25	679	Area (ha)	100.2	Area (ha)	18.1
Date: 6/6/2025				Max. Velocity	3.0	m/s	Peaking Factor				Peaking Factor				Peaking Factor				Peaking Factor				Semi-Detatched	52	3.25	169	Density (ppha)	55	Density (ppha)	55
Designed By: EMW				Manning's 'n'	0.013		Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Townhouse	106	2.44	259	People	5511	People	996
Checked By: MN				Infiltration	0.15	l/s/ha	Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Avg. Daily Flow				Apartment	185	1.77	327	Area (ha)	100.2	Area (ha)	18.1
																							Area (ha)	26.16	ha	1434				
Pipe Data				Residential			Cumulative Residential			Commercial		Industrial		Institutional		Infiltration		Design Data			Design Check									
From	To	Length	Area	Units	Density	Population	Area	Population	Peak Factor	Area	Total Area	Area	Total Area	Area	Total Area	Area	Total Area	Area	Total Area	Total Flow	Diameter	Slope	V _{FULL}	Q _{FULL}	Q/Q _{FULL}	Q < Q _{FULL}	V > V _{MIN}	V<V _{MAX}		
		(m)	(ha)		(ppu)	(people)	(ha)	(people)		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(mm)	(%)	(m/s)	(L/s)						
Trunk Network Along Listowel Road From Timber Trail To Arthur St. From Southwood 4 and Gingerich Lands	MH49A	MH50A	86.2	126.360		6945	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	126.360	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH50A	MH51A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH51A	MH52A	85.2	0.000	1915 people per latest concept plan and prescribed population densities	0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE				
	MH52A	MH53A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE					
	MH53A	MH54A	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE					
	MH54A	621	85.2	0.000		0	126.360	6945	3.110	0.00	0.00	0.00	0.00	0.00	0.000	126.360	95.20	375	0.50	1.12	123.98	0.77	TRUE	TRUE	TRUE					
Southwood 5	621	620	64.4	18.100	1915	144.460	8860	3.007	0.00	0.00	0.00	0.00	0.00	0.00	18.100	144.460	115.71	375	0.64	1.27	139.93	0.83	TRUE	TRUE	TRUE					

APPENDIX C

Domestic Water Demand Calculations & EPANET Modelling

Hydrant Flow Test - Whippoorwill Dr
Whippoorwill Dr.
Elmira

Job # 20827



Static Hydrant at ** 50m West of Nighthawk Lane**

Flowing Hydrant between ** Nighthawk Ln and Green Warbler Cres**

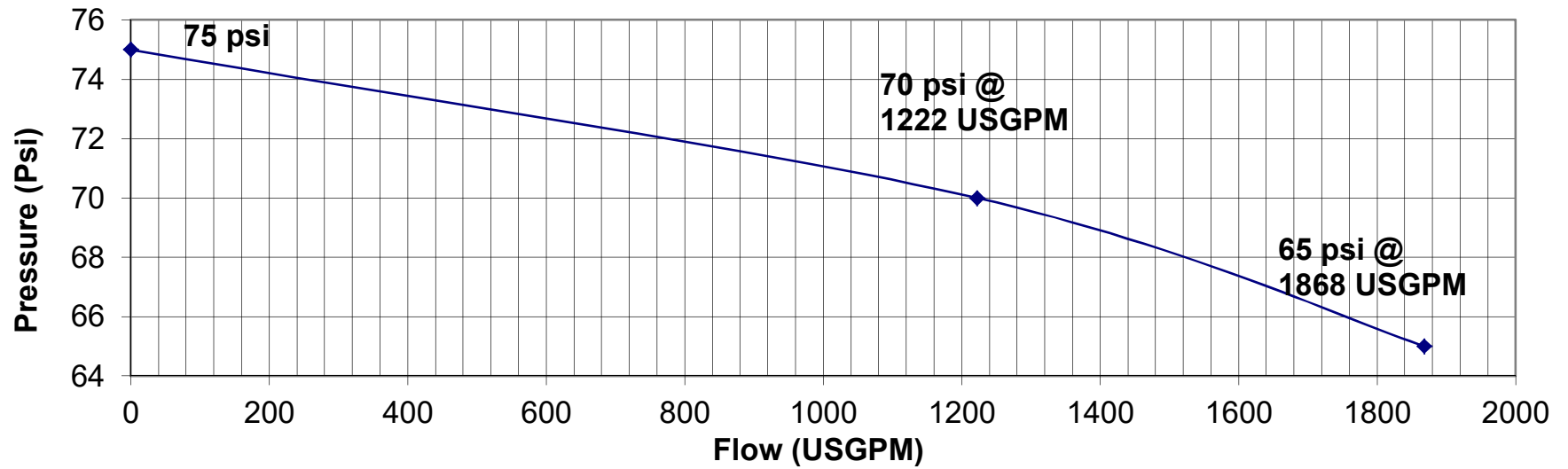
Static Pressure (Psi)	
	75
Residual Pressure 1 (Psi)	
	70
Residual Pressure 2 (Psi)	
	65
Residual Pressure 3 (Psi)	

Co efficient value	
	0.9

Pitot Reading 1	53
Outlet Size 1	2.5
Pitot Reading 2	32+30
Outlet Size 2	2.5
Pitot Reading 3	
Outlet Size 3	
Flow 1 Calculated	
	1221.97
Flow 2 Calculated	
	1868.23
Flow 3 Calculated	
	0.00

# of Outlets Flowed 1	1
# of Outlets Flowed 2	2
# of Outlets Flowed 3	0
Graph Data:	
Pressure Values (y-axis)	Flow Values (x-axis)
75	0
70	1222
65	1868
Time of Test :	
19-Dec-13	10:15am
Performed by:	C.B. + L.M.

Water Graph





ENGINEERING AND ENVIRONMENTAL SERVICES

Water and Wastewater Services

150 Frederick Street 7th Floor
Kitchener Ontario N2G 4J3 Canada
Telephone: 519-575-4400; TTY: 519-575-4608
Email: waterservices@regionofwaterloo.ca
www.regionofwaterloo.ca/water

Erika Woods,
WalterFedy
T: 519.576.2150 x387
C: 519.465.7767

Date: May 16, 2025

Dear: Erika

Re: 1065 Listowel Road, Elmira

Please find the results of the modeling simulations for boundary conditions requested on September 23, 2024. The results include a figure showing the location of the node from the Region's model. Attached are a series of spreadsheets containing results for Average Day, Maximum Day demands and available fire flows for node JCT_05381 located Listowel Rd & Arthur St S. The diurnal 24-hour demand distribution accounts for the minimum hour and peak hour peaking factors. The maximum pressure on the average day represents the minimum hour, and the minimum pressure on the maximum day represents the peak hour.

Table 1 – Modeling Results

Node	Elevation (mASL)	Demand		Fire Flow Results	
		Ave Day (L/s)	Max Day (L/s)	Design Flow (L/s)	Design Pressure (m)
JCT_05381	356	2.66	6.65	218.5	23.5

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me

A handwritten signature in black ink, appearing to read "KD", with a long horizontal line extending to the right.

Kevin Dolishny P.Eng.
Senior Engineer, Water Services
c. 226.751.4551
e. kdolishny@regionofwaterloo.ca

Elmira West

Listowel Rd & Arthur St S

JCT_05381 Average Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	1.22	419.52	63.52
01:00 hrs	1.41	419.35	63.35
02:00 hrs	1.52	419.17	63.17
03:00 hrs	1.36	419.01	63.01
04:00 hrs	1.12	418.86	62.86
05:00 hrs	1.73	418.60	62.60
06:00 hrs	3.65	418.98	62.98
07:00 hrs	3.95	419.21	63.21
08:00 hrs	3.66	419.49	63.49
09:00 hrs	3.55	419.78	63.78
10:00 hrs	3.40	420.03	64.03
11:00 hrs	3.21	420.37	64.37
12:00 hrs	3.07	420.65	64.65
13:00 hrs	2.87	420.90	64.90
14:00 hrs	2.65	420.38	64.38
15:00 hrs	2.80	420.11	64.11
16:00 hrs	2.99	419.83	63.83
17:00 hrs	3.43	419.52	63.52
18:00 hrs	3.72	419.24	63.24
19:00 hrs	3.73	418.99	62.99
20:00 hrs	3.46	418.76	62.76
21:00 hrs	3.09	418.52	62.52
22:00 hrs	2.47	419.31	63.31
23:00 hrs	1.62	419.83	63.83

Average Day HGL:

419.52

Minimum Hour:

420.90

JCT_05381 Maximum Day 24 Hour Simulation

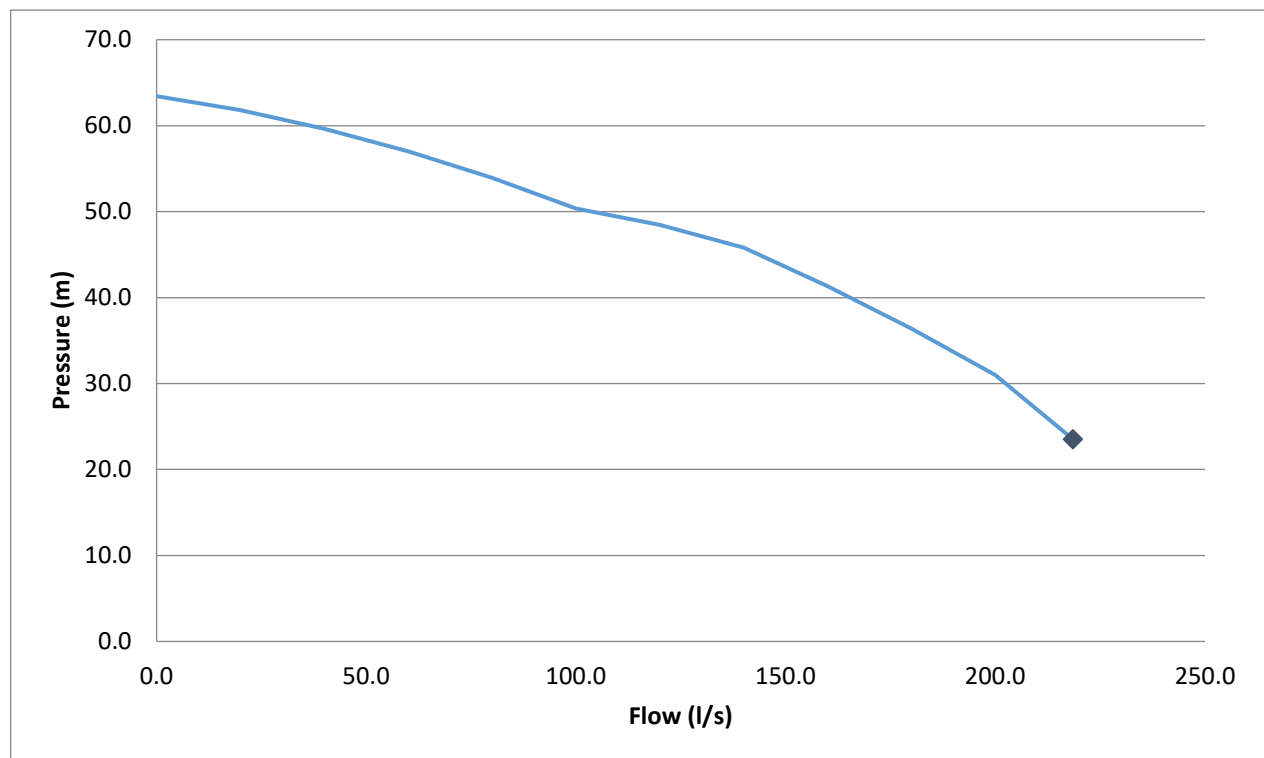
Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	6.16	420.32	64.32
01:00 hrs	4.37	420.12	64.12
02:00 hrs	4.26	419.85	63.85
03:00 hrs	4.70	419.68	63.68
04:00 hrs	5.09	419.12	63.12
05:00 hrs	7.94	418.55	62.55
06:00 hrs	8.15	418.04	62.04
07:00 hrs	8.20	417.64	61.64
08:00 hrs	11.82	417.52	61.52
09:00 hrs	12.23	417.35	61.35
10:00 hrs	12.39	417.02	61.02
11:00 hrs	13.12	416.81	60.81
12:00 hrs	9.89	416.77	60.77
13:00 hrs	4.87	417.50	61.50
14:00 hrs	7.15	418.20	62.20
15:00 hrs	4.06	418.77	62.77
16:00 hrs	3.13	419.16	63.16
17:00 hrs	2.74	419.52	63.52
18:00 hrs	3.33	419.83	63.83
19:00 hrs	4.01	420.06	64.06
20:00 hrs	4.49	420.22	64.22
21:00 hrs	6.66	420.43	64.43
22:00 hrs	7.14	420.87	64.87
23:00 hrs	6.43	420.60	64.60

Maximum Day HGL:

418.92

Peak Hour:

416.77





Region of Waterloo

ENGINEERING AND
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Water and Wastewater Services
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www.regionofwaterloo.ca

Subject Site

Junction

- Active
- Domain
- Inactive

Tank

- Active
- Domain
- Inactive

Reservoir

- Active
- Domain
- Inactive

Pump

- Active
- Domain
- Inactive

Valve

- Active
- Domain
- Inactive

Pipe

- Active
- Domain
- Inactive

1065 Listowel Rd, Elmira

REQUIRED DOMESTIC FLOW

ONTARIO BUILDING CODE

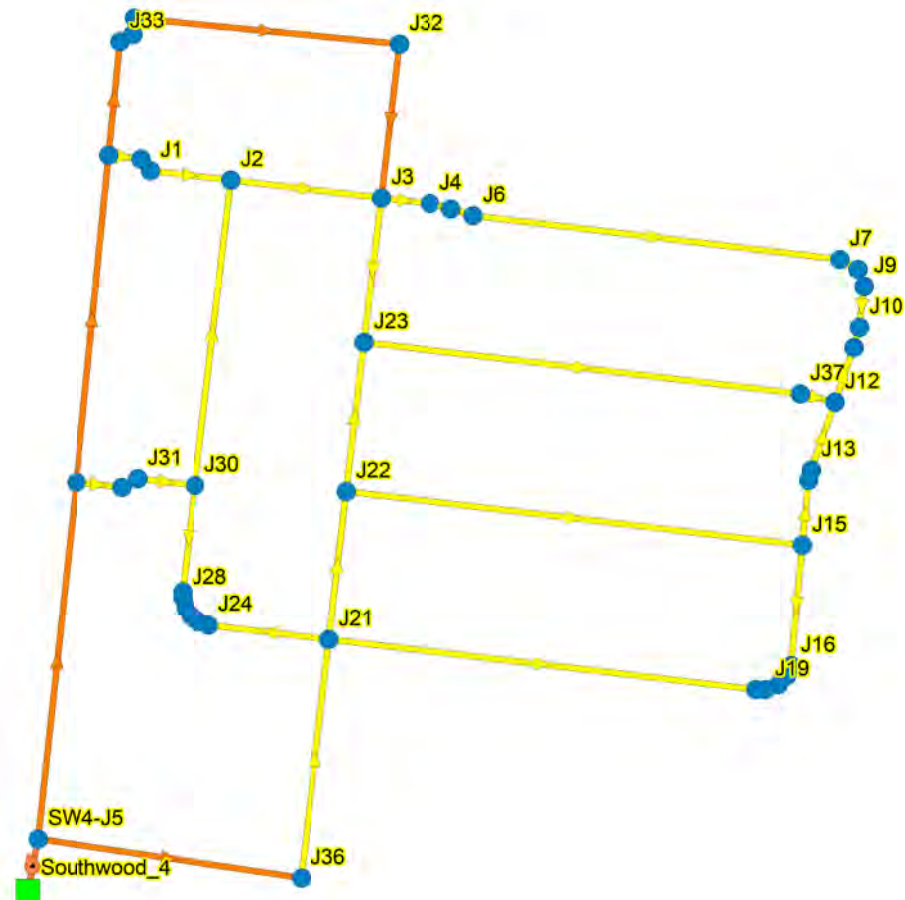
WALTERFEDY

Project	Elmira Southwood Subdivision								
Project #	2022-0374-10								
Designer	CM								
Description	Residential Domestic Flow								
Building Description	Area (ha)	Persons/ha	Population	Operating Hours	Demand	Max Daily Peak Factor	Max Hourly Peak Factor	Max Daily Demand (L/s)	Max Hourly Demand (L/s)
Low Density Residential	4.45	143	636	24					
Low Density/Semi/Towns	4.17	143	596	24					
Street Townhomes	1.38	196	270	24					
Multi-Residential	2.10	196	412	24					
Proposed Subdivision	12		1915	24	225 L/cap/day	2.50	3.75	12.47	18.70
Total								12.47	18.70

Notes:

- [1] Unit counts as per the Development Concept Plan produced by GSP group, dated April 23, 2025
- [2] Persons per unit as per the Township of Woolwich 2024 D.C. Background Study.
- [3] Peaking Factors were taken from Table 3-1: Peaking Factors from MECP's Design Guidelines for Drinking-Water Systems.

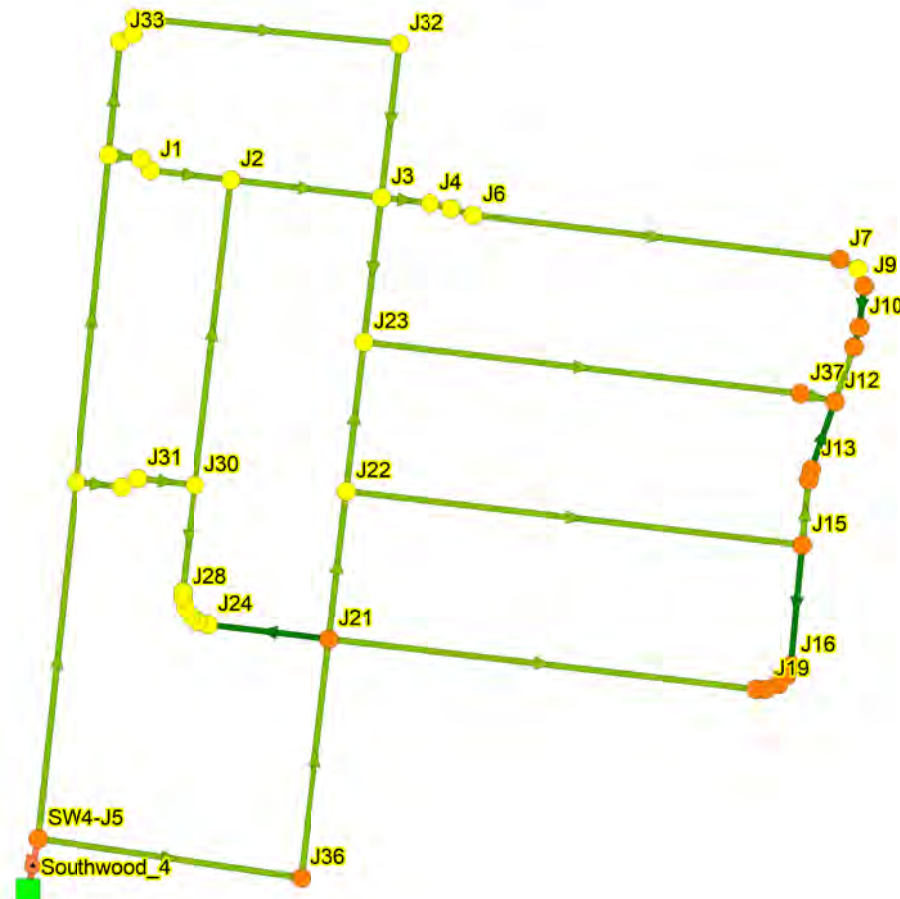
2022-0374-10 - System Layout



Legend

- Junctions
- Pumps
- Reservoirs
- Pipe velocity
- Diameter < 150 mm
- Diameter = 150 mm
- Diameter = 200 mm
- Diameter = 300 mm
- Diameter > 300 mm

2022-0374-10 - Peak Hourly Demand Results



Legend

Junctions

- Pressure < 14.1 m
- Pressure: 14.1 - 35.7 m
- Pressure: 35.7 - 56.1 m
- Pressure: 56.1 - 71.4 m
- Pressure >= 71.4 m

Pumps

- Reservoirs

Pipe velocity

- Velocity < 0.01 m/s
- Velocity: 0.01 - 1 m/s
- Velocity: 1 - 2 m/s
- Velocity: 2 - 5 m/s
- Velocity >= 5 m/s

 * E P A N E T *
 * Hydraulic and Water Quality *
 * Analysis for Pipe Networks *
 * Version 2.2 *

Input File: 2022-0374-10 - PHD Model_rev.inp

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
EX.L1	SW4-J5	J36	150.515	300
EX.C2	SW4-J4	SW4-J5	202.95	300
EX.C1	SW4-J2	SW4-J4	185.718	300
C9	SW4-J2	SW4-J1	18.112	200
C10	SW4-J1	J1	8.423	200
C11	J1	J2	46.162	200
C12	J2	J3	85.569	200
C13	J3	J4	27.773	200
C14	J4	J5	12.358	200
C15	J5	J6	13.018	200
C16	J6	J7	208.494	200
C17	J7	J8	11.435	200
C18	J8	J9	10.285	200
C19	J9	J10	23.305	200
C20	J10	J11	11.71	200
C21	J11	J12	32.742	200
C22	J12	J13	40.531	200
C23	J13	J14	5.954	200
C24	J14	J15	37.001	200
C25	J15	J16	68.317	200
C26	J16	J17	6.291	200
C27	J17	J18	6.931	200
C28	J18	J19	7.945	200
C29	J19	J20	5.538	200
C30	J20	J21	242.531	200
C31	J21	J24	68.757	200
C32	J24	J25	6.398	200
C33	J25	J26	4.736	200
C34	J26	J27	5.702	200
C35	J27	J28	5.969	200
C36	J28	J29	3.383	200
C37	J29	J30	60.645	200
C38	J30	J2	173.716	200
C39	J3	J23	82.282	200
C40	J23	J37	248.346	200
C41	J37	J12	19.883	200
C42	J23	J22	84.919	200



Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
C43	J22	J15	259.423	200
C44	J22	J21	84.09	200
C45	J21	J36	135.894	200
C46	SW4-J4	SW4-J3	25.944	200
C47	SW4-J3	J31	10.193	200
C48	J31	J30	32.672	200

2024-0374-10 - PHD Results

C3	J3	J32	87.495	300
CW4-J2	SW4-J2	J33	64.547	300
C2	J33	J34	8.404	300
C4	J34	J35	9.167	300
C5	J35	J32	150.547	300
P1	Southwood_4	SW4-J5	#N/A	#N/A Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
P1	100.00	75.00	0.23	15.32	15.32	0.00
Demand Charge:						0.00
Total Cost:						0.00

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
J1	0.57	418.67	52.42	0.00
J2	0.57	418.67	53.21	0.00
J3	0.57	418.66	55.61	0.00
J4	0.57	418.66	55.92	0.00
J5	0.57	418.66	56.01	0.00
J6	0.57	418.66	56.10	0.00
J7	0.57	418.65	56.21	0.00
J8	0.57	418.65	55.99	0.00
J9	0.57	418.65	56.17	0.00
J10	0.57	418.65	56.37	0.00
J11	0.57	418.65	56.57	0.00
J12	0.57	418.65	56.89	0.00
J13	0.57	418.65	57.35	0.00
J14	0.57	418.65	57.35	0.00
J15	0.57	418.65	57.53	0.00
J16	0.57	418.65	58.03	0.00
J17	0.57	418.65	58.11	0.00
J18	0.57	418.65	58.28	0.00
J19	0.57	418.65	58.28	0.00



Page 3

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality
J20	0.57	418.65	58.16	0.00
J21	0.57	418.66	56.24	0.00
J22	0.57	418.66	55.84	0.00
J23	0.57	418.66	55.47	0.00
J24	0.57	418.66	55.68	0.00
J25	0.57	418.66	55.56	0.00
J26	0.57	418.66	55.51	0.00
J27	0.57	418.66	55.51	0.00
J28	0.57	418.66	55.37	0.00
J29	0.57	418.66	55.23	0.00
J30	0.57	418.67	54.61	0.00
J31	0.57	418.67	54.20	0.00
SW4-J3	0.00	418.67	54.42	0.00
SW4-J4	0.00	418.68	54.22	0.00
SW4-J1	0.00	418.67	52.63	0.00
SW4-J2	0.00	418.67	52.46	0.00
J36	0.57	418.69	56.97	0.00
J37	0.57	418.65	57.18	0.00
SW4-J5	0.00	418.70	56.29	0.00

2024-0374-10 - PHD Results

J32	0.00	418.66	52.43	0.00
J33	0.00	418.67	52.79	0.00
J34	0.00	418.67	52.76	0.00
J35	0.00	418.67	52.44	0.00
Southwood_4	-18.70	356.00	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
EX.L1	6.90	0.10	0.03	Open
EX.C2	-11.80	0.17	0.09	Open
EX.C1	-6.10	0.09	0.06	Open
C9	2.64	0.08	0.04	Open
C10	2.64	0.08	0.04	Open
C11	2.07	0.07	0.03	Open
C12	2.86	0.09	0.05	Open
C13	3.68	0.12	0.08	Open
C14	3.11	0.10	0.06	Open
C15	2.54	0.08	0.04	Open
C16	1.98	0.06	0.02	Open
C17	1.41	0.04	0.01	Open
C18	0.84	0.03	0.00	Open
C19	0.28	0.01	0.00	Open
C20	-0.29	0.01	0.00	Open
C21	-0.86	0.03	0.00	Open
C22	-0.02	0.00	0.00	Open



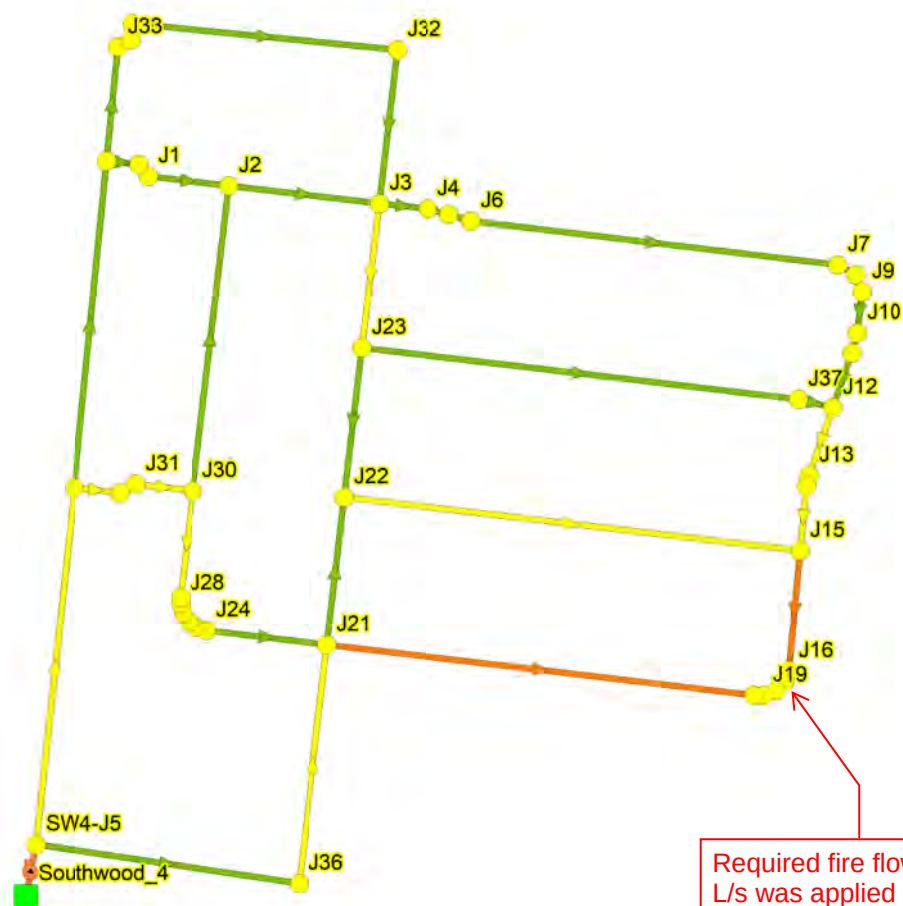
Page 4

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
C23	-0.59	0.02	0.01	Open
C24	-1.16	0.04	0.01	Open
C25	0.20	0.01	0.00	Open
C26	-0.36	0.01	0.00	Open
C27	-0.93	0.03	0.01	Open
C28	-1.50	0.05	0.01	Open
C29	-2.06	0.07	0.03	Open
C30	-2.63	0.08	0.04	Open
C31	0.19	0.01	0.00	Open
C32	-0.38	0.01	0.00	Open
C33	-0.95	0.03	0.01	Open
C34	-1.51	0.05	0.01	Open
C35	-2.08	0.07	0.03	Open
C36	-2.65	0.08	0.03	Open
C37	-3.21	0.10	0.06	Open
C38	1.36	0.04	0.01	Open
C39	2.08	0.07	0.03	Open
C40	1.97	0.06	0.02	Open
C41	1.40	0.04	0.01	Open
C42	-0.45	0.01	0.00	Open
C43	1.93	0.06	0.02	Open
C44	-2.95	0.09	0.05	Open
C45	-6.33	0.20	0.21	Open
C46	5.70	0.18	0.18	Open
C47	5.70	0.18	0.18	Open
C48	5.14	0.16	0.15	Open
C3	-3.46	0.05	0.02	Open
CW4-J2	3.46	0.05	0.02	Open
C2	3.46	0.05	0.02	Open
C4	3.46	0.05	0.02	Open
C5	3.46	0.05	0.02	Open
P1	18.70	0.00	-62.70	Open Pump

2024-0374-10 - PHD Results

2022-0374-10 - Max. Daily Demand + Fire Flow Results



Legend

Junctions

- Pressure < 14.1 m
- Pressure: 14.1 - 35.7 m
- Pressure: 35.7 - 56.1 m
- Pressure: 56.1 - 71.4 m
- Pressure >= 71.4 m

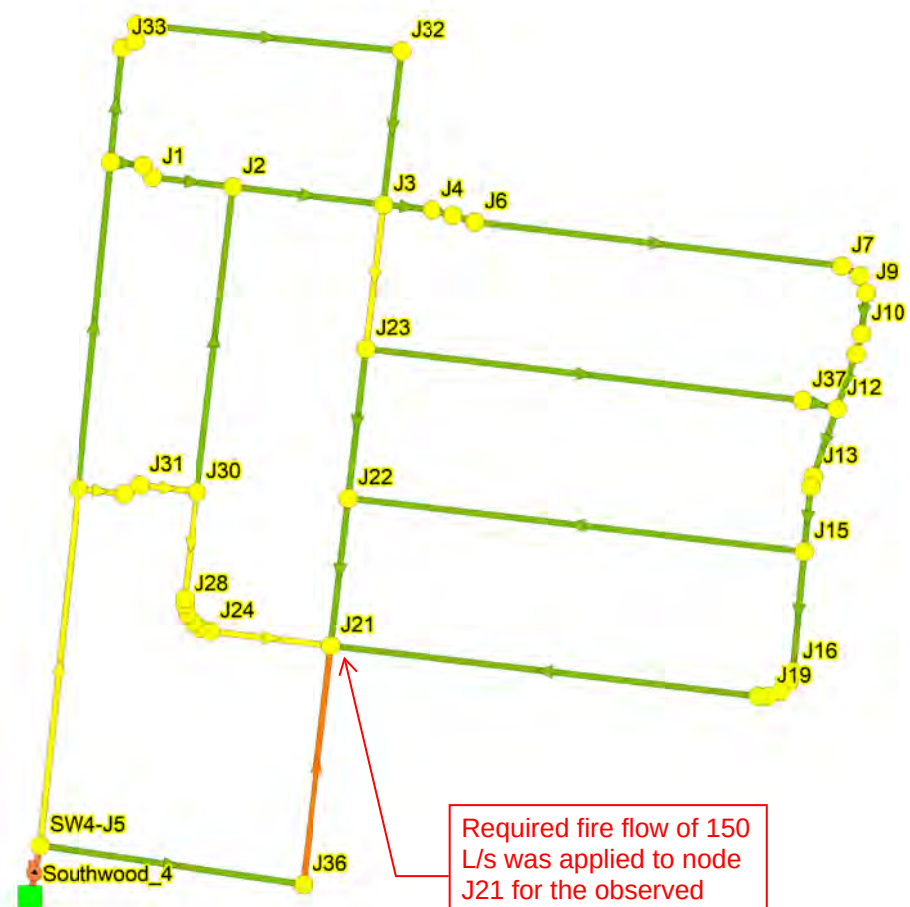
Pumps

- Reservoirs

Pipe velocity

- Velocity < 0.01 m/s
- Velocity: 0.01 - 1 m/s
- Velocity: 1 - 2 m/s
- Velocity: 2 - 5 m/s
- Velocity >= 5 m/s

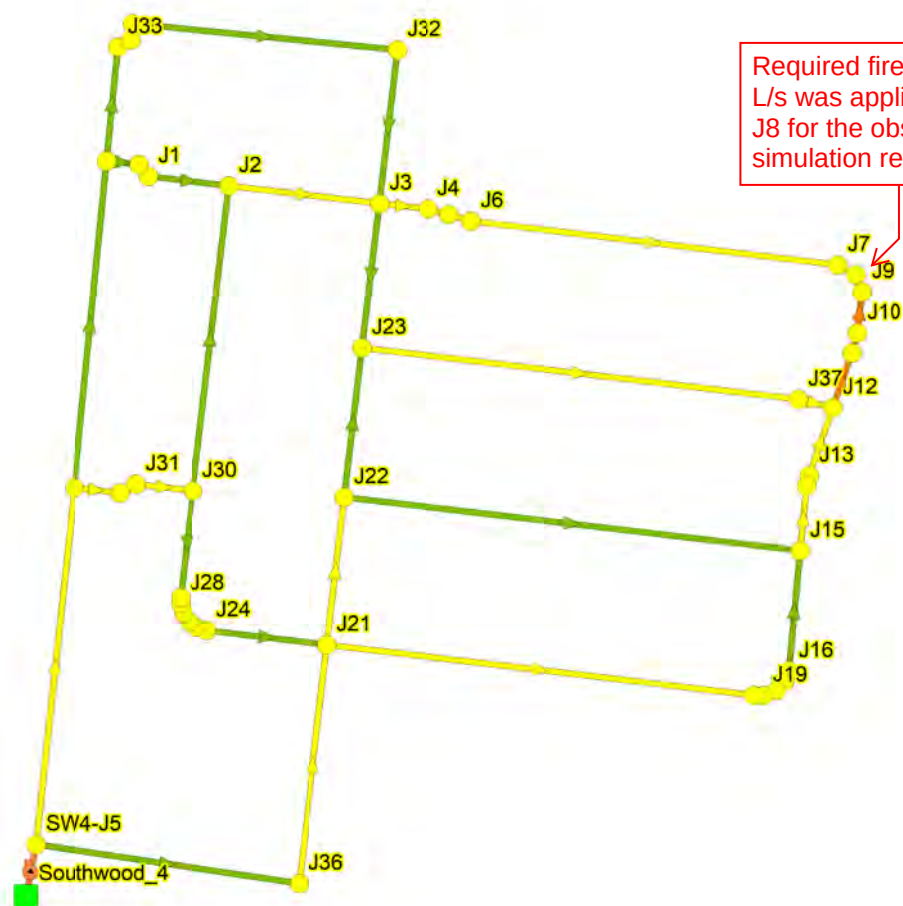
2022-0374-10 - Max. Daily Demand + Fire Flow Results



Legend

- Junctions
- Pressure < 14.1 m
 - Pressure: 14.1 - 35.7 m
 - Pressure: 35.7 - 56.1 m
 - Pressure: 56.1 - 71.4 m
 - Pressure >= 71.4 m
- Pumps
- Reservoirs
- Pipe velocity
- Velocity < 0.01 m/s
 - Velocity: 0.01 - 1 m/s
 - Velocity: 1 - 2 m/s
 - Velocity: 2 - 5 m/s
 - Velocity >= 5 m/s

2022-0374-10 - Max. Daily Demand + Fire Flow Results



Legend

Junctions

- Pressure < 14.1 m
- Pressure: 14.1 - 35.7 m
- Pressure: 35.7 - 56.1 m
- Pressure: 56.1 - 71.4 m
- Pressure >= 71.4 m

Pumps

- Reservoirs

Pipe velocity

- Velocity < 0.01 m/s
- Velocity: 0.01 - 1 m/s
- Velocity: 1 - 2 m/s
- Velocity: 2 - 5 m/s
- Velocity >= 5 m/s

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*****
*               E P A N E T               *
*           Hydraulic and Water Quality    *
*       Analysis for Pipe Networks         *
*           Version 2.2                    *
*****

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Input File: 2022-0374-10 - MDD + Fire Model_rev.inp

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
EX.L1	SW4-J5	J36	150.515	300
EX.C2	SW4-J4	SW4-J5	202.95	300
EX.C1	SW4-J2	SW4-J4	185.718	300
C9	SW4-J2	SW4-J1	18.112	200
C10	SW4-J1	J1	8.423	200
C11	J1	J2	46.162	200
C12	J2	J3	85.569	200
C13	J3	J4	27.773	200
C14	J4	J5	12.358	200
C15	J5	J6	13.018	200
C16	J6	J7	208.494	200
C17	J7	J8	11.435	200
C18	J8	J9	10.285	200
C19	J9	J10	23.305	200
C20	J10	J11	11.71	200
C21	J11	J12	32.742	200
C22	J12	J13	40.531	200
C23	J13	J14	5.954	200
C24	J14	J15	37.001	200
C25	J15	J16	68.317	200
C26	J16	J17	6.291	200
C27	J17	J18	6.931	200
C28	J18	J19	7.945	200
C29	J19	J20	5.538	200
C30	J20	J21	242.531	200
C31	J21	J24	68.757	200
C32	J24	J25	6.398	200
C33	J25	J26	4.736	200
C34	J26	J27	5.702	200
C35	J27	J28	5.969	200
C36	J28	J29	3.383	200
C37	J29	J30	60.645	200
C38	J30	J2	173.716	200
C39	J3	J23	82.282	200
C40	J23	J37	248.346	200
C41	J37	J12	19.883	200
C42	J23	J22	84.919	200



Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
C43	J22	J15	259.423	200
C44	J22	J21	84.09	200
C45	J21	J36	135.894	200
C46	SW4-J4	SW4-J3	25.944	200
C47	SW4-J3	J31	10.193	200
C48	J31	J30	32.672	200

2024-0374-10 - MDD + Fire Results

C3	J3	J32	87.495	300
CW4-J2	SW4-J2	J33	64.547	300
C2	J33	J34	8.404	300
C4	J34	J35	9.167	300
C5	J35	J32	150.547	300
P1	Southwood_4	SW4-J5	#N/A	#N/A Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
P1	100.00	75.00	0.14	82.57	82.57	0.00
Demand Charge:						0.00
Total Cost:						0.00

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
J1	0.38	403.45	37.20	0.00
J2	0.38	403.37	37.91	0.00
J3	0.38	402.81	39.76	0.00
J4	0.38	402.39	39.66	0.00
J5	0.38	402.21	39.56	0.00
J6	0.38	402.02	39.46	0.00
J7	0.38	399.01	36.57	0.00
J8	150.38	398.85	36.19	0.00
J9	0.38	399.14	36.66	0.00
J10	0.38	399.82	37.54	0.00
J11	0.38	400.16	38.08	0.00
J12	0.38	401.13	39.37	0.00
J13	0.38	401.58	40.28	0.00
J14	0.38	401.65	40.35	0.00
J15	0.38	402.08	40.96	0.00
J16	0.38	402.33	41.71	0.00
J17	0.38	402.35	41.81	0.00
J18	0.38	402.38	42.01	0.00
J19	0.38	402.41	42.04	0.00



Page 3

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality
J20	0.38	402.44	41.95	0.00
J21	0.38	403.45	41.03	0.00
J22	0.38	402.80	39.98	0.00
J23	0.38	402.67	39.48	0.00
J24	0.38	403.57	40.59	0.00
J25	0.38	403.58	40.48	0.00
J26	0.38	403.59	40.44	0.00
J27	0.38	403.60	40.45	0.00
J28	0.38	403.61	40.32	0.00
J29	0.38	403.61	40.18	0.00
J30	0.38	403.74	39.68	0.00
J31	0.38	403.99	39.52	0.00
SW4-J3	0.00	404.07	39.82	0.00
SW4-J4	0.00	404.28	39.82	0.00
SW4-J1	0.00	403.46	37.42	0.00
SW4-J2	0.00	403.49	37.28	0.00
J36	0.38	405.12	43.40	0.00
J37	0.38	401.24	39.77	0.00
SW4-J5	0.00	405.38	42.97	0.00

2024-0374-10 - MDD + Fire Results

J32	0.00	403.00	36.77	0.00
J33	0.00	403.35	37.47	0.00
J34	0.00	403.33	37.42	0.00
J35	0.00	403.31	37.08	0.00
Southwood_4	-162.47	366.50	0.00	0.00 Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
EX.L1	56.82	0.80	1.73	Open
EX.C2	-105.64	1.49	5.46	Open
EX.C1	-61.42	0.87	4.24	Open
C9	19.11	0.61	1.66	Open
C10	19.11	0.61	1.66	Open
C11	18.73	0.60	1.60	Open
C12	40.21	1.28	6.57	Open
C13	62.64	1.99	14.94	Open
C14	62.26	1.98	14.77	Open
C15	61.88	1.97	14.61	Open
C16	61.51	1.96	14.44	Open
C17	61.13	1.95	14.28	Open
C18	-89.25	2.84	28.78	Open
C19	-89.63	2.85	29.01	Open
C20	-90.01	2.86	29.24	Open
C21	-90.38	2.88	29.46	Open
C22	-53.72	1.71	11.24	Open



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Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
C23	-54.09	1.72	11.39	Open
C24	-54.47	1.73	11.53	Open
C25	-29.59	0.94	3.72	Open
C26	-29.96	0.95	3.81	Open
C27	-30.34	0.97	3.90	Open
C28	-30.72	0.98	3.99	Open
C29	-31.10	0.99	4.08	Open
C30	-31.47	1.00	4.18	Open
C31	-19.34	0.62	1.70	Open
C32	-19.72	0.63	1.76	Open
C33	-20.10	0.64	1.82	Open
C34	-20.48	0.65	1.88	Open
C35	-20.85	0.66	1.95	Open
C36	-21.23	0.68	2.01	Open
C37	-21.61	0.69	2.08	Open
C38	21.85	0.70	2.12	Open
C39	19.50	0.62	1.72	Open
C40	37.42	1.19	5.75	Open
C41	37.04	1.18	5.65	Open
C42	-18.30	0.58	1.53	Open
C43	25.26	0.80	2.78	Open
C44	-43.94	1.40	7.75	Open
C45	-56.45	1.80	12.32	Open
C46	44.22	1.41	7.84	Open
C47	44.22	1.41	7.84	Open
C48	43.84	1.40	7.72	Open
C3	-42.31	0.60	2.12	Open
CW4-J2	42.31	0.60	2.12	Open
C2	42.31	0.60	2.13	Open
C4	42.31	0.60	2.13	Open
C5	42.31	0.60	2.12	Open
P1	162.47	0.00	-38.88	Open Pump

2024-0374-10 - MDD + Fire Results

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      *               E P A N E T               *
    *           Hydraulic and Water Quality       *
    *           Analysis for Pipe Networks         *
      *                                           *
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Node Results

Node ID	Elevation (m)	Peak Hourly Demand			Max. Daily Demand + Fire		
		Demand (LPS)	Head (m)	Pressure (m)	Demand (LPS)	Head (m)	Pressure (m)
Modelled Junctions							
J1	366.25	0.566625	418.667	52.417	0.37775	403.445	37.195
J10	362.28	0.566625	418.653	56.373	0.37775	399.819	37.539
J11	362.08	0.566625	418.653	56.573	0.37775	400.161	38.081
J12	361.76	0.566625	418.653	56.893	0.37775	401.126	39.366
J13	361.3	0.566625	418.653	57.353	0.37775	401.582	40.282
J14	361.3	0.566625	418.653	57.353	0.37775	401.649	40.349
J15	361.12	0.566625	418.653	57.533	0.37775	402.076	40.956
J16	360.62	0.566625	418.653	58.033	0.37775	402.331	41.711
J17	360.54	0.566625	418.653	58.113	0.37775	402.355	41.815
J18	360.37	0.566625	418.653	58.283	0.37775	402.382	42.012
J19	360.37	0.566625	418.654	58.284	0.37775	402.413	42.043
J2	365.46	0.566625	418.666	53.206	0.37775	403.372	37.912
J20	360.49	0.566625	418.654	58.164	0.37775	402.436	41.946
J21	362.42	0.566625	418.664	56.244	0.37775	403.449	41.029
J22	362.82	0.566625	418.66	55.84	0.37775	402.797	39.977
J23	363.19	0.566625	418.659	55.469	0.37775	402.668	39.478
J24	362.98	0.566625	418.664	55.684	0.37775	403.565	40.585
J25	363.1	0.566625	418.664	55.564	0.37775	403.577	40.477
J26	363.15	0.566625	418.664	55.514	0.37775	403.585	40.435
J27	363.15	0.566625	418.664	55.514	0.37775	403.596	40.446
J28	363.29	0.566625	418.664	55.374	0.37775	403.608	40.318
J29	363.43	0.566625	418.664	55.234	0.37775	403.615	40.185
J3	363.05	0.566625	418.662	55.612	0.37775	402.809	39.759
J30	364.06	0.566625	418.668	54.608	0.37775	403.741	39.681
J31	364.47	0.566625	418.673	54.203	0.37775	403.993	39.523
J32	366.23	0	418.663	52.433	0	402.995	36.765
J33	365.88	0	418.667	52.787	0	403.352	37.472
J34	365.91	0	418.667	52.757	0	403.334	37.424
J35	366.23	0	418.667	52.437	0	403.315	37.085
J36	361.72	0.566625	418.693	56.973	0.37775	405.123	43.403
J37	361.47	0.566625	418.653	57.183	0.37775	401.238	39.768
J4	362.738	0.566625	418.659	55.921	0.37775	402.394	39.656
J5	362.651	0.566625	418.659	56.008	0.37775	402.212	39.561
J6	362.56	0.566625	418.658	56.098	0.37775	402.022	39.462
J7	362.44	0.566625	418.653	56.213	0.37775	399.01	36.57
J8	362.66	0.566625	418.653	55.993	150.3778	398.847	36.187
J9	362.48	0.566625	418.653	56.173	0.37775	399.143	36.663
SW4-J1	366.04	0	418.667	52.627	0	403.459	37.419
SW4-J2	366.21	0	418.668	52.458	0	403.489	37.279
SW4-J3	364.25	0	418.675	54.425	0	404.073	39.823
SW4-J4	364.46	0	418.679	54.219	0	404.276	39.816
SW4-J5	362.41	0	418.698	56.288	0	405.384	42.974

Name	Inlet Node	Outlet Node	Length (m)	Diameter (mm)	Roughness	Initial Status
C10	SW4-J1	J1	8.423	200	150	Open
C11	J1	J2	46.162	200	150	Open
C12	J2	J3	85.569	200	150	Open
C13	J3	J4	27.773	200	150	Open
C14	J4	J5	12.358	200	150	Open
C15	J5	J6	13.018	200	150	Open
C16	J6	J7	208.494	200	150	Open
C17	J7	J8	11.435	200	150	Open
C18	J8	J9	10.285	200	150	Open
C19	J9	J10	23.305	200	150	Open
C2	J33	J34	8.404	300	100	Open
C20	J10	J11	11.71	200	150	Open
C21	J11	J12	32.742	200	150	Open
C22	J12	J13	40.531	200	150	Open
C23	J13	J14	5.954	200	150	Open
C24	J14	J15	37.001	200	150	Open
C25	J15	J16	68.317	200	150	Open
C26	J16	J17	6.291	200	150	Open
C27	J17	J18	6.931	200	150	Open
C28	J18	J19	7.945	200	150	Open
C29	J19	J20	5.538	200	150	Open
C3	J3	J32	87.495	300	100	Open
C30	J20	J21	242.531	200	150	Open
C31	J21	J24	68.757	200	150	Open
C32	J24	J25	6.398	200	150	Open
C33	J25	J26	4.736	200	150	Open
C34	J26	J27	5.702	200	150	Open
C35	J27	J28	5.969	200	150	Open
C36	J28	J29	3.383	200	150	Open
C37	J29	J30	60.645	200	150	Open
C38	J30	J2	173.716	200	150	Open
C39	J3	J23	82.282	200	150	Open
C4	J34	J35	9.167	300	100	Open
C40	J23	J37	248.346	200	150	Open
C41	J37	J12	19.883	200	150	Open
C42	J23	J22	84.919	200	150	Open
C43	J22	J15	259.423	200	150	Open
C44	J22	J21	84.09	200	150	Open
C45	J21	J36	135.894	200	150	Open
C46	SW4-J4	SW4-J3	25.944	200	150	Open
C47	SW4-J3	J31	10.193	200	150	Open
C48	J31	J30	32.672	200	150	Open
C5	J35	J32	150.547	300	100	Open
C9	SW4-J2	SW4-J1	18.112	200	150	Open
CW4-J2	SW4-J2	J33	64.547	300	100	Open
EX.C1	SW4-J2	SW4-J4	185.718	300	100	Open
EX.C2	SW4-J4	SW4-J5	202.95	300	150	Open
EX.L1	SW4-J5	J36	150.515	300	150	Open

2022-0374-10
FIRE FLOW ANALYSIS RESULTS

Note: The fire flow analysis was conducted on the maximum day demand models for each scenario, the fire flow analysis takes into account the previously prescribed maximum day demand values at each node when determining the available fire flow at each hydrant

Junction	Required Fire Flow (L/s)	Min. Residual Pressure (m)	Fire Flow Period (hours)	Available Fire Flow at Min. Residual Pressure (L/s)
Fire Flow Analysis				
J2	150	14.1	3.00	173.29
J6	150	14.1	3.00	171.32
J8	150	14.1	3.00	167.66
J13	150	14.1	3.00	175.69
J18	150	14.1	3.00	175.04
J21	150	14.1	3.00	177.98
J22	150	14.1	3.00	177.04
J23	150	14.1	3.00	174.60
J26	150	14.1	3.00	176.96
J30	150	14.1	3.00	176.82

APPENDIX D

Stormwater Management Information

Historical Pre-Development Catchment Area

Pre-Development Area		
Area 100	7.865 Ha	
Impervious Area	0.00 Ha.	CN = 98
Woodlot Area	0.70 Ha	CN = 66
Cultivated Area	7.165 Ha.	CN = 76
% Impervious	0	
WCN	75.11	
Length	350 m	
Avg. Slope	1.0%	

Original Pre-Development Boundary

PROPOSED DEVELOPMENT AREA

SCALE	DATE	JOB No.	CAD FILE	SHEET No.
1:2000	JULY 14, 1997	05-96-22	SWMFIG1	FIGURE 1

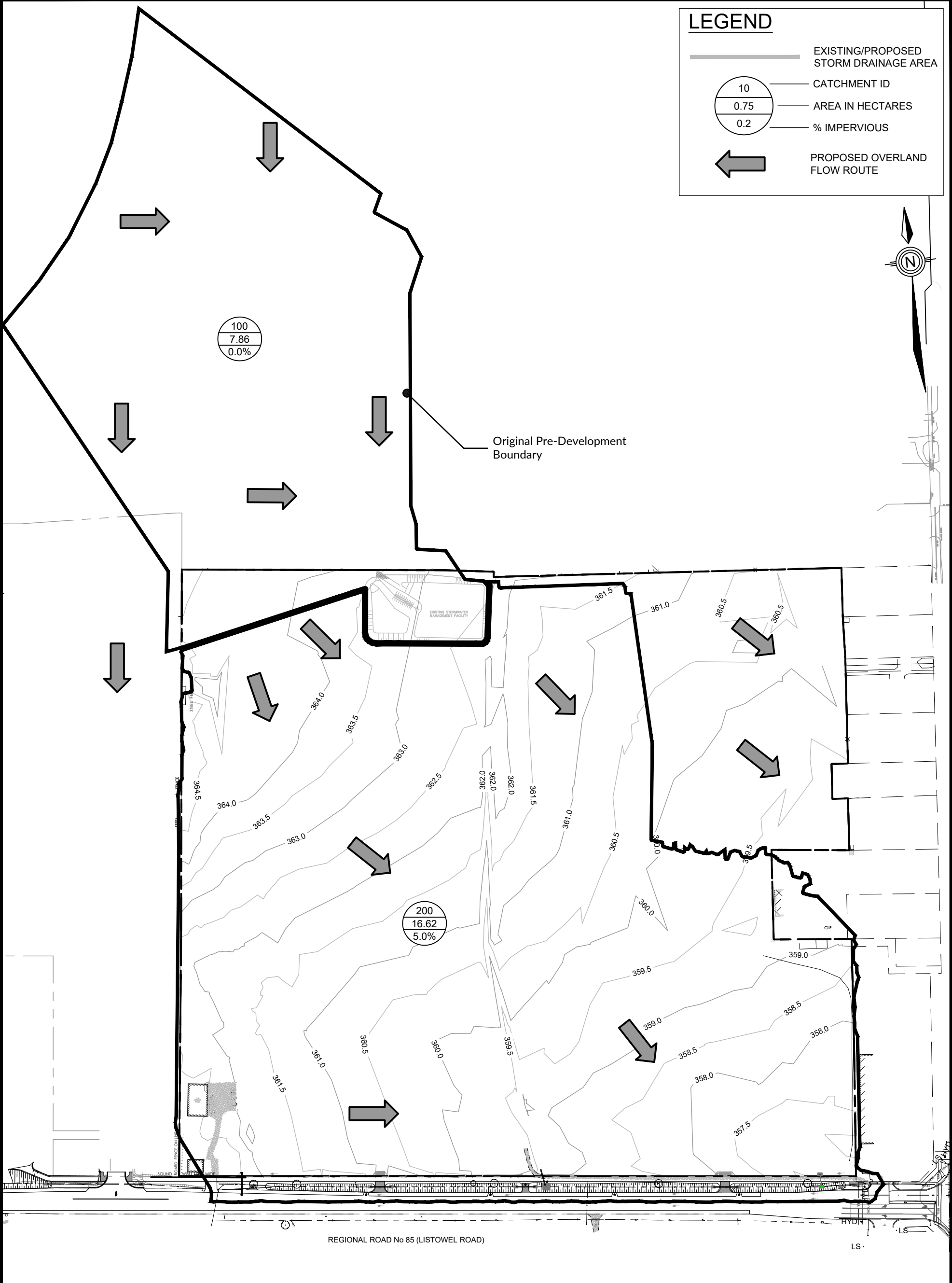


The Walter Fedy Partnership
546 BELMONT AVE. W., KITCHENER, ONTARIO, N2M 1N5
PHONE (519) 576 2150 FAX (519) 576 5498

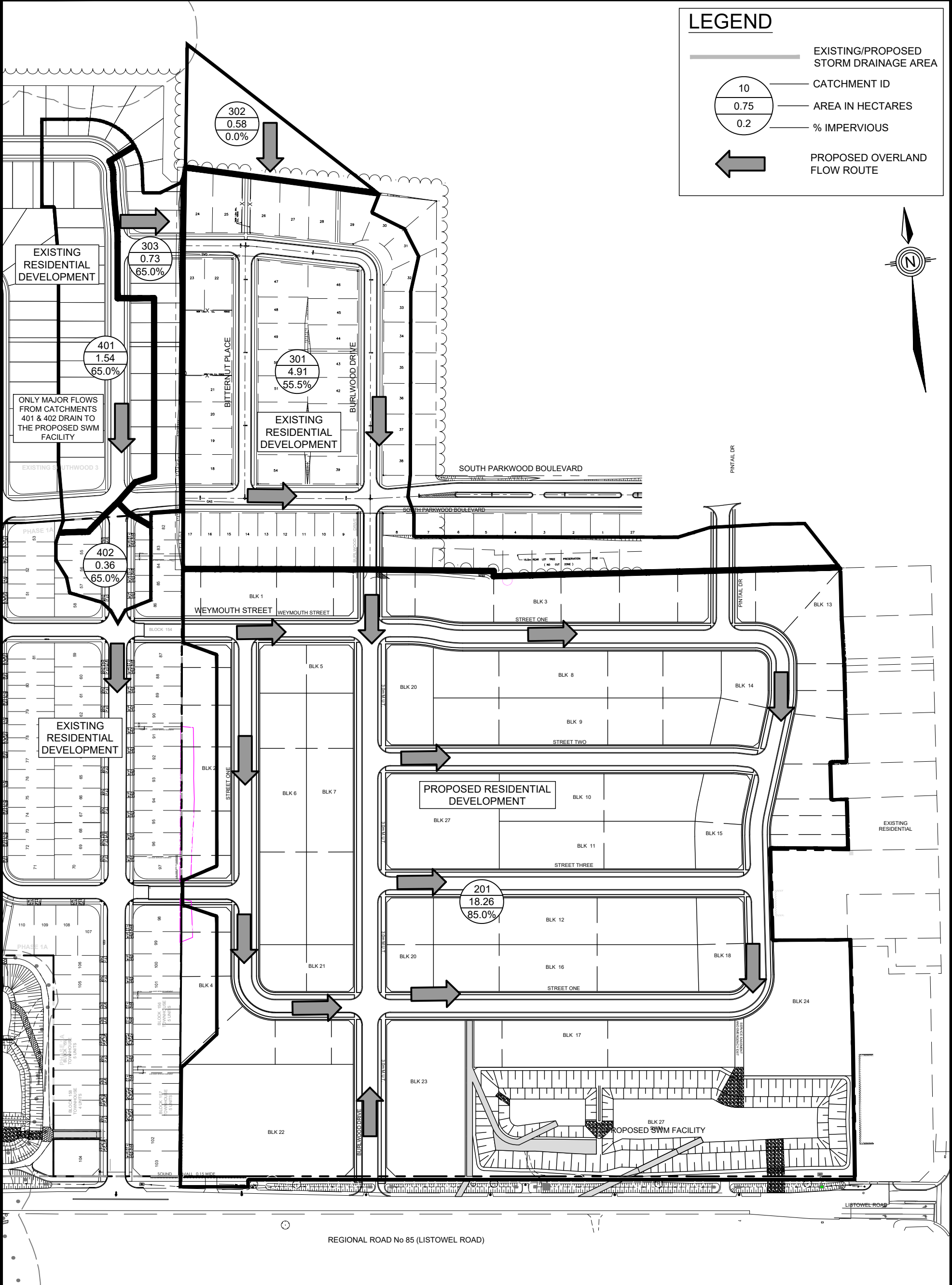
PROJECT
SOUTHWOOD PARK SUBDIVISION PHASE II

TITLE
PRE-DEVELOPMENT CONDITION

Source:
Stormwater Management Report - Southwood Park Subdivision - Phase II, The Walter Fedy Partnership (July 14, 1997)



	PROJECT: SOUTHWOOD 5 1065 LISTOWEL ROAD, ELMIRA, ON		WALTERFEDY KITCHENER OFFICE 675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1 T: 519.576.2150 F: 519.576.5499 walterfedy.com	
	TITLE: EXISTING CATCHMENT PLAN			
	REPRODUCTION OR DISTRIBUTION FOR PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY IS FORBIDDEN. CONTRACTORS SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB AND REPORT ANY VARIATIONS FROM THE DIMENSIONS AND CONDITIONS SHOWN ON DRAWINGS TO WALTERFEDY. DO NOT SCALE THIS DRAWING.		SCALE: 1:2500 DATE: 2025-06-09	
	COPYRIGHT © 2025 WalterFedy		DRAWN BY: AM PROJECT NO.: 2022-0374-10	
			CHECKED BY: MN FILE: 2022-0374-10_EX_CATCHME	
		SHEET NO.: FIG 1.0		



PROJECT:
**SOUTHWOOD 5
SCHLEGEL URBAN DEVELOPMENT**

TITLE:
PROPOSED DRAINAGE AREA PLAN

REPRODUCTION OR DISTRIBUTION FOR PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY IS FORBIDDEN. CONTRACTORS SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB AND REPORT ANY VARIATIONS FROM THE DIMENSIONS AND CONDITIONS SHOWN ON DRAWINGS TO WALTERFEDY. DO NOT SCALE THIS DRAWING.

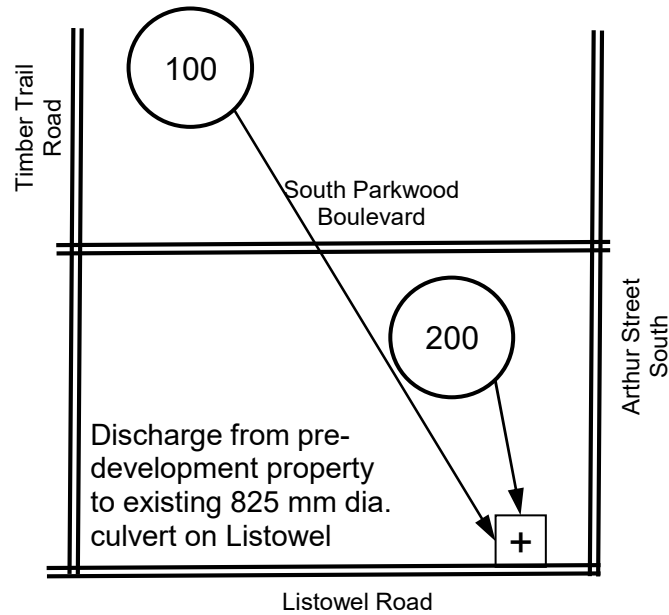
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WALTERFEDY
KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

SCALE: 1:2500	DATE: 2025-06-03
DRAWN BY: JBM	PROJECT NO.: 2022-0374-10
CHECKED BY: EMW/MN	FILE: 2022-0374-10_PR_CATCHMENT_FIG
SHEET NO.:	

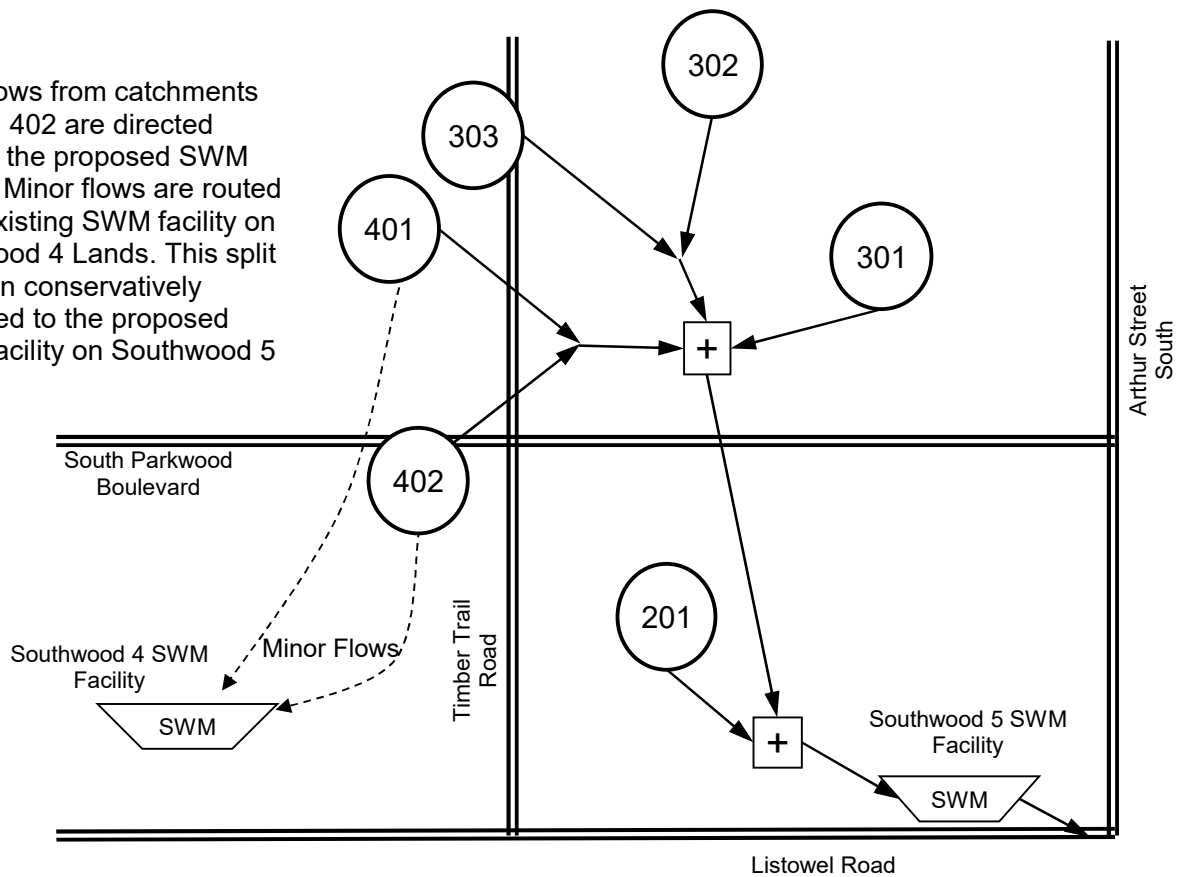
SWMHYMO HYDROLOGIC MODELING SCHEMATIC

EXISTING CONDITIONS



PROPOSED CONDITIONS

Major flows from catchments 401 and 402 are directed towards the proposed SWM Facility. Minor flows are routed to the existing SWM facility on Southwood 4 Lands. This split has been conservatively redirected to the proposed SWM Facility on Southwood 5



Southwood Subdvision 5

Elmira, Ontario

Catchment Summary

PRE-DEVELOPMENT

Catchment ID	Hyd Type	Area (ha)	Percent Impervious (%)	Manning's Roughness Impervious (-)	Manning's Roughness Pervious (-)	CN Number (-)	Depression Storage Impervious (mm)	Depression Storage Pervious (mm)	Time to Peak (hrs)	
	100 NasHyd	7.865	0		0	75.11		0	5	2.617
	200 NasHyd	16.62	0		0	74.48		0	5	2.667
Total:		24.48								

POST-DEVELOPMENT

Catchment ID	Hyd Type	Area (ha)	Percent Impervious (%)	Manning's Roughness Impervious (-)	Manning's Roughness Pervious (-)	CN Number (-)	Depression Storage Impervious (mm)	Depression Storage Pervious (mm)	Time to Peak (hrs)
303	StanHyd	0.73	65	0.013	0.24	80	1	5	1.667
302	NasHyd	0.58	0	0	0	65	0	5	2.1
301	StanHyd	4.91	55.5	0.013	0.24	80	1	5	1.667
401	StanHyd	1.54	65	0.013	0.24	80	1	5	1.667
402	StanHyd	0.36	65	0.013	0.24	80	1	5	1.667
201	StanHyd	18.26	85	0.013	0.24	80	1	5	1.667
Total:		26.38							

Southwood Subdivision 5
Elmira, Ontario

Total Runoff Volume Summary

PRE-DEVELOPMENT

Catchment ID (m3)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
100	7.86	302.924	676.196	1,212.641	1,640.618	2,270.125	2,796.902	3,350.482	16,919.28
200	16.62	623.416	1,395.249	2,508.457	3,398.458	4,710.440	5,809.853	6,966.605	35,497.00

(mm)

100	7.86	3.854	8.603	15.428	20.873	28.882	35.584	42.627	215.26
200	16.62	3.751	8.395	15.093	20.448	28.342	34.957	41.917	213.58

Add Hyd

(m3)									
Total-Pre	24.48	925.344	2,071.008	3,720.960	5,037.984	6,981.696	8,607.168	10,318.320	52,416.58

(mm)

Total-Pre	24.48	3.78	8.460	15.200	20.580	28.520	35.160	42.150	214.12
-----------	-------	------	-------	--------	--------	--------	--------	--------	--------

POST-DEVELOPMENT

Catchment ID (m3)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
303	0.73	126.356	195.458	277.407	336.202	416.874	480.917	545.872	1,930.536
302	0.58	14.848	34.301	63.522	87.615	124.021	155.202	188.564	1,090.916
301	4.91	760.166	1,197.696	1,725.030	2,107.028	2,634.510	3,055.297	3,483.449	12,724.805
401	1.54	266.559	412.335	585.215	709.247	879.432	1,014.537	1,151.566	4,072.622
402	0.36	62.312	96.390	136.804	165.798	205.582	237.164	269.197	952.045
201	18.26	3,863.086	5,805.037	8,041.521	9,617.542	11,753.962	13,434.065	15,126.949	50,326.203

(mm)

303	0.73	17.309	26.775	38.001	46.055	57.106	65.879	74.777	264.457
302	0.58	2.560	5.914	10.952	15.106	21.383	26.759	32.511	188.089
301	4.91	15.482	24.393	35.133	42.913	53.656	62.226	70.946	259.161
401	1.54	17.309	26.775	38.001	46.055	57.106	65.879	74.777	264.456
402	0.36	17.309	26.775	38.001	46.055	57.106	65.879	74.777	264.457
201	18.26	21.156	31.791	44.039	52.670	64.370	73.571	82.842	275.609

Add Hyd

(m3)									
T-UNCON	26.38	5,093.978	7,739.892	10,828.990	13,023.806	16,015.298	18,376.308	20,766.336	71,096.738
T-CON	26.38	5,091.340	7,739.892	10,828.990	13,021.168	16,012.660	18,376.308	20,763.698	71,091.462

(mm)

T-UNCON	26.38	19.310	29.340	41.050	49.370	60.710	69.660	78.720	269.510
T-CON	26.38	19.300	29.340	41.050	49.360	60.700	69.660	78.710	269.490

Southwood Subdivision 5
Elmira, Ontario

Peak Flows Summary

PRE-DEVELOPMENT

Catchment ID (m3/s)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
100	7.86	0.040	0.092	0.178	0.249	0.350	0.437	0.528	0.844
200	16.62	0.080	0.184	0.357	0.500	0.704	0.879	1.064	1.759

Add Hyd

Catchment ID (m3/s)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
Total-Pre	24.48	0.120	0.276	0.535	0.749	1.054	1.315	1.591	2.603

POST-DEVELOPMENT

Catchment ID (m3/s)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
303	0.73	0.08	0.125	0.178	0.224	0.267	0.308	0.351	0.106
302	0.58	0.003	0.008	0.015	0.022	0.032	0.040	0.049	0.069
301	4.91	0.48	0.770	1.117	1.420	1.707	1.983	2.274	0.707
401	1.54	0.169	0.264	0.376	0.473	0.563	0.650	0.740	0.223
402	0.36	0.04	0.062	0.088	0.111	0.132	0.152	0.173	0.052
201	18.26	2.47	3.692	5.088	6.292	7.368	8.411	9.459	2.669

Add Hyd

Catchment ID (m3/s)	Area (ha)	Return Period 25-mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	250-Year
T-UNCON	26.38	3.24	4.915	6.849	8.524	10.044	11.513	13.008	3.824
T-CON	26.38	0.05	0.114	0.292	0.407	0.525	0.600	0.666	1.971

Southwood Subdivision 5
Elmira, Ontario

SWMF Storage Summary

POST-DEVELOPMENT

Reservoir ID	Return Period	Peak Inflow (m3/s)	Peak Outflow (m3/s)	Peak Overflow (m3/s)	Max. Storage (m3)
From T-UNCO To SWM	25-mm	3.240	0.050	0.000	4,690.000
	2-Year	4.915	0.114	0.000	6,898.000
	5-Year	6.849	0.292	0.000	8,983.000
	10-Year	8.524	0.407	0.000	10,640.000
	25-Year	10.044	0.525	0.000	13,010.000
	50-Year	11.513	0.600	0.000	14,970.000
	100-Year	13.008	0.666	0.000	16,990.000
	250-Year	3.824	1.971	0.000	35,420.000

Required Protection Level: Enhanced
 SWMP Type: Wet Pond
 Contributing Drainage Area (ha): 23.09
 Impervious Level: 76%

Sub Catchment ID	Area (ha)	RC	Percent Impervious (%)
301	4.91	0.8	56%
302	0.58	0.35	0%
303	0.73	0.8	65%
201	16.87	0.8	85%
23.09			76%

Note:
 Omitted 401 and 402 from Water Quality area calculations as minor flows are directed to another SWMP

Total Required Water Quality Storage (m3/ha): 234.93
 Required Permanent Pool Volume (m3/ha): 194.93
 Required Extended Detention Storage Volume (m3/ha): 40.00

 Required Permanent Pool (m3): 4,500.99
 Provided Permanent Pool (m3): 9,550.74

 MECP Required Extended Detention Storage Volume: 923.60
 Required Extended Storage Volume (based on 25 mm event): 4,169.71

302+303+301+401+402+201
 =0.58+0.73+4.91+1.54+0.36+18.26
 26.38

Outlet Device No. 1 (Quality & Erosion)		Outlet Device No. 2 (Quantity)		Outlet Device No. 3		Outlet No. 4 (Quantity)	
Type:	Circular Orifice	Type:	Circular Orifice	Type:	N/A	Type:	Broad crested overflow weir
Diameter (mm)	190	Diameter (mm)	400	Diameter (mm)	0	Sill Elevation (m)	358.50
Area (m ²)	0.02835	Area (m ²)	0.12566	Area (m ²)	0.00000	Length (m)	10.0
Invert Elev. (m)	355.95	Invert Elev. (m)	356.45	Invert Elev. (m)	0.00	Discharge (Q) =	1.67 L H ^{1.5}
C/L Elev. (m)	356.05	C/L Elev. (m)	356.65	C/L Elev. (m)	0.00		
Disch. Coeff. (C _d)	0.6	Disch. Coeff. (C _d)	0.6	Disch. Coeff. (C _d)	0.6		
Discharge (Q) =	C _d A (2 g H) ^{0.5}	Discharge (Q) =	C _d A (2 g H) ^{0.5}	Discharge (Q) =	C _d A (2 g H) ^{0.5}		
Number of Orifices:	1	Number of Orifices:	2	1 Number of Orifices:	1		
				Spill into structure at elev. (m)	0.00		

	Elevation m	SWM Pond Volumes				Outlet No. 1		Outlet No. 2		Outlet No. 3		Outlet No. 4		Total Discharge m³/s
		Area m²	Incremental Volume m³	Cumulative Volume m³	Active Storage Volume m³	H m	Discharge m³/s	H m	Discharge m³/s	H m	Discharge m³/s	H m	Discharge m³/s	
Bottom of Pond	354.45	4405	0	0	0									
	354.60	4771	716	706	0									
	354.75	5146	772	1449	0									
	354.90	5529	829	2250	0									
	355.05	5920	888	3108	0									
	355.20	6320	948	4026	0									
	355.35	6728	1009	5005	0									
	355.50	7145	1072	6045	0									
	355.65	7571	1136	7149	0									
	355.80	8004	1201	8317	0									
Top Permanent Pool	355.95	8507	1276	9551	0	0.000	0.000							0.0000
Ext. Det. - 25mm (356.45 m)	356.10	8964	1345	10861	1,310.28	0.150	0.0090							0.0090
	356.25	9458	1419	12241	2,689.84	0.300	0.0314							0.0314
	356.40	10283	1543	13720	4,169.71	0.450	0.0428							0.0428
	356.55	10882	1632	15315	5,764.52	0.600	0.0518	0.100	0.0137					0.0655
	356.70	11328	1699	16981	7,430.20	0.750	0.0595	0.250	0.0778					0.1373
	356.85	11781	1767	18714	9,163.28	0.900	0.0663	0.400	0.2438					0.3100
	357.00	12238	1836	20515	10,964.65	1.050	0.0724	0.550	0.3555					0.4279
	357.15	12702	1905	22386	12,835.10	1.200	0.0781	0.700	0.4396					0.5177
	357.30	13171	1976	24326	14,775.50	1.350	0.0833	0.850	0.5101					0.5934
	357.45	13646	2047	26337	16,786.70	1.500	0.0883	1.000	0.5719					0.6602
	357.60	14126	2119	28420	18,869.56	1.650	0.0930	1.150	0.6277					0.7207
	357.75	14613	2192	30576	21,024.91	1.800	0.0975	1.300	0.6789					0.7764
	357.90	15106	2266	32804	23,253.67	1.950	0.1017	1.450	0.7266					0.8283
	358.05	15612	2342	35108	25,557.30	2.100	0.1059	1.600	0.7712					0.8771
	358.20	16128	2419	37488	27,937.65	2.250	0.1098	1.750	0.8135					0.9233
	358.35	16658	2499	39947	30,396.34	2.400	0.1136	1.900	0.8536					0.9672
	Weir Sill	358.50	17152	2573	42483	32,932.18	2.550	0.1173	2.050	0.8920			0.000	0.0000
	358.65	17634	2645	45092	35,541.26	2.700	0.1209	2.200	0.9287			0.150	0.9702	2.0198
Top of Pond	358.80	18113	2717	47773	38,222.27	2.850	0.1243	2.350	0.9641			0.300	2.7441	3.8325

SWM Facility - Sediment Forebay Sizing

Based on MOEE SWMP Planning & Design Manual

Length Based on Settling Velocity

$$\begin{aligned} r : 1 &= \text{length to width ratio} & r &= 4 \\ Q_p &= \text{peak SWM outflow during quality storm (25mm storm)} & Q_p &= 0.05 \\ v_s &= \text{settling velocity for 0.15 mm particles (m/s)} & v_s &= 0.0003 \\ L &= 25.82 \text{ m} \end{aligned}$$

Dispersion Length

$$\begin{aligned} Q &= \text{Inlet pipe to SWMF - 1350mm @ 0.50\% (m}^3\text{/s)} & Q &= 3.77 \\ d &= \text{depth of perm pool in forebay (m)} & d &= 1.5 \\ v_f &= \text{desired vel in forebay (m/s)} & v_f &= 0.5 \\ L_D &= 40.26 \text{ m} \end{aligned}$$

Check Scour Velocity

$$\begin{aligned} v &= Q/A & b &= \text{bottom width (avg) of forebay (m)} & b &= 18 \\ v &= 0.129 \text{ m/s} & Q &= \text{inlet flow (m}^3\text{/s)} & Q &= 3.77 \\ & & A &= \text{cross-sectional area (m}^2\text{)} & A &= 29.25 \\ & & \text{Target velocity} &= 0.15 \text{ m/s} & V_{\text{targ}} &= 0.15 \end{aligned}$$

Therefore, **Velocity Target Satisfied**

$$\text{Required Forebay Length} = 40.26 \text{ m}$$

Proposed SWM Facility - Drawdown Calculations

Pond drawdown time can be estimated using Equation 4.10
(MOEE SWMP Planning & Design Manual)

Equation 4.10: Drawdown Time

$$t = \frac{2 A_p}{C A_o (2g)^{0.5}} \left(h_1^{0.5} - h_2^{0.5} \right)$$

t = drawdown time in seconds	=	to be calculated
Ap = surface area of the pond (m2)	=	9695 (Avg. Surface Area between h ₁ & h ₂)
C = discharge coefficient	=	0.6
D = diameter of controlling orifice (m)	=	0.19
Ao = cross-sectional area of orifice (m2)	=	0.028353
g = acceleration due to gravity (m/s ²)	=	9.81
Orifice invert elevation (m)	=	355.95 (Permanent Pool Elev.)
Orifice centreline elevation (m)	=	356.045
Extended detention elevation (m)	=	356.45 (modelled max. depth at 25 mm over
h ₁ = starting water level above orifice (m)	=	0.41
h ₂ = ending water level above orifice (m)	=	0
t = 164304 seconds	=	45.64 hours

Major Overland Flow Route Channel Analysis

Channel Analysis

Type: Rectangular

Side Slope 1 (Z1): 2.0

Side Slope 2 (Z2): 3.0

Channel Width (B): 5.9999998 (m)

Flow Depth (D): 0.0 (m)

Longitudinal Slope: 0.055 (m/m)

Manning's Roughness: 0.0130

Enter Flow: 6.160 (cms)

Enter Depth: 0.183 (m)

Calculate

Plot... Compute Curves...

Parameter	Value	Units
Flow	6.160	cms
Depth	0.183	m
Area of Flow	1.101	m ²
Wetted Perimeter	6.367	m
Hydraulic Radius	0.173	m
Average Velocity	5.597	m/s
Top Width (T)	6.000	m
Froude Number	4.172	
Critical Depth	0.475	m
Critical Velocity	2.160	m/s
Critical Slope	0.00259	m/m
Critical Top Width	6.000	m
Calculated Max Shear Stress	98.885	N/m ²
Calculated Avg Shear Stress	93.187	N/m ²

OK

Cancel

CAPACITY OF EXISTING STORM SEWER ON LISTOWEL ROAD (RIGHT-OF-WAY FLOWS + CONTROLLED SWM FACILITY DISCHARGE)

WALTERFEDY																			
Project: Project No: Date: Designed By:		Southwood Phase 5 - Existing Storm Sewer on Listowel Road - SWM Facility Outlet						Storm Parameters		5-YEAR STORM SEWER DESIGN CALCULATIONS									
		2022-0374-10						A	1593	Design Frequency			5-yr	Maximum Permitted Full Flow Velocity (m/s)				6	
		06-Jun-25						B	11				Minimum Permitted Full Flow Velocity (m/s)				0.6		
		KP	Checked By:	JO				C	0.8789	Manning's 'n'			0.013						
	Pipe Data			Drainage Area				Time		Design Flow		Pipe Flow							
	From	To	Length	Area	C	AC	ΣAC	Inlet	System	I	Q	Diameter	Slope	Q _{FULL}	Q/Q _{FULL}	V _{FULL}	V	Flow Time	Remarks
			(m)	(ha)				(min)	(min)	(mm/hr)	(L/s)	(mm)	(%)	(L/s)		(m/s)	(m/s)	(min)	
South side of ROW + farmland	Ex. MH 28	Ex. MH 76	24.8	2.869	0.26	0.746	0.746	15	15.00	90.91	188.51	750	0.62%	876.60	0.22	1.98	1.58	0.26	No Surcharge
								15.26											
North side of ROW	North ditch	Ex. MH 76	0	0.738	0.56	0.413	0.413	15	15.00	90.91	104.44								
Total from ROW Area				0.00	0.00		1.159	15.26	15.26	90.11	290.39								
5-Yr SWM Facility Discharge					Add 5-yr SWM Facility Discharge from SWMHYMO analysis =						292.00								
Total to D/S System				0.00	0.00		1.159	0.00	0.00	193.61	915.95	825	1.36%	1673.99	0.55	3.13	3.20	0.00	No Surcharge



CAPACITY OF EXISTING STORM SEWER ON LISTOWEL ROAD (RIGHT-OF-WAY FLOWS + CONTROLLED SWM FACILITY DISCHARGE)

WALTERFEDY																				
Project: Project No: Date: Designed By:		Southwood Phase 5 - Existing Storm Sewer on Listowel Road - SWM Facility Outlet						Storm Parameters		100-YEAR STORM SEWER DESIGN CALCULATIONS										
		2022-0374-10						A	1593	Design Frequency			100-yr	Maximum Permitted Full Flow Velocity (m/s)			6			
		06-Jun-25						B	11				Minimum Permitted Full Flow Velocity (m/s)			0.6				
		KP	Checked By:	JO				C	0.8789	Manning's 'n'			0.013				0.6			
	Pipe Data			Drainage Area				Time		Design Flow		Pipe Flow								
	From	To	Length (m)	Area (ha)	C *	AC	ΣAC	Inlet (min)	System (min)	I (mm/hr)	Q (L/s)	Diameter (mm)	Slope (%)	Q _{FULL} (L/s)	Q/Q _{FULL}	V _{FULL} (m/s)	V (m/s)	Flow Time (min)	Remarks	
South side of ROW + farmland	Ex. MH 28	Ex. MH 76	24.8	2.869	0.33	0.947	0.947	15	15.00	90.91	239.27	750	0.62%	876.60	0.27	1.98	1.69	0.24	No Surcharge	
								15.24												
North side of ROW	North ditch	Ex. MH 76	0	0.738	0.70	0.517	0.517	15	15.00	90.91	130.56									
Total from ROW Area				0.00	0.00		1.463	15.24	15.24	90.16	366.79									
100-Yr SWM Facility Discharge				Add 100-yr SWM Facility Discharge from SWMHYMO analysis =						666.00										
Total to D/S System							1.463	0.00	0.00	193.61	1453.65	825	1.36%	1673.99	0.87	3.13	3.53	0.00	No Surcharge	

* Runoff coefficient (C) increased by 1.25 to account for antecedent moisture conditions



2 Metric units

```

*****
## Project Name : SOUTHWOOD
## Project Number: 2022-0374-10
## Date : MARCH 2025
## Update : JUNE 2025
## Company : Walterfedy
## File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
*****
## 2-YEAR 4-HR SCS
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[2]
KIT4-002.STM
%------|-----
READ STORM STORM_FILENAME=["STORM.001"]

##-----|-----
## CATCHMENT 100 - NORTH OF SITE
CALIB NASHYD ID=[1], NHYD=["100"], DT=[1]min, AREA=[7.865](ha),
DWF=[0](cms), CN/C=[75.11], IA=[5.0](mm),
N=[3], TP=[0.75]hrs,
RAINFALL=[ , , , ](mm/hr), END=-1
##-----|-----
## CATCHMENT 200 - SITE
CALIB NASHYD ID=[2], NHYD=["200"], DT=[1]min, AREA=[16.617](ha),
DWF=[0](cms), CN/C=[74.48], IA=[5.0](mm),
N=[3], TP=[0.78]hrs,
RAINFALL=[ , , , ](mm/hr), END=-1

##-----|-----
## ADD 100 & 200
ADD HYD IDsum=[3], NHYD=["Total-Pre"], IDs to add=[1 2]

## Run remaining Storm Files
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[5]
KIT4-005.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[10]
KIT4-010.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[25]
KIT4-025.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[50]
KIT4-050.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[100]
KIT4-100.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[250]
hazel48.STM
##-----|-----
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[325]
KIT425MM.STM
##-----|-----
FINISH

```

```
=====
SSSSS W W M M H H Y Y M M 000 999 999 =====
S W W M M M H H Y Y M M 0 0 9 9 9 9
SSSSS W W M M M H H H H Y M M M 0 0 # 9 9 9 9 Ver 4.05
S W W M M M H H Y M M 0 0 9999 9999 Sept 2011
SSSSS W W M M H H Y M M 000 9 9 9 # 2018430
StormWater Management HYdrologic Model 999 999 =====

***** SWMMHYD Ver/4.05 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89 *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 836-3884 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmym@fso.com *****

***** Licensed user: Walterfedy *****
***** Kitchener SERIAL#: 2018430 *****

***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 105408 *****
***** Max. number of flow points : 105408 *****

***** DETAILED OUTPUT *****
*****
* DATE: 2025-06-04 TIME: 16:14:08 RUN COUNTER: 000082 *
* Input filename: C:\Users\kpgang\DOCUME~1\CURREN~1\374-PRE.dat *
* Output filename: C:\Users\kpgang\DOCUME~1\CURREN~1\374-PRE.out *
* Summary filename: C:\Users\kpgang\DOCUME~1\CURREN~1\374-PRE.sum *
* User comments: *
* 1: *
* 2: *
* 3: *
*****
```

```
001:0001-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
*****
*# 2-YEAR 4-HR SCS
** END OF RUN : 1
*****
```

```
| START | Project dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
```

```
002:0005-----
*#-----|-----|
*# ADD 100 & 200
| ADD HYD (Total-Pre ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
| | | (ha) (cms) (cms) (hrs) (mm) (cms)
+ID1 01:100 7.86 .092 2.62 8.60 .000
+ID2 02:200 16.62 .184 2.67 8.40 .000
=====
SUM 03:Total-Pre 24.48 .276 2.65 8.46 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
002:0006-----
*# Run remaining Storm Files
** END OF RUN : 4
*****
```

```
| START | Project dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
```

```
Rainfall dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 005
NSTORM= 1
# 1=KIT4-005.STM
```

```
005:0002-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
*****
*# 2-YEAR 4-HR SCS
005:0002-----
| READ STORM | Filename: KITCHENER - 5-YR 4HR CHICAGO STORM
| Ptotal= 49.57 mm | Comments: KITCHENER - 5-YR 4HR CHICAGO STORM

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.148 1.17 7.825 2.17 11.684 3.17 3.280
.33 2.447 1.33 13.150 2.33 8.340 3.33 2.917
.50 2.842 1.50 33.210 2.50 6.424 3.50 2.627
.67 3.390 1.67 109.677 2.67 5.199 3.67 2.389
.83 4.196 1.83 39.203 2.83 4.356 3.83 2.191
1.00 5.484 2.00 18.654 3.00 3.743 4.00 2.024
```

```
005:0003-----
*#-----|-----|
*# CATCHMENT 100 - NORTH OF SITE
| CALIB NASHYD | Area (ha)= 7.86 Curve Number (CN)=75.11
| 01:100 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .750
```

```
----- Rainfall dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 002
NSTORM= 1
# 1=KIT4-002.STM
```

```
002:0002-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
*****
*# 2-YEAR 4-HR SCS
```

```
002:0002-----
| READ STORM | Filename: KITCHENER - 2-YR 4HR CHICAGO STORM
| Ptotal= 36.55 mm | Comments: KITCHENER - 2-YR 4HR CHICAGO STORM

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.155 1.17 6.025 2.17 8.349 3.17 3.021
.33 2.392 1.33 9.205 2.33 6.345 3.33 2.753
.50 2.696 1.50 21.099 2.50 5.149 3.50 2.532
.67 3.101 1.67 81.099 2.67 4.352 3.67 2.347
.83 3.672 1.83 24.706 2.83 3.783 3.83 2.189
1.00 4.539 2.00 12.400 3.00 3.355 4.00 2.054
```

```
002:0003-----
*#-----|-----|
*# CATCHMENT 100 - NORTH OF SITE
```

```
| CALIB NASHYD | Area (ha)= 7.86 Curve Number (CN)=75.11
| 01:100 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .750

Unit Hyd Qpeak (cms)= .401

PEAK FLOW (cms)= .092 (i)
TIME TO PEAK (hrs)= 2.617
RUNOFF VOLUME (mm)= 8.603
TOTAL RAINFALL (mm)= 36.553
RUNOFF COEFFICIENT = .235
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
002:0004-----
*#-----|-----|
*# CATCHMENT 200 - SITE
```

```
| CALIB NASHYD | Area (ha)= 16.62 Curve Number (CN)=74.48
| 02:200 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .780

Unit Hyd Qpeak (cms)= .814

PEAK FLOW (cms)= .184 (i)
TIME TO PEAK (hrs)= 2.657
RUNOFF VOLUME (mm)= 8.395
TOTAL RAINFALL (mm)= 36.553
RUNOFF COEFFICIENT = .230
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
Unit Hyd Qpeak (cms)= .401

PEAK FLOW (cms)= .178 (i)
TIME TO PEAK (hrs)= 2.583
RUNOFF VOLUME (mm)= 15.428
TOTAL RAINFALL (mm)= 49.567
RUNOFF COEFFICIENT = .311
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
005:0004-----
*#-----|-----|
*# CATCHMENT 200 - SITE
```

```
| CALIB NASHYD | Area (ha)= 16.62 Curve Number (CN)=74.48
| 02:200 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .780

Unit Hyd Qpeak (cms)= .814

PEAK FLOW (cms)= .357 (i)
TIME TO PEAK (hrs)= 2.617
RUNOFF VOLUME (mm)= 15.093
TOTAL RAINFALL (mm)= 49.567
RUNOFF COEFFICIENT = .304
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
005:0005-----
*#-----|-----|
*# ADD 100 & 200
```

```
| ADD HYD (Total-Pre ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
| | | (ha) (cms) (hrs) (mm) (cms)
+ID1 01:100 7.86 .170 2.58 15.43 .000
+ID2 02:200 16.62 .357 2.62 15.09 .000
=====
SUM 03:Total-Pre 24.48 .535 2.60 15.20 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
005:0006-----
*# Run remaining Storm Files
005:0002-----
*#-----|-----|
** END OF RUN : 9
*****
```

```
| START | Project dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
```

```
Rainfall dir.: C:\Users\kpgang\DOCUME~1\CURREN~1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 010
NSTORM= 1
# 1=KIT4-010.STM
```

```
010:0002-----
*# Project Name : SOUTHWOOD
```

PRE-DEVELOPMENT

[illegible]

```

010:0003
-----
# CATCHMENT 100 - NORTH OF SITE
-----
| CALIB NASHDY          Area (ha) = 7.86   Curve Number (CN)=75.11
| 01:100   DT=1.00      | Ia (mm) = 5.000   # of Linear Res.(N)= 3.00
|                               U.H. Tp(hrs) = .750
Unit Hyd Qpeak (cms) = .401

PEAK FLOW (cms) = .249 (i)
TIME TO PEAK (hrs) = 2.567
RUNOFF VOLUME (mm) = 20.673
TOTAL RAINFALL (mm) = 58.631
RUNOFF COEFFICIENT = .356

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

010:0004
-----
# CATCHMENT 200 - SITE
-----
| CALIB NASHDY      Area   (ha)=   16.62   Curve Number   (CN)=74.48
| 82:200   DT=1.00   | Ta      (mm)=   5.000   # of Linear Res.(N)= 3.00
|                  U.H. Tp(hrs)=      .780
-----
Unit Hyd Qpeak      (cms)=      .814

PEAK FLOW           (cms)=      .500 (i)
TIME TO PEAK        (hrs)=      2.600
RUNOFF VOLUME        (mm)=      28.440
TOTAL RAINFALL       (mm)=      58.631
RUNOFF COEFFICIENT   =      .349

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

010:0005-----
*#-----|-----
*# ADD 100 & 200
-----
| ADD HYD (Total-Pre ) | ID: NHYD
AREA      QPEAK      TPEAK      R.V.      Dwf
(ha)      (cms)      (hrs)      (mm)      (cms)
ID1 01:100      7.86      .249      2.57      20.87      .000
+ID2 02:200      16.62      .500      2.60      20.45      .000

```

RUNOFF VOLUME (mm)= 28.882
TOTAL RAINFALL (mm)= 70.818
RUNOFF COEFFICIENT = .408

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

025:0004
-----
#*-----
# CATCHMENT 200 - SITE
-----
Area (ha) = 16.62 Curve Number (CN)=74.48
| CALUL NASH (mm) = 5.000 # of Linear Res.(N)= 3.00
| 02:200 DT= 1.00
| 1a (mm) = 5.000
| U.H. Tp(hrs) = .780
-----
Unit Hyd Gpeak (cms) = .814
-----
PEAK FLOW (cms) = .704 (i)
TIME TO PEAK (hrs) = 2.600
RUNOFF VOLUME (mm) = 28.342
TOTAL RAINFALL (mm) = 70.818
RUNOFF COEFFICIENT = .400
-----
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

025:0005-----|-----|-----|-----|-----|-----|
*#-----|-----|-----|-----|-----|-----|
*# ADD 100 & 200
-----|-----|-----|-----|-----|-----|
| ADD HYD (Total-Pre ) | ID: NHYD
-----|-----|-----|-----|-----|-----|
AREA      QPEAK      TPEAK      R.V.      DWF
(ha)      (cms)      (hrs)      (mm)      (cms)
ID1 01:100      7.86      .350      2.55 28.88      .000
+ID2 02:200      16.62      .704      2.60 28.34      .000
=====|=====|=====|=====|=====|=====|
SUM 03:Total-Pre 24.48      1.854      2.58 28.52      .000

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

[illegible]

```

-----
| START | Project dir.: C:\Users\kpgang\DOCUMENTS\CURRENT-1\
| Rainfall dir.: C:\Users\kpgang\DOCUMENTS\CURRENT-1\
|
| TZERO = 00 hrs on 0
| METOUT= 2 (output = METRIC)
| NRUN = 050
| NSTORM = 1
| # 1=KIT4-050-STM
|
-----
050:0002-

```

SUM 03:Total-Pre	24.48	.749	2.58	20.58	.000
------------------	-------	------	------	-------	------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
010:0006
** Run remaining Storm Files

010:0002
**-----|-----|-----|-----|
010:0002
**-----|-----|-----|-----|
** END OF RUN : 24
```

```

| START          Project dir.: C:\Users\kpgang\DOCU~1\CURREN~1\
-----
Rainfall dir.: C:\Users\kpgang\DOCU~1\CURREN~1\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 025
NSTORM= 1
# 1=KIT4-025.STM

```

```
=====
025:0002-----
=====
*# Project Name      : SOUTHCO200
*# Date              : MARCH 2025
*# Update            : JUNE 2025
*# Company           : Wal-Mart
*# File              : 0374-PRE.dat - POST-DEVELOPMENT MODELING
=====
*# 2-YEAR 4-HR SCS
=====
```

025:0002-----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.342	1.17	11.001	2.17	17.294	3.17	3.925
.33	2.747	1.33	19.704	2.33	11.830	3.33	3.405
.50	3.299	1.50	15.616	2.50	8.751	3.50	2.996
.67	4.007	1.67	15.567	2.67	6.824	3.67	2.658
.83	5.286	1.83	30.968	2.83	5.527	3.83	2.400
1.00	7.269	2.00	28.718	3.00	4.607	4.00	2.177

Filename: KITCHENER- 25-YR 4HR CHICAGO STORM
 Comments: KITCHENER- 25-YR 4HR CHICAGO STORM

```

025:0003-----|
*#-----|
*# CATCHMENT 100 - NORTH OF SITE
|-----|
| CALIB NASHYD | Area (ha) = 7.86 | Curve Number (CN)=75.11
| 01:100 DT= 1.00 | Ia (mm) = 5.000 | # of Linear Res.(N)= 3.00
|-----|
| U.H. Tp(hrs) = .750 |
|-----|

```

Unit Hyd Qpeak (cms)= .401

PEAK FLOW (cms)= .350 (i)

TIME TO PEAK (hrs)= 2.550

```
#####
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : WalterFedy
*# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
#####
*# 2-YEAR 4-HR SCS
```

```

050:0002:-----
  READ STORM      Filename: KITCHENER - 50-YR 4HR CHICAGO STORM
  Ptotal = 80.34 mm Comments: KITCHENER - 50-YR 4HR CHICAGO STORM

  TIME  RAIN      TIME  RAIN      TIME  RAIN      TIME  RAIN
  hrs  mm/hr     hrs  mm/hr     hrs  mm/hr     hrs  mm/hr
  17   2.458      1.17  12.435     2.17  19.792     3.17   4.243
  20   3.910      1.33  22.610     2.33  14.420     3.33  3.652
  50   3.232      1.58  59.628     2.58   9.812     3.58  3.190
  67   4.428      1.67  175.103    2.67  7.576     3.67  6.821
  83   5.801      1.83  78.422     2.83   6.979     3.83  5.522
  1.00  8.092     2.00  33.142     3.00  5.022     4.00  2.274

```

```

050:0003-----
*#-----|-----
*# CATCHMENT 100 - NORTH OF SITE
-----|-----
| CALIB NASHYD | Area (ha)= 7.86 Curve Number (CN)=75.11
| 01:100 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .750

```

```

Unit Hyd Qpeak (cms)= .401

PEAK FLOW (cms)= .437 (i)
TIME TO PEAK (hrs)= 2.550
RUNOFF VOLUME (mm)= 35.584
TOTAL RAINFALL (mm)= 80.340
RUNOFF COEFFICIENT = .443

```

(1) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
050:0004-----
*#-----
*# CATCHMENT 200 - SITE-----
-----
| CALIB NASHYD      | Area   (ha)= 16.62   Curve Number   (CN)=74.48
| 02:200   DT= 1.00 | Is      = 5.0000     # of Linear Res.(N)= 3.00
|                   | U.H. Tp(hrs)= .780
-----

```

```

Unit Hyd Upeak (cms)= .814
PEAK FLOW (cms)= .879 (i)
TIME TO PEAK (hrs)= 2.583
RUNOFF VOLUME (mm)= 34.957
TOTAL RAINFALL (mm)= 80.340
RUNOFF COEFFICIENT = .435

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
050:0005-----
*#-----|-----|
*# ADD 100 & 200
-----
| ADD HYD (Total-Pre ) | ID: NHYD
      (ha)              (cms)  (hrs)  (mm)  (cms)

```

PRE-DEVELOPMENT

ID1 01:100	7.86	.437	2.55	35.58	.000
+ID2 02:200	16.62	.879	2.58	34.96	.000
SUM 03:Total-Pre	24.48	1.315	2.57	35.16	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
050:0006-----
# Run remaining Storm Files
-----
050:0002-----
#-----|-----|
#-----|-----|
050:0002-----
#-----|-----|
#-----|-----|
050:0002-----
#-----|-----|
#-----|-----|
** END OF RUN : 99
-----
*****
```

```
-----
| START | Project dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
|-----| Rainfall dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 100
NSTORM= 1
# 1=KIT4-100.STM
-----
```

```
-----
100:0002-----
#*****
# Project Name : SOUTHWOOD
# Date : MARCH 2025
# Update : JUNE 2025
# Company : Walterfedy
# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
#*****
# 2-YEAR 4-HR SCS
-----
```

READ STORM		Filename: KITCHENER - 100-YR 4HR CHICAGO STORM	
Ptotal= 89.89 mm		Comments: KITCHENER - 100-YR 4HR CHICAGO STORM	
TIME		TIME	
hrs	mm/hr	hrs	mm/hr
.17	2.552	1.17	13.903
.33	3.053	1.33	25.613
.50	3.747	1.50	67.817
.67	4.754	1.67	196.536
.83	6.308	1.83	80.061
1.00	8.920	2.00	37.714
		3.00	5.424
		4.00	2.350

```
-----
100:0003-----
#-----|-----|
# CATCHMENT 100 - NORTH OF SITE
-----
```

```
-----
| START | Project dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
|-----| Rainfall dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 250
NSTORM= 1
# 1=hazel48.STM
-----
```

```
-----
250:0002-----
#*****
# Project Name : SOUTHWOOD
# Date : MARCH 2025
# Update : JUNE 2025
# Company : Walterfedy
# File : 0374-PRE.dat - POST-DEVELOPMENT MODELING
#*****
# 2-YEAR 4-HR SCS
-----
```

READ STORM		Filename: 48 hour Hurricane Hazel	
Ptotal= 284.97 mm		Comments: 48 hour Hurricane Hazel	
TIME		TIME	
hrs	mm/hr	hrs	mm/hr
1.00	2.027	13.00	2.027
2.00	2.027	14.00	2.027
3.00	2.027	15.00	2.027
4.00	2.027	16.00	2.027
5.00	2.027	17.00	2.027
6.00	2.027	18.00	2.027
7.00	2.027	19.00	2.027
8.00	2.027	20.00	2.027
9.00	2.027	21.00	2.027
10.00	2.027	22.00	2.027
11.00	2.027	23.00	2.027
12.00	2.027	24.00	2.027

```
-----
250:0003-----
#-----|-----|
# CATCHMENT 100 - NORTH OF SITE
-----
```

CALIB NASHYD		Area (ha)=	7.86	Curve Number (CN)=	75.11
01:100 DT= 1.00		Ia (mm)=	5.000	# of Linear Res.(N)=	3.00
		U.H. Tp(hrs)=	.750		
Unit Hyd Qpeak (cms)= .481					
PEAK FLOW (cms)= .844 (i)					
TIME TO PEAK (hrs)= 46.800					
RUNOFF VOLUME (mm)= 215.258					
TOTAL RAINFALL (mm)= 284.973					
RUNOFF COEFFICIENT = .755					

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
250:0004-----
#-----|-----|
# CATCHMENT 200 - SITE
-----
| CALIB NASHYD | Area (ha)= 16.62 Curve Number (CN)=74.48
-----
```

CALIB NASHYD		Area (ha)= 7.86		Curve Number (CN)=75.11	
01:100 DT= 1.00		Ia (mm)= 5.000		# of Linear Res.(N)= 3.00	
		U.H. Tp(hrs)= .750			

Unit Hyd Qpeak (cms)= .481
PEAK FLOW (cms)= .528 (i)
TIME TO PEAK (hrs)= 2.550
RUNOFF VOLUME (mm)= 42.627
TOTAL RAINFALL (mm)= 89.891
RUNOFF COEFFICIENT = .474

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
100:0004-----
#-----|-----|
# CATCHMENT 200 - SITE
-----
| CALIB NASHYD | Area (ha)= 16.62 Curve Number (CN)=74.48
| 02:200 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= .780
-----
```

Unit Hyd Qpeak (cms)= .814
PEAK FLOW (cms)= 1.064 (i)
TIME TO PEAK (hrs)= 2.583
RUNOFF VOLUME (mm)= 41.917
TOTAL RAINFALL (mm)= 89.891
RUNOFF COEFFICIENT = .466

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
100:0005-----
#-----|-----|
# ADD 100 & 200
-----
| ADD HYD (Total-Pre ) | ID: NYHD
```

(ha)	(cms)	(hrs)	(mm)	R.V.	DWF (cms)
ID1 01:100	7.86	.528	2.55	42.63	.000
+ID2 02:200	16.62	1.064	2.58	41.92	.000
SUM 03:Total-Pre	24.48	1.591	2.57	42.15	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
100:0006-----
# Run remaining Storm Files
-----
100:0002-----
#-----|-----|
#-----|-----|
100:0002-----
#-----|-----|
#-----|-----|
100:0002-----
#-----|-----|
#-----|-----|
100:0002-----
#-----|-----|
#-----|-----|
** END OF RUN : 249
-----
*****
```

02:200 DT= 1.00		Ia (mm)= 5.000		# of Linear Res.(N)= 3.00	
		U.H. Tp(hrs)= .780			

Unit Hyd Qpeak (cms)= .814
PEAK FLOW (cms)= 1.759 (i)
TIME TO PEAK (hrs)= 46.883
RUNOFF VOLUME (mm)= 213.580
TOTAL RAINFALL (mm)= 284.973
RUNOFF COEFFICIENT = .749

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
250:0005-----
#-----|-----|
# ADD 100 & 200
-----
| ADD HYD (Total-Pre ) | ID: NYHD
```

(ha)	(cms)	(hrs)	(mm)	R.V.	DWF (cms)
ID1 01:100	7.86	.844	46.80	215.25	.000
+ID2 02:200	16.62	1.759	46.88	213.58	.000
SUM 03:Total-Pre	24.48	2.603	46.85	214.12	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
250:0006-----
# Run remaining Storm Files
-----
250:0002-----
#-----|-----|
#-----|-----|
250:0002-----
#-----|-----|
#-----|-----|
250:0002-----
#-----|-----|
#-----|-----|
250:0002-----
#-----|-----|
#-----|-----|
** END OF RUN : 324
-----
*****
```

```
-----
| START | Project dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
|-----| Rainfall dir.: C:\Users\kpag\DOCLIME-1\CURREN-1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 325
NSTORM= 1
# 1=KIT425MM.STM
-----
```

```
-----
325:0002-----
#*****
# Project Name : SOUTHWOOD
# Date : MARCH 2025
-----
```

```
*# Update      : JUNE 2025
*# Company    : Walterfedy
*# File       : 0374-PRE.dat - POST-DEVELOPMENT MODELING
*#*****
*#
*# 2-YEAR 4-HR SCS
```

325:0002							
READ STORM		Filename: KITCHENER		25MM 4HR CHICAGO STORM			
Prtal= 25.04 mm		Comments: KITCHENER		25MM 4HR CHICAGO STORM			
TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME
hrs	hrs	hrs	hrs	mm/hr	mm/hr	hrs	hrs
.17	1.476	1.17	4.128	2.17	5.720	3.17	2.670
.33	1.638	1.33	6.386	2.33	4.347	3.33	1.886
.50	1.847	1.50	14.454	2.50	3.527	3.50	1.734
.67	2.125	1.67	5.555	2.67	2.982	3.67	1.688
.83	2.515	1.83	16.925	2.83	2.592	3.83	1.500
1.00	3.109	2.00	8.495	3.03	2.259	4.00	1.407

```

325:0003
-----
#* CATCHMENT 100 - NORTH OF SITE
-----
| CALIB NASHVO          Area (ha) = 7.86      Curve Number (CN)=75.11
| 01.100      DT=1.00    | Ia (mm) = 5.000
| U.H. Tp(hrs) = .750    | # of Linear Res.(N)= 3.00
-----

Unit Hyd Peak      (cms) = .401

PEAK FLOW          (cms) = .040 (i)
TIME TO PEAK      (hrs) = 2.667
RUNOFF VOLUME      (mm) = 3.854
TOTAL RAINFALL     (mm) = 25.841
RUNOFF COEFFICIENT = .154

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

325:0004 .....
-----
*# CATCHMENT 200 - SITE
-----
| CALIB NASHVO      | Area (ha)=      16.62   | Curve Number (CN)=74.48
| 62.200            | Ia              =      5.000
| 01.100            | U.H. Tp(hrs)=    .780   | # of Linear Res.(N)= 3.00
-----
Unit Hyd Peak      (cms)=      .814
PEAK FLOW          (cms)=      .080 (i)
TIME TO PEAK      (hrs)=      2.717
RUNOFF VOLUME      (mm)      =      3.751
TOTAL RAINFALL     (mm)=      25.841
RUNOFF COEFFICIENT =      .158
-----
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

325:0005-----
*#-----|-----
*# ADD 100 & 200
|
| ADD HYD (Total-Pre ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DfF
|                        | (ha)      (cms)      (hrs)      (mm)      (cms)
| ID1 01:100           | 7.86      .049      2.67      3.85      .000
| +ID2 02:200           | 16.62     .000      2.72      3.75      .000

```

SUM 03:Total-Pre	24.48	.120	2.70	3.78	.000
------------------	-------	------	------	------	------

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

325:0006
** Run remaining Storm Files

325:0002
**-----|
-----|
325:0006
**-----|
-----|
325:0002
**-----|
-----|
325:0002
**-----|
-----|
325:0002
**-----|
-----|
325:0002
**-----|
-----|
325:0002
**-----|
-----|
325:0002
**-----|
-----|
FINISH

-----|
-----|
WARNINGS / ERRORS / NOTES

Simulation ended on 2025-06-04 at 16:14:09

```

```

2      Metric units
*****
## Project Name   : SOUTHWOOD
## Project Number: 2022-0374-10
## Date          : MARCH 2025
## Update        : JUNE 2025
## Company       : Walterfedy
## File          : 0374-PST-B.dat - POST-DEVELOPMENT MODELING
*****
## 2-YEAR 4-HR SCS
START      TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[2]
           KIT4-002.STM
*%-----|-----
READ STORM  STORM_FILENAME=["STORM.001"]
*%-----|-----
## CATCHMENT 303 ~
CALIB STANDHYD ID=[3], NHYD=["303"], DT=[1](min), AREA=[0.73](ha),
               XIMP=[0.65], TIMP=[0.65], DWF=[0](cms), LOSS=[2],
               SCS curve number CN=[80],
               Pervious surfaces: IAPER=[5.0](mm), SLPP=[1](%),
                                   LGP=[1](m), MNP=[0.240], SCP=[0](min),
               Impervious surfaces: IAIMP=[1.0](mm), SLPI=[1](%),
                                   LGI=[15](m), MNI=[0.013], SCI=[0](min),
               RAINFALL=[ , , , ](mm/hr) , END=-1
*%-----|-----
## CATCHMENT 302 ~ NORTH SIDE AREA
CALIB NASHYD  ID=[2], NHYD=["302"], DT=[1]min, AREA=[0.58](ha),
               DWF=[0](cms), CN/C=[65], IA=[5.0](mm),
               N=[3], TP=[0.36]hrs,
               RAINFALL=[ , , , ](mm/hr) , END=-1
*%-----|-----
## CATCHMENT 301 ~
CALIB STANDHYD ID=[1], NHYD=["301"], DT=[1](min), AREA=[4.91](ha),
               XIMP=[0.555], TIMP=[0.555], DWF=[0](cms), LOSS=[2],
               SCS curve number CN=[80],
               Pervious surfaces: IAPER=[5.0](mm), SLPP=[1](%),
                                   LGP=[1](m), MNP=[0.240], SCP=[0](min),
               Impervious surfaces: IAIMP=[1.0](mm), SLPI=[1](%),
                                   LGI=[15](m), MNI=[0.013], SCI=[0](min),
               RAINFALL=[ , , , ](mm/hr) , END=-1
*%-----|-----
## CATCHMENT 401 ~
CALIB STANDHYD ID=[4], NHYD=["401"], DT=[1](min), AREA=[1.54](ha),
               XIMP=[0.65], TIMP=[0.65], DWF=[0](cms), LOSS=[2],
               SCS curve number CN=[80],
               Pervious surfaces: IAPER=[5.0](mm), SLPP=[1](%),
                                   LGP=[1](m), MNP=[0.240], SCP=[0](min),
               Impervious surfaces: IAIMP=[1.0](mm), SLPI=[1](%),
                                   LGI=[15](m), MNI=[0.013], SCI=[0](min),
               RAINFALL=[ , , , ](mm/hr) , END=-1
*%-----|-----
## CATCHMENT 402 ~
CALIB STANDHYD ID=[5], NHYD=["402"], DT=[1](min), AREA=[0.36](ha),
               XIMP=[0.65], TIMP=[0.65], DWF=[0](cms), LOSS=[2],
               SCS curve number CN=[80],
               Pervious surfaces: IAPER=[5.0](mm), SLPP=[1](%),
                                   LGP=[1](m), MNP=[0.240], SCP=[0](min),
               Impervious surfaces: IAIMP=[1.0](mm), SLPI=[1](%),
                                   LGI=[15](m), MNI=[0.013], SCI=[0](min),
               RAINFALL=[ , , , ](mm/hr) , END=-1
*%-----|-----
## ADD 401 & 402
ADD HYD      IDsum=[7], NHYD=["400_SERIES"], IDs to add=[4 5]
*%-----|-----
## ADD 303 & 302
ADD HYD      IDsum=[8], NHYD=["US_301"], IDs to add=[2 3]
*%-----|-----
## ADD 400 SERIES, UPSTREAM 301,& 301

```

ADD HYD IDsum=[9], NHYD=["US_201"], IDs to add=[1 7 8]

```
##-----|-----|
## CATCHMENT 201 ~ PROPOSED RESIDENTIAL DEVELOPMENT
CALIB STANDHYD ID=[6], NHYD=["201"], DT=[1](min), AREA=[18.26](ha),
                XIMP=[0.85], TIMP=[0.85], DWF=[0](cms), LOSS=[2],
                SCS curve number CN=[80],
                Pervious surfaces: IAper=[5.0](mm), SLPP=[1](%),
                                LGP=[1](m), MNP=[0.240], SCP=[0](min),
                Impervious surfaces: IAimp=[1.0](mm), SLPI=[1](%),
                                LGI=[15](m), MNI=[0.013], SCI=[0](min),
                RAINFALL=[ , , , , ](mm/hr) , END=-1
```

```
##-----|-----|
## ADD FLOWS TO POND
ADD HYD IDsum=[10], NHYD=["T-UNCON"], IDs to add=[6 9]
##-----|-----|
```

```
## ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS
ROUTE RESERVOIR IDout=[8], NHYD=["SWM"], IDin=[10],
                RDT=[1](min),
                TABLE of ( OUTFLOW-STORAGE ) values
                        (cms) - (ha-m)
                        0.0000 0
                        0.0090 0.1310
                        0.0314 0.2690
                        0.0428 0.4170
                        0.0655 0.5765
                        0.1373 0.7430
                        0.3100 0.9163
                        0.4279 1.0965
                        0.5177 1.2835
                        0.5934 1.4776
                        0.6602 1.6787
                        0.7207 1.8870
                        0.7764 2.1025
                        0.8283 2.3254
                        0.8771 2.5557
                        0.9233 2.7938
                        0.9672 3.0396
                        1.0093 3.2932
                        2.0198 3.5541
                        3.8325 3.8222
```

```
                [ -1 , -1 ]
IDovf=[7], NHYDovf=["SWM-OF"]
```

```
SAVE HYD ID=[8], # OF PCYCLES=[-1], ICASEsh=[1]
HYD_COMMENT=[" "]
```

```
##-----|-----|
```

```
##-----|-----|
## TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED
ADD HYD IDsum=[9], NHYD=["T-CON"], IDs to add=[8 7]
##-----|-----|
```

```
## Run remaining Storm Files
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[5]
KIT4-005.STM
```

```
##-----|-----|
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[10]
KIT4-010.STM
```

```
##-----|-----|
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[25]
KIT4-025.STM
```

```
##-----|-----|
START TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[1], NRUN=[50]
KIT4-050.STM
```

```
*#-----|-----|
START      TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[100]
            KIT4-100.STM
*#-----|-----|
START      TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[250]
            haze148.STM
*#-----|-----|
START      TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[325]
            KIT425MM.STM
*#-----|-----|
FINISH
```

POST-DEVELOPMENT

```
=====
SSSSS W W M M H H Y Y M M O O 999 999 =====
S W W W M M H H Y Y M M O O 9 9 9 9
SSSSS W W W M M H H H H Y Y M M O O ## 9 9 9 9 Ver 4.05
S W W M M H H Y Y M M O O 9999 9999 Sept 2011
SSSSS W W M M H H Y Y M M O O 9 9 9 9 # 2018430
StormWater Management HYdrologic Model 999 999 =====

***** SWMMHYO Ver/4.05 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89 *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 836-3884 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmym@jfsa.com *****

***** Licensed user: Walterfedy *****
***** Kitchener SERIAL#: 2018430 *****

***** *****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 105408 *****
***** Max. number of flow points : 105408 *****

***** DETAILED OUTPUT *****
*****
* DATE: 2025-06-06 TIME: 15:49:53 RUN COUNTER: 000085 *
* Input filename: C:\Users\kpgang\DOCU~1\CURREN~1\374-PSTB.dat *
* Output filename: C:\Users\kpgang\DOCU~1\CURREN~1\374-PSTB.out *
* Summary filename: C:\Users\kpgang\DOCU~1\CURREN~1\374-PSTB.sum *
* User comments: *
* 1: *
* 2: *
* 3: *

001:0001-----
#*-----
#* Project Name : SOUTHWOOD
#* Date : MARCH 2025
#* Update : JUNE 2025
#* Company : Walterfedy
#* File : 0374-PST-B.dat - POST-DEVELOPMENT MODELING
#* 2-YEAR 4-HR SCS 1
** END OF RUN : 1
=====
```

| START | Project dir.: C:\Users\kpgang\DOCU~1\CURREN~1\

```
| CALIB STANDHYD | Area (ha)= .58 Curve Number (CN)=65.00
| 02:302 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .360

Unit Hyd. Tpeak (cms)= .062

PEAK FLOW (cms)= .008 (i)
TIME TO PEAK (hrs)= 2.100
RUNOFF VOLUME (mm)= 5.914
TOTAL RAINFALL (mm)= 36.553
RUNOFF COEFFICIENT = .162

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
002:0005-----
#*-----
#* CATCHMENT 301 ~
| CALIB STANDHYD | Area (ha)= 4.91 Dir. Conn.(%)= 55.50
| 01:301 DT= 1.00 | Total Imp(%)= 55.50

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 2.73 2.18
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 81.10 29.75
over (min) 1.00 2.00
Storage Coeff. (min)= .89 (ii) 2.40 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.15 .50

*TOTALS*
PEAK FLOW (cms)= .61 .16
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 35.55 10.47 24.393
TOTAL RAINFALL (mm)= 36.55 36.55 36.553
RUNOFF COEFFICIENT = .97 .29 .667

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
002:0006-----
#*-----
#* CATCHMENT 401 ~
| CALIB STANDHYD | Area (ha)= 1.54 Dir. Conn.(%)= 65.00
| 04:401 DT= 1.00 | Total Imp(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 .54
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 81.10 29.75
over (min) 1.00 2.00
Storage Coeff. (min)= .89 (ii) 2.40 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.15 .50

*TOTALS*
```

```
----- Rainfall dir.: C:\Users\kpgang\DOCU~1\CURREN~1\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 002
NSTORM= 1
# 1-KIT4-002.STM
```

```
002:0002-----
#*-----
#* Project Name : SOUTHWOOD
#* Date : MARCH 2025
#* Update : JUNE 2025
#* Company : Walterfedy
#* File : 0374-PST-B.dat - POST-DEVELOPMENT MODELING
#* 2-YEAR 4-HR SCS
```

```
002:0002-----
| READ STORM | Filename: KITCHENER - 2-YR 4HR CHICAGO STORM
| Ptotal= 36.55 mm | Comments: KITCHENER - 2-YR 4HR CHICAGO STORM

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.155 1.17 6.025 2.17 8.349 3.17 3.021
.33 2.392 1.33 9.205 2.33 6.345 3.33 2.753
.50 2.696 1.50 21.098 2.50 5.149 3.50 2.532
.67 3.101 1.67 81.099 2.67 4.352 3.67 2.347
.83 3.672 1.83 24.706 2.83 3.783 3.83 2.189
1.00 4.539 2.00 12.400 3.00 3.355 4.00 2.854
```

```
002:0003-----
#*-----
#* CATCHMENT 303 ~
| CALIB STANDHYD | Area (ha)= .73 Dir. Conn.(%)= 65.00
| 03:303 DT= 1.00 | Total Imp(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .47 .26
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 81.10 29.75
over (min) 1.00 2.00
Storage Coeff. (min)= .89 (ii) 2.40 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.15 .50

*TOTALS*
PEAK FLOW (cms)= .11 .02 .125 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 35.55 10.47 26.775
TOTAL RAINFALL (mm)= 36.55 36.55 36.553
RUNOFF COEFFICIENT = .97 .29 .733

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
002:0004-----
#*-----
#* CATCHMENT 302 ~ NORTH SIDE AREA
```

```
PEAK FLOW (cms)= .23 .04 .264 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 35.55 10.47 26.775
TOTAL RAINFALL (mm)= 36.55 36.55 36.553
RUNOFF COEFFICIENT = .97 .29 .733
```

```
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
002:0007-----
#*-----
#* CATCHMENT 402 ~
| CALIB STANDHYD | Area (ha)= .36 Dir. Conn.(%)= 65.00
| 05:402 DT= 1.00 | Total Imp(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .23 .13
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 81.10 29.75
over (min) 1.00 2.00
Storage Coeff. (min)= .89 (ii) 2.40 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.15 .50

*TOTALS*
PEAK FLOW (cms)= .05 .01 .062 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 35.55 10.47 26.775
TOTAL RAINFALL (mm)= 36.55 36.55 36.553
RUNOFF COEFFICIENT = .97 .29 .733

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
002:0008-----
#*-----
#* ADD 401 & 402
```

```
| ADD HYD (400_SERIES) | ID: NYHD AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm) DWF (cms)
ID1 04:401 1.54 .264 1.67 26.78 .000
+ID2 05:402 .36 .062 1.67 26.78 .000
=====
SUM 07:400_SERIES 1.90 .326 1.67 26.78 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
002:0009-----
#*-----
#* ADD 303 & 302
```

```
| ADD HYD (US_301 ) | ID: NYHD AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm) DWF (cms)
ID1 02:302 .58 .008 2.10 5.91 .000
+ID2 03:303 .73 .125 1.67 26.78 .000
=====
```

POST-DEVELOPMENT

SUM 08:US_301 1.31 .127 1.67 17.54 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
002:0010-----
*#-----
*# ADD 400 SERIES, UPSTREAM 301,8 301
| ADD HYD (US_201 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
| (ha) (cms) (hrs) (mm) (cms)
| ID1 01:301 4.91 .770 1.67 24.39 .000
| ID2 07:400_SERIES 1.90 .326 1.67 26.78 .000
| ID3 08:US_301 1.31 .127 1.67 17.54 .000
=====
SUM 09:US_201 8.12 1.223 1.67 23.84 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
002:0011-----
*#-----
*# CATCHMENT 201 ~ PROPOSED RESIDENTIAL DEVELOPMENT
| CALIB STANDHYD | Area (ha)= 18.26
| 06:201 DT= 1.00 Total Imp(K)= 85.00 Dir. Conn.(%)= 85.00
=====
IMPERVIOUS PERVIOUS (I)
Surface Area (ha)= 15.52 2.74
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 81.10 29.75
over (min)= 1.00 2.00
Storage Coeff. (min)= .89 (ii) 2.40 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.15 .50
*TOTALS*
PEAK FLOW (cms)= 3.50 .20 3.692 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 35.55 10.47 31.791
TOTAL RAINFALL (mm)= 36.55 36.55 36.553
RUNOFF COEFFICIENT = .97 .29 .870
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
002:0012-----
*#-----
*# ADD FLOWS TO POND
| ADD HYD (T-UNCON ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
| (ha) (cms) (hrs) (mm) (cms)
| ID1 06:201 18.26 3.692 1.67 31.79 .000
| ID2 09:US_201 8.12 1.223 1.67 23.84 .000
=====
SUM 10:T-UNCON 26.38 4.915 1.67 29.34 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
002:0013-----
*#-----
```

```
| START | Project dir.: C:\Users\kpgang\DOCUMENT-1\CURRENT-1\
Rainfall dir.: C:\Users\kpgang\DOCUMENT-1\CURRENT-1\
TZERO = 0 hrs on
METOUT= 2 (output = METRIC)
NRUN = 005
NSTORM= 1
# 1-KIT4-005.STM
```

```
005:0002-----
*#-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PSF-B.dat - POST-DEVELOPMENT MODELING
*#-----
*# 2-YEAR 4-HR SCS
```

```
005:0002-----
| READ STORM | Filename: KITCHENER - 5-YR 4HR CHICAGO STORM
| Pictal= 49.57 mm | Comments: KITCHENER - 5-YR 4HR CHICAGO STORM
=====
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.148 1.17 7.825 2.17 11.684 3.17 3.280
.33 2.447 1.33 13.150 2.33 8.340 3.33 2.917
.50 2.842 1.50 33.210 2.50 6.424 3.50 2.627
.67 3.390 1.67 109.677 2.67 5.199 3.67 2.389
.83 4.196 1.83 39.203 2.83 4.356 3.83 2.191
1.00 5.484 2.00 18.654 3.00 3.743 4.00 2.024
```

```
005:0003-----
*#-----
*# CATCHMENT 303 ~
| CALIB STANDHYD | Area (ha)= .73
| 03:303 DT= 1.00 Total Imp(K)= 65.00 Dir. Conn.(%)= 65.00
=====
IMPERVIOUS PERVIOUS (I)
Surface Area (ha)= .47 .26
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 109.68 51.76
over (min)= 1.00 2.00
Storage Coeff. (min)= .79 (ii) 2.00 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.22 .56
*TOTALS*
PEAK FLOW (cms)= .14 .03 .178 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 48.57 18.38 38.001
TOTAL RAINFALL (mm)= 49.57 49.57 49.567
RUNOFF COEFFICIENT = .98 .37 .767
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*# ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS

```
| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN=10:(T-UNCO) |
| OUT=08:(SWM ) |
=====
OUTFLOW STORAGE TABLE
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha-m.) | (cms) (ha-m.)
.000 .0000E+00 | .660 .1679E+01
.009 .1310E+00 | .721 .1887E+01
.031 .2690E+00 | .776 .2102E+01
.043 .4170E+00 | .828 .2325E+01
.065 .5765E+00 | .877 .2556E+01
.137 .7430E+00 | .923 .2794E+01
.310 .9163E+00 | .967 .3040E+01
.428 .1097E+01 | 1.009 .3293E+01
.518 .1283E+01 | 2.020 .3554E+01
.593 .1478E+01 | 3.832 .3822E+01
```

```
ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >10: (T-UNCO) 26.38 4.915 1.667 29.345
OUTFLOW<08: (SWM ) 26.38 .114 4.000 29.342
OVERFLOW<07: (SWM-OF) .00 .000 .000 .000
TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00
```

```
PEAK FLOW REDUCTION [Qout/Qin](%)= 2.326
TIME SHIFT OF PEAK FLOW (min)= 140.00
MAXIMUM STORAGE USED (ha-m.)=.6898E+00
```

```
002:0014-----
| SAVE HYD | AREA (ha)= 26.380
| ID=08 (SWM ) | QPEAK (cms)= .114 (i)
| DT= 1.00 PCVC=-1 | TPEAK (hrs)= 4.000
| VOLUME (mm)= 29.342
Filename: C:\Users\kpgang\DOCUMENT-1\CURRENT-1\H-SWM.002
Comments: HYD_COMMENT=[" "]
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
002:0015-----
*#-----
*# TOTAL SITE DISCHARGE CONTROLLED + UNCONTROLLED
| ADD HYD (T-CON ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
| (ha) (cms) (hrs) (mm) (cms)
| ID1 08:SWM 26.38 .114 4.00 29.34 .000
| ID2 07:SWM-OF .00 .000 .00 .00 .000 **DRY**
=====
SUM 09:T-CON 26.38 .114 4.00 29.34 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
002:0016-----
*#-----
*# Run remaining Storm Files
** END OF RUN : 4
*****
```

```
005:0004-----
*#-----
*# CATCHMENT 302 ~ NORTH SIDE AREA
| CALIB NASHYD | Area (ha)= .58 Curve Number (CN)=65.00
| 02:302 DT= 1.00 Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .360
Unit Hyd Qpeak (cms)= .062
```

```
PEAK FLOW (cms)= .015 (i)
TIME TO PEAK (hrs)= 2.100
RUNOFF VOLUME (mm)= 10.952
TOTAL RAINFALL (mm)= 49.567
RUNOFF COEFFICIENT = .221
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
005:0005-----
*#-----
*# CATCHMENT 301 ~
| CALIB STANDHYD | Area (ha)= 4.91
| 01:301 DT= 1.00 Total Imp(K)= 55.50 Dir. Conn.(%)= 55.50
=====
IMPERVIOUS PERVIOUS (I)
Surface Area (ha)= 2.73 2.18
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 109.68 51.76
over (min)= 1.00 2.00
Storage Coeff. (min)= .79 (ii) 2.00 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.22 .56
*TOTALS*
PEAK FLOW (cms)= .83 .29 1.117 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 48.57 18.38 35.133
TOTAL RAINFALL (mm)= 49.57 49.57 49.567
RUNOFF COEFFICIENT = .98 .37 .709
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
005:0006-----
*#-----
*# CATCHMENT 401 ~
| CALIB STANDHYD | Area (ha)= 1.54
| 04:401 DT= 1.00 Total Imp(K)= 65.00 Dir. Conn.(%)= 65.00
=====
IMPERVIOUS PERVIOUS (I)
Surface Area (ha)= 1.00 .54
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 109.68 51.76
over (min)= 1.00 2.00
Storage Coeff. (min)= .79 (ii) 2.00 (ii)
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

POST-DEVELOPMENT

Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.22 .56 *TOTALS*
PEAK FLOW (cms)= .30 .07 1.376 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 48.57 18.38 38.001
TOTAL RAINFALL (mm)= 49.57 49.57 49.567
RUNOFF COEFFICIENT = .37 .767

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0007--
*#-----
*# CATCHMENT 402 ~

| CALIB STANDHYD | Area (ha)= .36
| 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PVIOUS (i)
Surface Area (ha)= .23 .13
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 109.68 51.76
over (min)= 1.00 2.00
Storage Coeff. (min)= .79 (ii) 2.00 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.22 .56

PEAK FLOW (cms)= .07 .02 .088 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 48.57 18.38 38.001
TOTAL RAINFALL (mm)= 49.57 49.57 49.567
RUNOFF COEFFICIENT = .37 .767

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0008--
*#-----
*# ADD 401 & 402

| ADD HYD (400_SERIES) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 04:401 .376 1.54 .376 1.67 38.00 .000
+ID2 05:402 .36 .088 1.67 38.00 .000
SUM 07:400_SERIES 1.90 .463 1.67 38.00 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0009--
*#-----
*# ADD 303 & 302

| ADD HYD (US_301) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)

005:0013--
*#-----
*# ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS

| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN=10:(T-UNCO) |
| OUT=08:(SWM) |

===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
.000 .0000E+00 | .660 .1679E+01
.009 .1310E+00 | .721 .1887E+01
.031 .2690E+00 | .776 .2102E+01
.043 .4170E+00 | .828 .2325E+01
.065 .5765E+00 | .877 .2556E+01
.137 .7430E+00 | .923 .2794E+01
.310 .9163E+00 | .967 .3040E+01
.428 .1097E+01 | 1.009 .3293E+01
.518 .1283E+01 | 2.020 .3554E+01
.593 .1478E+01 | 3.832 .3822E+01

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >10: (T-UNCO) 26.38 6.849 1.667 41.052
OUTFLOW<08: (SWM) 26.38 .292 2.83 41.049
OVERFLOW<07: (SWM-OF) .00 .000 .000 .000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.264
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)=.8983E+00

005:0014--
*#-----
*# SAVE HYD

| ID=08 (SWM) | AREA (ha)= 26.380
| DT= 1.00 PCYC=-1 | QPEAK (cms)= .292 (i)
| | TPEAK (hrs)= 2.833
| | VOLUME (mm)= 41.049

Filename: C:\Users\kpgang\DOCU-1\CURREN-1\H-SWM.005
Comments: HYD_COMMENT=" "

- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0015--
*#-----
*# TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED

| ADD HYD (T-CON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 08:SWM 26.38 .292 2.83 41.05 .000
+ID2 07:SWM-OF .00 .000 .00 .00 .000 **DRY**
SUM 09:T-CON 26.38 .292 2.83 41.05 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0016--
*#-----
*# Run remaining Storm Files

005:0002--
*#-----
*# END OF RUN : 9

ID1 02:302 .58 .015 2.10 10.95 .000
+ID2 03:303 .73 .178 1.67 38.00 .000
SUM 08:US_301 1.31 .181 1.67 26.03 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0010--
*#-----
*# ADD 400 SERIES, UPSTREAM 301,& 301

| ADD HYD (US_201) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 01:301 4.91 1.117 1.67 35.13 .000
+ID2 07:400_SERIES 1.90 .463 1.67 38.00 .000
+ID3 08:US_301 1.31 .181 1.67 26.03 .000
SUM 09:US_201 8.12 1.761 1.67 34.34 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0011--
*#-----
*# CATCHMENT 201 ~ PROPOSED RESIDENTIAL DEVELOPMENT

| CALIB STANDHYD | Area (ha)= 18.26
| 06:201 DT= 1.00 | Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

IMPERVIOUS PVIOUS (i)
Surface Area (ha)= 15.52 2.74
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 109.68 51.76
over (min)= 1.00 2.00
Storage Coeff. (min)= .79 (ii) 2.00 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.22 .56

PEAK FLOW (cms)= 4.73 .36 5.088 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 48.57 18.38 44.039
TOTAL RAINFALL (mm)= 49.57 49.57 49.567
RUNOFF COEFFICIENT = .37 .888

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0012--
*#-----
*# ADD FLOWS TO POND

| ADD HYD (T-UNCON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 06:201 18.26 5.088 1.67 44.04 .000
+ID2 09:US_201 0.12 1.761 1.67 34.34 .000
SUM 10:T-UNCON 26.38 6.849 1.67 41.05 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| START | Project dir.: C:\Users\kpgang\DOCU-1\CURREN-1
Rainfall dir.: C:\Users\kpgang\DOCU-1\CURREN-1
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 010
NSTORM= 1
1-KIT4-010.STM

010:0002--
*#-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PST-B.dat - POST-DEVELOPMENT MODELING
*# 2-YEAR 4-HR SCS

010:0002--
*#-----
*# READ STORM | Filename: KITCHENER - 10-YR 4HR CHICAGO STORM
| Ptotal= 58.63 mm | Comments: KITCHENER - 10-YR 4HR CHICAGO STORM

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.170 1.17 8.863 2.17 13.616 3.17 3.445
.33 2.501 1.33 15.446 2.33 9.490 3.33 3.031
.50 2.946 1.50 40.614 2.50 7.161 3.50 2.703
.67 3.572 1.67 134.162 2.67 5.692 3.67 2.437
.83 4.508 1.83 48.140 2.83 4.695 3.83 2.217
1.00 6.032 2.00 22.332 3.00 3.980 4.00 2.033

010:0003--
*#-----
*# CATCHMENT 303 ~

| CALIB STANDHYD | Area (ha)= .73
| 03:303 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PVIOUS (i)
Surface Area (ha)= .47 .26
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 134.16 71.67
over (min)= 1.00 2.00
Storage Coeff. (min)= .73 (ii) 1.79 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.27 .60

PEAK FLOW (cms)= .18 .05 .224 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 57.63 24.56 46.055
TOTAL RAINFALL (mm)= 58.63 58.63 58.631
RUNOFF COEFFICIENT = .42 .786

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:

POST-DEVELOPMENT

CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0004-----
*#-----
*# CATCHMENT 302 ~ NORTH SIDE AREA
| CALIB NASHHYD | Area (ha)= .58 Curve Number (CN)=65.00
| 02:302 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .360
Unit Hyd Qpeak (cms)= .062
PEAK FLOW (cms)= .022 (i)
TIME TO PEAK (hrs)= 2.100
RUNOFF VOLUME (mm)= 15.106
TOTAL RAINFALL (mm)= 58.631
RUNOFF COEFFICIENT = .258
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0005-----
*#-----
*# CATCHMENT 301 ~
| CALIB STANDHYD | Area (ha)= 4.91
| 01:301 DT= 1.00 | Total Imp(%)= 55.50 Dir. Conn.(%)= 55.50
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 2.73 2.18
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 134.16 71.67
over (min) 1.00 2.00
Storage Coeff. (min)= .73 (ii) 1.79 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.27 .60
PEAK FLOW (cms)= 1.02 .40 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 57.63 24.56 42.913
TOTAL RAINFALL (mm)= 58.63 58.63 58.631
RUNOFF COEFFICIENT = .98 .42 .732
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0006-----
*#-----
*# CATCHMENT 401 ~
| CALIB STANDHYD | Area (ha)= 1.54
| 04:401 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 .54
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00

010:0009-----
*#-----
*# ADD 303 & 302
| ADD HYD (US_301) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 01:301 4.91 1.420 1.67 42.91 .000
ID2 03:303 .58 .022 2.10 15.11 .000
ID3 08:303 .73 .224 1.67 46.05 .000
SUM 08:US_301 1.31 .229 1.67 32.35 .000
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

010:0010-----
*#-----
*# ADD 400 SERIES, UPSTREAM 301, & 301
| ADD HYD (US_201) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 01:301 4.91 1.420 1.67 42.91 .000
ID2 07:400_SERIES 1.90 .583 1.67 46.05 .000
ID3 08:US_301 1.31 .229 1.67 32.35 .000
SUM 09:US_201 8.12 2.232 1.67 41.94 .000
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

010:0011-----
*#-----
*# CATCHMENT 201 ~ PROPOSED RESIDENTIAL DEVELOPMENT
| CALIB STANDHYD | Area (ha)= 18.26
| 06:201 DT= 1.00 | Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 15.52 2.74
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 134.16 71.67
over (min) 1.00 2.00
Storage Coeff. (min)= .73 (ii) 1.79 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.27 .60
PEAK FLOW (cms)= 5.78 .51 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 57.63 24.56 52.670
TOTAL RAINFALL (mm)= 58.63 58.63 58.631
RUNOFF COEFFICIENT = .98 .42 .898
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0012-----
*#-----
*# ADD FLOWS TO POND
| ADD HYD (T-UNCON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 06:201 18.26 6.292 1.67 52.67 .000

Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 134.16 71.67
over (min) 1.00 2.00
Storage Coeff. (min)= .73 (ii) 1.79 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.27 .60
TOTALS
PEAK FLOW (cms)= .37 .10 .473 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 57.63 24.56 46.055
TOTAL RAINFALL (mm)= 58.63 58.63 58.631
RUNOFF COEFFICIENT = .98 .42 .786

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0007-----
*#-----
*# CATCHMENT 402 ~
| CALIB STANDHYD | Area (ha)= .36
| 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .23 .13
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 134.16 71.67
over (min) 1.00 2.00
Storage Coeff. (min)= .73 (ii) 1.79 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.27 .60
PEAK FLOW (cms)= .09 .02 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 57.63 24.56 46.055
TOTAL RAINFALL (mm)= 58.63 58.63 58.631
RUNOFF COEFFICIENT = .98 .42 .786
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0008-----
*#-----
*# ADD 401 & 402
| ADD HYD (400_SERIES) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 04:401 1.54 .473 1.67 46.05 .000
ID2 05:402 .36 .111 1.67 46.05 .000
SUM 07:400_SERIES 1.90 .583 1.67 46.05 .000
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ID2 09:US_201 8.12 2.232 1.67 41.94 .000
SUM 10:T-UNCON 26.38 8.524 1.67 49.37 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

010:0013-----
*#-----
*# ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS
| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN:10 (T-UNCO) |
| OUT:08 (SWM) |
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.000 .0000E+00 | .660 .1679E+01
.009 .1310E+00 | .721 .1887E+01
.031 .2690E+00 | .776 .2102E+01
.043 .4170E+00 | .828 .2325E+01
.065 .5765E+00 | .877 .2556E+01
.137 .7430E+00 | .923 .2794E+01
.310 .9163E+00 | .967 .3040E+01
.428 .1097E+01 | 1.009 .3293E+01
.518 .1283E+01 | 2.020 .3554E+01
.593 .1478E+01 | 3.832 .3822E+01
ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >10: (T-UNCO) 26.38 8.524 1.667 49.368
OUTFLOW<08: (SWM) 26.38 .407 2.533 49.366
OVERFLOW<07: (SWM-OF) .00 .000 .000 .000
TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00
PEAK FLOW REDUCTION [Qout/Qin](%)= 4.772
TIME SHIFT OF PEAK FLOW (min)= 52.00
MAXIMUM STORAGE USED (ha.m.)=.1064E+01

010:0014-----
| SAVE HYD | AREA (ha)= 26.380
| ID=08 (SWM) | QPEAK (cms)= .407 (i)
| DT= 1.00 PCYC=-1 | TPEAK (hrs)= 2.533
| ID1 08:SWM | VOLUME (mm)= 49.366
| ID2 07:SWM-OF |
Filename: C:\Users\khang\Documents\1\CURRENT-1\H-SWM_010
Comments: HYD_COMMENT=" ")
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0015-----
*#-----
*# TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED
| ADD HYD (T-CON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 08:SWM 26.38 .407 2.53 49.37 .000
ID2 07:SWM-OF .00 .000 .00 .00 .000
SUM 09:T-CON 26.38 .407 2.53 49.36 .000
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

010:0016-----

POST-DEVELOPMENT

```
*#-----|-----|
*# Run remaining Storm Files
*#-----|-----|
010:0002-----|-----|
*#-----|-----|
*#-----|-----|
010:0002-----|-----|
*#-----|-----|
** END OF RUN : 24
```

```
*****
| START | Project dir.: C:\Users\kpang\DOCUME~1\CURREN~1\
| Rainfall dir.: C:\Users\kpang\DOCUME~1\CURREN~1\
| TZERO = .00 hrs on 0
| METOUT= 2 (output = METRIC)
| NRUN = 025
| NSTORM= 1
| # 1=KIT4-025.STM
```

```
025:0002-----|-----|
*#-----|-----|
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-POST-B.dat - POST-DEVELOPMENT MODELING
*#-----|-----|
*# 2-YEAR 4-HR SCS
```

```
025:0002-----|-----|
| READ STORM | Filename: KITCHENER - 25-YR 4HR CHICAGO STORM
| Ptotal= 70.82 mm | Comments: KITCHENER - 25-YR 4HR CHICAGO STORM

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.342 1.17 11.001 2.17 17.294 3.17 3.925
.33 2.747 1.33 19.704 2.33 11.830 3.33 3.405
.50 3.299 1.50 51.616 2.50 8.751 3.50 2.996
.67 4.087 1.67 155.467 2.67 6.824 3.67 2.668
.83 5.286 1.83 60.968 2.83 5.527 3.83 2.400
1.00 7.269 2.00 28.718 3.00 4.607 4.00 2.177
```

```
025:0003-----|-----|
*#-----|-----|
*# CATCHMENT 303 ~
| CALIB STANDHYD | Area (ha)= .73
| 03:303 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .47 .26
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 155.47 92.37
over (min)= 1.00 2.00
Storage Coeff. (min)= .69 (ii) 1.64 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.30 .63

*TOTALS*
PEAK FLOW (cms)= .43 .13 .563 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 57.106
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .806
```

```
*# CATCHMENT 401 ~
| CALIB STANDHYD | Area (ha)= 1.54
| 04:401 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 .54
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 155.47 92.37
over (min)= 1.00 2.00
Storage Coeff. (min)= .69 (ii) 1.64 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.30 .63

*TOTALS*
PEAK FLOW (cms)= .43 .13 .563 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 57.106
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .806

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
025:0007-----|-----|
*#-----|-----|
*# CATCHMENT 402 ~
| CALIB STANDHYD | Area (ha)= .36
| 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .23 .13
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 155.47 92.37
over (min)= 1.00 2.00
Storage Coeff. (min)= .69 (ii) 1.64 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.30 .63

*TOTALS*
PEAK FLOW (cms)= .10 .03 .132 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 57.106
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .806

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
025:0008-----|-----|
*#-----|-----|
*# ADD 401 & 402
| ADD HYD (400_SERIES) | ID: NYHD AREA QPEAK TPEAK R.V. DWF
```

```
Unit Hyd. peak (cms)= 1.30 .63
PEAK FLOW (cms)= .20 .06 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 57.106
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .806
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
025:0004-----|-----|
*#-----|-----|
*# CATCHMENT 302 ~ NORTH SIDE AREA
| CALIB NASHYD | Area (ha)= .58 Curve Number (CN)=65.00
| 02:302 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .360

Unit Hyd Qpeak (cms)= .062
PEAK FLOW (cms)= .032 (i)
TIME TO PEAK (hrs)= 2.100
RUNOFF VOLUME (mm)= 21.383
TOTAL RAINFALL (mm)= 70.818
RUNOFF COEFFICIENT = .302

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
025:0005-----|-----|
*#-----|-----|
*# CATCHMENT 301 ~
| CALIB STANDHYD | Area (ha)= 4.91
| 01:301 DT= 1.00 | Total Imp(%)= 55.50 Dir. Conn.(%)= 55.50

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 2.73 2.18
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 155.47 92.37
over (min)= 1.00 2.00
Storage Coeff. (min)= .69 (ii) 1.64 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.30 .63

*TOTALS*
PEAK FLOW (cms)= 1.18 .53 1.707 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 53.656
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .758

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
025:0006-----|-----|
*#-----|-----|
```

```
-----|-----|
ID1 04:401 (ha) (cms) (hrs) (mm) (cms)
+ID2 05:402 .36 .132 1.67 57.11 .000
=====
SUM 07:400_SERIES 1.90 .695 1.67 57.11 .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
025:0009-----|-----|
*#-----|-----|
*# ADD 303 & 302
| ADD HYD (US_301 ) | ID: NYHD AREA QPEAK TPEAK R.V. DWF
|-----| (ha) (cms) (hrs) (mm) (cms)
ID1 02:302 .58 .032 2.10 21.38 .000
+ID2 03:303 .73 .267 1.67 57.11 .000
=====
SUM 08:US_301 1.31 .274 1.67 41.29 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
025:0010-----|-----|
*#-----|-----|
*# ADD 400 SERIES, UPSTREAM 301,& 301
| ADD HYD (US_201 ) | ID: NYHD AREA QPEAK TPEAK R.V. DWF
|-----| (ha) (cms) (hrs) (mm) (cms)
ID1 01:301 4.91 1.707 1.67 53.66 .000
+ID2 07:400_SERIES 1.90 .695 1.67 57.11 .000
+ID3 08:US_301 1.31 .274 1.67 41.29 .000
=====
SUM 09:US_201 8.12 2.676 1.67 52.47 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
025:0011-----|-----|
*#-----|-----|
*# CATCHMENT 301 ~ PROPOSED RESIDENTIAL DEVELOPMENT
| CALIB STANDHYD | Area (ha)= 18.26
| 06:201 DT= 1.00 | Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 15.52 2.74
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 155.47 92.37
over (min)= 1.00 2.00
Storage Coeff. (min)= .69 (ii) 1.64 (ii)
Unit Hyd. Tpeak (min)= 1.00 2.00
Unit Hyd. peak (cms)= 1.30 .63

*TOTALS*
PEAK FLOW (cms)= 6.70 .67 7.368 (iii)
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 69.82 33.50 64.370
TOTAL RAINFALL (mm)= 70.82 70.82 70.818
RUNOFF COEFFICIENT = .99 .47 .909

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

POST-DEVELOPMENT

```
-----
ID1 08:5MM      26.38      .525      2.52      60.70      .000
+ID2 07:5MM-OF      .00      .000      .00      .00      .000 **DRY**
025:0012-----
*#-----
*# ADD FLOWS TO POND
-----
| ADD HYD (T-UNCON ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DMF
| IN:10: (T-UNCO ) |      (ha)      (cms)      (hrs)      (mm)      (cms)
ID1 06:201      18.26      7.368      1.67      64.37      .000
+ID2 09:US_201      8.12      2.676      1.67      52.47      .000
SUM 10:T-UNCON      26.38      10.044      1.67      60.71      .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
025:0013-----
*#-----
*# ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS
-----
| ROUTE RESERVOIR      Requested routing time step = 1.0 min.
| IN:10: (T-UNCO ) |
| OUT:00: (SMM ) |
-----
| OUTFLOW STORAGE | OUTFLOW STORAGE |
| (cms) (ha.m.) | (cms) (ha.m.) |
.000 .0000E+00 | .660 .1679E+01
.009 .1310E+00 | .721 .1887E+01
.011 .2698E+00 | .776 .2102E+01
.043 .4170E+00 | .828 .2325E+01
.065 .5765E+00 | .877 .2556E+01
.137 .7438E+00 | .923 .2794E+01
.310 .9163E+00 | .967 .3040E+01
.428 .1097E+01 | 1.009 .3293E+01
.518 .1283E+01 | 2.020 .3554E+01
.593 .1478E+01 | 3.832 .3822E+01
-----
ROUTING RESULTS      AREA      QPEAK      TPEAK      R.V.
-----
INFLOW >10: (T-UNCO) 26.38      10.044      1.667      60.707
OUTFLOW<00: (SMM ) 26.38      .525      2.517      60.701
OVERFLOW<07: (SMM-OF) .00      .000      .000      .000
-----
TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00
-----
PEAK FLOW REDUCTION [Qout/Qin](%)= 5.224
TIME SHIFT OF PEAK FLOW (min)= 51.800
MAXIMUM STORAGE USED (ha.m.)=.1301E+01
-----
```

```
025:0014-----
| SAVE HYD | AREA (ha)= 26.380
| ID=00 (SMM ) | QPEAK (cms)= 525 (i)
| DT= 1.00 PCYC=1 | TPEAK (hrs)= 2.517
| VOLUME (mm)= 60.701
Filename: C:\Users\kpgang\DOCUCE-1\CURREN-1V-SMM.025
Comments: HYD_COMMENT=" "
-----
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
```

```
025:0015-----
*#-----
*# TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED
-----
| ADD HYD (T-CON ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DMF
| IN:10: (T-UNCO ) |      (ha)      (cms)      (hrs)      (mm)      (cms)
-----
```

```
-----
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= .47      .26
Dep. Storage (mm)= 1.00      5.00
Average Slope (%)= 1.00      1.00
Length (m)= 15.00      1.00
Mannings n = .013      .240
-----
Max.eff.Inten.(mm/hr)= 176.19      112.00
over (min) 1.00      2.00
Storage Coeff. (min)= .65 (ii) 1.54 (ii)
Unit Hyd. Tpeak (min)= 1.00      2.00
Unit Hyd. peak (cms)= 1.33      .66
-----
PEAK FLOW (cms)= .23      .08      *TOTALS*
TIME TO PEAK (hrs)= 1.67      1.67      1.667
RUNOFF VOLUME (mm)= 79.34      40.88      65.879
TOTAL RAINFALL (mm)= 80.34      80.34      80.340
RUNOFF COEFFICIENT = .99      .51      .820
-----
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
```

```
050:0004-----
*#-----
*# CATCHMENT 302 ~ NORTH SIDE AREA
-----
| CALIB NASHYD | Area (ha)= .58      Curve Number (CN)=65.00
| 02:302 DT= 1.00 | Ia = 5.000      # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .360
-----
Unit Hyd Qpeak (cms)= .062
-----
PEAK FLOW (cms)= .040 (i)
TIME TO PEAK (hrs)= 2.100
RUNOFF VOLUME (mm)= 26.759
TOTAL RAINFALL (mm)= 80.340
RUNOFF COEFFICIENT = .333
-----
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----
```

```
050:0005-----
*#-----
*# CATCHMENT 301 ~
-----
| CALIB STANDHYD | Area (ha)= 4.91
| 01:301 DT= 1.00 | Total Imp(%)= 55.50 Dir. Conn.(%)= 55.50
-----
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= 2.73      2.18
Dep. Storage (mm)= 1.00      5.00
Average Slope (%)= 1.00      1.00
Length (m)= 15.00      1.00
Mannings n = .013      .240
-----
Max.eff.Inten.(mm/hr)= 176.19      112.00
over (min) 1.00      2.00
Storage Coeff. (min)= .65 (ii) 1.54 (ii)
Unit Hyd. Tpeak (min)= 1.00      2.00
Unit Hyd. peak (cms)= 1.33      .66
-----
PEAK FLOW (cms)= 1.33      .65      *TOTALS*
TIME TO PEAK (hrs)= 1.67      1.67      1.667
RUNOFF VOLUME (mm)= 79.34      40.88      62.226
-----
```

```
ID1 08:5MM      26.38      .525      2.52      60.70      .000
+ID2 07:5MM-OF      .00      .000      .00      .00      .000 **DRY**
SUM 09:T-CON      26.38      .525      2.52      60.70      .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
025:0016-----
*#-----
*# Run remaining Storm Files
-----
025:0002-----
*#-----
025:0002-----
*#-----
025:0002-----
*#-----
** END OF RUN : 49
-----
```

```
-----
| START | Project dir.: C:\Users\kpgang\DOCUCE-1\CURREN-1\
| Rainfall dir.: C:\Users\kpgang\DOCUCE-1\CURREN-1\
-----
ZERO = .00 hrs on 0
NETOUT= 2 (output = METRIC)
NRUN = 050
NSTORM= 1
# 1-KIT4-050_STM
-----
```

```
050:0002-----
*#-----
*# Project Name : SOUTHWOOD
*# Date : MARCH 2025
*# Update : JUNE 2025
*# Company : Walterfedy
*# File : 0374-PST-B.dat - POST-DEVELOPMENT MODELING
*# 2-YEAR 4-HR SCS
-----
```

```
050:0002-----
| READ STORM | Filename: KITCHENER - 50-YR 4HR CHICAGO STORM
| Pictal= 80.34 mm | Comments: KITCHENER - 50-YR 4HR CHICAGO STORM
-----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
.17 2.458 | 1.17 12.435 | 2.17 19.792 | 3.17 4.243
.33 2.910 | 1.33 22.610 | 2.33 13.402 | 3.33 3.652
.50 3.532 | 1.50 59.628 | 2.50 9.812 | 3.50 3.190
.67 4.428 | 1.67 176.192 | 2.67 7.576 | 3.67 2.821
.83 5.001 | 1.83 70.423 | 2.83 6.079 | 3.83 2.522
1.00 8.092 | 2.00 33.142 | 3.00 5.022 | 4.00 2.274
-----
```

```
050:0003-----
*#-----
*# CATCHMENT 303 ~
-----
| CALIB STANDHYD | Area (ha)= .73
| 03:303 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00
-----
```

```
TOTAL RAINFALL (mm)= 80.34      80.34      80.340
RUNOFF COEFFICIENT = .99      .51      .775
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
050:0006-----
*#-----
*# CATCHMENT 401 ~
-----
| CALIB STANDHYD | Area (ha)= 1.54
| 04:401 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00
-----
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= 1.00      .54
Dep. Storage (mm)= 1.00      5.00
Average Slope (%)= 1.00      1.00
Length (m)= 15.00      1.00
Mannings n = .013      .240
-----
Max.eff.Inten.(mm/hr)= 176.19      112.00
over (min) 1.00      2.00
Storage Coeff. (min)= .65 (ii) 1.54 (ii)
Unit Hyd. Tpeak (min)= 1.00      2.00
Unit Hyd. peak (cms)= 1.33      .66
-----
PEAK FLOW (cms)= .49      .16      *TOTALS*
TIME TO PEAK (hrs)= 1.67      1.67      1.667
RUNOFF VOLUME (mm)= 79.34      40.88      65.879
TOTAL RAINFALL (mm)= 80.34      80.34      80.340
RUNOFF COEFFICIENT = .99      .51      .820
-----
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
050:0007-----
*#-----
*# CATCHMENT 402 ~
-----
| CALIB STANDHYD | Area (ha)= .36
| 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00
-----
```

```
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= .23      .13
Dep. Storage (mm)= 1.00      5.00
Average Slope (%)= 1.00      1.00
Length (m)= 15.00      1.00
Mannings n = .013      .240
-----
Max.eff.Inten.(mm/hr)= 176.19      112.00
over (min) 1.00      2.00
Storage Coeff. (min)= .65 (ii) 1.54 (ii)
Unit Hyd. Tpeak (min)= 1.00      2.00
Unit Hyd. peak (cms)= 1.33      .66
-----
PEAK FLOW (cms)= .11      .04      *TOTALS*
TIME TO PEAK (hrs)= 1.67      1.67      1.667
RUNOFF VOLUME (mm)= 79.34      40.88      65.879
TOTAL RAINFALL (mm)= 80.34      80.34      80.340
RUNOFF COEFFICIENT = .99      .51      .820
-----
```


POST-DEVELOPMENT

Surface Area (ha)= 2.73 2.18
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 196.54 133.79
over (min) 1.00 1.00
Storage Coeff. (min)= .62 (ii) 1.45 (ii)
Unit Hyd. Tpeak (min)= 1.00 1.00
Unit Hyd. peak (cms)= 1.36 .85

PEAK FLOW (cms)= 1.49 .79 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 88.89 48.56 70.946
TOTAL RAINFALL (mm)= 89.89 89.89 89.891
RUNOFF COEFFICIENT = .99 .54 .789

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 88.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0006-----
*#-----
*# CATCHMENT 401 ~

| CALIB STANDHYD | Area (ha)= 1.54
| 04:401 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 .54
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 196.54 133.79
over (min) 1.00 1.00
Storage Coeff. (min)= .62 (ii) 1.45 (ii)
Unit Hyd. Tpeak (min)= 1.00 1.00
Unit Hyd. peak (cms)= 1.36 .85

PEAK FLOW (cms)= .55 .19 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 88.89 48.56 74.777
TOTAL RAINFALL (mm)= 89.89 89.89 89.891
RUNOFF COEFFICIENT = .99 .54 .832

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 88.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0007-----
*#-----
*# CATCHMENT 402 ~

| CALIB STANDHYD | Area (ha)= .36
| 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= .23 .13
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00

Max.eff.Inten.(mm/hr)= 196.54 133.79
over (min) 1.00 1.00
Storage Coeff. (min)= .62 (ii) 1.45 (ii)
Unit Hyd. Tpeak (min)= 1.00 1.00
Unit Hyd. peak (cms)= 1.36 .85

PEAK FLOW (cms)= 8.47 .99 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 88.89 48.56 82.842
TOTAL RAINFALL (mm)= 89.89 89.89 89.891
RUNOFF COEFFICIENT = .99 .54 .922

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 88.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB STANDHYD | Area (ha)= 18.26
| 06:201 DT= 1.00 | Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 15.52 2.74
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 1.00
Length (m)= 15.00 1.00
Mannings n = .013 .240

Max.eff.Inten.(mm/hr)= 196.54 133.79
over (min) 1.00 1.00
Storage Coeff. (min)= .62 (ii) 1.45 (ii)
Unit Hyd. Tpeak (min)= 1.00 1.00
Unit Hyd. peak (cms)= 1.36 .85

PEAK FLOW (cms)= 8.47 .99 *TOTALS*
TIME TO PEAK (hrs)= 1.67 1.67 1.667
RUNOFF VOLUME (mm)= 88.89 48.56 82.842
TOTAL RAINFALL (mm)= 89.89 89.89 89.891
RUNOFF COEFFICIENT = .99 .54 .922

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 88.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0012-----
*#-----
*# ADD FLOWS TO POND

| ADD HYD (T-UNCON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 06:201 18.26 9.459 1.67 82.84 .000
+ID2 09:US_201 8.12 3.558 1.67 69.44 .000
SUM 10:T-UNCON 26.38 13.008 1.67 78.72 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0013-----
*#-----
*# ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS

| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN10:(T-UNCO) |
| OUT08:(SWM) |

===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
.000 .0000E+00 .668 .1679E+01
.000 .1310E+00 .721 .1807E+01
.031 .2690E+00 .776 .2102E+01
.043 .4170E+00 .828 .2325E+01
.065 .5765E+00 .877 .2556E+01
.137 .7430E+00 .923 .2794E+01
.310 .9163E+00 .967 .3040E+01
.428 .1097E+01 1.009 .3293E+01
.518 .1283E+01 2.020 .3554E+01
.593 .1478E+01 3.832 .3822E+01

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >10: (T-UNCO) 26.38 13.008 1.667 78.717
OUTFLOW<08: (SWM) 26.38 .666 2.517 78.712
OVERFLOW<07: (SWM-OF) .00 .000 .000 .000

Length (m)= 15.00 1.00
Mannings n = .013 .240
Max.eff.Inten.(mm/hr)= 196.54 133.79
over (min) 1.00 1.00
Storage Coeff. (min)= .62 (ii) 1.45 (ii)
Unit Hyd. Tpeak (min)= 1.00 1.00
Unit Hyd. peak (cms)= 1.36 .85
PEAK FLOW (cms)= .13 .05 *TOTALS*
TIME TO PEAK (hrs)= 1.65 1.67 1.667
RUNOFF VOLUME (mm)= 88.89 48.56 74.777
TOTAL RAINFALL (mm)= 89.89 89.89 89.891
RUNOFF COEFFICIENT = .99 .54 .832

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 88.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0008-----
*#-----
*# ADD 401 & 402

| ADD HYD (400_SERIES) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 04:401 1.54 .740 1.67 74.78 .000
+ID2 05:402 .36 .173 1.67 74.78 .000
SUM 07:400_SERIES 1.90 .913 1.67 74.78 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0009-----
*#-----
*# ADD 303 & 302

| ADD HYD (US_301) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 02:302 .58 .049 2.08 32.51 .000
+ID2 03:303 .73 .351 1.67 74.78 .000
SUM 08:US_301 1.31 .363 1.67 56.06 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0010-----
*#-----
*# ADD 400 SERIES, UPSTREAM 301,& 301

| ADD HYD (US_201) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 01:301 4.91 2.274 1.67 70.95 .000
+ID2 07:400_SERIES 1.90 .913 1.67 74.78 .000
+ID3 08:US_301 1.31 .363 1.67 56.06 .000
SUM 09:US_201 8.12 3.558 1.67 69.44 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0011-----
*#-----
*# CATCHMENT 201 = PROPOSED RESIDENTIAL DEVELOPMENT

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.120
TIME SHIFT OF PEAK FLOW (min)= 51.00
MAXIMUM STORAGE USED (ha.m.)=.1699E+01

100:0014-----
*#-----
*# SAVE HYD

| ID=08 (SWM) | AREA (ha)= 26.380
| DT= 1.00 PCYC=-1 | QPEAK (cms)= .666 (i)
TPEAK (hrs)= 2.517
VOLUME (mm)= 78.712
Filename: C:\Users\kpgang\DOCUME~1\CURREN~1\H-SWM.100
Comments: HYD_COMMENT=["]

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0015-----
*#-----
*# TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED

| ADD HYD (T-CON) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
(ha) (cms) (hrs) (mm) (cms)
ID1 08:SWM 26.38 .666 2.52 78.71 .000
+ID2 07:SWM-OF .00 .000 .00 .00 **DRY**
SUM 09:T-CON 26.38 .666 2.52 78.71 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0016-----
*#-----
*# Run remaining Storm Files

100:0002-----
*#-----
*#

100:0002-----
*#-----
*#

100:0002-----
*#-----
*#

100:0002-----
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100:0002-----
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*#

POST-DEVELOPMENT

250:0002-----

 *# Project Name : SOUTHWOOD
 *# Date : MARCH 2025
 *# Update : JUNE 2025
 *# Company : WalterFedy
 *# File : 0374-PSF-B.dat - POST-DEVELOPMENT MODELING

 *# 2-YEAR 4-HR SCS

250:0002-----
 | READ STORM | Filename: 48 hour Hurricane Hazel
 | Ptotal= 284.97 mm | Comments: 48 hour Hurricane Hazel

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
1.00	2.027	13.00	2.027	25.00	2.027	37.00	6.000
2.00	2.027	14.00	2.027	26.00	2.027	38.00	4.000
3.00	2.027	15.00	2.027	27.00	2.027	39.00	6.000
4.00	2.027	16.00	2.027	28.00	2.027	40.00	13.000
5.00	2.027	17.00	2.027	29.00	2.027	41.00	17.000
6.00	2.027	18.00	2.027	30.00	2.027	42.00	13.000
7.00	2.027	19.00	2.027	31.00	2.027	43.00	23.000
8.00	2.027	20.00	2.027	32.00	2.027	44.00	13.000
9.00	2.027	21.00	2.027	33.00	2.027	45.00	13.000
10.00	2.027	22.00	2.027	34.00	2.027	46.00	53.000
11.00	2.027	23.00	2.027	35.00	2.027	47.00	38.000
12.00	2.027	24.00	2.027	36.00	2.027	48.00	13.000

250:0003-----
 *#-----
 *# CATCHMENT 303 ~

| CALIB STANDHYD | Area (ha)= .73
 | 03:303 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.47	.26
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	15.00	1.00
Mannings n	=	.013	.240
Max.eff.Inten.(mm/hr)=		53.00	50.49
over (min)		1.00	2.00
Storage Coeff. (min)=	1.06 (ii)	2.27 (ii)	
Unit Hyd. Tpeak (min)=	1.00	2.00	
Unit Hyd. peak (cms)=	1.04	.51	
PEAK FLOW (cms)=	.07	.04	*TOTALS*
TIME TO PEAK (hrs)=	45.45	46.00	
RUNOFF VOLUME (mm)=	283.97	264.457	
TOTAL RAINFALL (mm)=	284.97	284.973	
RUNOFF COEFFICIENT	=	1.00	.928

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0004-----
 *#-----
 *# CATCHMENT 302 ~ NORTH SIDE AREA

PEAK FLOW (cms)=	.15	.08	.223 (iii)
TIME TO PEAK (hrs)=	45.45	46.00	46.000
RUNOFF VOLUME (mm)=	283.96	228.20	264.456
TOTAL RAINFALL (mm)=	284.97	284.97	284.973
RUNOFF COEFFICIENT	=	1.00	.80

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0007-----
 *#-----
 *# CATCHMENT 402 ~

| CALIB STANDHYD | Area (ha)= .36
 | 05:402 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.23	.13
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	15.00	1.00
Mannings n	=	.013	.240
Max.eff.Inten.(mm/hr)=		53.00	50.49
over (min)		1.00	2.00
Storage Coeff. (min)=	1.06 (ii)	2.27 (ii)	
Unit Hyd. Tpeak (min)=	1.00	2.00	
Unit Hyd. peak (cms)=	1.04	.51	
PEAK FLOW (cms)=	.03	.02	*TOTALS*
TIME TO PEAK (hrs)=	45.45	46.00	
RUNOFF VOLUME (mm)=	283.97	228.21	264.457
TOTAL RAINFALL (mm)=	284.97	284.973	
RUNOFF COEFFICIENT	=	1.00	.80

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0008-----
 *#-----
 *# ADD 401 & 402

ADD HYD (400_SERIES) ID: NHYD		AREA	QPEAK	TPEAK	R.V.	DWF
----		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 04:401		1.54	.223	46.00	264.46	.000
+ID2 05:402		.36	.052	46.00	264.46	.000
SUM 07:400_SERIES		1.90	.275	46.00	264.46	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

250:0009-----
 *#-----
 *# ADD 303 & 302

ADD HYD (US_301) ID: NHYD		AREA	QPEAK	TPEAK	R.V.	DWF
----		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 02:302		.58	.069	46.12	188.09	.000
+ID2 03:303		.73	.106	46.00	264.46	.000

| CALIB NASHYD | Area (ha)= .58 Curve Number (CN)=65.00
 | 02:302 DT= 1.00 | Ia (mm)= 5.000 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .360

Unit Hyd Qpeak (cms)= .062

PEAK FLOW (cms)= .069 (i)
 TIME TO PEAK (hrs)= 46.117
 RUNOFF VOLUME (mm)= 188.089
 TOTAL RAINFALL (mm)= 284.973
 RUNOFF COEFFICIENT = .660

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0005-----
 *#-----
 *# CATCHMENT 301 ~

| CALIB STANDHYD | Area (ha)= 4.91
 | 01:301 DT= 1.00 | Total Imp(%)= 55.50 Dir. Conn.(%)= 55.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.73	2.18
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	15.00	1.00
Mannings n	=	.013	.240
Max.eff.Inten.(mm/hr)=		53.00	50.49
over (min)		1.00	2.00
Storage Coeff. (min)=	1.06 (ii)	2.27 (ii)	
Unit Hyd. Tpeak (min)=	1.00	2.00	
Unit Hyd. peak (cms)=	1.04	.51	

PEAK FLOW (cms)= .40 .31 .707 (iii)
 TIME TO PEAK (hrs)= 45.45 46.00 46.000
 RUNOFF VOLUME (mm)= 283.97 228.21 259.161
 TOTAL RAINFALL (mm)= 284.97 284.97 284.973
 RUNOFF COEFFICIENT = 1.00 .80 .909

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0006-----
 *#-----
 *# CATCHMENT 401 ~

| CALIB STANDHYD | Area (ha)= 1.54
 | 04:401 DT= 1.00 | Total Imp(%)= 65.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.00	.54
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	15.00	1.00
Mannings n	=	.013	.240
Max.eff.Inten.(mm/hr)=		53.00	50.49
over (min)		1.00	2.00
Storage Coeff. (min)=	1.06 (ii)	2.27 (ii)	
Unit Hyd. Tpeak (min)=	1.00	2.00	
Unit Hyd. peak (cms)=	1.04	.51	

PEAK FLOW (cms)= .07 .04 .106 (iii)
 TIME TO PEAK (hrs)= 45.45 46.00 46.000
 RUNOFF VOLUME (mm)= 283.97 228.21 264.457
 TOTAL RAINFALL (mm)= 284.97 284.97 284.973
 RUNOFF COEFFICIENT = 1.00 .80 .928

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SUM 08:US_301 1.31 .173 46.00 230.65 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

250:0010-----
 *#-----
 *# ADD 400 SERIES, UPSTREAM 301,& 301

ADD HYD (US_201) ID: NHYD		AREA	QPEAK	TPEAK	R.V.	DWF
----		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 01:301		4.91	.707	46.00	259.16	.000
+ID2 07:400_SERIES		1.90	.275	46.00	264.46	.000
+ID3 08:US_301		1.31	.173	46.00	230.65	.000
SUM 09:US_201		8.12	1.155	46.00	255.80	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

250:0011-----
 *#-----
 *# CATCHMENT 201 ~ PROPOSED RESIDENTIAL DEVELOPMENT

| CALIB STANDHYD | Area (ha)= 18.26
 | 06:201 DT= 1.00 | Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	15.52	2.74
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	15.00	1.00
Mannings n	=	.013	.240
Max.eff.Inten.(mm/hr)=		53.00	50.49
over (min)		1.00	2.00
Storage Coeff. (min)=	1.06 (ii)	2.27 (ii)	
Unit Hyd. Tpeak (min)=	1.00	2.00	
Unit Hyd. peak (cms)=	1.04	.51	
PEAK FLOW (cms)=	2.29	.38	*TOTALS*
TIME TO PEAK (hrs)=	45.45	46.00	2.669 (iii)
RUNOFF VOLUME (mm)=	283.96	228.21	275.609
TOTAL RAINFALL (mm)=	284.97	284.97	284.973
RUNOFF COEFFICIENT	=	1.00	.80

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 80.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0012-----
 *#-----
 *# ADD FLOWS TO POND

ADD HYD (T-UNCON) ID: NHYD		AREA	QPEAK	TPEAK	R.V.	DWF
----		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 06:201		18.26	2.669	46.00	275.61	.000
+ID2 09:US_201		8.12	1.155	46.00	255.80	.000
SUM 10:T-UNCON		26.38	3.824	46.00	269.51	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

250:0013-----
 *#-----
 *#

POST-DEVELOPMENT

*# ADD 401 & 402

ADD HYD (400_SERIES)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 04:401		1.54	.169	1.67	17.31	.000
+ID2 05:402		.36	.040	1.67	17.31	.000
SUM 07:400_SERIES		1.90	.209	1.67	17.31	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

325:0009

ADD HYD (US_301)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 02:302		.58	.083	2.13	2.56	.000
+ID2 03:303		.73	.080	1.67	17.31	.000
SUM 08:US_301		1.31	.081	1.67	10.78	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

325:0010

ADD HYD (US_201)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 01:301		4.91	.480	1.67	15.48	.000
+ID2 07:400_SERIES		1.90	.209	1.67	17.31	.000
+ID3 08:US_301		1.31	.081	1.67	10.78	.000
SUM 09:US_201		8.12	.770	1.67	15.15	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

325:0011

CATCHMENT 201 - PROPOSED RESIDENTIAL DEVELOPMENT						
CALIB STANDHYD	Area (ha)=	18.26				
06:201 DT= 1.00	Total Imp(%)=	85.00	Dir. Conn.(%)=	85.00		
	IMPERVIOUS		PERVIOUS (i)			
Surface Area (ha)=	15.52	2.74				
Dep. Storage (mm)=	1.00	5.00				
Average Slope (%)=	1.00	1.00				
Length (m)=	15.00	1.00				
Manning's n	.013	.240				
Max.eff.Inten.(mm/hr)=	55.56	13.08				
over (min)=	1.00	3.00				
Storage Coeff. (min)=	1.04 (ii)	3.13 (ii)				
Unit Hyd. Tpeak (min)=	1.00	3.00				
Unit Hyd. peak (cms)=	1.05	.37				
PEAK FLOW (cms)=	2.40	.08	2.470 (iii)			
TIME TO PEAK (hrs)=	1.67	1.68	1.667			
RUNOFF VOLUME (mm)=	24.04	4.31	21.156			
TOTAL RAINFALL (mm)=	25.04	25.04	25.041			
RUNOFF COEFFICIENT	.96	.19	.845			

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (T-UNCON)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 06:201		18.26	2.470	1.67	21.16	.000
+ID2 09:US_201		8.12	.770	1.67	15.15	.000
SUM 10:T-UNCON		26.38	3.240	1.67	19.31	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ROUTE FLOWS THROUGH UNDERGROUND STORAGE TANKS						
ROUTE RESERVOIR	Requested routing time step =	1.0 min.				
In>10:(T-UNCO)						
OUT<08:(SWM)						

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >10: (T-UNCO)	26.38	3.240	1.667	19.307
OUTFLOW<08: (SWM)	26.38	.050	4.017	19.306
OVERFLOW<07: (SWM-OF)	.00	.000	.000	.000
TOTAL NUMBER OF SIMULATED OVERFLOWS	= 0			
CUMULATIVE TIME OF OVERFLOWS (hours)	= .00			
PERCENTAGE OF TIME OVERFLOWING (%)	= .00			

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.549
TIME SHIFT OF PEAK FLOW (min)= 141.00
MAXIMUM STORAGE USED (ha,m.)=.4690E+00

SAVE HYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID=08 (SWM)	26.380	.050 (i)		
DT= 1.00 PCYC=1		4.017		
VOLUME (mm)=	19.306			
Filename: C:\Users\kpang\DOCU~1\CURREN~1\H-SWM.325				
Comments: HYD_COMMENT=[" "]				

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

TOTAL SITE DISCHARGE - CONTROLLED + UNCONTROLLED						

ADD HYD (T-CON)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 08:SWM		26.38	.050	4.02	19.31	.000
+ID2 07:SWM-OF		.00	.000	.00	.00	.000
SUM 09:T-CON		26.38	.050	4.02	19.30	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

325:0016						
*#						
*# Run remaining Storm Files						
325:0002						
*#						
325:0002						
*#						
325:0002						
*#						
325:0002						
*#						
325:0002						
*#						
325:0002						
*#						
FINISH						

WARNINGS / ERRORS / NOTES

Simulation ended on 2025-06-06 at 15:49:57

APPENDIX E

Chloride Assessment

Project	Southwood 5		Location	WATERLOO WELLINGTON AP (1981-2010)										
Project #:	2022-0374-10		ID	6149387										
Address	1065 Listowel Road, Elmira ON		Latitude	43.578	degrees	0.761	radians							
Soil Moisture Capacity (mm) 175 (MOE Table 3.1 - Moderately Rooted Crops (Corn) - Clay Loam)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Number of Days	$n \text{ (days)}$	31	28	31	30	31	30	31	31	30	31	30	31	365
Daily Average Temperature	$T_m \text{ (}^{\circ}\text{C)}$	-6.5	-5.5	-1.0	6.2	12.5	17.6	20.0	18.9	14.5	8.2	2.5	-3.3	7.0
Potential Evapotranspiration Analysis for Site														
$I \text{ (Annual Heat Index)} = \sum_{n=1}^{12} i_n; \quad i \text{ (Monthly Heat Index)} = \left(\frac{T_m}{5}\right)^{1.514}; \quad PET = 16 \times k \times \left(\frac{10 \times T_m}{I}\right)^{\alpha}$ $\alpha = (675 \times 10^{-9} \times I^3) - (771 \times 10^{-7} \times I^2) + (1792 \times 10^{-5} \times I) + 0.49239$														
Monthly Heat Index	i	0.000	0.000	0.000	1.385	4.004	6.721	8.157	7.487	5.013	2.115	0.350	0.000	35.232
Alpha	a	1.058												
$N = \frac{24}{\pi} \omega_s; \quad \omega_s = \frac{\pi}{2} - \arctan\left[\frac{-\tan(\varphi) \cdot \tan(\delta)}{X^{0.5}}\right]; \quad X = 1 - [\tan(\varphi)]^2 \cdot [\tan(\delta)]^2; \quad \delta = 0.409 \cdot \sin\left(2\pi \cdot \frac{d_j}{365} - 1.39\right); \quad k = \left(\frac{N}{12}\right) \times \left(\frac{n}{30}\right)$														
Julian Day	d_j	15	45	75	105	136	166	197	228	258	289	319	350	
	δ	-0.370	-0.236	-0.040	0.166	0.333	0.407	0.372	0.233	0.037	-0.175	-0.335	-0.408	
	X	0.864	0.948	0.999	0.975	0.892	0.832	0.862	0.949	0.999	0.972	0.890	0.831	
	ω_s	1.193	1.340	1.532	1.731	1.906	1.992	1.950	1.799	1.606	1.401	1.233	1.148	
Mean Daylight Hours	N	9.114	10.236	11.706	13.222	14.559	15.220	14.899	13.741	12.268	10.705	9.423	8.771	
Correction Factor	k	0.810	---	1.020	1.120	1.270	1.290	1.300	1.200	1.040	0.950	0.800	0.740	
Unadjusted PET	(mm)	0.65	0.00	0.00	29.09	61.06	87.68	100.37	94.54	71.44	39.09	11.13	0.00	
Potential ET	$PET \text{ (mm)}$	0.10	0.00	0.00	32.58	77.55	113.11	130.49	113.45	0.10	37.14	8.91	0.00	513.42
Evapotranspiration Analysis														
Average Precipitation	(mm)	65.20	54.90	61.00	74.50	82.30	82.40	98.60	83.90	87.80	67.40	87.10	71.20	916.30
P-PET (Surplus for Infil & Runoff)	$\Delta P \text{ (mm)}$	65.10		61.00	41.92	4.75	-30.71	-31.89	-29.55	87.70	30.26	78.19	71.20	402.88
Potential Water Loss	$APWL \text{ (mm)}$	18.85	0.00	0.00	0.00	0.00	-30.71	-62.60	-92.15	-4.45	0.00	0.00	0.00	
Storage	(mm)	311.30	311.30	372.30	175.00	175.00	146.83	122.38	103.36	170.61	175.00	175.00	246.20	
Change in Storage	$\Delta S \text{ (mm)}$	0.00	0.00	0.00	0.00	0.00	-28.17	-24.46	-19.02	67.25	0.00	0.00	0.00	-4.39
Actual Evapotranspiration	$AET \text{ (mm)}$	0.10	0.00	0.00	32.58	77.55	110.57	123.06	102.92	0.10	37.14	8.91	0.00	492.91

Project	Southwood 5										
Project #:	2022-0374-10										
Address	1065 Listowel Road, Elmira ON										
Average Annual Water Balance - Full Buildout Conditions											
EXISTING CONDITIONS			101							TOTAL	
Imperviousness	(%)	0.0%								0.00%	
Topography		0.100								0.100	
Soils		0.200								0.200	
Cover		0.100								0.100	
Infiltration Factor		0.400								0.400	
Catchment Area	ha	18.85								18.85	
Pervious Area	m ²	188500								188500	
Precipitation	m ³ /year	172723								172723	
Evapotranspiration	m ³ /year	92913								92913	
Surplus	m ³ /year	79809								79809	
Infiltration	m ³ /year	31924								31924	
Runoff	m ³ /year	47886								47886	
Impervious Area	m ²	0								0	
Precipitation	m ³ /year	0								0	
Evaporation (10% of PET)	m ³ /year	0								0	
Runoff	m ³ /year	0								0	
Diverted Runoff (to Infiltration)	m ³ /year	0								0	
Totals											
Precipitation	m ³ /year	172723								172723	
Evapotranspiration & Evaporation	m ³ /year	92913								92913	
Runoff	m ³ /year	47886								47886	
Infiltration	m ³ /year	31924								31924	
PROPOSED CONDITIONS			201	---							TOTAL
Imperviousness	(%)	65.0%	0.0%							65.00%	
Topography		0.100	0.000	201 - Residential Draft Plan						0.100	
Soils		0.200	0.000							0.200	
Cover		0.100	0.100							0.100	
Infiltration Factor		0.400								0.400	
Catchment Area	ha	18.85	0							18.85	
Pervious Area	m ²	65975	0							65975	
Precipitation	m ³ /year	60453	0							60453	
Evapotranspiration	m ³ /year	32520	0							32520	
Surplus	m ³ /year	27933	0							27933	
Infiltration	m ³ /year	11173	0							11173	
Runoff	m ³ /year	16760	0							16760	
Infiltration	m ³ /year	11173	0							11173	
Impervious Area	m ²	122525	0							122525	
Precipitation	m ³ /year	112270	0							112270	
Evaporation	m ³ /year	6291	0							6291	
Runoff	m ³ /year	105979	0							105979	
Diverted Runoff (to Infiltration)	m ³ /year	0	0							0	
Totals											
Precipitation	m ³ /year	172723	0							172723	
Evapotranspiration & Evaporation	m ³ /year	38810	0							38810	
Runoff	m ³ /year	122739	0							122739	
Infiltration	m ³ /year	11173	0							11173	
Comparison		EX	PR	PR - EX						Change	
Precipitation	mm/year	916.30	916.30			m ³ /year	0			0%	
Evapotranspiration & Evaporation	mm/year	492.91	205.89			m ³ /year	-54103			-58%	
Runoff	mm/year	254.04	651.14			m ³ /year	74853			256%	
Infiltration	mm/year	169.36	59.27			m ³ /year	-20750			-65%	

Salt/Chloride Loading - Reasonable Use Concept (RUC)
With No Adjustments to Application Rate

$C_m = C_b + x(C_r - C_b)$

Where:

C_b = Background Chloride Concetration (mg/L) = 15
 C_r = Ontario Drinking Water Standard (ODWS) (mg/L) = 250
 x = Factor for non-health related parameter = 0.5
 C_m = Maximum allowable concentration (mg/L) = 132.5

Location / Area	Length of Road (km)	Parking Areas (ha)	Annual Salt Application (tonnes/2-lane km) or (g/m ² /event @ 37 events/year) ¹	Total Annual Salt Load (tonnes)	Total Annual Chloride Load (tonnes)
Primary Roads		0		44	0
Secondary Roads		0		22	0.00
Local Roads		2.18		2.2	4.80
Total					4.80
Salt Infiltration into Subsurface (30%)					1.44
Site Parking			0.7	15	10.50
Salt Infiltration into Subsurface (30%)					3.15
Total Annual Salt Load				15.30	
Total Annual Salt Infiltrated				4.59	2.78
Total Annual Infiltration Volume from Water Balance Calculation (m ³)					11,173
Chloride Concentration from Proposed Development based on Infiltration Rate (mg/L)					248.89

Notes:

- 1. Source Protection Guidance - Salt Impact Assessment (*Region of Waterloo*)
- 2. Chloride accounts for 60.6% of Sodium-Chloride

Salt/Chloride Loading - Reasonable Use Concept (RUC) With Adjustments to Application Rate

$$C_m = C_b + x(C_r - C_b)$$

Where:

C_b = Background Chloride Concentration (mg/L) = 15

C_r = Ontario Drinking Water Standard (ODWS) (mg/L) = 250

x = Factor for non-health related parameter = 0.5

C_m = Maximum allowable concentration (mg/L) = 132.5

Location / Area	Length of Road	Parking Areas	Annual Salt Application	Total Annual Salt	Total Annual
	(km)	(ha)	(tonnes/2-lane km) or (g/m ² /event @ 37 events/year) ¹	Load (tonnes)	Chloride Load (tonnes)
Primary Roads		0		44	0
Secondary Roads		0		22	0.00
Local Roads		2.18		2.2	4.80
Total					4.80
Salt Infiltration into Subsurface (30%)					1.44
Site Parking 4:1 Sand-Salt mixture			0.7	15	2.63
Salt Infiltration into Subsurface (30%)					0.79
Total Annual Salt Load					7.42
Total Annual Salt Infiltrated					2.23
					1.35
			Total Annual Infiltration Volume from Water Balance Calculation (m ³)		
					11,173
			Chloride Concentration from Proposed Development based on Infiltration Rate (mg/L)		
					120.75

Notes:

1. Source Protection Guidance - Salt Impact Assessment (*Region of Waterloo*)
2. Chloride accounts for 60.6% of Sodium-Chloride

Beneficial Practices Worksheet



Winter Maintenance

Version 1 2017

Reference number: 4424429



Region of Waterloo, Water and Wastewater Services

Supply · Protection · Conservation · Wastewater

regionofwaterloo.ca/water

Section 1: instructions

This worksheet includes beneficial practices for property owners and staff to consider when developing a winter maintenance plan. Following these practices may help improve winter safety and reduce the use of salt that can be harmful to our drinking water sources.

Before you start

The Region of Waterloo recommends you first confirm the property is not in a wellhead protection area. Properties in wellhead protection areas may be subject to the Grand River Source Protection Plan and may require the negotiation of a Risk Management Plan with the Region of Waterloo. Financial support may also be available to implement the Risk Management Plan.

To find out if the property requires a Risk Management Plan:

1. Go to <http://taps.regionofwaterloo.ca>
2. Click on “Does the Source Protection Plan apply to my property?”
3. Enter the property location
4. Answer questions as prompted
5. Follow instructions on how to proceed

To learn more go to www.regionofwaterloo.ca/SourceProtection.

Create your winter maintenance plan

- ☐ Complete a property site assessment
 - Complete a visual inspection of the property
 - Use a property site map to include applicable identifiers. Refer to the end of this worksheet for a sample map with possible identifiers.
 - Complete Sections 2 and 3 of this worksheet
- ☐ Develop and implement your winter maintenance plan
- ☐ Review the plan annually with your winter maintenance team
 - Are there changes to the property requiring updates to your plan?
 - Does your team require training?
 - How effective was the plan last year? Can you identify areas for improvement?
- ☐ Additional resources available at www.regionofwaterloo.ca/WinterPlan

Section 2: property and contact information

Company name: _____

Property address: _____

Property owner: _____

Property tenant (if applicable): _____

Property contractor (if applicable): _____

Person(s) engaged in activity or activities:

☐ Owner

☐ Tenant

☐ Contractor

☐ Other (e.g. property / site manager): _____

Section 3: beneficial management practices

The following section contains the beneficial management practices that will protect our water and form the basis of your Winter Maintenance Plan. Under each practice indicate the most accurate status and provide additional information in the notes section as follows:

- In place: describe what you are doing or have done and indicate the location on the site map
- Planned: describe how and when you will have the practice in place, and indicate the new location (where applicable) on the site map
- Not practical: describe the reason and provide an alternative practice that can achieve a similar result

Certifications, training and tracking

1. Property is Smart About Salt™ Certified

- ☐ Completed. Certification date: _____
- ☐ Planned or in progress
- ☐ Not planned

Notes: _____

2. Individuals (employees and /or contractors) performing or supervising winter maintenance activities are Smart About Salt trained

- ☐ Completed
 - Winter maintenance staff have successfully completed Smart About Salt Operator Training
 - Winter maintenance is completed by a Smart About Salt Certified Contractor
- ☐ Planned

Notes: _____

3. Maintain annual documentation of winter maintenance activities and employee and/or contractor training

Documentation may include:

- Weather and site condition logs
- Application records
- Training records
- Spreader calibration logs
- Salt and snow management protocols: application rates, snow plowing and storage, salt storage inspections

☐ In place

☐ Planned

Notes: _____

Salt contract

☐ Not applicable. Do not contract out winter maintenance.

1. Contract salt by unit price per event or lump sum per season

Many contracts are “salt extra” where the client pays based on how much salt is applied. To encourage contractors to use less salt, the basis of payment for new contracts should be unit price per event or lump sum per season.

☐ In place

☐ Planned

Notes: _____

2. Contract specifies that all winter maintenance activities are performed by persons who have successfully completed Smart About Salt Operator Training

☐ In place

☐ Planned

Notes: _____

Ice formation prevention and parking lot design

1. Direct roof drainage away from paved areas, including walkways and entrances

☐ In place

☐ Planned

☐ Not practical

Notes: _____

2. Maintain pavement to ensure impermeability, to allow for complete snow removal, and to prevent ponding

Examples where ponding may occur include around catch basins and low areas.

☐ In place

☐ Planned

☐ Not practical

Notes: _____

3. Close off areas not requiring maintenance during winter months

Close off unneeded areas that do not block emergency exits, accessibility ramps or entrances.

Benefits may include:

- Allows winter maintenance team to focus efforts on high traffic areas
- Reduce winter maintenance costs and repairs from salt damage
- Manage risk from potential slip and fall hazards
- Reduce winter maintenance costs from plowing and salting
- Provides location to store plowed snow

☐ In place

☐ Planned

☐ Not practical

Notes: _____

Winter maintenance practices

1. Clean up excess applied salt

- If using contractor, notify them to assess the application rate and clean up excess applied salt
- Train staff to recognize excess salt and clean up when contractor not involved

☐ In place

☐ Planned

Notes: _____

2. Prepare and implement a maintenance strategy for temperatures below -10°C, when salt is less effective

- ☐ In place. Include strategy with completed worksheet
- ☐ Planned

Notes: _____

3. Remove areas of drifting snow

Consider wind direction, elevation changes and location of snow fences.

- ☐ In place
- ☐ Planned
- ☐ Not practical

Notes: _____

4. Store snow on a sufficiently sized impermeable surface adjacent to a catch basin

- Consult with contractor about snow storage location and size to ensure feasibility
- Direct snow melt from piles towards a catch basin to prevent an ice hazard requiring more salt
- Snow melt must not infiltrate directly to grassed areas

- ☐ In place
- ☐ Planned
- ☐ Snow is stored on an impermeable surface, but cannot be feasibly located adjacent to a catch basin. Use chloride-free chemical (ex. Calcium magnesium acetate) to de-ice snow storage melt between snow events.

Notes: _____

Salt storage

☐ Not applicable. Salt not stored on property.

1. Store smaller quantity of salt on property as needed and only during winter months

☐ In place

☐ Planned

☐ Not practical

Notes: _____

2. Store salt in a secure, closed container or enclosure on an impermeable pad

☐ In place

☐ Planned

Notes: _____

3. Clean up spilled salt

☐ In place

☐ Planned

Notes: _____

Salt storage – liquid de-icers only

☐ Not applicable. Liquid de-icers not stored on property.

1. Store and handle liquid de-icers in an area that does not drain into the environment, including storm sewer, sanitary sewer or watercourse

- Includes direct and indirect drainage such as floor cracks, drains or ditches
- Prevention includes sealing cracked floors, moving liquid de-icer storage away from drainage areas, completing drain assessments, covering or decommissioning drainage points
- If moving de-icers to new location, label proposed storage area on the site plan

☐ In place

☐ Planned

Notes: _____

2. Protect liquid de-icer storage areas from all vehicular traffic

☐ In place

☐ Planned

Notes: _____

3. Prepare and implement your Spills Plan, including prevention and response measures

- Complete and review your written Spills Plan at least once a year
- Document the completion of each review in your Spills Plan

☐ In place. Include Spills Plan with completed worksheet.

☐ Planned

Notes: _____

4. Train staff on Spills Plan, including prevention and response measures

- All staff to complete training initially with annual review
- New staff to complete training upon hire
- Document training and retain records

☐ In place

☐ Planned

Notes: _____

5. Continuously supervise delivery and transfer of liquid de-icers by personnel trained on the Spills Plan

☐ In place

☐ Planned

Notes: _____

6. Place spill kits in accessible locations

- Spill kit contents must be appropriate for liquid salt, inventoried annually with Spills Plan review, and restocked as necessary
- Document spill kit contents and locations

☐ In place

☐ Planned

Notes: _____

7. Store de-icing liquids in a tank or tote on an impermeable pad with 110% secondary containment and collision protection

☐ In place

☐ Planned

Notes: _____



- ## Winter maintenance beneficial practices worksheet

Salt Application Best Practices for Winter Maintenance Contracts



Help reduce damage to your property and protect the environment by ensuring your winter snow and ice maintenance contractor is not applying too much salt. Salt is a critical component of any good winter maintenance plan. But applying too much salt shortens the life of pavements and hastens the corrosion of building materials. Salt applied to parking lots and roads also finds its way into streams and rivers, where it harms fish and other aquatic life, many of which are very sensitive to even low amounts of salt.

Businesses can help reduce over-salting by ensuring that salt is applied responsibly on parking lots and walkways. An easy way to do this is by ensuring that your snow and ice maintenance contract includes provisions requesting that industry best practices be employed and operators are adequately trained. These will not only help ensure the 'right' amount of salt is applied to manage risk, but can also save money and prevent damage to building infrastructure.

PROCUREMENT BEST PRACTICES INCLUDE:

Effective pricing of services - Often payment for services is based on the amount of work or the quantity of salt applied which can encourage using more salt than is necessary. Contract pricing structures based on a lump sum by season, a fixed sum per event with extra paid for standby costs, or some combination of these payment options creates a financial incentive to apply less salt.

Accurate salt delivery - Calibration of salt spreaders helps ensure that the equipment is functioning properly and the amount of salt applied matches the rate of application set by the driver. Automated salt delivery systems that control application rates by vehicle ground speed can significantly reduce the amount of salt applied compared to conventional spreaders. These delivery systems ensure a more even spread of salt and allow contractors to precisely track the amount of salt applied.

Reducing liability risk - Slip and falls may occur, even when contractors and owners have tried their best to maintain a safe environment. In the event of lawsuits, it helps to have good records as evidence of the care that has been taken. Knowing and presenting accurate records of where, when, and how plowing and salting has occurred is the best form of defense against lawsuits.



Efficient application - The amount of road salt needed to keep parking lots clear of snow and ice can be significantly reduced by using anti-icing application techniques and pre-wetted salt. Anti-icing involves applying a liquid (such as salt brine) to paved surfaces before the storm arrives. This prevents snow and ice from bonding to the pavement, reducing the amount of salt needed after plowing. Pre-wetting involves coating the surface with a liquid to accelerate melting by providing initial moisture, while helping salt adhere better to the road surface.

Low chloride alternatives - A number of low chloride alternatives to road salt are currently available, such as acetates, formates, and organic products made from sugar beets, and other plant materials. Road salt alternatives provide effective snow and ice control at a wide range of temperatures. Many can be used as anti-icing or pre-wetting agents, delivering the same benefits as conventional salts and brines, while using considerably less salt.

Well informed decision making - Making good decisions about application methods and timing requires the use of supporting tools. Skillful use of local weather forecasts, road weather information systems, internet



based radar systems, and infrared thermometers to determine pavement temperature trends can help make decisions that save on salt, time and money.

Trained professionals - Applying the right material in the right amount at the right time and place can only be achieved by knowledgeable contractor and property management staff. Developing this knowledge requires training and experience. Requesting evidence of this experience and requiring training and certification through the **Ontario Smart about Salt Program** will help to ensure that the contractor and property operation staff have the skills necessary to implement best practices for road salt use.

KEY FACTS:

1. In a comprehensive study in the US, the use of closed loop electronic controllers resulted in salt savings of up to 47% when compared with manually controlled systems (Blackburn et al, 2008).
2. In the City of Toronto, the implementation of a road salt management training program for winter maintenance supervisors and operators reduced salt use by almost 37,000 tonnes over two winter seasons and saved nearly \$1.9 million dollars. (Environment Canada 2003).
3. In the Niagara Region, municipal application of a beet juice compound as an anti-icing and pre-wetting agent to roads has reduced the amount of road salt on the roads by as much as 30% while also lowering winter road maintenance costs. (Regional Municipality of Niagara).
4. In a study of Ontario roadways, prewetted salt was more effective than dry salts in 5 of 7 cases, reducing snow cover by between 18% and 40% compared to dry salt (Fu et al., 2006).

This communication has been prepared by the Sustainable Technologies Evaluation Program. Funding support for this project is provided by the Toronto and Region Remedial Action Plan (MOECC and Environment Canada), Region of Peel, York Region and the City of Toronto. The contents of this document do not necessarily represent the policies of the supporting agencies and the funding does not indicate an endorsement of the contents.

Published 2019. Visit us at www.sustainabletechnologies.ca to access our guidance document on how salt best practices can be incorporated into your winter maintenance contracts.

Please contact us at:

STEP@trca.on.ca | twitter.com/STEPLivingCity

The water component of STEP is a collaborative of:



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Salt Impact Assessment			

1.0 Purpose

To assess if salt loading due to winter de-icing activities from a proposed development will cause adverse source water quality concerns in the context of the Ministry of the Environment, Conservation and Parks (MECP) *Reasonable Use Concept (RUC)* water quality guidelines.

2.0 Background

Policy RW-MC-36

The Regional Municipality of Waterloo and Area Municipalities shall amend their Official Plans to state that *Planning Act* and *Condominium Act* applications proposing new roads as part of a subdivision and condominium applications where salt could be applied may be permitted subject to study in accordance with the Regional Implementation Guideline for Source Water Protection Studies and a Regional Salt Impact Assessment to the satisfaction of the Regional Municipality of Waterloo:

- i. In Wellhead Protection Area B where the vulnerability is equal to ten (10);
- ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except Wellhead Protection Area A.

3.0 Qualifications

This assessment shall be prepared by a Qualified Person (QP). A QP is a licensed Professional Geoscientist in the Province of Ontario or an exempted Professional Engineer as set out in the *Professional Geoscientists Act of Ontario*. The assessment should follow generally accepted methods outlined in the *Professional Practice Guidelines for Groundwater Resources Evaluation, Development, Management and Protection Programs in Ontario* (APGO, 2004).

4.0 Methodology

A *Salt Impact Assessment* is required to the satisfaction of the Region prior to draft plan approval proposing new roads as part of a subdivision or condominium application where salt will be applied. Based on the total length of roads and parking lot areas, and the amount of salt applied, the hydraulic loading to groundwater must be assessed relative to the MECP's *Reasonable Use Concept (RUC)* water quality guideline for chloride. In determining the hydraulic loading, a pre- and post-construction water balance (water budget) is required whereby consideration is given to the hydraulic

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properties of the underlying soil materials, the area of imperviousness, and the overall stormwater management strategy for the site.

Predicted chloride concentrations need to be determined prior to development to evaluate if the proposed land use is reasonable and if preventative measures should be implemented through the development approval process. The MECP's *Reasonable Use Concept (RUC)* was not strictly developed for this purpose; however, it is one approach to assessing stormwater-related impacts to groundwater recommended in the *Stormwater Management Planning and Design Manual* (MOE, 2003).

Two assessments may be required as part of an overall *Salt Impact Assessment* for a particular area:

- an assessment of the impact of the individual development on groundwater quality; and,
- an area-wide assessment of the cumulative impact on municipal water supply well(s).

The first assessment noted above is to ensure that the proposed development does not have an adverse impact on local groundwater quality. The second assessment is necessary in the case of secondary plans, new major roads (i.e. roads requiring a Municipal Class Environmental Assessment), etc. where the cumulative impact of roads and parking lots in a specific area could result in increased chloride loadings to a particular municipal water supply well(s) as a result of winter de-icing activities.

This guideline is provided for the first type of assessment – i.e. an assessment related to salt loading associated with individual developments. In the case of an area-wide assessment, the proponent should contact Region Hydrogeology and Source Water staff for additional guidance.

All information requested below must be included in the *Salt Impact Assessment*.

4.1 Hydrogeological Assessment

A hydrogeologic characterization should be completed according to generally accepted professional practice guidelines before initiating the *Salt Impact Assessment*. The hydrogeological characterization should include the following information:

- location and condition of boreholes and monitoring wells;
- location and condition of domestic and municipal water supply wells;

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- local and regional-scale hydrostratigraphy in cross-section (conceptual hydrogeologic model), including depth to municipal water supply aquifers and aquitards and hydraulic properties;
- Source Water Protection areas; including vulnerability scores
- intrinsic susceptibility of water supply aquifers;
- seasonal groundwater contours and flow direction;
- seasonal horizontal and vertical hydraulic gradients;
- identification of recharge and discharge areas; and,
- background groundwater quality, including sodium and chloride.

4.2 Salt Impact Assessment

In addition to the information in the *Hydrogeological Assessment* above, the *Salt Impact Assessment* will require soils investigations to determine soil profiles and the hydraulic properties of the native geologic materials to estimate infiltration rates across the subject property. Representative infiltration rates are required for all soil types on the property.

The *Salt Impact Assessment* should also include an evaluation of the proposed *Stormwater Management Plan* for the subject property and its ability to minimize the infiltration of salt-laden winter runoff and to mitigate impacts to source water quality.

It is necessary for the proponent to determine existing background chloride concentrations, and include a discussion of the concentrations relative to potential sources. If the Region has already completed an area-wide assessment for a well under consideration for a given development application, then the applicant will be expected to use this background assessment in their chloride loading calculations. If the proposed development is located in an area where an estimate has not been completed by the Region, the site-specific *Salt Impact Assessment* should determine the background levels.

Background chloride concentrations in the groundwater prior to anthropogenic impacts in the Region are typically between 2.5 and 15 mg/L. Where background concentrations cannot be determined the maximum concentration (15 mg/L) should be used to assess the impact from a development.

The following additional site-specific information is also required:

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- the total length of roads in the development (in 2-lane-kms) and type of roads (e.g. primary, secondary or local);
- the area of parking lots;
- anticipated winter maintenance service level and salt application rates (based upon the type of roads proposed or other available information); and,
- anticipated proportion of salt that will infiltrate to the ground water.

Based on the proposed road network, parking lot area, and the anticipated salt loading the hydraulic loading to the groundwater must be assessed. In determining the hydraulic loading, an existing and proposed conditions water balance will be required which must be consistent with the water balance determined as part of the *Stormwater Management Plan* for the subject property.

4.2.1 Assumptions

4.2.1.1 Salt Application Rates

For roads, the proponent should assume the following:

- 44 tonnes/two-lane-km (primary roads);
- 22 tonnes/two-lane-km (secondary roads); and,
- 2.2 tonnes/two-lane-km (local roads).

Instead of the rates above, loading rates reported by the Area Municipalities may also be used based on a minimum 3-year rolling average. Justification will be required if lower salt loading rates than those recommended above are used.

For parking lots, data provided by the Smart About Salt (SAS) program indicates that there is a wide range reported in terms of salt application rates and the number of times salt is applied per year by winter maintenance contractors. The proponent should assume an average loading rate of 50 g/m²/event to parking lots with salt applied on average 37 events per year (WESA, 2013).

4.2.1.2 Salt Infiltration Rate

The proponent should assume 28% of the salt that is applied to the roads infiltrates to the subsurface in catchments where there is a surface water outlet and up to 100% of the salt that is applied to the roads infiltrates to the subsurface in catchments with no outlet (e.g. in the case of dry ponds or end-of-pipe

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infiltration facilities). If road salt is applied to roads with impervious boulevards (i.e. kill strips) the amount of salt infiltrating may be reduced to 25%.

Any other assumptions used in the assessment should be clearly stated and justified to the satisfaction of the Region.

4.2.2 Reasonable Use Concept

The assessment must demonstrate that chloride levels in groundwater found at the site boundary under proposed conditions meet the provincially accepted RUC water quality criteria as set out in the 1994 MOEE document *Guidelines B-7 – Incorporation of the Reasonable Use concept into MOE Groundwater Management Activities*. RUC criteria for chloride evaluate whether groundwater concentrations at the site boundary exceed the following:

$$\text{RUC} = \text{background chloride concentration (in groundwater on the subject land)} + 50\% \text{ of } 250 \text{ mg/L (ODWS aesthetic objective for chloride)}$$

4.3 Reporting and Recommendations

The *Salt Impact Assessment* should discuss the final anticipated chloride concentrations in the groundwater as a result of the proposed development relative to the calculated RUC water quality guideline.

Recommendations should be made for mitigating the impacts of winter de-icing in terms of the overall layout of roads, parking areas, snow storage, etc. in the proposed Development Concept Plan.

Recommendations should also be provided to guide the *Stormwater Management Plan* to prevent or mitigate the impacts of winter de-icing on the municipal drinking water supply and to enable opportunities for environmental restoration or enhancement with respect to water resources.

As well, recommendations should be made in terms of the overall winter de-icing activities for the proposed development, including *Salt Management Plans*, snow storage, and other winter de-icing best practices. The *Salt Impact Assessment* should also include discussions of the existing and proposed conditions water balance, as well as the overall effect of development on the regional water budget, if applicable.

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Salt Impact Assessment			

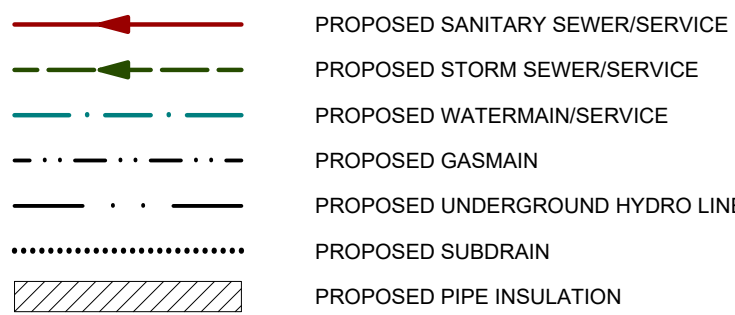
5.0 Relevant Documents

Relevant Documents	Document Location, Source or URL
• C.T. Johnson et al, 2004, Evaluation of Road Salt Impacts and Management Strategies for Groundwater Supplies Using GIS and Mass Balance Modeling Techniques • MOEE, 1994, GUIDELINE B-7 Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities. • MOE, 2003, Stormwater Management Planning and Design Manual. • RMOW, 2016, Risk Management Plan, Winter Maintenance, New Activities • Stantec, 2003, Road Salt Management and Chloride Reduction Study Phase 2: Evaluation of Chloride Reduction Options. • WESA, 2013, Winter De-Icing Salt Assessment For Higher Priority Well Fields.	https://www.ontario.ca/document/guideline-b-7-incorporation-reasonable-use-concept-moe-groundwater-management-activities https://www.ontario.ca/document/stormwater-management-planning-and-design-manual

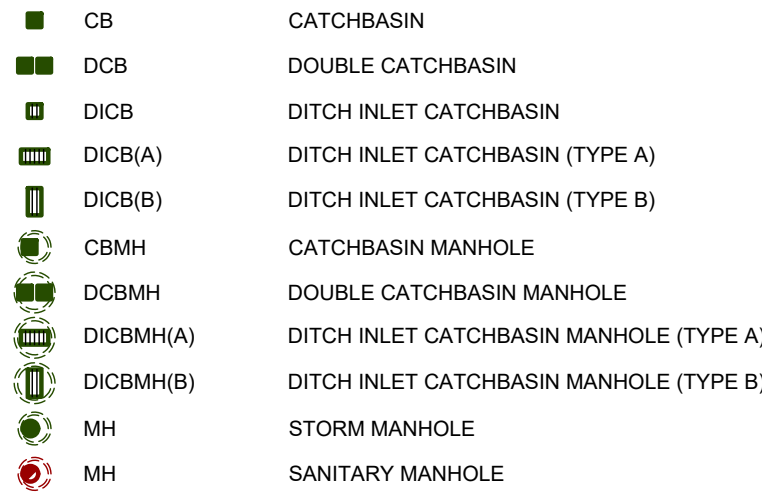
APPENDIX F

Drawings

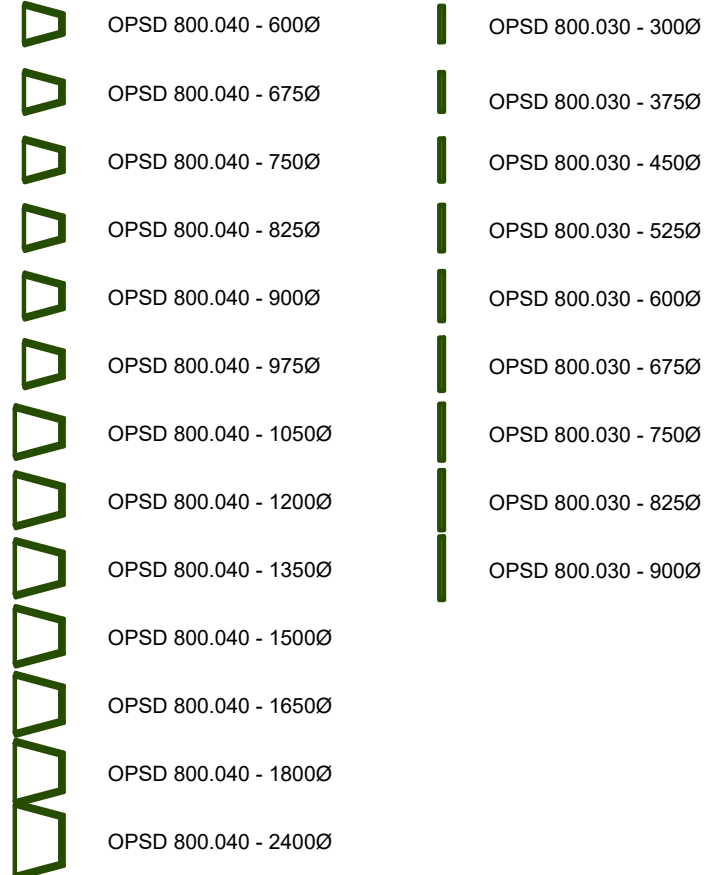
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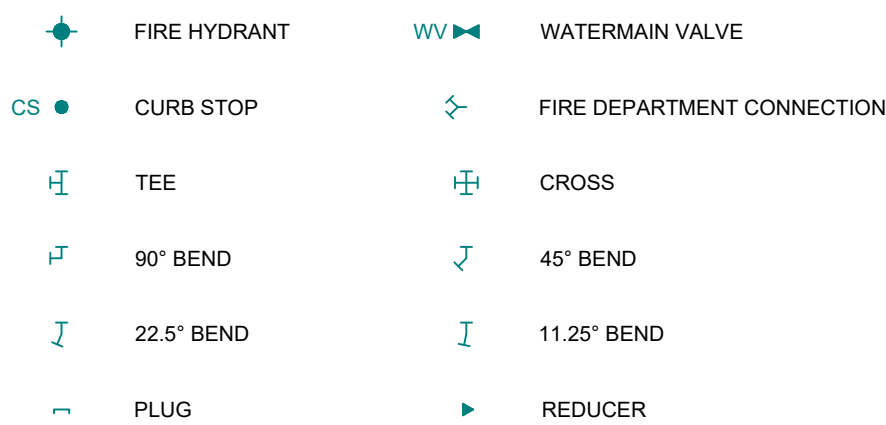
PROPOSED STANARD STRUCTURES



PROPOSED STORM HEADWALLS



PROPOSED WATERMAIN FITTINGS



PROPOSED ELECTRICAL STRUCTURES

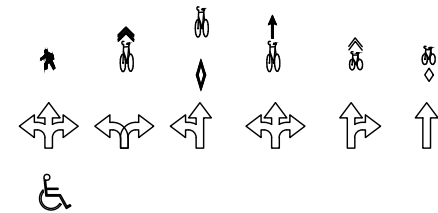


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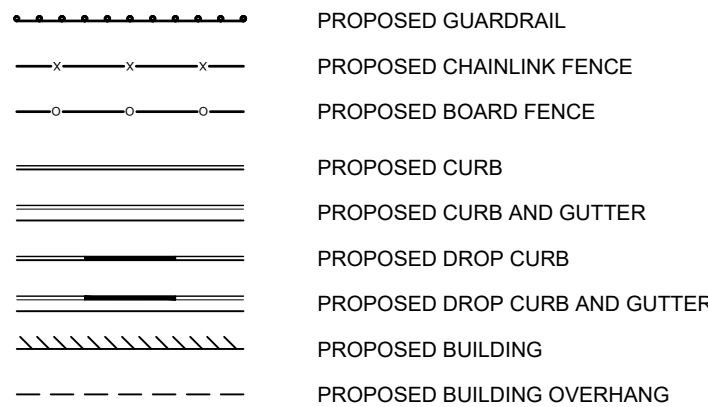
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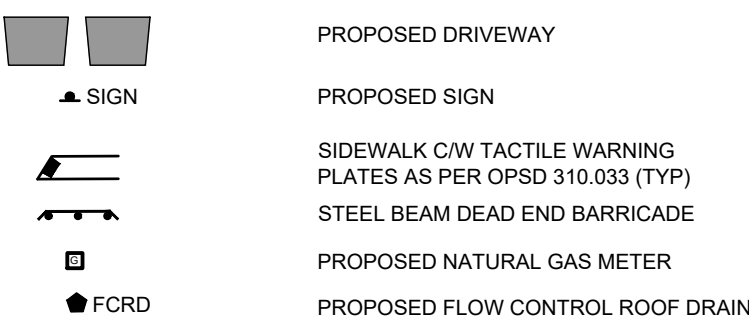
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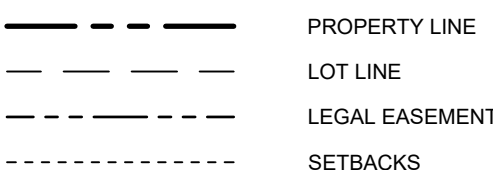
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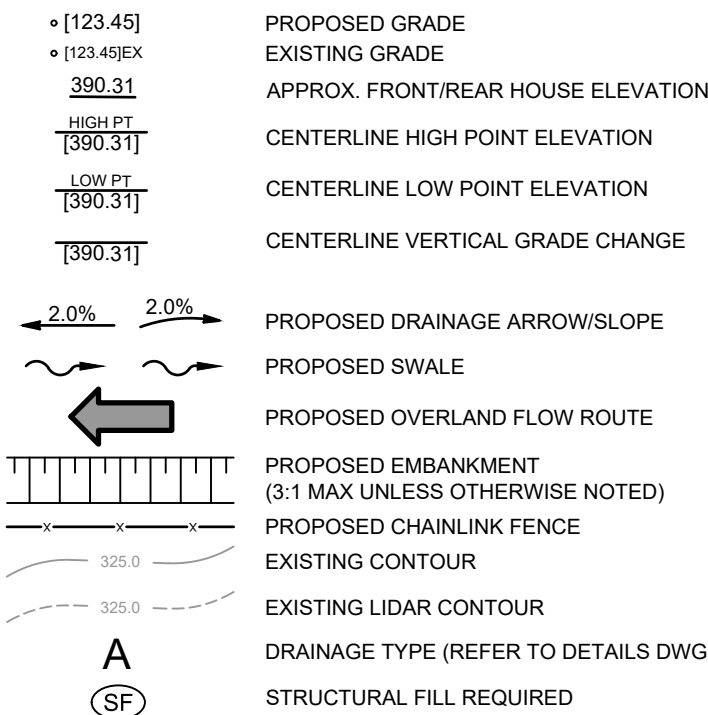
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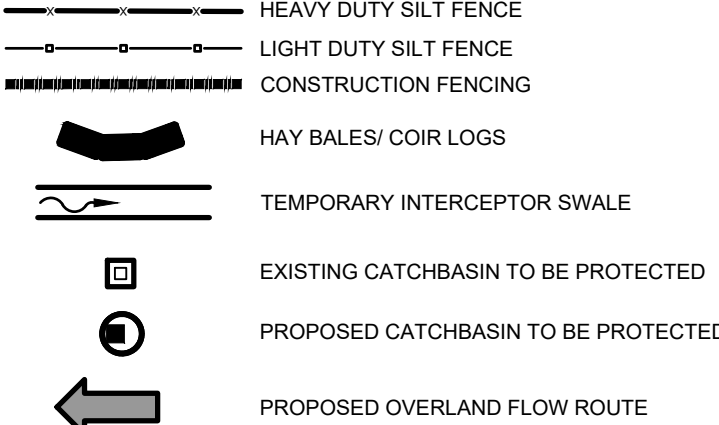
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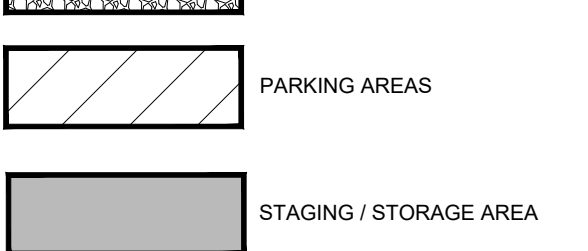
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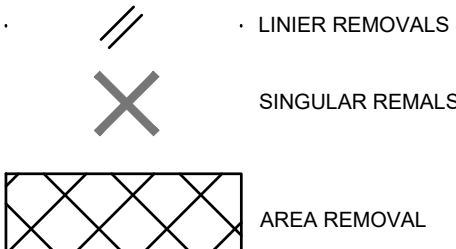
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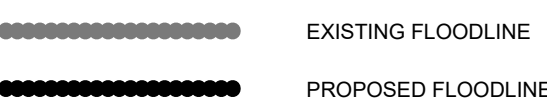
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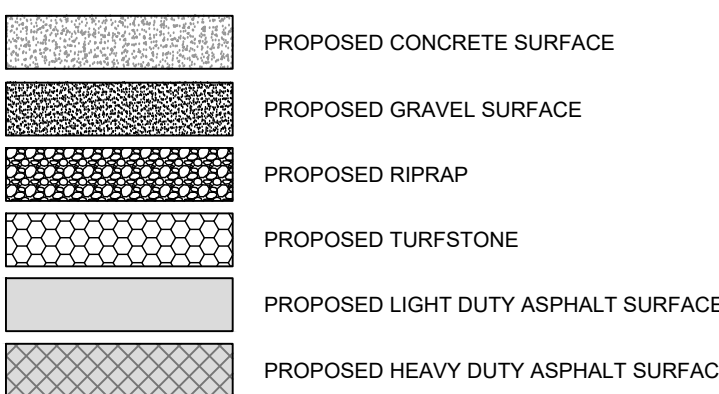
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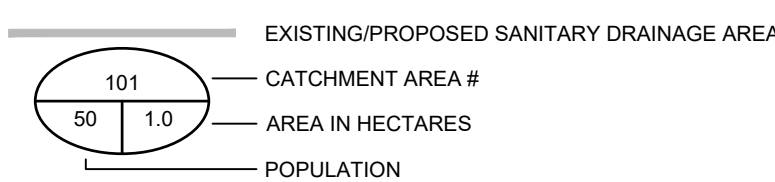
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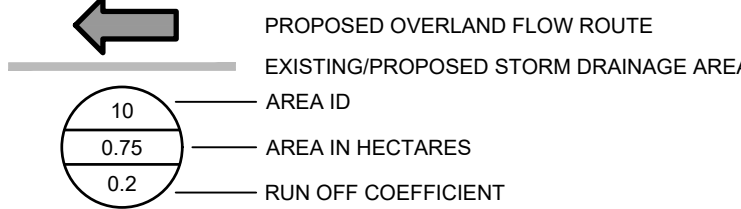
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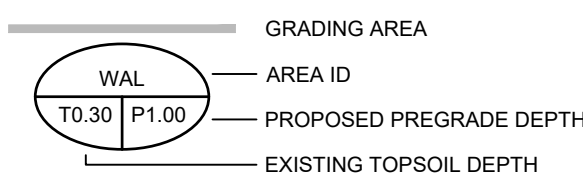
SANITARY AREAS



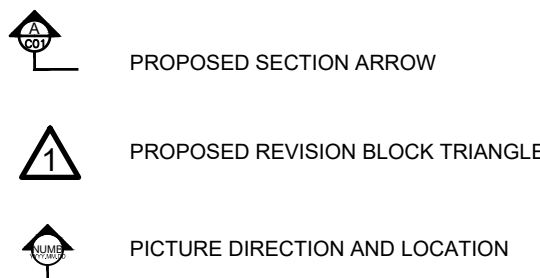
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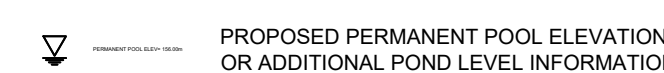
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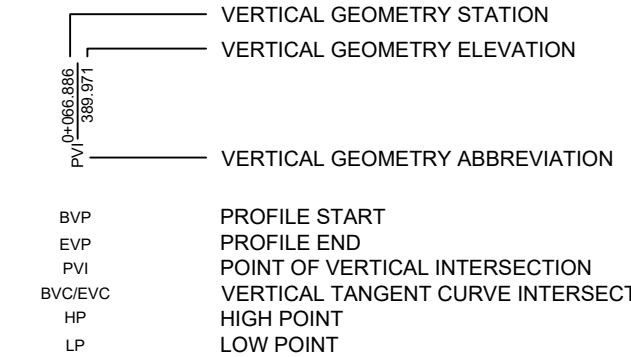
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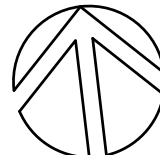
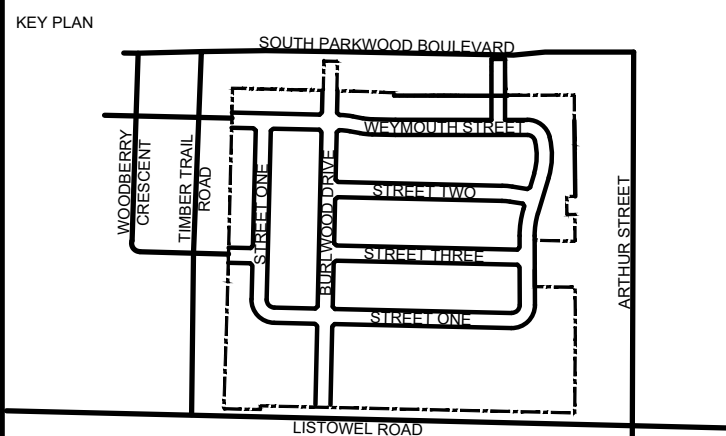
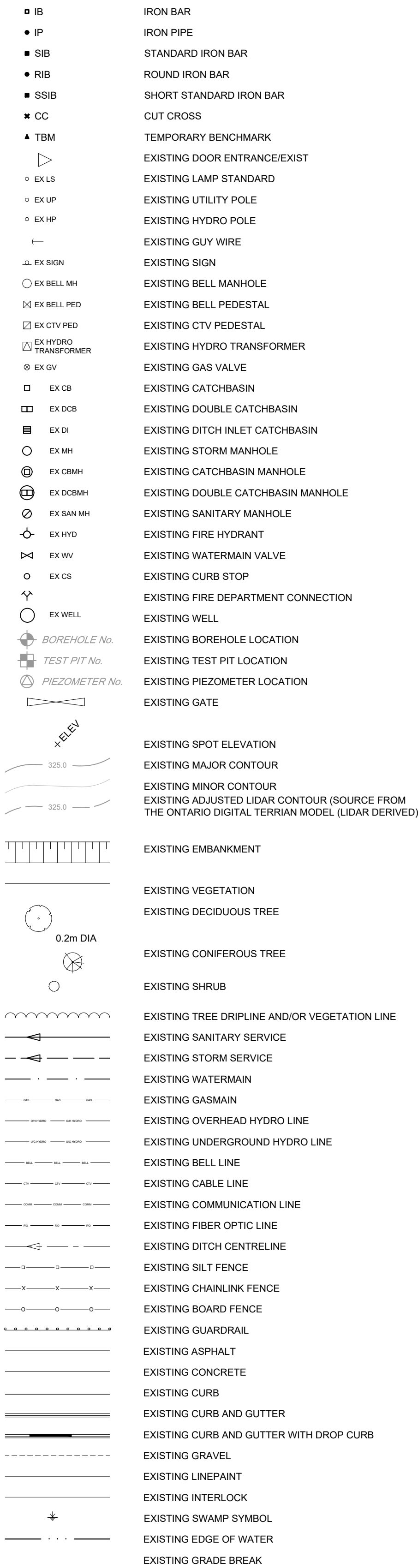
SECTIONS AND PROFILES



VERTICAL GEOMETRY POINTS



EXISTING SURVEY



DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

CLIENT
SCHLEGEL URBAN DEVELOPMENTS

PROJECT
SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE
LEGEND PLAN

WALTERFEDY
TORONTO | CALGARY | KITCHENER | HAMILTON
800.685.1378 walterfedy.com

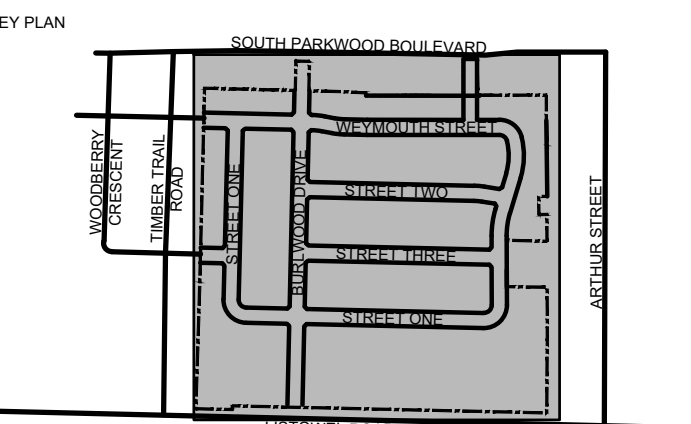


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SCALE	N.T.S.	SHEET NO.:
DATE	2025-05-26	C001
PROJECT NO.:	2022-0374-10	
DRAWN BY	KDB/UBM	
CHECKED BY	MN/EMW	

TYPICAL AERIAL PHOTO/MAPPING SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, SPINER/SURBUS DS, USGS, AEROGRI, IGN, AND THE GIS USER COMMUNIT POWERED BY ESRI

NOTES:
1. LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
2. BENCHMARKS
SB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY, AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE, N 482625.60, E 34809.00, ELEV = 365.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD, N 482397.70, E 34665.08, ELEV = 363.350
3. CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
4. ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.



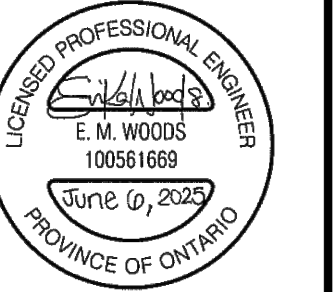
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025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

	BOREHOLE LOCATION	EXISTING BOREHOLE LOCATION
	TEST PIT No.	EXISTING TEST PIT LOCATION
	PIEZOMETER No.	EXISTING PIEZOMETER LOCATION
	EXISTING DECIDUOUS / CONIFEROUS TREE	
	0.2m DIA	
	325.0	EXISTING TREE DRIPLINE AND/OR VEGETATION LINE
	325.0	EXISTING CONTOUR
	325.0	EXISTING LIDAR CONTOUR
		REMOVALS
		EXISTING EDGE OF WATER
		PROPOSED TREE PROTECTION ZONE (NRSI)
		INSPECTED ROOT ZONES (NRSI)



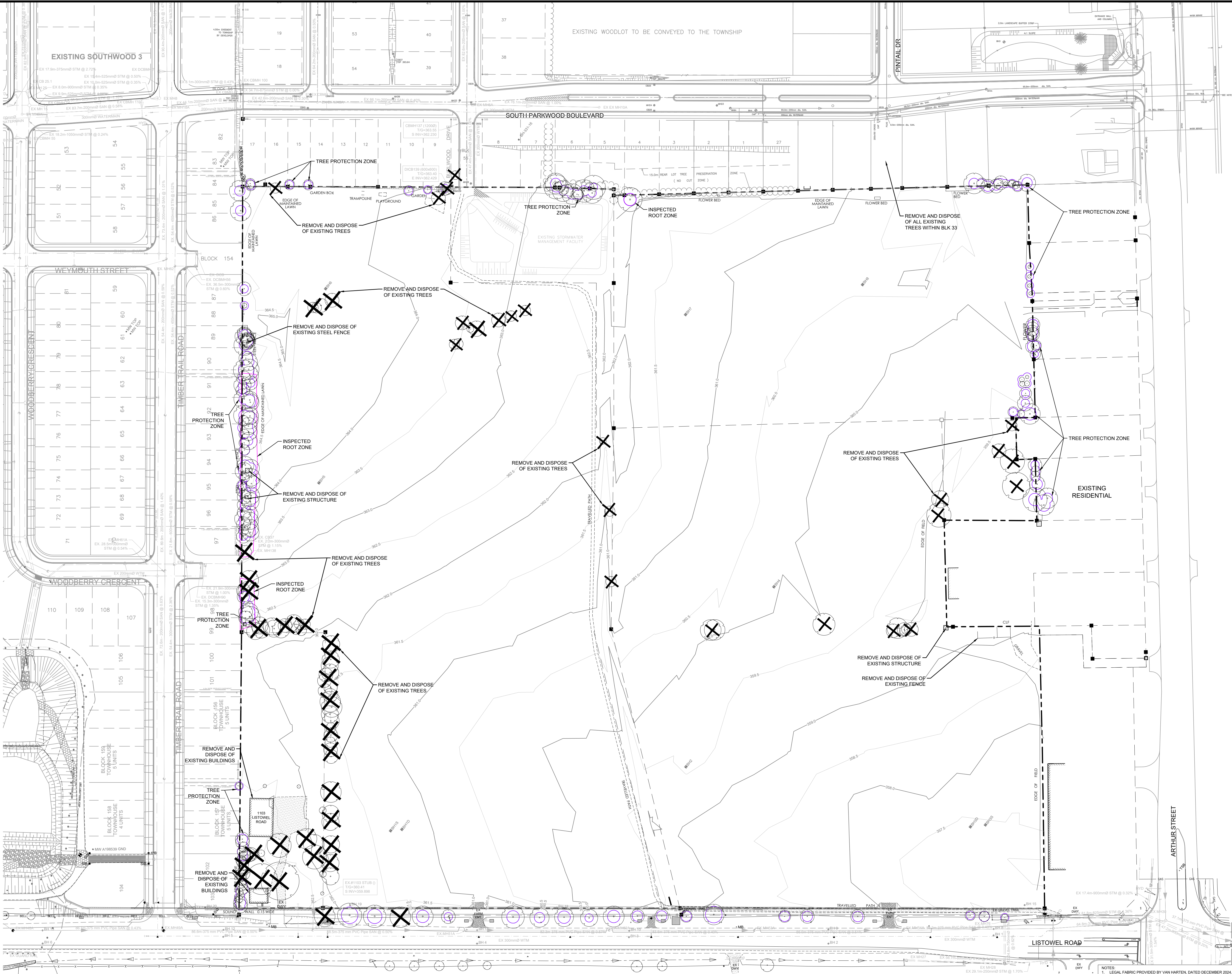
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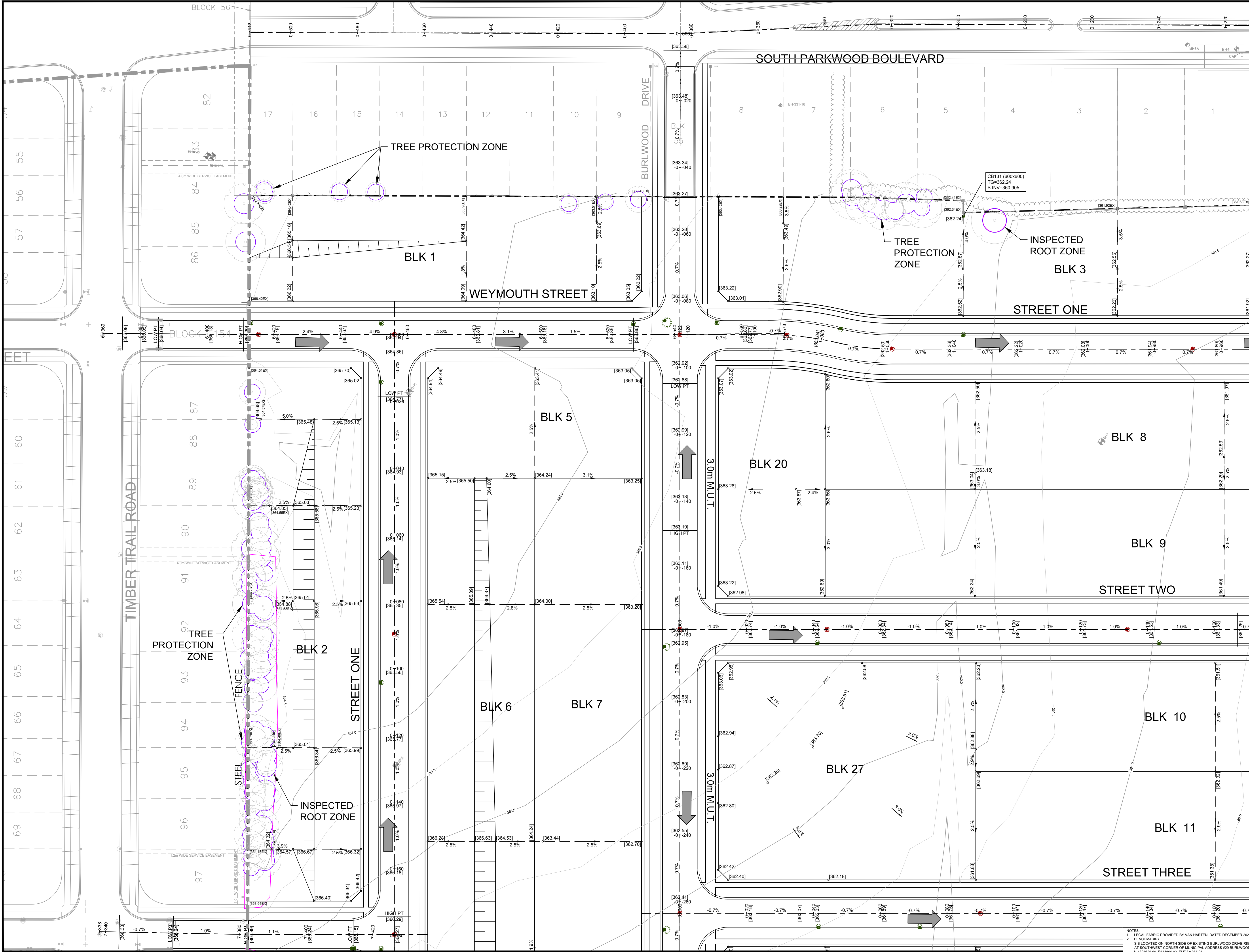
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DATE: 2025-06-06	
PROJECT NO.: 2022-0374-10	
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3. CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025
4. ENVIRONMENTAL RIPLANS AND TRFEE SURVEY PROVIDED BY NRSI 2025

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MATCHLINE
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AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE,
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4. ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.

SCHLEGEL URBAN DEVELOPMENTS

KEY PLAN

North

DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND

- [123.45] PROPOSED GRADE
- [123.45] EXISTING GRADE
- 2.0% 2.0% PROPOSED DRAINAGE ARROW/SLOPE
- PROPOSED SWALE
- PROPOSED OVERLAND FLOW ROUTE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CHAINLINK FENCE
- EXISTING LIDAR CONTOUR
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE
- PROPOSED RIPRAP
- PROPOSED LIGHT DUTY ASPHALT SURFACE
- PROPOSED HEAVY DUTY ASPHALT SURFACE
- PROPOSED TREE PROTECTION ZONE (NRSI)
- INSPECTED ROOT ZONES (NRSI)

1:500

CLIENT

SCHLEGEL URBAN DEVELOPMENTS

PROJECT

SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE

GRADING PLAN
SHEET 1 OF 4

LICENSED PROFESSIONAL ENGINEER
M. A. HUNGWYIA
100114044
June 10, 2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
E. M. WOODS
100581669
June 10, 2023
PROVINCE OF ONTARIO

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DATE: 2025-06-06

PROJECT NO.: 2022-0374-10

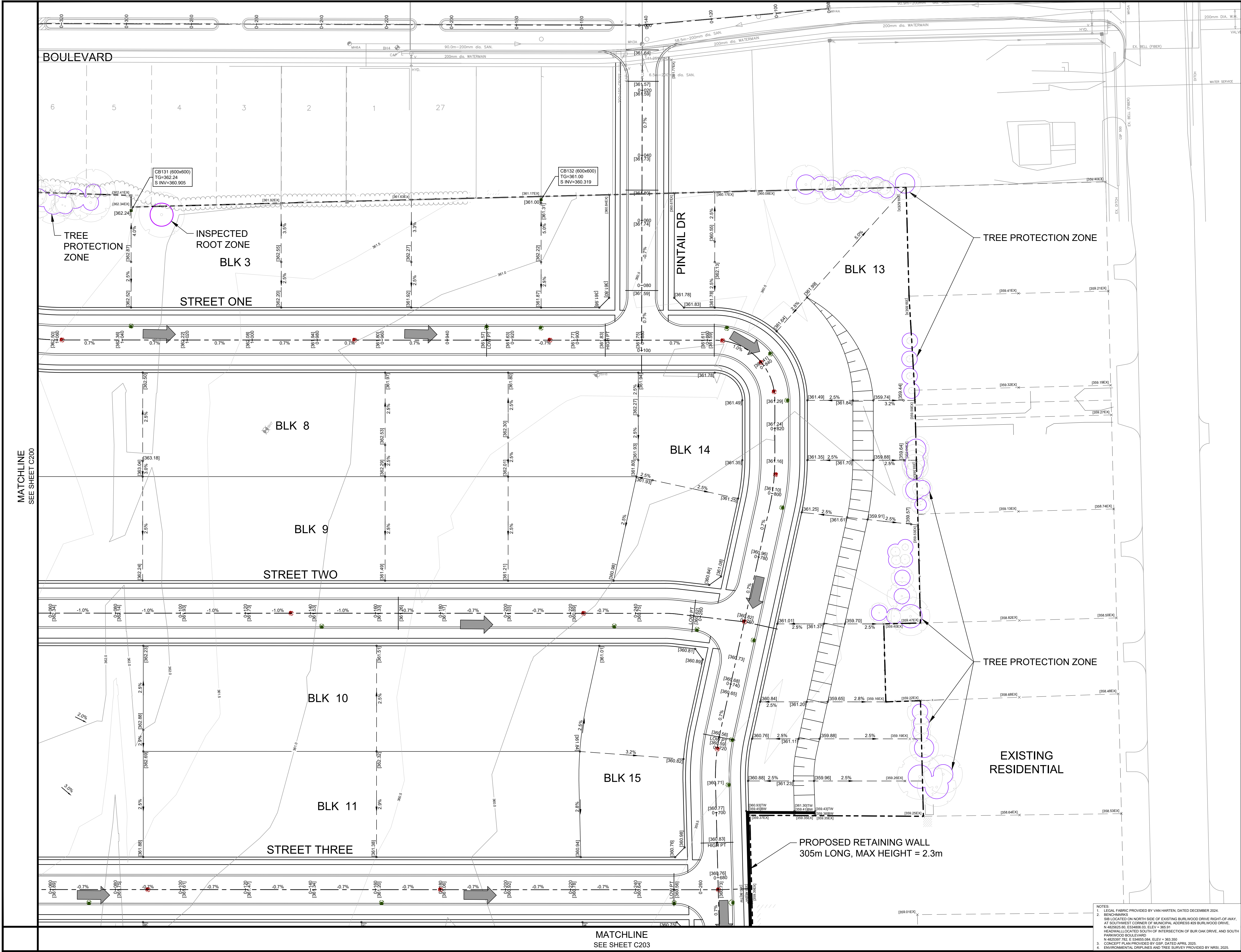
DRAWN BY: KDB/UBM

CHECKED BY: MN/EMW

SHEET NO.:

C200

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SCHLEGEL URBAN DEVELOPMENTS

KEY PLAN

North

DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND

- [123.45] PROPOSED GRADE
- [123.45] EX EX PROPOSED GRADE
- 2.0% 2.0% PROPOSED DRAINAGE ARROW/SLOPE
- PROPOSED SWALE
- PROPOSED OVERLAND FLOW ROUTE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CHAINLINK FENCE
- EXISTING CONTOUR
- EXISTING LIDAR CONTOUR
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE
- PROPOSED RIPRAP
- PROPOSED LIGHT DUTY ASPHALT SURFACE
- PROPOSED HEAVY DUTY ASPHALT SURFACE
- PROPOSED TREE PROTECTION ZONE (NRSI)
- INSPECTED ROOT ZONES (NRSI)

1:500

CLIENT

SCHLEGEL URBAN DEVELOPMENTS

PROJECT

SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE

GRADING PLAN

SHEET 2 OF 4

WALTERFEDY

TORONTO | CALGARY | KITCHENER | HAMILTON

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NOTES:

- LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024
- BENCHMARKS
SB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY, AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE, N 482625 E0, E33489.03, ELEV = 361.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD, N 482397 T02, E 334655.04, ELEV = 363.350
- CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025
- ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.

SCALE: 1:500

DATE: 2025-06-06

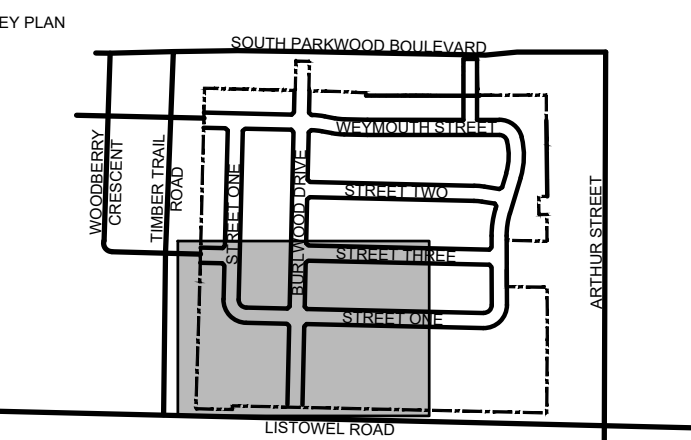
PROJECT NO.: 2022-0374-10

DRAWN BY: KDB/UBM

CHECKED BY: MN/EMW

SHEET NO.:

C201

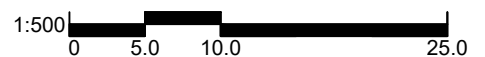


North

DATE	ISSUANCE	NO.
025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND

- | | |
|--|---|
| 
 | <p>PROPOSED GRADE</p> <p>EXISTING GRADE</p> |
|  | <p>PROPOSED DRAINAGE ARROW/SLOPE</p> |
|  | <p>PROPOSED SWALE</p> |
|  | <p>PROPOSED OVERLAND FLOW ROUTE</p> |
|  | <p>PROPOSED EMBANKMENT
(3:1 MAX UNLESS OTHERWISE NOTED)</p> |
|  | <p>PROPOSED CHAINLINK FENCE</p> |
|  | <p>EXISTING CONTOUR</p> |
|  | <p>EXISTING LIDAR CONTOUR</p> |
|  | <p>PROPOSED CONCRETE SURFACE</p> |
|  | <p>PROPOSED GRAVEL SURFACE</p> |
|  | <p>PROPOSED RIPRAP</p> |
|  | <p>PROPOSED LIGHT DUTY ASPHALT SURFACE</p> |
|  | <p>PROPOSED HEAVY DUTY ASPHALT SURFACE</p> |
|  | <p>PROPOSED TREE PROTECTION ZONE (NRSI)</p> |
|  | <p>INSPECTED ROOT ZONES (NRSI)</p> |



CLIENT

SCHLEGEL URBAN
DEVELOPMENTS

PROJECT

SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE

GRADING PLAN
SHEET 3 OF 4

WALTERFEDY

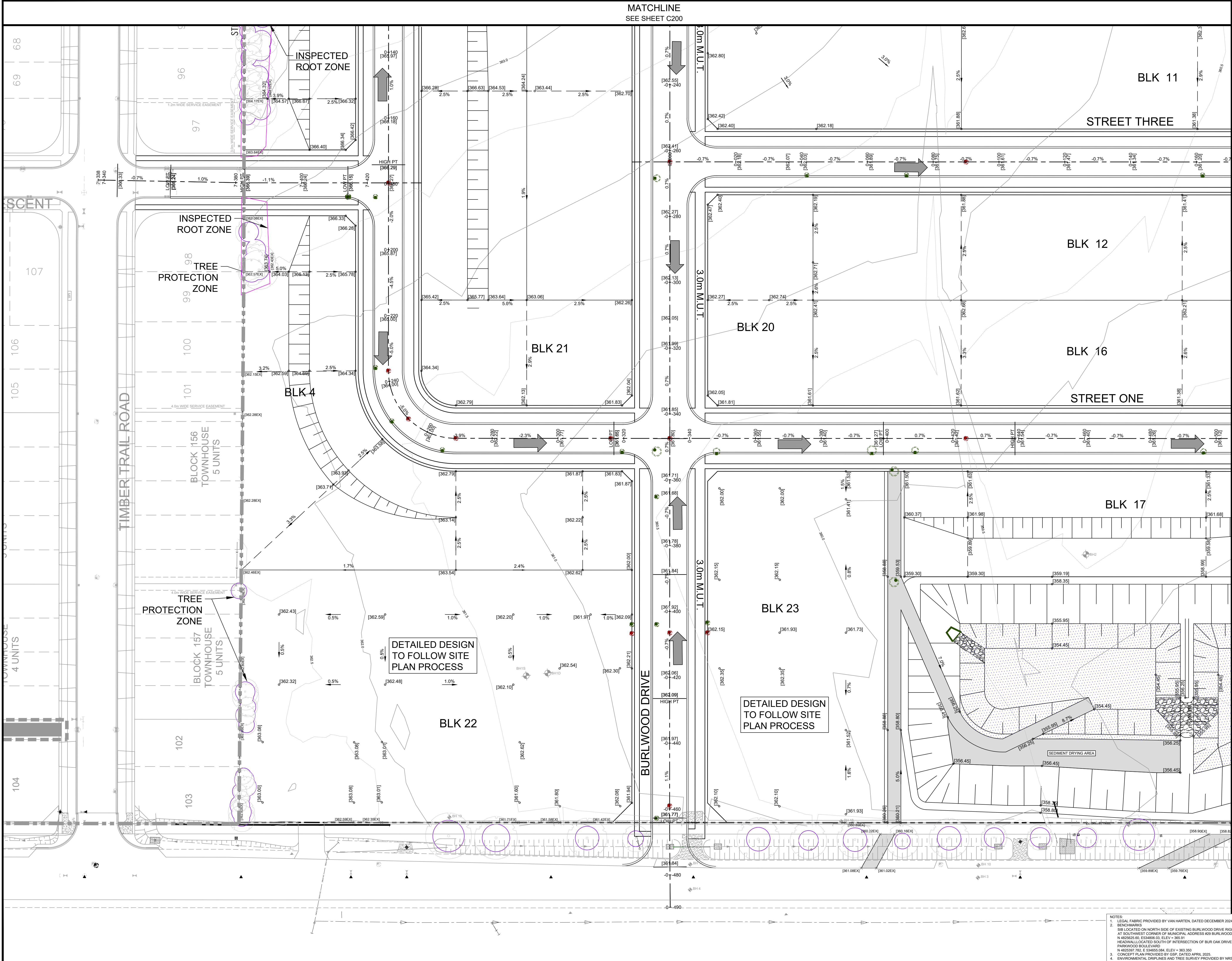
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SCALE: 1:500	SHEET NO.: C202
DATE: 2025-06-06	
PROJECT NO.: 2022-0374-10	
DRAWN BY: KDB/JBM	
CHECKED BY: MN/EMW	

1. LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
2. BENCHMARKS
SIB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY, AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS #29 BURLWOOD DRIVE, N 4825625.60, E534806.03, ELEV = 365.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD
N 4825397.782, E 534655.084, ELEV = 363.350
3. CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
4. ENVIRONMENTAL DRIPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.



MATCHLINE
SEE SHEET C201

BLK 15

BLK 11

STREET THREE

BLK 12

BLK 16

STREET ONE

BLK 18

BLK 24

BLK 17

BLK 27

SWM

STORM WATER MANAGEMENT POND
REFER TO C600 FOR DETAILS

SERVICE EASEMENT
AND EMERGENCY EXIT

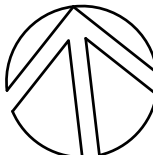
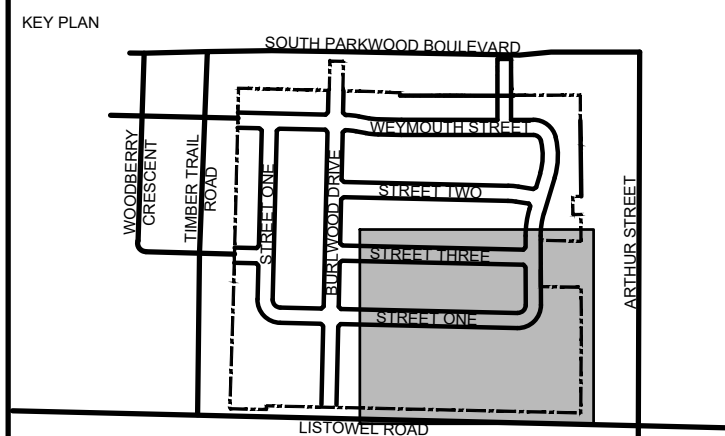
EXISTING
RESIDENTIAL

PROPOSED RETAINING WALL
305m LONG, MAX HEIGHT = 2.3m

DETAILED DESIGN
TO FOLLOW SITE
PLAN PROCESS

ARTHUR STREET

LISTOWEL ROAD



DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND	
• [123.45]	PROPOSED GRADE
• [123.45]EX	EXISTING GRADE
2.0%	PROPOSED DRAINAGE ARROW/SLOPE
2.0%	PROPOSED SWALE
←	PROPOSED OVERLAND FLOW ROUTE
[]	PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
[]	PROPOSED CHAINLINK FENCE
---	EXISTING CONTOUR
---	EXISTING LIDAR CONTOUR
[]	PROPOSED CONCRETE SURFACE
[]	PROPOSED GRAVEL SURFACE
[]	PROPOSED RIPRAP
[]	PROPOSED LIGHT DUTY ASPHALT SURFACE
[]	PROPOSED HEAVY DUTY ASPHALT SURFACE
[]	PROPOSED TREE PROTECTION ZONE (NRSI)
[]	INSPECTED ROOT ZONES (NRSI)

1:500
0 5.0 10.0 25.0

CLIENT
SCHLEGEL URBAN DEVELOPMENTS

PROJECT
SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE
**GRADING PLAN
SHEET 4 OF 4**

WALTERFEDY
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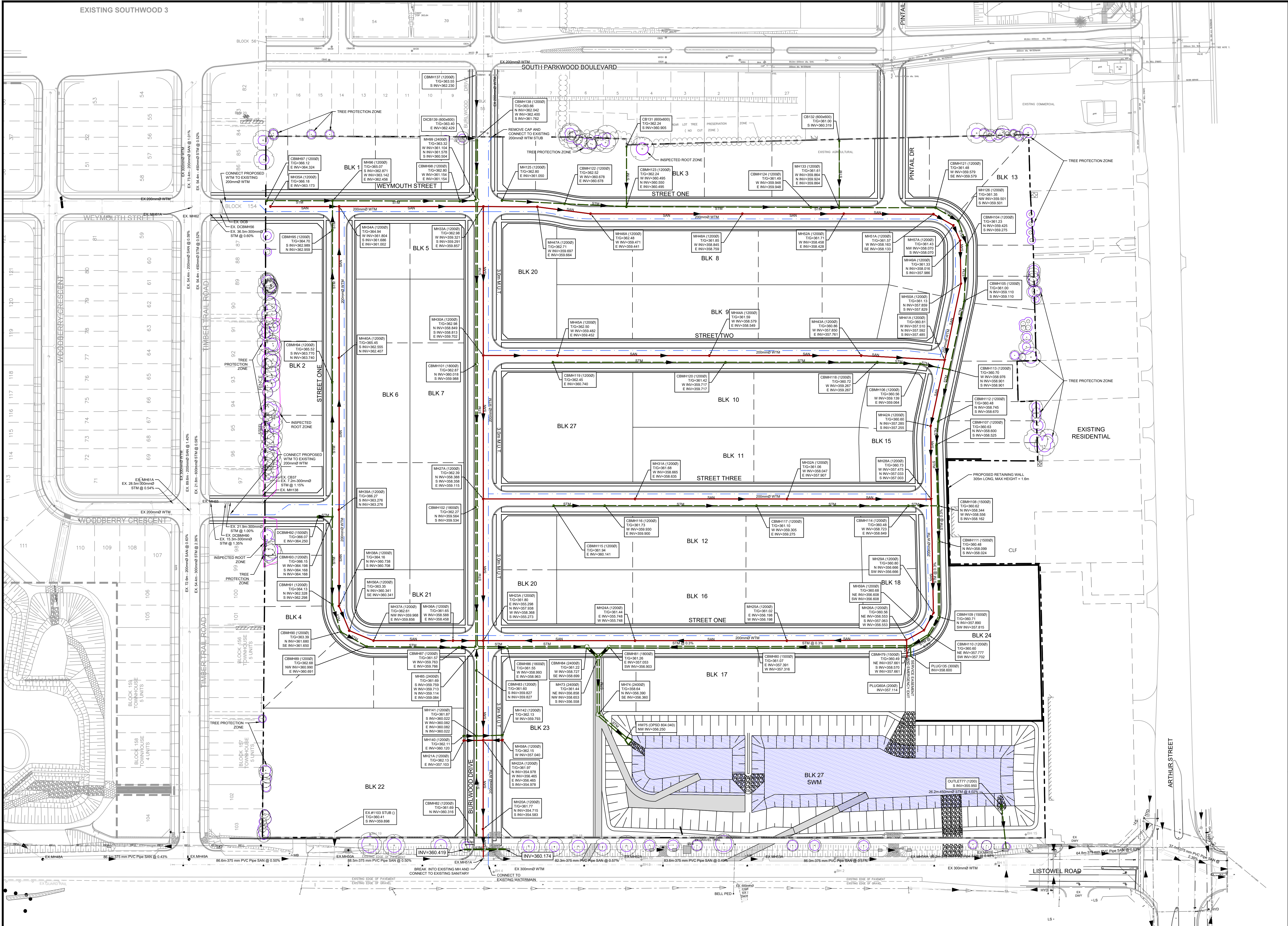
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SCALE	DATE	SHEET NO.
1:500	2025-06-06	C203
PROJECT NO.	2022-0374-10	
DRAWN BY	KDB/UBM	
CHECKED BY	MN/EMW	

MATCHLINE
SEE SHEET C203

NOTES:
1. LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
2. BENCHMARKS
SB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY,
AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE,
N 482625.60, E 34889.03, ELEV = 365.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH
PARKWOOD BOULEVARD,
N 482639.72, E 348655.04, ELEV = 363.350
3. CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
4. ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.



SCHLEGEL URBAN DEVELOPMENTS

KEY PLAN

North

DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND

CB / DCB	PROPOSED CATCHBASIN / DOUBLE CATCHBASIN
DCB/DDCB	PROPOSED DITCH INLET CATCHBASIN / DOUBLE CATCHBASIN
CBMH / DCBHM	PROPOSED CATCHBASIN MANHOLE / DOUBLE CATCHBASIN MANHOLE
DCBHM(A)/(B)	PROPOSED DITCH INLET CATCHBASIN MANHOLE (TYPE A) / (TYPE B)
MH	PROPOSED STORM MANHOLE
MH	PROPOSED SANITARY MANHOLE
HYD	PROPOSED FIRE HYDRANT
WV	PROPOSED WATERMAIN VALVE
CS	PROPOSED CURB STOP
REDUCER	PROPOSED REDUCER
EX CB / DCB	EXISTING CATCHBASIN / DOUBLE CATCHBASIN
EX CB	EXISTING DITCH INLET CATCHBASIN
EX CBMH / DCBHM	EXISTING CATCHBASIN MANHOLE / DOUBLE CATCHBASIN MANHOLE
EX SAN MH	EXISTING SANITARY MANHOLE
EX HYD	EXISTING FIRE HYDRANT
EX WV	EXISTING WATERMAIN VALVE
EX CS	EXISTING CURB STOP
EX WELL	EXISTING FIRE DEPARTMENT CONNECTION EXISTING WELL
PROPOSED SANITARY SEWER/SERVICE	PROPOSED SANITARY SEWER/SERVICE
PROPOSED WATERMAIN/SERVICE	PROPOSED WATERMAIN/SERVICE
PROPOSED SANITARY SERVICE	PROPOSED SANITARY SERVICE
EXISTING WATERMAIN	EXISTING WATERMAIN
PROPOSED SUBDRAIN	PROPOSED SUBDRAIN
PROPOSED LAMP STANDARD	PROPOSED LAMP STANDARD
PROPOSED UTILITY / HYDRO POLE	PROPOSED UTILITY / HYDRO POLE
PROPOSED SIGN	PROPOSED SIGN
PROPOSED HYDRO TRANSFORMER	PROPOSED HYDRO TRANSFORMER
PROPOSED TREE PROTECTION ZONE (NRSI)	PROPOSED TREE PROTECTION ZONE (NRSI)
INSPECTED ROOT ZONES (NRSI)	INSPECTED ROOT ZONES (NRSI)

1:1000

CLIENT

SCHLEGEL URBAN DEVELOPMENTS

PROJECT

SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE

GENERAL SERVICING PLAN

SHEET 1 OF 1

WALTERFEDY

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NOTES:

- LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
- BENCHMARKS
- SB LOCATED ON NORTH SIDE OF EXISTING BURWOOD DRIVE RIGHT-OF-WAY. AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURWOOD DRIVE, N 482625.60, E 34898.03, ELEV = 363.91 HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD. N 482397.702, E 348655.084, ELEV = 363.350
- CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
- ENVIRONMENTAL DISCIPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.

SCALE: 1:1000

DATE: 2025-06-06

PROJECT NO.: 2022-0374-10

DRAWN BY: KDB/JBM

CHECKED BY: MN/EMW

SHEET NO.:

C300

LEGEND

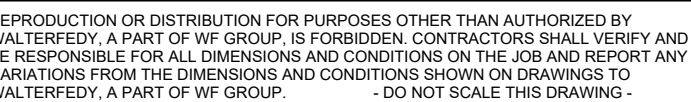
— PROPOSED SANITARY SEWER

- - - PROPOSED STORM SEWER

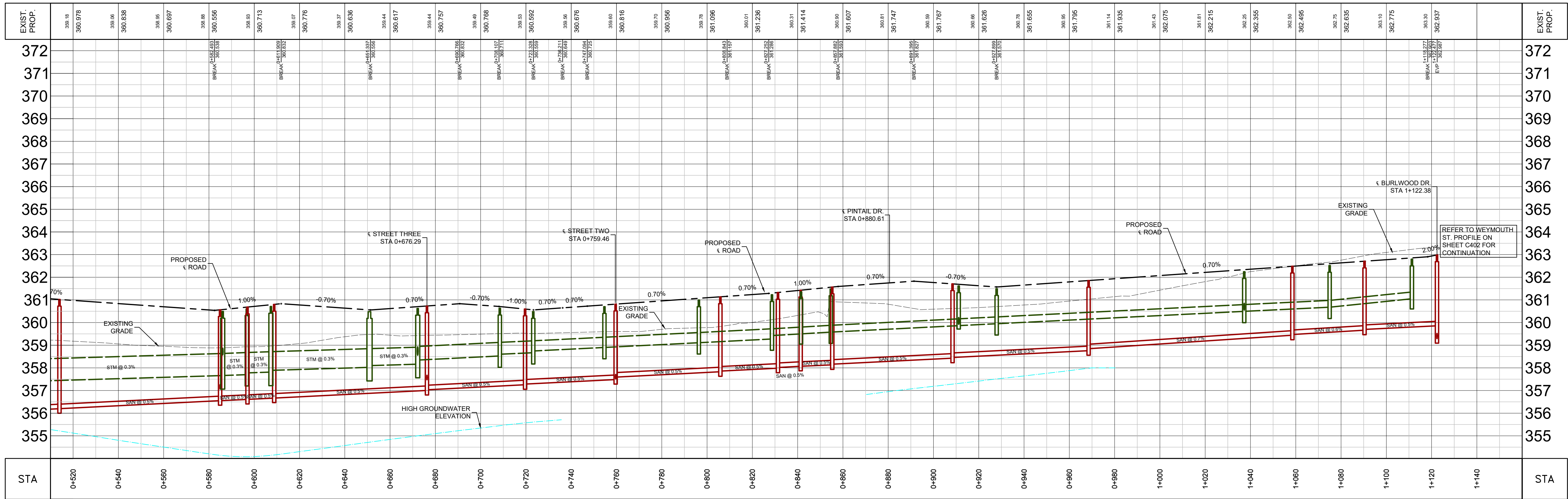
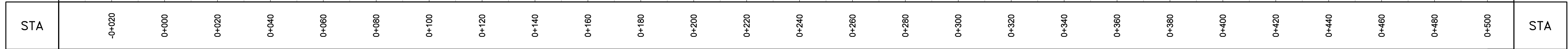
CLIENT
SCHLEGEL URBAN
DEVELOPMENTS

1065 Listowel Rd, Elmira, ON

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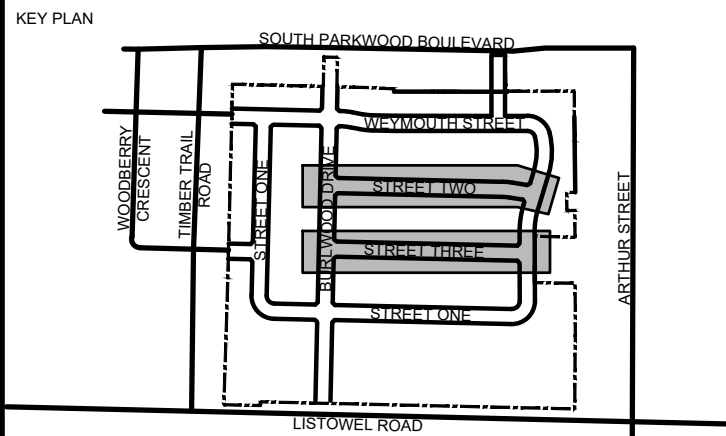
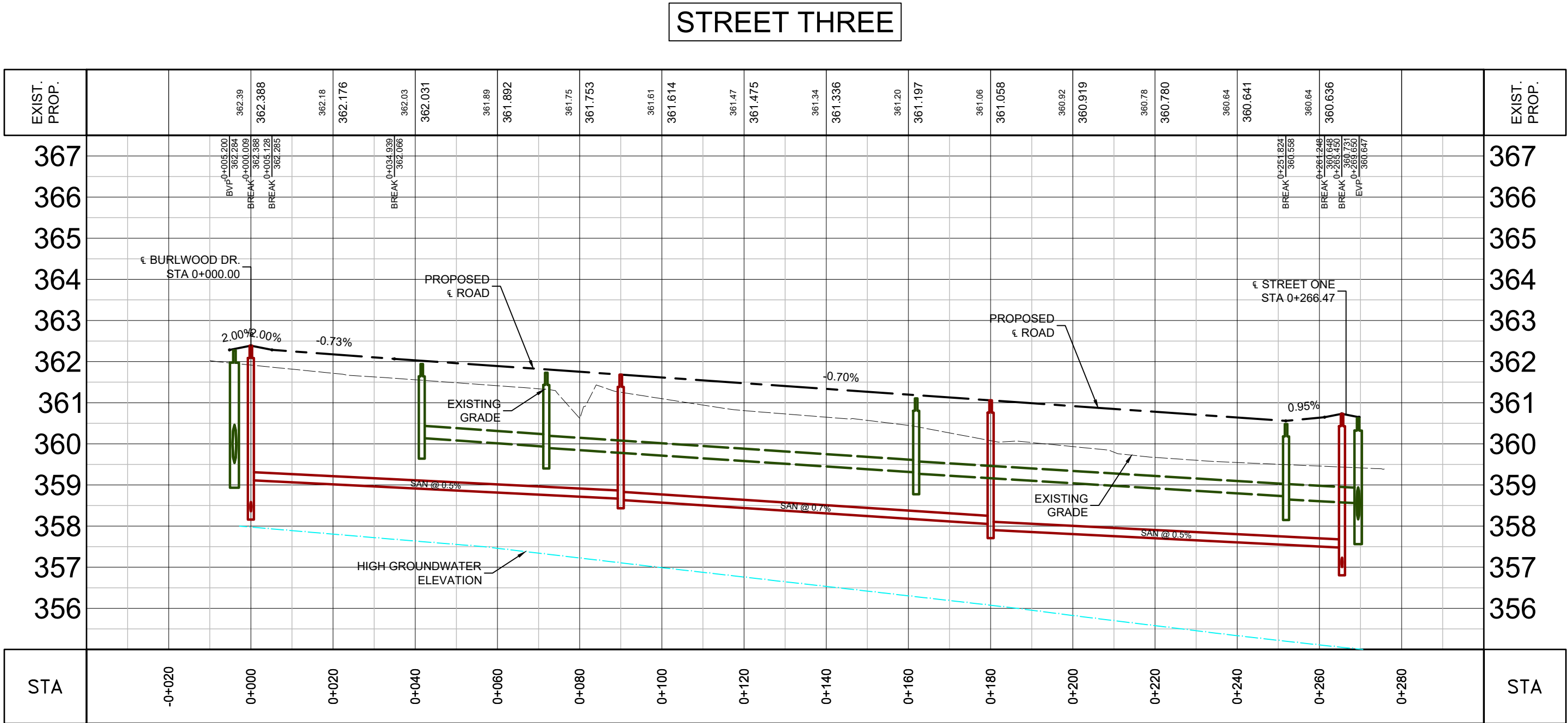
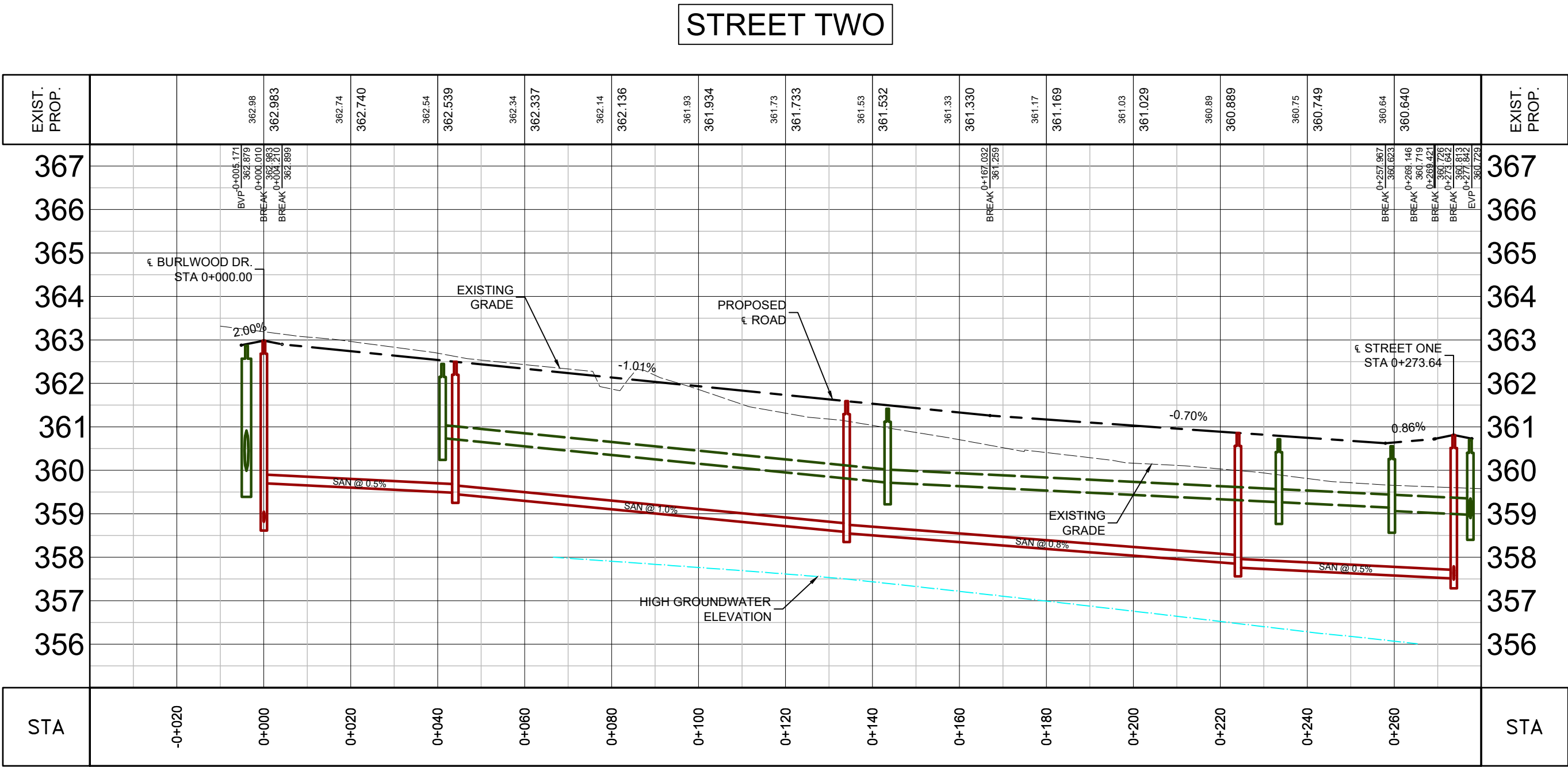


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CASE: H1:1000 V1:100 DATE: 2025-06-04 PROJECT NO.: 2022-0374-10 DRAWN BY: KDB/JBM CHECKED BY: MN/EMW	SHEET NO.: C400



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SCALE: H1:1000 V1:100	SHEET NO.: C400
DATE: 2025-06-04	
PROJECT NO.: 2022-0374-10	
DRAWN BY: KDB/JBM	
CHECKED BY: MN/EMW	

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DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND
PROPOSED SANITARY SEWER
PROPOSED STORM SEWER

- NOTE:
- DROP STRUCTURES AND SAFETY GRATES REQUIREMENTS TO BE REVIEWED DURING DETAILED DESIGN.
 - PIPE & STRUCTURE SIZES TO BE REVIEWED DURING DETAILED DESIGN.



CLIENT
SCHLEGEL URBAN DEVELOPMENTS

PROJECT
SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE
**SHEET TWO & THREE
SHEET 2 OF 3**

WALTERFEDY
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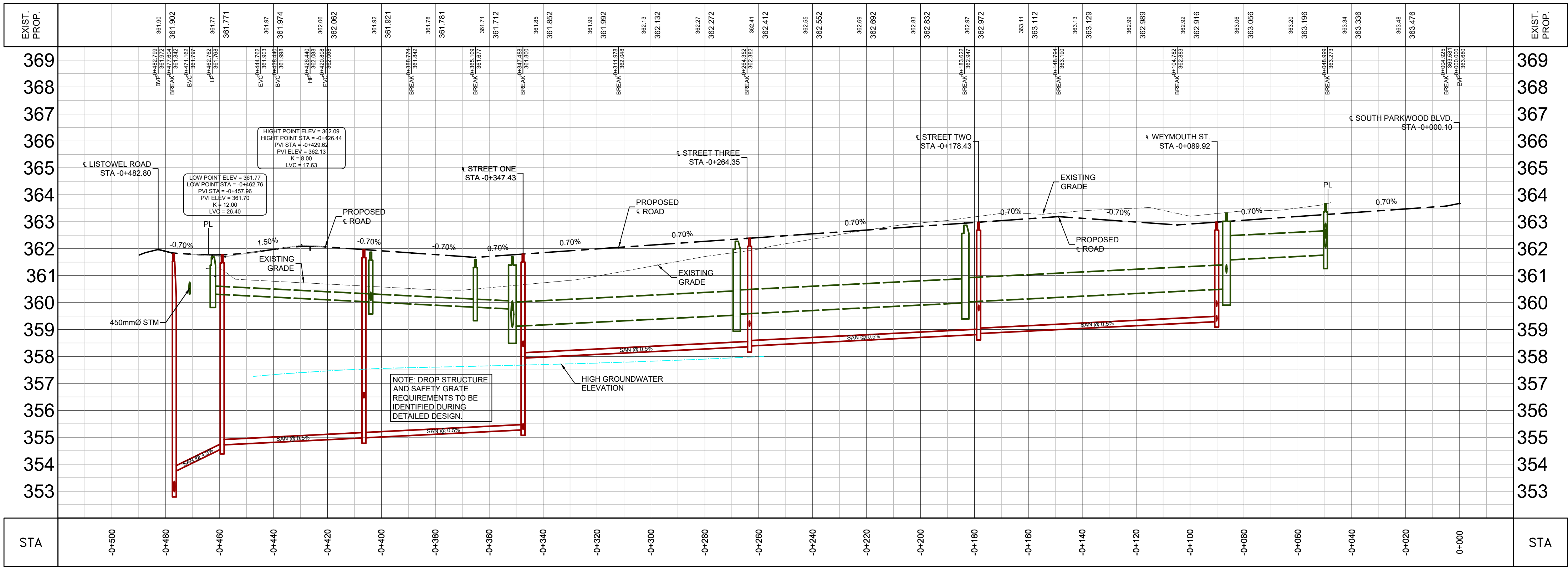
- NOTES:
- LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
 - BENCHMARKS
SB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY, AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE, N 482625.00, E 34895.00, ELEV = 365.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD, N 482387.70, E 348655.04, ELEV = 363.350
 - CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
 - ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSL, 2025.

SCALE: H1:1000 V1:100	SHEET NO.:
DATE: 2025-06-04	
PROJECT NO.: 2022-0374-10	
DRAWN BY: KDB/UBM	
CHECKED BY: MN/EMW	

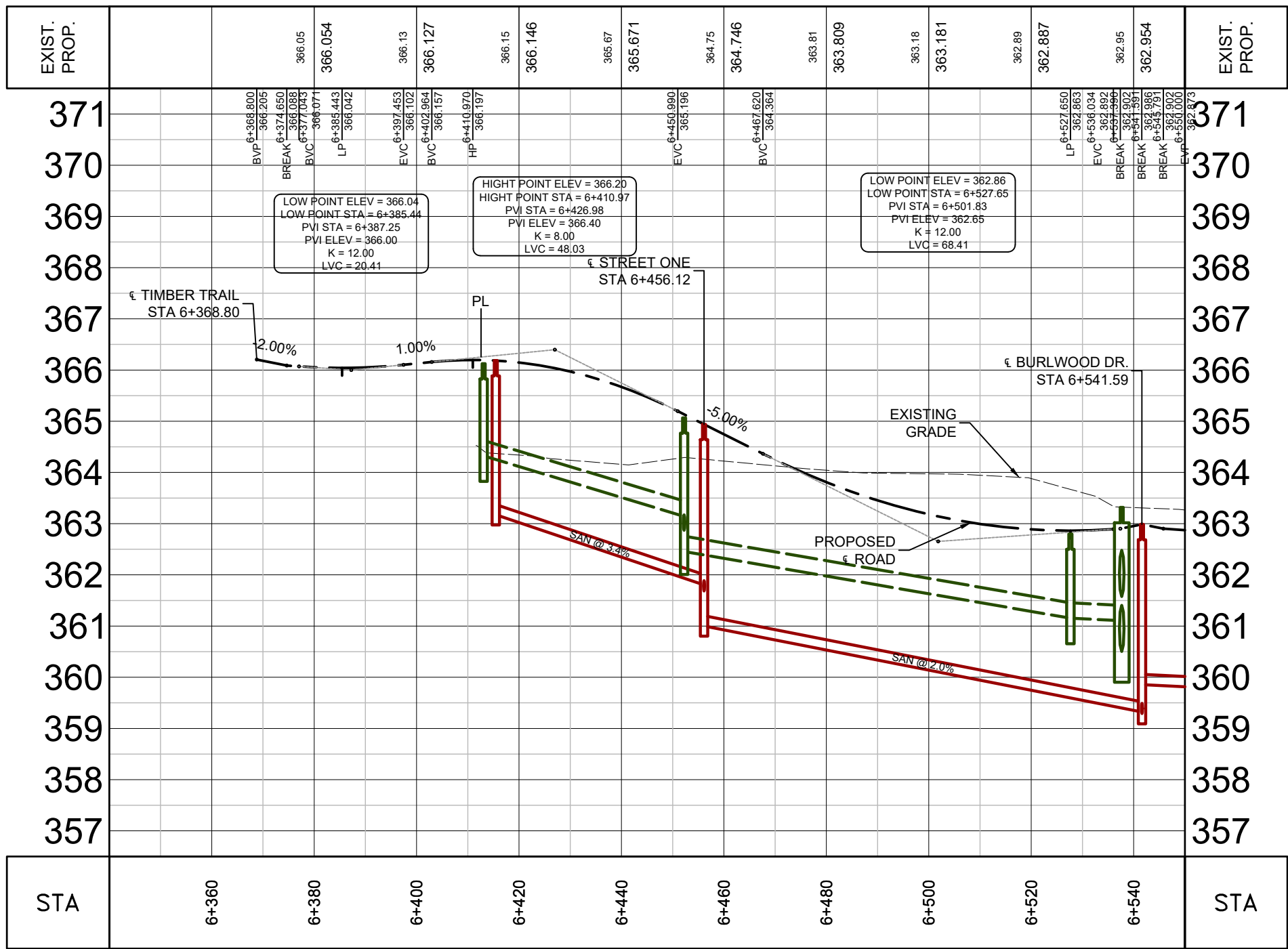
C401

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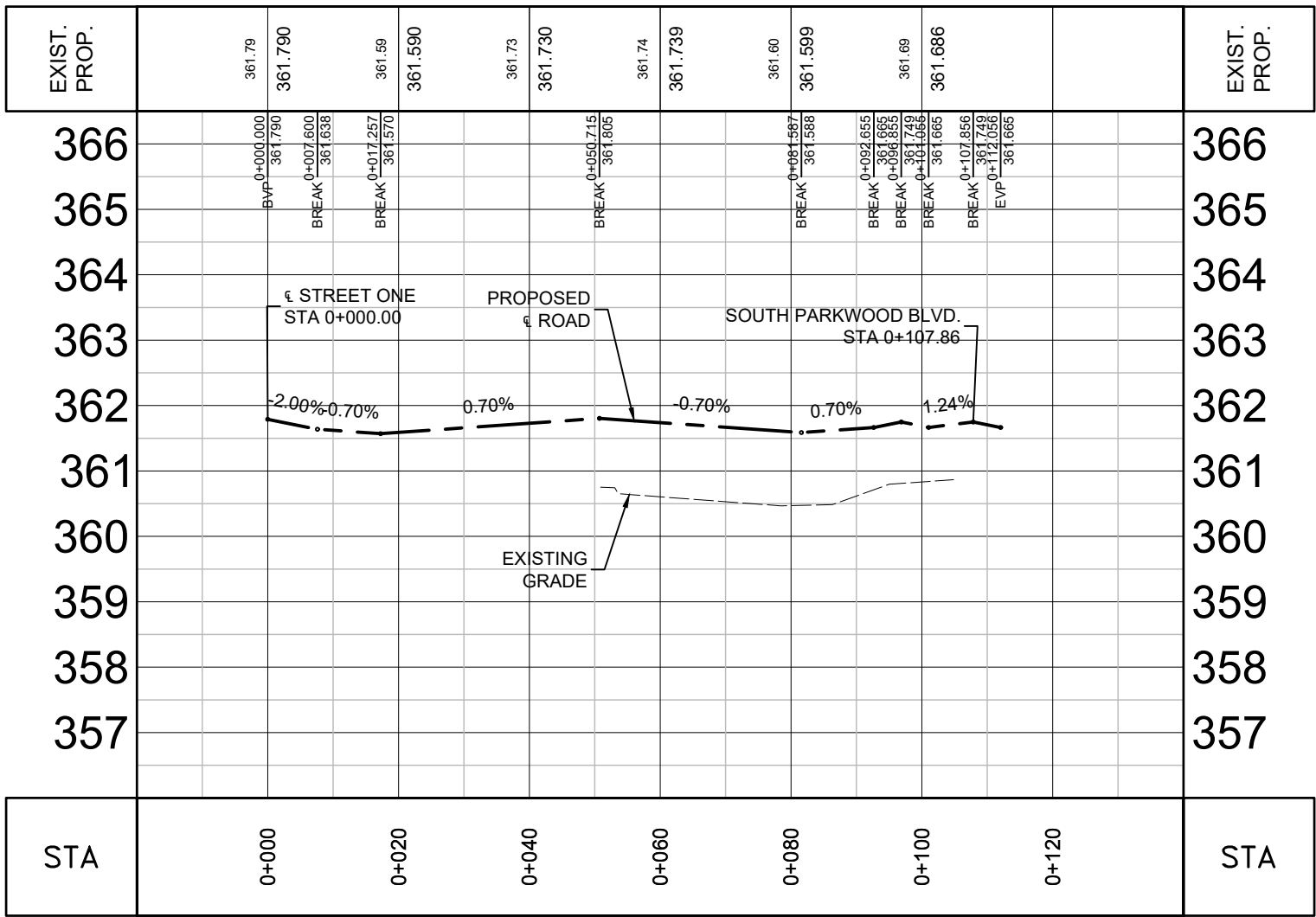
BURLWOOD DR.



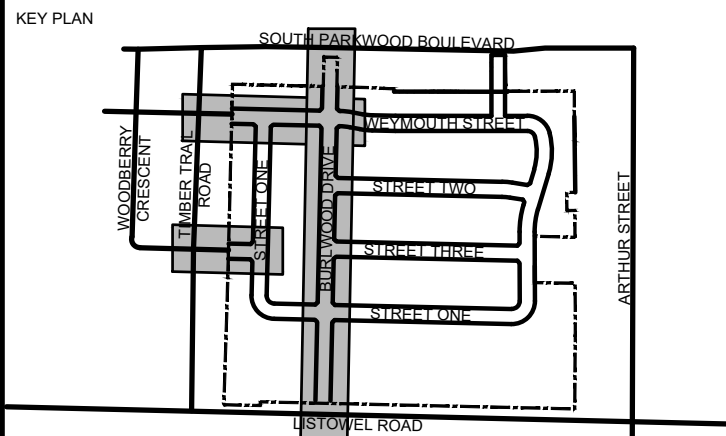
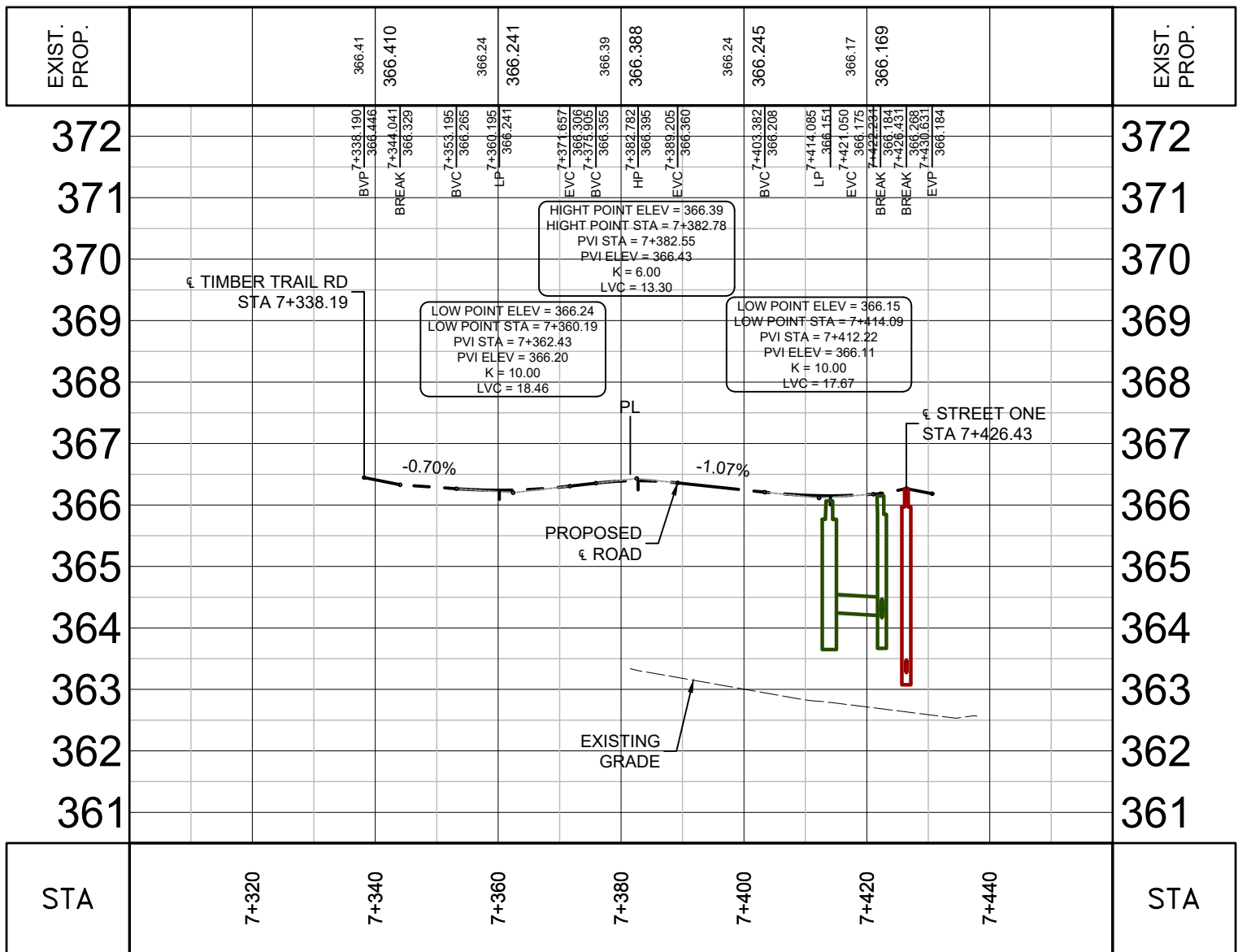
WEYMOUTH ST.



PINTAIL DR.



WOODBERRY CRES.



DATE	ISSUANCE	NO.
2025.06.06	ISSUED FOR DRAFT PLAN APPROVAL	

LEGEND
PROPOSED SANITARY SEWER
PROPOSED STORM SEWER

- NOTE:
- DROP STRUCTURES AND SAFETY GRATES REQUIREMENTS TO BE REVIEWED DURING DETAILED DESIGN.
 - PIPE & STRUCTURE SIZES TO BE REVIEWED DURING DETAILED DESIGN.



CUSTOMER
SCHLEGEL URBAN DEVELOPMENTS

PROJECT
SOUTHWOOD 5

1065 Listowel Rd, Elmira, ON

TITLE
**BURLWOOD DR, WEYMOUTH ST & WOODBERRY CRES
SHEET 3 OF 3**

WALTERFEDY
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SCALE	H1:1000 V1:100	SHEET NO.:
DATE	2025-06-04	C402
PROJECT NO.:	2022-0374-10	
DRAWN BY:	KDB/UBM	
CHECKED BY:	MN/EMW	

- NOTES:
- LEGAL FABRIC PROVIDED BY VAN HARTEN, DATED DECEMBER 2024.
 - BENCHMARKS
SB LOCATED ON NORTH SIDE OF EXISTING BURLWOOD DRIVE RIGHT-OF-WAY.
AT SOUTHWEST CORNER OF MUNICIPAL ADDRESS FOR BURLWOOD DRIVE.
N 482625.60, E 34898.00, ELEV = 365.91
HEADWALL LOCATED SOUTH OF INTERSECTION OF BUR OAK DRIVE, AND SOUTH PARKWOOD BOULEVARD.
N 482387.70, E 348655.04, ELEV = 363.350
 - CONCEPT PLAN PROVIDED BY GSP, DATED APRIL 2025.
 - ENVIRONMENTAL DISPLINES AND TREE SURVEY PROVIDED BY NRSI, 2025.

