
FUNCTIONAL SERVICING REPORT

AXIA GEOCAPITAL LLC

ALLEN SQUARE CONVERSION

Project No.: 2022-0823-10

February 8, 2023

WALTERFEDY

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AXIA GEOCAPITAL LLC

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1.0 INTRODUCTION

WalterFedy was retained by Axio GeoCapital LLC to complete a Functional Servicing Report in support of a Zoning By-Law Amendment for the conversion of an existing office building, known as Allen Square, to a residential building with commercial space on the ground floor. The site is located at 180 King Street South in Waterloo, Ontario. The existing building is currently 7-storeys, and the overall site includes one level of underground parking, as well as an above-grade parking deck. It is proposed that the existing building be expanded to 10-storeys, with the top 9-storeys consisting of residential space. The site will also include rooftop and ground-level amenity space and maintain the parking facilities.

The purpose of this Functional Servicing Report is to identify how the development will be serviced, including water, sanitary, and storm connections to the existing municipal infrastructure. The report will discuss existing servicing conditions surrounding the site to determine how it will accommodate the development. Stormwater management will not be required, as the site imperviousness will remain unchanged in proposed conditions.

1.1 Background

The site is located at the northeastern corner of King Street South and Allen Street East in Waterloo, Ontario, and is approximately 0.44 ha. The site is bound by a 2-storey office building to the north, King Street to the west, Allen Street to the south, and the Waterloo-Kitchener United Mennonite Church to the east. The site is accessed off Allen Street, with this access being maintained in proposed conditions. The northbound LRT runs along King Street directly fronting the site.

The site is currently zoned Uptown Mixed-Use (U2), with a proposal to grant a special provision (U2-30) which would allow for residential use, as well as commercial use.

The proposed building is expected to consist of approximately 14,150 ft² of non-residential floor space on the ground floor, with 131 residential units on the upper floors. The existing overall floor space is approximately 115,170 ft². The proposed addition increases the total floor space to 163,440 ft².

1.2 Reference Reports and Drawings

The following guidance documents were referenced in preparation of this report:

1. *Development Engineering Manual*, City of Waterloo, 2013.
2. *Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS)*, Region of Waterloo and Area Municipalities, February 2022
3. *Design Guidelines for Sewage Works*, Ministry of the Environment, Conservation and Parks, March 2019
4. *Design Guidelines for Drinking Water Systems*, Ministry of the Environment, Conservation and Parks, May 2019
5. *Water Supply for Public Fire Protection – A Guide to Recommended Practise in Canada*, Fire Underwriters Survey, 2020
6. Ontario Building Code (Current)

2.0 EXISTING INFORMATION

2.1 Topography

A topographical survey was completed by WalterFedy in December 2022. The topographic survey was completed in a local coordinate system.

The site consists of the 7-storey office building and associated parking. The entrance for the site is from Allen Street to the east. Concrete patios with some landscaping features surround the occupied office portion of the site, and there is a sidewalk connection to the main entrance off King Street.

The parking deck is raised approximately 1-2 m above the surrounding properties. The parking deck also appears to drain towards the northeastern corner of the site, with approximately 0.5 m of fall from the building towards the northeastern corner. The northern concrete patio sheet flows north towards a swale between the site and the neighbouring property. The site frontage onto King Street drains to area drains behind the planters which are captured by the mechanical drainage system. The southern concrete patio sheet flows to Allen Street. Along the frontage of the site King Street typically drains from south-to-north, and Allen Street drains from west-to-east. These drainage patterns will be maintained in proposed conditions.

Refer to Drawing C1-1 for the existing site conditions.

2.2 Servicing and Utilities

Information regarding the services within and surrounding the site were obtained from the topographical survey by WalterFedy, as well as from available Plan and Profile drawings from the City of Waterloo, and existing building plans.

The building is serviced by a 150-mm-diameter water service from Allen Street, 200-mm-diameter storm service that conveys flows to the municipal sewer on Allen Street, and a 150-mm-diameter sanitary service that conveys flows towards King Street. This sanitary service crosses under the LRT tracks. Based on the available as-constructed plan profile drawings provided by the City of Waterloo, the sanitary service is not indicated to be installed in a sleeve beneath the rail tracks. The slopes of the sanitary and storm services are not known, but are assumed to be minimum 1.0%.

The municipal storm sewer on Allen Street is a 1000-mm-diameter concrete pipe that runs towards the east. Peak flow rates in proposed conditions will remain unchanged from pre-development rates, and the existing service will remain active to service the building.

The municipal watermain on Allen Street is a 150-mm-diameter cast iron watermain. The existing service will continue to provide domestic demand for the building, as well as feed the sprinkler system.

The sanitary sewer on King Street is a 300-mm-diameter PVC pipe and runs north. The service from the building ties directly into a manhole within the middle of the King and Allen intersection.

It is assumed that all municipal infrastructure has adequate capacity to service the proposed development. Other services surrounding the site include hydro, gas, and telecommunications.

3.0 REVIEW AGENCIES

3.1 City of Waterloo

The City of Waterloo will be responsible for the review and approval of the Zoning By-Law Amendment, as well as the eventual Site Plan Application, final Site Servicing, and Grading Plans, if required. At this time, it is assumed that Servicing and Grading Plans will not be required as no external upgrades or improvements are proposed.

3.2 Region of Waterloo

The Region of Waterloo will be responsible for the review and approval of the Zoning By-Law Amendment and Site Plan Application. Any proposed service connections to the municipal services on King Street will also need to be reviewed and approved by the Region.

3.3 Authorities Having Jurisdiction

Local gas, hydro, and communications utilities/providers will be circulated by the City to comment on their nearby plants and capacity to service the proposed development. Final coordination will be completed directly with the commenting agencies during the detailed design phase.

As the operator of the adjacent LRT line, Keolis Grand River will also be circulated for comment.

4.0 SANITARY SERVICING

The City of Waterloo references the 2022 DGSSMS for sanitary demand, which stipulates that a per-capita sanitary flow rate of 275 L/cap/day is to be used for residential developments, peaked using the Harmon Formula. The City of Waterloo's *Development Engineering Manual* stipulates that apartments are to assume a people per unit (ppu) density of 1.76. This results in a design population of 231 people for 131 units.

The DGSSMS also stipulates that sanitary demand for commercial sites is 0.95 L/s/ha in core areas, with a peaking factor of 2.5. The residential and commercial demands are to be coupled with an extraneous flow allowance of 0.25 L/s/ha.

Refer to Table I for the existing sanitary demand for the site. Refer to Table II for the proposed overall sanitary demand for the site.

Table I: Existing Sanitary Demand

Site Area	0.437 ha
Average Daily Flow	0.95 L/s/ha
Peaking Factor (DGSSMS)	2.5
Existing Domestic Flow	1.04 L/s
Extraneous Flow Allowance	0.25 L/s/ha
Total Extraneous Flow	0.11 L/s
Total Sanitary Flow	1.15 L/s

The existing sanitary flow for the site is 1.15 L/s.

Table II: Proposed Sanitary Demand

Site Area	0.437 ha
Residential Average Daily Flow	275 L/cap/day
Proposed Design Population	231
Peaking Factor (Harmon)	4.12
Proposed Domestic Flow	3.03 L/s
Proposed Commercial Flow	1.04 L/s
Total Extraneous Flow	0.11 L/s
Total Sanitary Flow	4.18 L/s

The overall proposed sanitary demand for the site is 4.18 L/s, which is a 3.03 L/s increase from existing conditions. Refer to the sanitary sewer design sheet in Appendix A for detailed calculations. The commercial demand for the site has remained the same to be conservative since the building will still include commercial floor space.

The existing 150-mm-diameter sewer, assumed to be sloped at 1.0%, can service the development based on City Engineering Design Criteria.

The mechanical consultant has indicated that, based on proposed fixture counts and Ontario Building Code requirements, a minimum 200-mm-diameter sanitary service at 1% slope is required for the site. As such, an upsized service connection will be required. Installation timing, means, and methods will need to be coordinated with the City of Waterloo, Region of Waterloo, and Keolis.

5.0 WATER SERVICING

5.1 Design Criteria

The DGSSMS require that watermain distribution systems be able to convey the larger of maximum daily demand and fire flow or the peak hourly demand. Additionally, it is recommended that the average daily flow from any development be conveyed with a resulting pressure within the range of 350 kPa (50 psi) to 550 kPa (80 psi).

The Region also stipulates that the minimum resultant pressure under any non-fire demand scenario shall not be less than 275 kPa (40 psi). With the inclusion of fire flows, the minimum residual pressure in the distribution system shall not be less than 140 kPa (20 psi) and shall not cause velocities in the system, at any point, to be greater than 5 m/s. If static pressure in the system exceeds 550 kPa (80 psi), the Region requires the use of individual pressure-reducing valves for new developments and interior renovations.

5.2 Domestic Water Demand

Calculations of the water demand for the proposed development have been determined using the guidelines outlined within the DGSSMS and the Ministry of the Environment, Conservation and Parks (MECP) *Design Guidelines for Drinking-Water Systems*.

In accordance with DGSSMS, the average residential demand for the proposed development was estimated using a per-capita demand of 225 L/day. The same design population of 231 people used in the sanitary design calculations was also used for the residential domestic water demand calculations.

To convert the average daily demands into maximum daily and peak hourly flows, a peaking factor was applied. The peak factor was in accordance with Table 3-3 of the MECP Drinking Water Guidelines, resulting in a peak factor of 3.6 for maximum daily demand and a peak factor of 5.4 for peak hourly demand for a population of approximately 300 people.

According to the MECP, commercial sites generate an average domestic water demand of 28 m³/ha/day. Assuming a 12-hour operational period, this demand increases to 56 m³/ha/day. Commercial sites do not typically generate large maximum day to average day ratios, so a peaking factor of 1.5 was used for the maximum day demand, and a peaking factor of 2.5 was used for the peak hour demand.

Table III summarizes the existing water demand for the site, and Table IV summarizes the expected water demand for the proposed development.

Table III: Existing Domestic Water Demand

Site Area	0.437 ha
Average Daily Demand	56 m ³ /ha/day
Max Day Peak Factor	1.5
Max Hour Peak Factor	2.5
Existing Max Day Demand	0.42 L/s
Existing Max Hour Demand	0.71 L/s

The site has an existing maximum day domestic demand of 0.42 L/s and an existing maximum hour demand of 0.71 L/s.

Table IV: Proposed Domestic Water Demand

Proposed Residential Design Population	231
Average Daily Demand	225 L/cap/day
Max Day Peak Factor (MECP)	3.6
Max Hour Peak Factor (MECP)	5.4
Existing Max Day Demand	2.17 L/s
Existing Max Hour Demand	3.25 L/s

The expected maximum day demand for the residential portion of the proposed development is 2.17 L/s. The expected maximum hour demand is 3.25 L/s. Including the commercial space for the site, in order to be conservative, the overall maximum day demand is 2.59 L/s, and the maximum hour demand is 3.96 L/s.

5.3 Fire Flow Demand

In addition to the daily demand from the proposed development, fire flow demand calculations are required to assess the adequacy of any proposed watermain system. The fire flow requirements are 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. To facilitate calculations, it is necessary to determine whether the building is to be protected by a sprinkler system, as the resulting requirement for fire flow is calculated differently for buildings with or without sprinkler systems. Based on the Building Code Analysis, it is noted that the building will be required to be fitted with a sprinkler system. Additionally, visual inspections of the existing building confirm that the building is currently fitted with a sprinkler system. As such, the fire flow for the site will need to be designed per NFPA 13 *Standard for Installation of Sprinkler Systems* (2013), which stipulates the criteria used for determining fire flow for buildings with sprinklers.

The proposed fire demand for the site is summarized in Table V. Detailed fire flow demand calculations are presented in Appendix B.

Table V: Fire Flow Demand

Type of Construction	Non-Combustible Construction (C=0.8)
Effective Floor Space	8919 m ²
Occupancy Charge	Limited-Combustible Contents (-15%)
Automated Sprinkler Protection	Yes
Designed to NFPA 13 Standard	Yes (-30%)
Standard Water Supply to Sprinklers and Standpipes	Yes (-10%)
Fully Supervised System	Yes (-10%)
Exposure Charges	Surrounding Buildings (+15%)
Fire Flow Demand	150 L/s (2378 usgpm)

The maximum fire demand for the site is 150 L/s. Using the same criteria for the existing building, the previous fire demand for the site was 133 L/s. The slight increase in fire demand is not expected to cause any capacity constraints within the municipal watermain.

5.4 Service Design

The water service shall be sized to convey the combination of the Maximum Day Demand and the Fire Demand, within the pressure and velocity ranges as specified. For the proposed development, this combined flow rate is 152.59 L/s, which is an increase of 19.17 L/s.

A hydrant flow test was completed by Vipond Inc. in December 2022. This test concluded that, at a pressure of 20 psi, there is 4850 usgpm (306 L/s) of flow available within the municipal system.

The existing water service will continue servicing the site. Booster pumps may be required for water to reach the upper floors of the building. Existing hydrants on King Street will continue providing fire protection for the site.

6.0 STORM SERVICING AND STORMWATER MANAGEMENT

The imperviousness of the site in proposed conditions, as well as the general site layout, remains unchanged from existing conditions. Therefore, no stormwater management quantity or quality is required for the site. The existing storm service for the site will continue conveying stormwater to the municipal sewer on Allen Street. Existing drainage patterns will also be maintained.

7.0 SITE GRADING

The grading of the site will respect the existing grades along all property lines, with the existing driveway off Allen Street being maintained. The site will be graded to comply with City of Waterloo and Region of Waterloo standards, as well as the Accessibility for Ontarians with Disabilities Act (AODA).

Existing major overland flow patterns will remain. The only grading work for the site will be the redesigned concrete patios surrounding the building. The existing drainage patterns will be maintained, with the northern and southern sides of the building sheet flowing off site, and the part of the site fronting King Street will drain to area drains, which drain mechanically.

8.0 EROSION AND SEDIMENT CONTROL

Any sediment tracked onto the roadway during the course of construction will be cleaned by the Contractor. To help minimize the amount of mud being tracked onto the roadway, a mud mat will be installed at the primary construction access. Additionally, silt fence will be installed around most of the site to eliminate any sediment from leaving the site and will remain in place and be maintained until landscaping has been completed and soil has been vegetated. Silt fence will also be installed around any stockpiles on site, with the stockpiles kept a minimum 2.5 m from the property boundary.

Silt sacs in catchbasins will be installed to prevent silt or sediment-laden water from entering inlets. This includes catchbasins within the site, as well as within the municipal right-of-way. These will be inspected to ensure that they have been properly installed and function as designed throughout construction.

The controls will be maintained, and accumulated sediments removed once their capture capacity has been decreased by one third. It is proposed that, during construction activities, visual monitoring will be conducted bi-weekly and within 24 hours of any rainfall event of 25 mm or greater. During the construction period,

monitoring will consist of visual observation for the effectiveness of the sediment and erosion controls and sediment migration off site. Construction inspections will be conducted until such time as the construction activities are complete, the site has been stabilized and all vegetation has achieved a minimum 70% density.

Given the retrofit nature of the project and the limited disturbed area planned, minimal erosion and sedimentation controls will be required.

9.0 CONCLUSIONS

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

- The mechanical consultant has stated that a minimum 200-mm-diameter sanitary service is required to meet Ontario Building Code. Coordination of timing, means, and method of the service upsizing will be coordinated with the City, Region, and Keolis during the detailed design phase of the project.
- The existing 150-mm-diameter water service will continue to provide domestic water and fire protection for the site. The hydrants on King Street will also continue to provide fire protection for the site.
- The existing storm service for the site will continue conveying flows to the municipal sewer on Allen Street. No stormwater quantity or quality control is required.
- Existing drainage patterns and major overland flow routes will be maintained.
- Minimal sediment and erosion controls are anticipated on site given the retrofit nature of the project.

All of which is respectfully submitted,

WALTERFEDY



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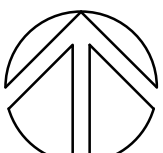
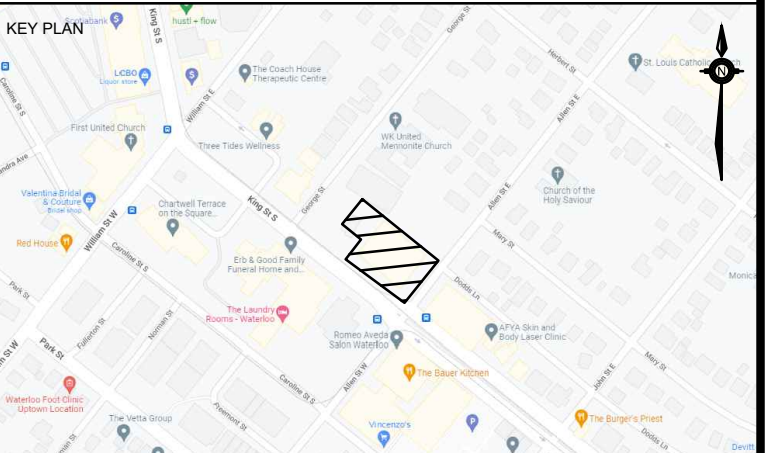
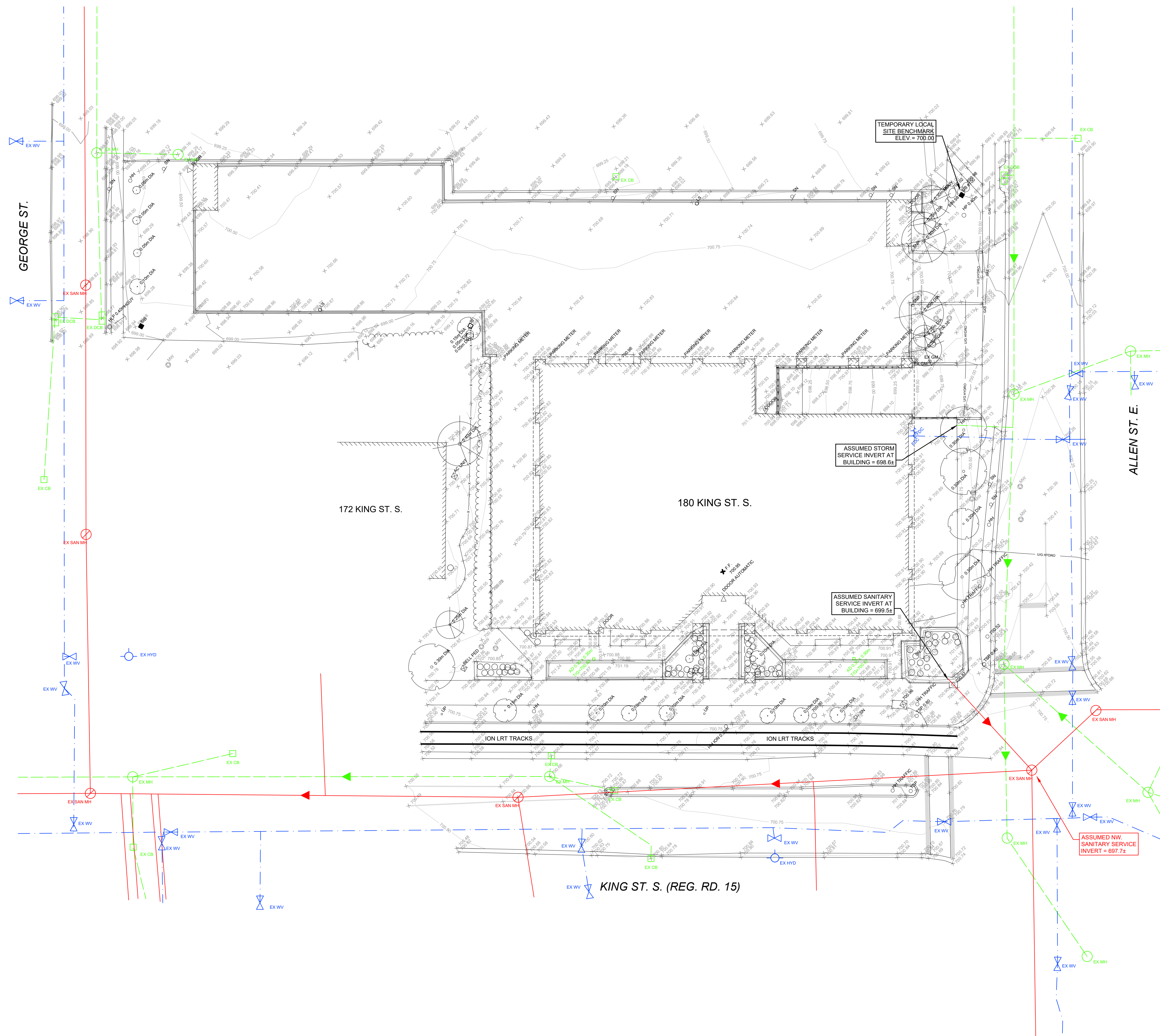


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DRAWINGS

	PROPERTY LINE
	LOT LINE
	LEGAL EASEMENT
	BUILDING SETBACK
	EXISTING BUILDING
	IRON BAR
	STANDARD IRON BAR
	CUT CROSS
	EXISTING LAMP STANDARD
	EXISTING UTILITY POLE
	EXISTING HYDRO POLE
	EXISTING GUY WIRE
	EXISTING SIGN
	EXISTING BELL PEDESTAL
	EXISTING CTV PEDESTAL
	EXISTING HYDRO TRANSFORMER
	EXISTING GAS VALVE
	EXISTING CATCHBASIN
	EXISTING DOUBLE CATCHBASIN
	EXISTING STORM MANHOLE
	EXISTING SANITARY MANHOLE
	EXISTING FIRE HYDRANT
	EXISTING WATERMAIN VALVE
	EXISTING FIRE DEPARTMENT CONNECTION
	EXISTING MONITORING WELL LOCATION
	EXISTING SPOT ELEVATION
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	EXISTING DECIDUOUS TREE
	EXISTING CONIFEROUS TREE
	EXISTING SHRUB
	EXISTING TREE DRIPLINE AND/OR VEGETATION LINE
	EXISTING SANITARY SERVICE
	EXISTING STORM SERVICE
	EXISTING WATERMAIN
	EXISTING GASMAIN
	EXISTING UNDERGROUND HYDRO LINE
	EXISTING ASPHALT
	EXISTING CONCRETE
	EXISTING CURB



PROJECT NORTH



TRUE NORTH

DATE	ISSUANCE	NO.
2023.02.08	ISSUED FOR OPA/ZBA	1

SOURCE:

SURVEY COMPLETED DECEMBER 19, 2022 BY WALTER FEDY.
SURVEY IS IN LOCAL COORDINATE SYSTEM AND VERTICAL DATUM.
NORTH AS SHOWN IS APPROXIMATE. SET AROUND POINT #100
(SIB), ASSUMED TO HAVE COORDINATES OF N: 5000, E: 3000, &
ELEVATION: 700.00m.

CLIENT

AXIA GEOCAPITAL LLC

PROJECT

ALLEN SQUARE

180 KING ST. S., WATERLOO, ON

TITLE

EXISTING CONDITIONS

WALTER FEDY

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SCALE: 1:250	SHEET NO.: C1-1
DATE: 2023-01-20	
PROJECT NO.: 2022-0823-10	
DRAWN BY: JJ	
CHECKED BY: JZ	

C1-1

APPENDIX A

Sanitary Design Calculations

Project:	180 King Street South - Allen Square			Design Data				SANITARY SEWER DESIGN CALCULATIONS																		
Project No:	2022-0823-10																									
Date:	2023-01-19																									
Designed By:	JJZ Checked By:																									
				Min. Velocity	0.8	m/s		Residential			Commercial			Industrial			Institutional									
				Max. Velocity	3.0	m/s		Peaking Factor		Harmon		Peaking Factor		2.5		Peaking Factor		1		Peaking Factor		1				
				Manning's 'n'	0.013			Avg. Daily Flow		275 L/c/d		Avg. Daily Flow		0.95 L/s/ha		Avg. Daily Flow		0 L/s/ha		Avg. Daily Flow		0 L/s/ha				
				Infiltration	0.25	l/s/ha																				
Pipe Data				Residential				Cumulative			Commercial		Industrial		Institutional		Infiltration		Total Flow	Design Data						
From		To	Length	Area	Units	Density	Population	Area	Population	Peak Factor	Area	Total Area	Area	Total Area	Area	Total Area	Area	Total Area	Area	Diameter	Slope	Q _{FULL}	V _{FULL}			
			(m)	(ha)		(ppu)	(people)	(ha)	(people)		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(mm)	(%)	(L/s)	(m/s)			
	Building	King St		0.437	131	1.76	231	0.437	231	4.12	0.44	0.44	0.00	0.00	0.00	0.00	0.44	0.44	4.180	150	1.00	15.23	0.86			
	Existing	King St		0.437			0		0	0.00	0.44	0.44	0.00	0.00	0.00	0.00	0.44	0.44	1.147	150	1.00	15.23	0.86			

APPENDIX B

**Water Design Criteria
Fire Demand Calculations (FUS 2020)
Hydrant Flow Test**

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Project	Allen Square
Project #	2022-0823-10
Designer	TK
Address	180 King Street South, Waterloo, ON
Description	Overall Domestic Flows

Description	Site Area (ha)	Units	People/unit	Population	Operating Hours	Demand	Max Daily Peak Factor	Max Hourly Peak Factor	Max Daily Demand (L/s)	Max Hourly Demand (L/s)
Residential	0.437	131	1.76	231	-	225 L/cap/day	3.60	5.40	2.17	3.25
Overall Residential Demand									2.17	3.25

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2019 DRAFT)

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Project Allen Square
 Project # 2022-0823-10
 Designer TK
 Address 180 King Street South, Waterloo, ON
 Description Existing Building

$$F = 220 \times C \times \sqrt{A}$$

F = Required fire flow (LPM)

C = Coefficient related to type of construction

A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)

Type of Construction Non-Combustible Construction C = 0.8
 Description Unprotected Metal Structural Components, Masonry or Metal Walls. All Structural Members are Non-Combustible but does not qualify as Fire-Resistive

Total Floor Area 10700 m²
 # Storeys 7
 Fire Resistant Building? NO
 Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? NO
 Area 6885 m²
 Description Area of two largest floors + 50% of each of the floors above it
 Required Fire Flow 15000 L/min

Occupancy Charge Limited-Combustible Contents
 Fire Flow Reduction -15% OR -2250 L/min
 Required Fire Flow 12750 L/min

Automated Sprinkler Protection YES
 Designed to NFPA 13 Standard YES -30%
 Standard Water Supply to Sprinklers and Standpipes YES -10%
 Fully Supervised System YES -10%
 Fire Flow Adjustment -6375 L/min

Exposure 1 (East) Distance 33 m Charge 0%
 Description Existing Residential

Exposure 2 (South) Distance 31 m Charge 0%
 Description 188 King St S

Exposure 3 (North) Distance 10.5 m Charge 15%
 Description 172 King St S

Exposure 4 (West) Distance 35 m Charge 0%
 Description 185 King St S

Total Exposure Charge 15%
 Fire Flow Adjustment 1912.5 L/min

Total Required Fire Flow 8000 L/min
 Total Required Fire Flow 2113 U.S. GPM
 Total Required Fire Flow 133 L/s

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2019 DRAFT)

WALTERFEDY

Project Allen Square
 Project # 2022-0823-10
 Designer TK
 Address 180 King Street South, Waterloo, ON
 Description Existing Building

$$F = 220 \times C \times \sqrt{A}$$

F = Required fire flow (LPM)

C = Coefficient related to type of construction

A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)

Type of Construction Non-Combustible Construction C = 0.8
 Description Unprotected Metal Structural Components, Masonry or Metal Walls. All Structural Members are Non-Combustible but does not qualify as Fire-Resistive

Total Floor Area 15190 m²
 # Storeys 10
 Fire Resistant Building? NO
 Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? NO

Area 8919 m²
 Description Area of two largest floors + 50% of each of the floors above it
 Floor 1-8 = 1530, Floor 9 = 1378, Floor 10 = 1160
 Required Fire Flow 17000 L/min

Occupancy Charge Limited-Combustible Contents
 Fire Flow Reduction -15% OR -2550 L/min
 Required Fire Flow 14450 L/min

Automated Sprinkler Protection YES
 Designed to NFPA 13 Standard YES -30%
 Standard Water Supply to Sprinklers and Standpipes YES -10%
 Fully Supervised System YES -10%
 Fire Flow Adjustment -7225 L/min

Exposure 1 (East) Distance 33 m Charge 0%
 Description Existing Residential

Exposure 2 (South) Distance 31 m Charge 0%
 Description 188 King St S

Exposure 3 (North) Distance 10.5 m Charge 15%
 Description 172 King St S

Exposure 4 (West) Distance 35 m Charge 0%
 Description 185 King St S

Total Exposure Charge 15%
 Fire Flow Adjustment 2167.5 L/min

Total Required Fire Flow 9000 L/min
 Total Required Fire Flow 2378 U.S. GPM
 Total Required Fire Flow 150 L/s

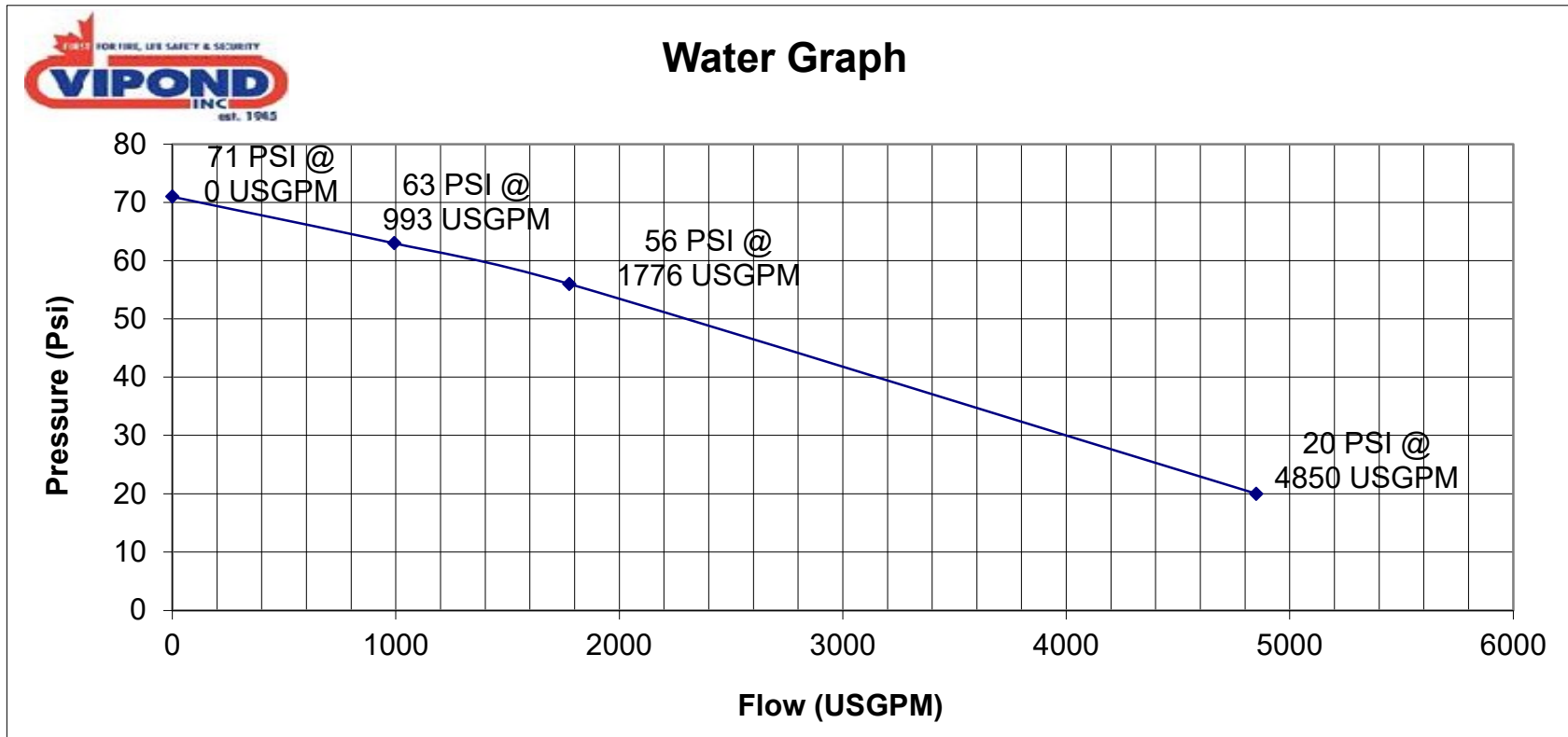
Hydrant Flow Test - 180 KING STREET SOUTH, WATERLOO

STATIC HYDRANT -ON KING STREET CORNER WITH ALLEN ST -FLOW HYDRANT-ON KING STREET ACROSS FROM 180 KING ST.SOUTH

Static Pressure (Psi)	
	71
Residual Pressure 1 (Psi)	
	63
Residual Pressure 2 (Psi)	
	56
Residual Pressure 3 (Psi)	
	20
Co efficient value	
	0.9

Pitot Reading 1	35
Outlet Size 1	2.5
Pitot Reading 2	28
Outlet Size 2	2.5
Pitot Reading 3	
Outlet Size 3	
Flow 1 Calculated	
	992.68
Flow 2 Calculated	
	1775.76
Flow 3 Calculated	
	4850.00

# of Outlets Flowed 1	1
# of Outlets Flowed 2	2
# of Outlets Flowed 3	0
Graph Data: DECEMBER 1, 2022	
Pressure Values (y-axis)	Flow Values (x-axis)
71	0
63	993
56	1776
20	4850
Time of Test :	
DEC.1/2022	11:00 AM
Performed by:	J.D. & J.S.



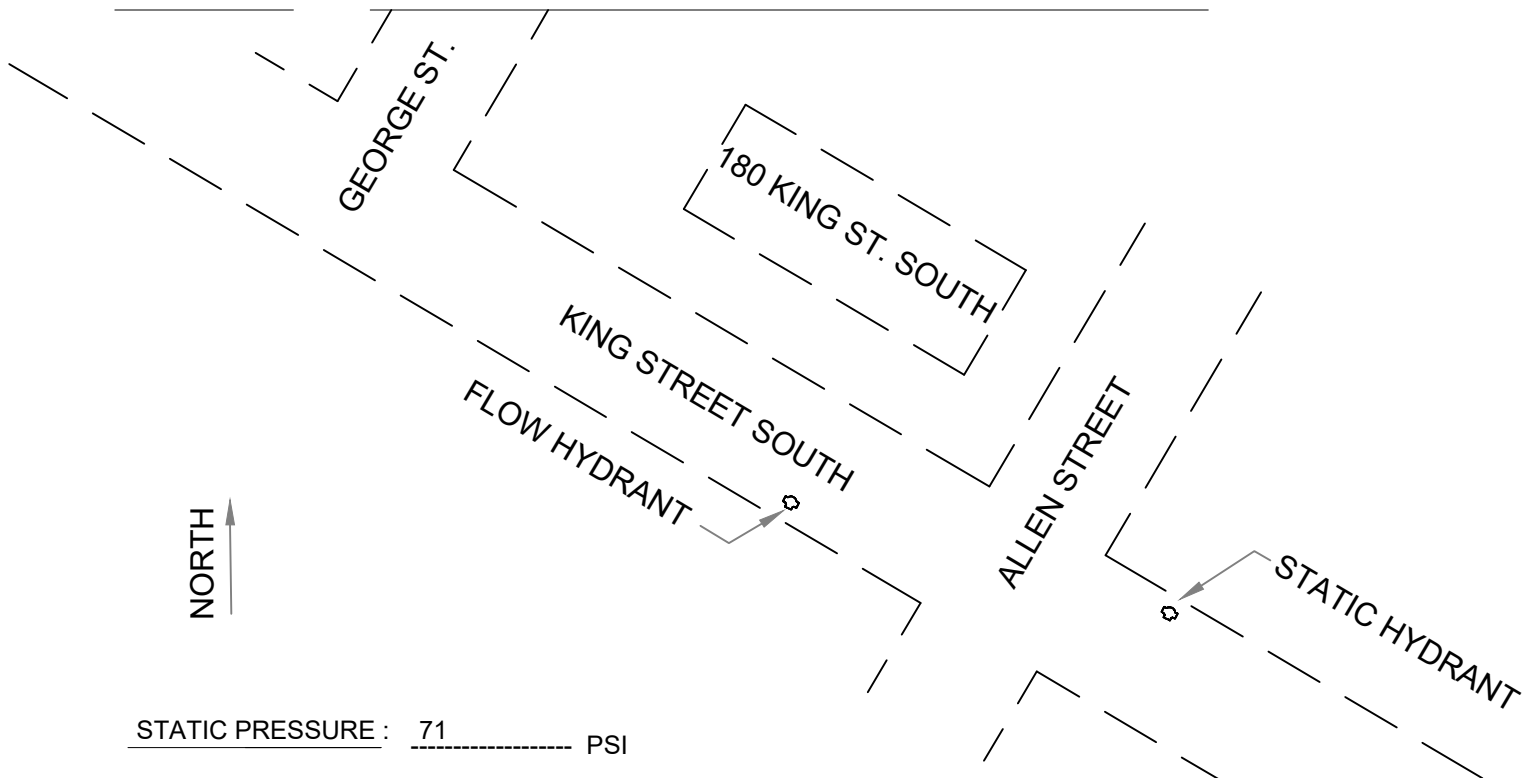


FLOW TEST RESULTS

DATE : 1 DEC. 2022 TIME : 11:00 AM

LOCATION : 180 KING STREET SOUTH
WATERLOO, ONTARIO

TEST BY : VIPOND AND PUC WATERLOO



STATIC PRESSURE : 71 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	2-1/2"	0.9	63	35	993
2	2	2-1/2"	0.9	56	28	1776
				20		4850