FUNCTIONAL SERVICING REPORT

ROYAL GEORGE
THEATRE RE-DEVELOPMENT

79-83 Queen Street
Niagara-on-The-Lake, Ontario

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1.0 Introduction

This functional servicing report (FSR) serves to demonstrate how servicing of the subject development will be appropriately achieved and provides design support for the drawings submitted for zoning amendment and site plan approval. This FSR addresses the following key aspects of municipal servicing design:

- Water Supply and Distribution
- Sanitary Sewerage
- Drainage and Stormwater Management
- Surface Works
- Utility Servicing
- Servicing Locations

2.0 Background

The Royal George theatre campus of the Shaw Festival Theatre is currently located at 79-83 Queen Street in Niagara-on-The-Lake. Additional property located at 178 & 188 Victoria Street has been acquired to facilitate the proposed facility. It is noted that older drawings indicate multiple parcels that are now consolidated under the single parcel with the address 83 Queen Street. The development proposal entails the re-development of The Royal George theatre (theatre and box office) and two residential dwellings (178-188 Victoria Street) with a three (3) storey theatre facility with loading area access on Victoria Street. The property is approximately 0.285 ha in area.

Adjacent land uses include commercial (restaurant and retail) immediately adjacent to the east and west as well as south across Queen Street, and single family residential west across Victoria Street and along the north limit of the site. Street parking spaces are located along both Queen Street and Victoria Street.

The subject property currently has ±23m of frontage along Queen Street, and ±44m of frontage on Victoria Street. Queen Street is a busy central business district collector road. Victoria Street is a local road. Both roads are under the jurisdiction of the Town of Niagara-on-the-Lake.

A proposed site servicing and grading drawing (SSG-1) is attached to this report. It is based on the currently proposed site plan prepared for by the project architects, Unity Design Studio Inc. Figure 2.1 is a key plan showing the subject property location and the site and surrounding environs, with Niagara Navigator aerial imagery from 2020.

Figure 2.1: Subject Lands Aerial View
(Source: Niagara Navigator)

3.0 Water Supply and Distribution

3.1 Existing Conditions

Based on the 'as-constructed' issue of Dwg. 11-010-PP3 (Kerry T. Howe Ltd.) provided by Town of Niagara-on-The-Lake engineering staff, a 150mm diameter City watermain along the Victoria Street frontage, newly constructed in 2012, replaced a 100mm diameter cast iron watermain that is now abandoned. 'As constructed' Dwg. A1-89987-P2 (Proctor & Redfern Limited) shows a 250mm diameter PVC watermain constructed in 1991 along the Queen Street frontage of the site.

As the subject site is comprised of several property parcels, there are multiple existing water services supplied to it. Town service location cards and the 'as-constructed' issue of Dwg. 11-010 shows one 19mm diameter water service to each of 178 and 188 Victoria Street from the new main on Victoria Street. Service location cards for 79 (main theatre) and 83 Queen Street (box office) show existing 19mm and 38mm diameter water services respectively,.

There are 2 existing fire hydrants in very close proximity to the subject site. One is located in front of 164 Victoria Street, essentially at the north-west corner of the site, and only 25 metres from the face of the building. The 2nd hydrant is on the south-west corner of the Queen and Victoria Street intersection, approximately 66 metres from the principal entrance of the proposed building.

All of this existing infrastructure is shown on Quartek Dwg. 22183-SSG-1, Rev. D, attached hereto.

3.2 Proposed Works

All of the existing water services to the various former parcels comprising the consolidated site are much too small to address domestic or fire fighting water demands. It is proposed to cut, cap and abandon all existing services. As it will be very disruptive and costly to connect to the existing watermain in the Queen Street travelled roadway and as the mechanical room is proposed to be along the Victoria Street building face, it is proposed to connect a new 150mm diameter PVC service to the 150mm diameter PVC watermain that runs along the west boulevard of Victoria Street. The preferred location, with respect to the proposed building, is near the north-west corner of the building, where there will be mechanical room space available for metering and associated piping. The 100mm diameter domestic water supply will branch off the fire line inside the building and after the meter, with appropriate double check-valve backflow protection.

It is understood that the new building complex will be sprinklered and have a free-standing fire department connection near the west face of the building adjacent to the loading area and 32 metres from the existing fire hydrant at the north-west corner of the site. This location is shown on Dwg. 22183-SSG-1 attached.

Given the proximity of two (2) existing fire hydrants very near the proposed development site and building, it is not proposed to provide any additional fire hydrants.

Existing and proposed water supply and distribution plant is shown on the attached Site Servicing and Grading Drawing 22183-SSG-1 Rev. D.

3.3 Design Analysis

Design criteria and calculation for water demand is shown in Table 3.1. Peak hour potable design demand for the building is calculated at ±1.8 L/s.

Based on the building volume and the fact that the building will be sprinklered, the maximum fire demand under the Fire Underwriters Survey (FUS) methodology will be 128.5 L/s. Detailed FUS fire flow calculations are provided in Appendix C.

Accordingly, the estimated water demands are as follows:

Maximum Day + Fire - ***129.7 L/s*** *(128.5 L/s + 1.2 L/s)*
Peak Hour - ***1.8 L/s***

Table 3.1 Water Demand Criteria

POTABLE WATER DEMAND ANALYSIS							
Royal Goerge Theatre Niagara-on-the-Lake							22-JUL-2025
					POTABLE DEMAND		
Building	**Suites/Units**	**Population**	**Patrons / Seats**	**Demand Criteria**	**Avg. Daily Demand** **m^3**	**Max. Day Demand [1]** **L/s**	**Peak Hour Demand [1]** **L/s**
Audience		370		36 L/day/ capita	13.3	0.56	0.83
Staff / Performers		200		75 L/day/ capita	15.0	0.63	0.94
					0.0	0.00	0.00
					0.0	0.00	0.00
SUM LINE	0	570	0	0	**28.3**	**1.2**	**1.8**
Note [1]: Peaking Factors:	3.6	Max Day Peaking Factor (MOECC Design Guideline DWS Table 3-3)					
	5.4	Peak Hour Peaking Factor (MOECC Design Guideline DWS Table 3-3)					

Given a distance of 22 metres from the municipal watermain to the building face, and assumed pipe sizes of 150mm diameter for the fire service and 100mm diameter for the domestic water take-off, velocity head loss between the main and the building is estimated to be approximately 0.2 kPa (0.3 psi) for peak hour domestic flows and 70.5 kPa (10.2 psi) in the maximum day plus fire condition. This degree of pressure loss is acceptable. Table 3.2 demonstrates the anticipated head loss under 'maximum day flow + fire flow" delivered through a 150mm Ø water service.

Table 3.2 Fire Flow Pressure Loss Calculation

Hazen-Williams Equation					
	2056	USGPM			
	7782	L/min	**Date Created:**		
Q =	0.1297	m^3/s			
			Colour Coding	Modifiable value	
D =	0.15	m (inner diameter)		Driven Value	
L =	22	m (length)			
C =	125	(H-W's frictional coefficient)	0.72	bar (headloss)	1 bar = 100 kPa
P_d or h_f =	7.19	m (headloss due to friction)	$P_d = 6.05\ q^{1.85} / (c^{1.85}\ d_h^{4.8655}) \times 10^5$		
	70.50	kpa (headloss due to friction)	*where*		
	10.23	psi (headloss due to friction)	P_d = pressure drop (bars/m pipe)		
S =	32.66%	equilibrating slope	*c = design coefficient determined for the type of pipe or tube*		
V =	7.34	m/s	*the higher the factor, the smoother the pipe or tube*		
			q = flow rate (liter per minute)		
			d_h = inside hydraulic diameter (mm)		

Based on the hydrant flow test performed on JULY 25th, 2025, at Royal George Theatre, the water distribution system is capable of supplying up to 3,143 GPM (198 L/s) at 20 psi residual pressure. The hydrant flow test report is included in Appendix C.

The anticipated fire flow demand for the development is 129.7 L/s (2,056 USGPM). At this demand, the system pressure is interpolated to be approximately 49.2 psi.

Accounting for a calculated head loss of 15.6 psi within the building's private water service piping, the adjusted available system pressure would be approximately 34 psi at 2,056 GPM, which exceeds the minimum 20 psi residual pressure required for firefighting purposes as per NFPA, Regional and municipal standards.

Therefore, the municipal water supply is deemed adequate to support the proposed fire flow demand.

4.0 Sanitary Sewerage

4.1 Existing Conditions

Infrastructure drawings provided by Town of Niagara-on-The-Lake engineering staff indicate an existing 375mm diameter Town sanitary sewer along the Queen Street frontage, constructed in 1991, and an existing 200mm diameter sanitary sewer running northerly along the centreline of Victoria Street fronting the subject site.

In addition, a 200mm diameter sanitary sewage forcemain under the jurisdiction of the Niagara Region runs along the northbound lane of Victoria Street in front of the subject site. This is not available for connection and must be protected from service interruption.

According to Town of Niagara-on-the-Lake records, the existing theatre building, associated box office building and 2 existing residences on Victoria Street are currently served by 4 individual 125mm Ø sanitary services. All existing services to the subject property will be removed and capped at their respective mainlines on Queen and Victoria Streets.

Given the deemed need for a sanitary service of minimum 150mm diameter and the desire for a service alignment leading to the proposed mechanical room location along the west face of the building near the proposed loading driveway, it is proposed that one new connection will be made to the existing 200mm diameter sanitary sewer in the travelled portion of Victoria Street and that a 150mm diameter DR-35 PVC sanitary lateral will be extended by open cut to the west building face at a location as indicated on attached Site Servicing and Grading Drawing 22183-SSG-1 Rev. D.

Given the 'as-constructed' information regarding the depth of the existing sewer main on Victoria Street, and the conceptual building design, it is assumed that there is not adequate depth to facilitate gravity service from the basement level of the proposed facility. Accordingly, it is anticipated that a sanitary sewage pit and grinder pump will be required in order to service the building. This will be designed and specified by mechanical designers at the time of building permit submission.

4.2 Proposed Works

The anticipated equivalent design population for the proposed development is estimated as follows:

Audience – 370 @ 36 L/day/person = 13,320 L/day
Performers and staff – 200 @ 75 L/day/person = 15,000
Total Average Design Flow = 28,320 L/day
Average daily domestic flow = 380 Lpcd
Equivalent Residential Population = 28,320 / 380 L/day = 75

Based on Town of Niagara-on-the-Lake criteria, total peak sanitary sewer flow is calculated as follows:

$Q_T = Q_p + Q_i$,
where Q_p = peak domestic sewage flow (L/s)
Q_i = peak infiltration (L/s)

$Q_p = P \cdot Q_{avg} \cdot M$ / 86,400 s/day
where P = equivalent population
M = Harmon peaking factor = $1 + 14/(4 + (P/1000)^{0.5})$, [2.0 min., 4.0 max.]
$= 1 + 14/(4 + 0.075^{0.5}) = 4.28$

Thus, $Q_p = 28{,}320 \cdot 4.28 / 86{,}400 =$ ***1.40*** **L/s**

$Q_i = A \cdot I$
where A = site area – 0.285 (ha)
I = infiltration allowance = 0.18 L/ha/s

Thus, $Q_i = 0.285 \cdot 0.18 =$ **0.05 L/s** *and*
Q_T = 1.40 + 0.18 = 1.58 L/s

The proposed 150 mm diameter sanitary lateral at a 2.0% slope provides a flow capacity of 18.68 L/s, which is significantly greater than the anticipated peak design flow of 1.58 L/s. The existing 200 mm diameter sanitary main along Victoria Street has a slope of 0.60% and a calculated capacity of 25.00 L/s. The proposed development's total peak flow will utilize approximately 6% of the existing sewer's capacity, indicating that there is sufficient capacity to support the development.

Existing and proposed sanitary sewage servicing plan is shown on the attached Site Servicing and Grading Drawing 222183-SSG-1 Rev. D.

5.0 Drainage and Stormwater Management

5.1 Existing Conditions

The existing properties comprising the subject site are generally very flat and level. Surface runoff is generally contained on site, likely with a substantial component of the landscaped area draining to a pond behind the existing theatre on the property of 178 Victoria Street, and

infiltrating into the soil. Roof areas and foundation drains for the 4 properties drain to existing municipal storm sewers through the following storm sewer laterals, according to municipal records:

- 100mm Ø from 79 Queen Street, likely shared with 83 Queen Street
- 125mm Ø to 178 Victoria Street

Ground elevations generally vary from ±85.60 metres along the south-west property line to ±85.02 metres along the north-west streetline.

5.2 Drainage System

The proposed site has been divided into seven catchment areas as per the attached post-development drainage area plan 22183-STM-POST.

Runoff from rooftop Areas 202, 203 and 204 are to be collected on the building roof and temporarily stored on the roof using flow-restricting roof drains before being transmitted at reduced flow rates through the building to CBMH 1. Area 201 is comprised of peaked roofs. No detention will occur in these areas. Runoff from Area 201 will be transported via the building storm lateral to CBMH 1 before entering the Victoria Street storm sewer. Area 205 along the Victoria Street frontage will flow overland towards Victoria Street right-of-way. Area 206 contains a narrow landscape strip along the south-east face of the building. This area utilizes an infiltration trench to encourage infiltration and groundwater re-charge. Area 206 also contains a 2m wide swale to direct runoff from the north limits of the property to CBMH 1 before discharging to the proposed 300mmØ lateral. The 300mmØ storm lateral will convey collected flows to the existing municipal 375mmØ storm sewer along Victoria Street. The remaining small landscape Area 207 along the Queen Street frontage will flow overland towards the Queen Street right-of-way.

Since both 5-year and 100-year storms outlet to municipal sewers, the 100-year post-development peak flow, combined with proposed groundwater pumping discharge, has been restricted to the 5-year pre-development peak flow rate in accordance with Town of Niagara-on-the-Lake comments on the prior ZBA servicing submission. Stormwater detention is achieved using flow-restricting roof drains and temporary rooftop storage.

5.3 Design Criteria

The stormwater drainage and management criteria used for the analysis of the site is as follows:

1. Peak post-development flow for the 100-year storm event, when combined with proposed groundwater discharge, shall be restricted to the pre-development 5-year peak flow rate, and any detention required to achieve this to occur on site.

5.4 Stormwater Management

Minor system stormwater flows from the rooftop will be collected and transported through the building to the proposed storm drainage lateral. It is proposed that a portion of the rooftop will

detain and store runoff, reducing the site's post-development outflow to pre-development conditions.

Preliminary software modelling for the 5-year and 100-year return period storms were performed using MIDUSS (Micro Interactive Design of Urban Storm Sewers) software. The MIDUSS output can be viewed in Appendix A. The post-development 100-year controlled flow has been limited to 0.049 m^3/s, and the horizontal dewatering peak flow is 0.0006 m^3/s, as determined in the Horizontal Dewatering Calculation – Peak Flow Post Construction (see Appendix B for excerpt from Terra-Dynamics report dated 22 MAY 2024). The combined total peak outflow is therefore:

0.042 m^3/s (storm) + 0.0006 m^3/s (dewatering) = 0.0496 m^3/s

Post-development peak flows for the 100-year return period storm are shown in Table 5.1.

Table 5.1: Post Development Peak Flow Summary

Outlet	Max. Allowed Release Rate (m^3/s) 1:5 Year	Combined Design Peak Flow (m^3/s) 1:100 Year
Victoria St. 375mmØ Sewer	0.051	0.043

It is acknowledged that dewatering rates during operation may vary and could include intermittent fluctuations slightly above the peak calculated rate. However, the dewatering rate relative even to the managed runoff rates is small enough that there should not be a concern regarding its impact on the capacity of existing and/or proposed infrastructure.

Major system flow will be temporarily detained on a portion of the rooftop using flow-restricting roof drains. The storage volume provided is sufficient to restrict the 100-year post-development peak flow, together with proposed groundwater pumping discharge, to the pre-development 5-year peak flow rate.

6.0 Parking and Roadways

There are no travelled roadways, driveways and parking areas proposed on site. There is proposed to be a single loading dock with access from Victoria Street, with access restricted using a sliding security gate. This is shown on the site servicing drawing, the current version of which is attached hereto.

Traffic and/or parking issues are to be addressed by others in separate reports if/as required.

7.0 Utilities

Existing hydro, gas, cable television and telephone services are located in the adjacent rights of way and are expected to be adequate to service the re-developed site. Utilities will be circulated in connection with the planning applications and will advise if there are any concerns in this regard.

8.0 Service Locations

Refer to attached Drawing 22183-SSG-1 for existing and conceptual proposed municipal services.

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THEATRE RE-DEVELOPMENT

79-83 Queen Street,

Niagara-on-The-Lake, Ontario

APPENDIX A

MIDUSS Model Output

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" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.004     0.051     0.047     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.004     0.051     0.051     0.000"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 465"
"                MIDUSS created                                    February 5, 2008"
"           10   Units used:                                              ie METRIC"
"                Job folder:                                  P:\2022 Projects\"
"                 22183 Shaw Royal George Theatre\Design\Preliminary\SWM\MIDUSS"
"                Output filename:                                  100YR POST_K.out"
"                Licensee name:                                            Quartek"
"                Company                                                 Quartek_2"
"                Date & Time last used:                2025-08-17 at 1:24:53 PM"
" 31           TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      980.000   Coefficient A"
"        3.700   Constant B"
"        0.732   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          201.140    mm/hr"
"             Total depth                 64.717    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33           CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   BLD. ROOF"
"      100.000   % Impervious"
"        0.060   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.060   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.027     0.000     0.000     0.000 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.060      0.060      hectare"
```

```
"             Time of concentration  11.086     1.330      1.330      minutes"
"             Time to Centroid       115.824    89.370     89.370     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        0.00       38.83      38.83      c.m"
"             Rainfall losses        42.289     6.526      6.526      mm"
"             Runoff depth           22.428     58.191     58.191     mm"
"             Runoff volume          0.00       34.91      34.91      c.m"
"             Runoff coefficient     0.000      0.899      0.899      "
"             Maximum flow           0.000      0.027      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.027     0.027     0.000     0.000"
" 54          POND DESIGN"
"         0.027   Current peak flow    c.m/sec"
"         0.004   Target outflow    c.m/sec"
"          34.9   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.375   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.03750   0.00379     1.406"
"                 0.07500   0.00757    11.250"
"                  0.1125   0.01136    32.859"
"                  0.1500   0.01514    55.359"
"                  0.1875   0.01893    77.859"
"                  0.2250   0.02272   100.359"
"                  0.2625   0.02650   122.859"
"                  0.3000   0.03029   145.359"
"                  0.3375   0.03407   167.859"
"                  0.3750   0.03786   190.359"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.060       0.060      75.000      18.930      50.000"
"              Using 8 roofdrains on roofstorage area of 600. square metre"
"              Peak outflow                   0.008    c.m/sec"
"              Maximum level                  0.076    metre"
"              Maximum storage               11.971    c.m"
"              Centroidal lag                 1.763   hours"
"                   0.027     0.027     0.008     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                CBMH1"
"              Maximum flow                   0.008    c.m/sec"
"              Hydrograph volume             34.882    c.m"
"                      0.027     0.027     0.008     0.008"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                      0.027     0.000     0.008     0.008"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   BLD. ROOF"
"      100.000   % Impervious"
"        0.060   Total Area"
"       18.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       18.000   Pervious length"
"        2.000   Pervious slope"
"        0.060   Impervious Area"
"       18.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.897   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.027     0.000     0.008     0.008 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.060      0.060      hectare"
"             Time of concentration  10.407     1.249      1.249      minutes"
"             Time to Centroid       114.937    89.193     89.193     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        0.00       38.83      38.83      c.m"
"             Rainfall losses        42.359     6.690      6.690      mm"
"             Runoff depth           22.359     58.027     58.027     mm"
"             Runoff volume          0.00       34.82      34.82      c.m"
"             Runoff coefficient     0.000      0.897      0.897      "
"             Maximum flow           0.000      0.027      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.027     0.027     0.008     0.008"
" 54          POND DESIGN"
"        0.027   Current peak flow    c.m/sec"
"        0.004   Target outflow    c.m/sec"
"         34.8   Hydrograph volume    c.m"
"           11.  Number of stages"
"        0.000   Minimum water level    metre"
"        0.350   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.03500   0.00353     1.143"
"                 0.07000   0.00707     9.147"
"                  0.1050   0.01060    28.359"
"                  0.1400   0.01413    49.359"
```

```
"                 0.1750   0.01767    70.359"
"                 0.2100   0.02120    91.359"
"                 0.2450   0.02474   112.359"
"                 0.2800   0.02827   133.359"
"                 0.3150   0.03180   154.359"
"                 0.3500   0.03534   175.359"
"           1.   ROOFTOP"
"                Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                  hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                    0.060       0.060      75.000      18.930      50.000"
"             Using 8 roofdrains on roofstorage area of 600. square metre"
"             Peak outflow                  0.008    c.m/sec"
"             Maximum level                 0.075    metre"
"             Maximum storage              11.835    c.m"
"             Centroidal lag                1.753   hours"
"                  0.027     0.027     0.008     0.008 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                CBMH1"
"             Maximum flow                  0.015    c.m/sec"
"             Hydrograph volume            69.702    c.m"
"                    0.027     0.027     0.008     0.015"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.027     0.000     0.008     0.015"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   No description"
"      100.000   % Impervious"
"        0.040   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.040   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.892   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.008     0.015 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.040      0.040      hectare"
```

```
"             Time of concentration  9.328      1.119      1.119      minutes"
"             Time to Centroid       113.447    88.886     88.886     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        0.00       25.89      25.89      c.m"
"             Rainfall losses        42.348     7.002      7.002      mm"
"             Runoff depth           22.369     57.715     57.715     mm"
"             Runoff volume          0.00       23.09      23.09      c.m"
"             Runoff coefficient     0.000      0.892      0.892      "
"             Maximum flow           0.000      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.008     0.015"
" 54          POND DESIGN"
"         0.018   Current peak flow    c.m/sec"
"         0.004   Target outflow    c.m/sec"
"          23.1   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.150   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                  0.01500   0.00076   0.04500"
"                  0.03000   0.00151    0.3600"
"                  0.04500   0.00227     1.215"
"                  0.06000   0.00303     2.880"
"                  0.07500   0.00379     5.625"
"                  0.09000   0.00454     9.720"
"                   0.1050   0.00530    15.333"
"                   0.1200   0.00606    21.333"
"                   0.1350   0.00681    27.333"
"                   0.1500   0.00757    33.333"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.040       0.040     100.000      18.930      50.000"
"              Using 4 roofdrains on roofstorage area of 400. square metre"
"              Peak outflow                  0.004    c.m/sec"
"              Maximum level                 0.085    metre"
"              Maximum storage               8.433    c.m"
"              Centroidal lag                1.804   hours"
"                   0.018     0.018     0.004     0.015 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                CBMH1"
"              Maximum flow                  0.020    c.m/sec"
"              Hydrograph volume            92.779    c.m"
"                   0.018     0.018     0.004     0.020"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                   0.018     0.000     0.004     0.020"
" 33          CATCHMENT 201"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   No description"
"      100.000   % Impervious"
"        0.020   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.020   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.882   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.009     0.000     0.004     0.020 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.020      0.020      hectare"
"             Time of concentration  7.314      0.878      0.878      minutes"
"             Time to Centroid       110.778    88.677     88.677     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        0.00       12.94      12.94      c.m"
"             Rainfall losses        42.407     7.621      7.621      mm"
"             Runoff depth           22.311     57.097     57.097     mm"
"             Runoff volume          0.00       11.42      11.42      c.m"
"             Runoff coefficient     0.000      0.882      0.882      "
"             Maximum flow           0.000      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.004     0.020"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.020"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                CBMH1"
"             Maximum flow                  0.024    c.m/sec"
"             Hydrograph volume           104.199    c.m"
"                     0.009     0.009     0.009     0.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.009     0.000     0.009     0.024"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"          206   No description"
"       27.900   % Impervious"
"        0.060   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.043   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.017   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.903   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.008     0.000     0.009     0.024 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.043      0.017      0.060      hectare"
"             Time of concentration  12.674     1.521      7.067      minutes"
"             Time to Centroid       118.045    89.701     103.795    minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        28.00      10.83      38.83      c.m"
"             Rainfall losses        42.350     6.278      32.286     mm"
"             Runoff depth           22.367     58.440     32.431     mm"
"             Runoff volume          9.68       9.78       19.46      c.m"
"             Runoff coefficient     0.346      0.903      0.501      "
"             Maximum flow           0.004      0.007      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.008     0.008     0.009     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.008     0.008     0.024"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                CBMH1"
"             Maximum flow                 0.032    c.m/sec"
"             Hydrograph volume          123.657    c.m"
"                     0.008     0.008     0.008     0.032"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                CBMH1"
"             Maximum flow                 0.032    c.m/sec"
"             Hydrograph volume          123.657    c.m"
```

```
"                    0.008     0.032     0.008     0.000"
" 51          PIPE DESIGN"
"        0.032   Current peak flow    c.m/sec"
"        0.013   Manning 'n'"
"        0.300   Diameter    metre"
"        2.000   Gradient   %"
"             Depth of flow                 0.099    metre"
"             Velocity                      1.580    m/sec"
"             Pipe capacity                 0.137    c.m/sec"
"             Critical depth                0.137    metre"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.008     0.032     0.032     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                OFF SITE"
"             Maximum flow                  0.032    c.m/sec"
"             Hydrograph volume           123.657    c.m"
"                    0.008     0.032     0.032     0.032"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.008     0.000     0.032     0.032"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   No description"
"       35.300   % Impervious"
"        0.030   Total Area"
"       12.000   Flow length"
"        2.000   Overland Slope"
"        0.019   Pervious Area"
"       12.000   Pervious length"
"        2.000   Pervious slope"
"        0.011   Impervious Area"
"       12.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.886   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.032     0.032 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.019      0.011      0.030      hectare"
"             Time of concentration  8.159      0.979      3.974      minutes"
"             Time to Centroid       111.900    88.636     98.339     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
```

```
"             Rainfall volume        12.56      6.85       19.42      c.m"
"             Rainfall losses        42.330     7.376      29.991     mm"
"             Runoff depth           22.388     57.341     34.726     mm"
"             Runoff volume          4.35       6.07       10.42      c.m"
"             Runoff coefficient     0.346      0.886      0.537      "
"             Maximum flow           0.002      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.005     0.032     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.005     0.005     0.005     0.032"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                OFF SITE"
"             Maximum flow                 0.037    c.m/sec"
"             Hydrograph volume          134.075    c.m"
"                    0.005     0.005     0.005     0.037"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.005     0.000     0.005     0.037"
" 33          CATCHMENT 207"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          207   No description"
"       97.100   % Impervious"
"        0.010   Total Area"
"        2.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"        2.000   Pervious length"
"        1.000   Pervious slope"
"        0.010   Impervious Area"
"        2.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.340   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.825   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.005     0.037 c.m/sec"
"             Catchment 207          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.010      0.010      hectare"
"             Time of concentration  3.428      0.411      0.448      minutes"
"             Time to Centroid       105.568    88.418     88.627     minutes"
"             Rainfall depth         64.717     64.717     64.717     mm"
"             Rainfall volume        0.19       6.28       6.47       c.m"
```

```
"             Rainfall losses        42.718     11.355     12.265     mm"
"             Runoff depth           21.999     53.362     52.452     mm"
"             Runoff volume          0.06       5.18       5.25       c.m"
"             Runoff coefficient     0.340      0.825      0.810      "
"             Maximum flow           0.000      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.005     0.005     0.037"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.005     0.005     0.005     0.037"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                OFF SITE"
"             Maximum flow                 0.042    c.m/sec"
"             Hydrograph volume          139.320    c.m"
"                    0.005     0.005     0.005     0.042"
" 40          HYDROGRAPH   Confluence    2"
"            7   Confluence "
"            2   Node #"
"                OFF SITE"
"             Maximum flow                 0.042    c.m/sec"
"             Hydrograph volume          139.320    c.m"
"                    0.005     0.042     0.005     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.005     0.042     0.042     0.000"
" 38          START/RE-START TOTALS 2"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    0.280    hectare"
"             Total Impervious area                   0.217    hectare"
"             Total % impervious                     77.514"
" 19          EXIT"
```

FUNCTIONAL SERVICING REPORT

ROYAL GEORGE

THEATRE RE-DEVELOPMENT

79-83 Queen Street,

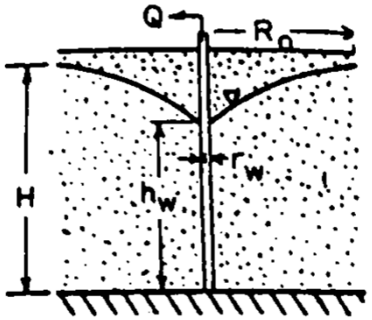
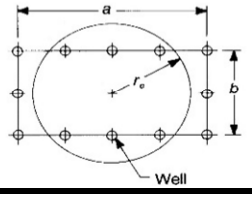
Niagara-on-The-Lake, Ontario

APPENDIX B

Horizontal Dewatering Calculation – Peak Flow Post Construction

Table D-6

Horizontal Dewatering Calculation - Peak Flow Post-Construction Basement and Elevator Shafts

Radial flow, water table aquifer	Inputs	Comments
H=Initial saturated thickness (m)	1.6	
h_w=Remaining saturated thickness (m)	0	
K=Hydraulic Conductivity (m/s)	7.E-05	
a=Rectangular Excavation Length (m)	50	Requirement for a/b < 1.5
b=Rectangular Excavation Width (m)	41	
	Calculations	
R_w=Re=Effective radius Calc (m)	26	$r_e = \sqrt{\frac{ab}{\pi}}$
R_0=Radius of Influence Calc (Sichart & Kryieleis) (m)	66	$R_o = r_e + 3000(H - h_w)\sqrt{k}$
Q_w=Flow Rate (m^3/s)	0.000596	$Q_w = \frac{\pi K(H^2 - h_w^2)}{\ln R_0 / r_w}$
Q_w=Flow Rate (m^3/day)	52	
Q_w=Flow Rate (L/day)	51,500	

EXCERPT FROM TERRA-DYNAMICS REPORT DATED 22 MAY 2024

FUNCTIONAL SERVICING REPORT

ROYAL GEORGE

THEATRE RE-DEVELOPMENT

79-83 Queen Street,

Niagara-on-The-Lake, Ontario

APPENDIX C

Detailed Fire Underwriters Survey Calculations and Hydrant Flow Test Report

Royal George Theater, Queen Street, Niagara On the Lake
Sprinklered

Estimated Fire Flow for the building (by FUS method)

Formula: F = 220 C √(A)

F = the required fire flow in litres per minute

C = coefficient related to the type of construction

= 1.5 for wood frame construction (structure essentially all combustible)

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)

= 0.8 for non-combustible construction(unprotected metal structural components, masonry or metal walls

= 0.6 for fire resistive construction (fully protected frame, floor, roof)

A = the total floor area in square metres (incl all storeys but not basements at least 50% below grade)

* for fire resistive buildings, consider the two (2) largest adjoining floors plus 50% of each of any floors immediately above them up to eight (8), when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two (2) immediately adjoining floors.

A	4415	m²	(fire resistive with openings protected)	
C	0.8			
F	11694.4	11700.0	195.0	L/s

Retail (shops/stores) use falls into low hazard occupancy, so 0.85 is applied

F	9945.0	L/min		
Sprinkler	50%	4972.5	L/min	reduction

Exposure

The charge for any one side generally should not exceed the following limits for the separations shown

Separation	Charge	Building Wall	Separation Distance
0 to 3 m	25 to 20 %		Bld
3 to 10 m	20 to 15 %	Left	3
10 to 20 m	15 to 10 %	Right	2.5
20 to 30 m	10 to 5 %	Front	20
30 to 45 m	5 to 0 %	Back	13

Normally any unpierced party wall/firewall considered to form a boundary when determining floor areas may warrant up to a 10 % exposure charge.

Calculation of Fire Flow Increase Due to Proximity to Other Buildings (PB)

PB = PL+PR+PF+PRR	Charge
where,	North
PL = proximity charge for left side of buildin	20%
PR = proximity charge for right side of buildi	20%
PF = proximity charge for front of building	5%
PRR = proximity charge for rear of building	10%
PB = increase due to proximity	55%

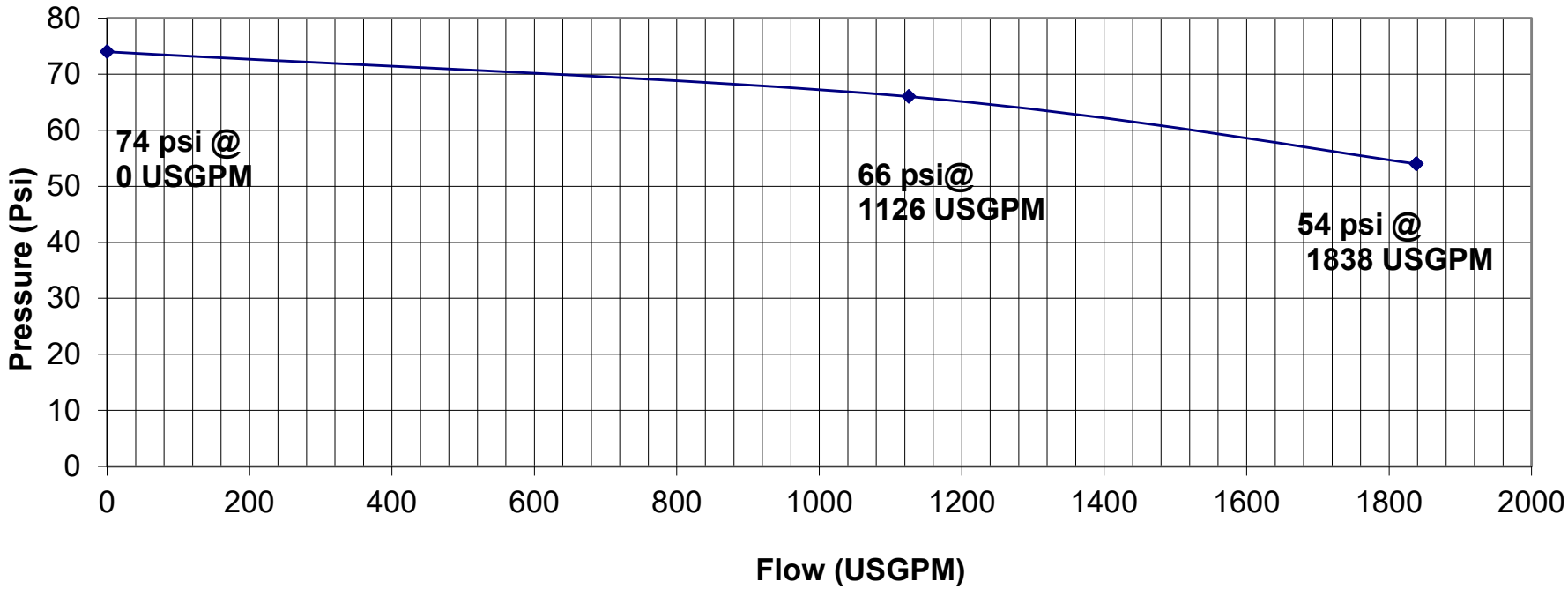
Increase in Fire Flow (IF):

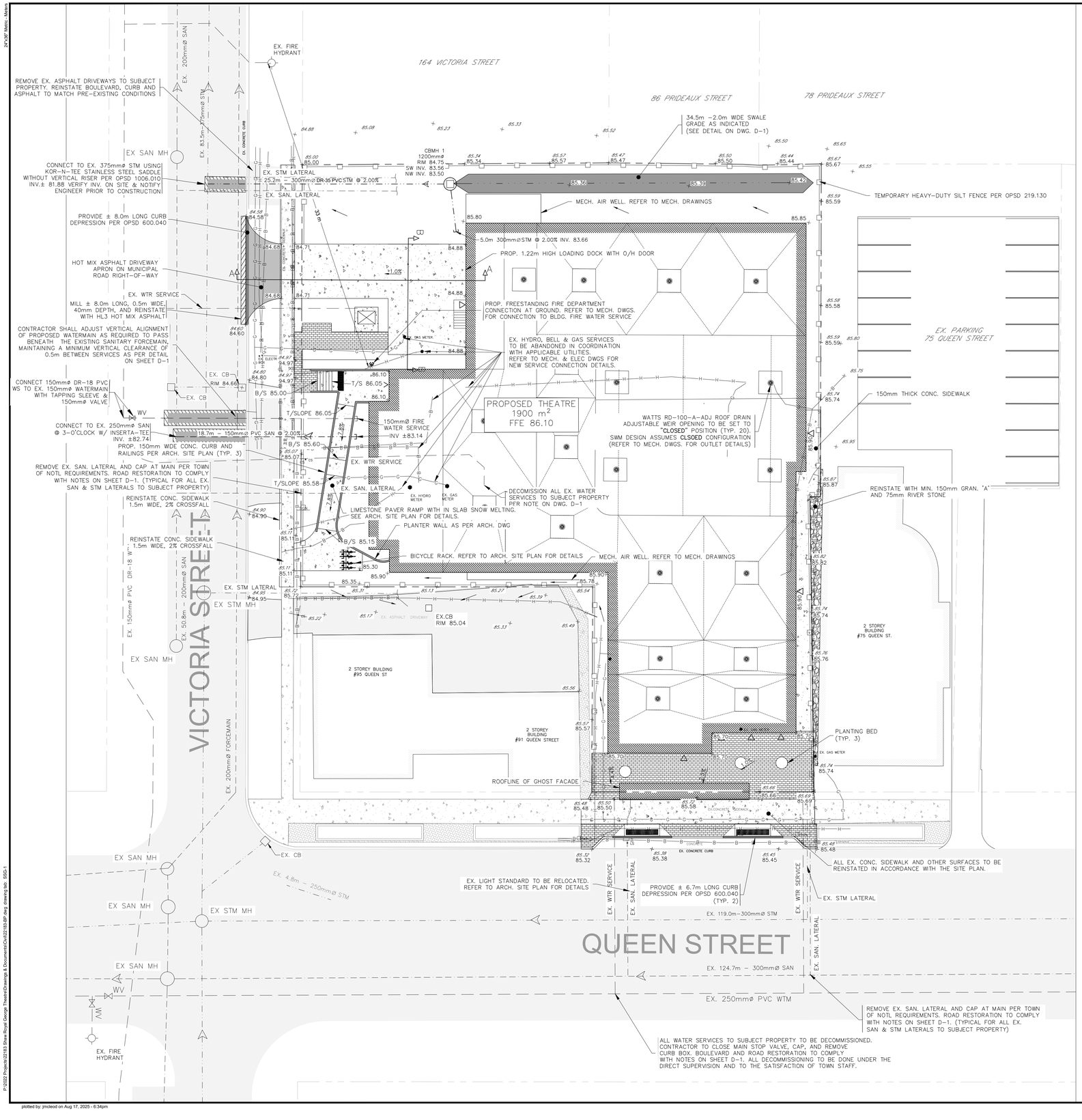
IF	2734.875	L/min	increase

Final Fire Flow	7707	L/min
	128.5	L/s

NIAGARA REGIONAL FIRE PROTECTION INC.							
Flow Test Location: Royal George Theatre							
Static Pressure (Psi)			**Pitot Reading 1**	45		**# of Outlets Flowed 1**	1
	74		**Outlet Size 1**	2.5		**# of Outlets Flowed 2**	2
Residual Pressure 1 (Psi)			**Pitot Reading 2**	30		**# of Outlets Flowed 3**	2
	66		**Outlet Size 2**	2.5		**Graph Data:**	
Residual Pressure 2 (Psi)			**Pitot Reading 3**	30		**Pressure Values (y-axis)**	**Flow Values (x-axis)**
	54		**Outlet Size 3**	2.5		74	0
Residual Pressure 3 (Psi)			**Flow 1 Calculated**			66	1126
	54			1125.6		54	1838
Extrapolated to 20psi residual 3143 GPM			**Flow 2 Calculated**			54	1838
Color code Blue				1838.1		**Date & Time of Test :**	**July 25/2025**
Coefficient value			**Flow 3 Calculated**				**8:00 AM**
	0.9			1838.1		**Performed by:**	Derek & Ryan

Water Graph





LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- PROPOSED SILT FENCE
- PROPOSED STORM SEWER
- PROPOSED WATER SERVICE & CURB STOP
- PROPOSED WATERMAIN
- PROPOSED SANITARY SEWER
- EXISTING MAINTENANCE HOLE
- PROPOSED MAINTENANCE HOLE
- EXISTING CATCHBASIN
- PROPOSED CATCHBASIN
- DIRECTION OF FLOW
- FFE FINISHED FLOOR ELEVATION
- WV PROPOSED WATER VALVE
- PROPOSED GRADE ARROW
- 93.28 × PROPOSED GROUND ELEVATION
- 93.28 × EXISTING GROUND ELEVATION
- PROPOSED TACTILE WARNING PLATE
- TRANSFORMER
- PROPOSED CONCRETE
- EXISTING ASPHALT
- PROPOSED ENTRANCE PAVEMENT STRUCTURE
- GRASS OR LANDSCAPE

E	ZBA SUBMISSION	17 AUG 2025	CJM
D	ZBA/SPA SUBMISSION	28 JUL 2025	CJM
C	ZBA SUBMISSION	20 MAY 2025	CJM
B	ZBA SUBMISSION	13 MAY 2025	CJM
A	ZBA SUBMISSION	05 JAN 2024	CJM
issue	issued for	date	init.

seal

REGISTERED PROFESSIONAL ENGINEER
D. K. PETERS
18 AUG 2025
PROVINCE OF ONTARIO

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www.quartekgroup.com

SHAW FESTIVAL

project title

ROYAL GEORGE THEATRE

85 Queen St, Niagara-on-the-Lake,

drawing title

SITE SERVICING AND GRADING PLAN

drawn by	designed by
CJM	CJM/DP
scale	date
1:200	08 DEC 2023
job number	issue
22183	E

drawing number

SSG-1

OWNER'S NAME

OWNER'S SIGNATURE

Town of Niagara-on-the-Lake

LORD MAYOR

TOWN CLERK

DATE

24"x36" Metric Meters

GENERAL

1. LOCATION AND SIZE OF EXISTING UTILITIES WAS DERIVED FROM VARIOUS DRAWINGS FROM OTHERS. THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN AND, WHERE SHOWN, THE ACCURACY OF THE LOCATION SHOWN OF SUCH UTILITIES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL CONTACT ALL SUCH UTILITIES INVOLVED AND INFORM HIMSELF AS TO THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME LIABILITY FOR DAMAGE TO THEM. CONTRACTOR TO REPORT ANY CONFLICTS OR DISCREPANCIES WITH THIS DRAWING TO THE ENGINEER IMMEDIATELY.
2. ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE NOTED.
3. ALL WORK SHALL BE IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS, AND THE NIAGARA PENINSULA STANDARD CONTRACT DOCUMENT (NPSCD) UNLESS OTHERWISE NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS.
4. COMPUTER DRAWING FILE CO-ORDINATES FOR THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION LAYOUT UNLESS SPECIFICALLY DIRECTED BY THE ENGINEER.
5. ALL GRANULAR MATERIAL SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND ALL NATIVE BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY UNLESS OTHERWISE NOTED.
6. ALL CONSTRUCTION SHALL BE CARRIED OUT IN SUCH A WAY THAT SILTATION OR OTHER DAMAGE TO WATER COURSES DOES NOT OCCUR. THE REQUIREMENTS OF THE MINISTRY OF NATURAL RESOURCES ARE TO BE ADHERED TO IN THIS RESPECT. AT A MINIMUM, PROVIDE SILT FENCE AND STABILIZED CONSTRUCTION ACCESS AND MAINTAIN SAME FOR DURATION OF CONSTRUCTION. REMOVE CONSTRUCTION ACCESS GRANULAR FOLLOWING COMPLETION OF CONSTRUCTION, DISPOSE OFF SITE AND REINSTATE REG. RD 55 BOULEVARD WITH MIN. 75mm TOPSOIL AND No. 1 NURSERY SOD. MAINTAIN SILT FENCE UNTIL GRASS OR OTHER GROUND COVER IS ESTABLISHED ADJACENT.
7. ALL EXCAVATION IN EXISTING ROADWAYS OR OTHER PAVED SURFACES SHALL BE BACKFILLED WITH GRANULAR 'A' COMPACTED TO 100% SPD. MINIMUM.
8. PROPOSED GRADES SHALL NOT ADVERSELY AFFECT ADJACENT PROPERTIES.
9. REFER TO SITE PLAN FOR SITE DIMENSIONS. REFER TO LANDSCAPE DRAWINGS FOR FENCING, PLANTINGS, HARD LANDSCAPE AND STREET FURNITURE. REFER TO SITE LIGHTING DRAWING FOR SITE LIGHTING. REFER TO MECHANICAL DRAWINGS FOR CONTINUATION OF SERVICES INSIDE BUILDING FROM 1.0m OUTSIDE BUILDING.

WATER SUPPLY

10. CONTRACTOR SHALL OBTAIN EXPLICIT APPROVAL FROM TOWN OF NIAGARA-ON-THE-LAKE WATER DEPARTMENT PRIOR TO MAKING A CONNECTION TO THE EXISTING TOWN WATERMAIN.
11. A MINIMUM CLEAR HORIZONTAL SEPARATION OF 2.5m SHALL BE MAINTAINED BETWEEN ANY SEWER & ANY PARALLEL WATERMAIN. A MINIMUM CLEAR VERTICAL SEPARATION OF 0.5m SHALL BE MAINTAINED AT SEWER CROSSINGS.
12. WATERMAINS AND WATER SERVICES 100mmØ OR LARGER SHALL BE PVC, DR-18, CL235 OR GREATER, INSTALLED PER OPSS-441 WITH GRANULAR 'A' BEDDING & COVER PER OPSD-802.010. WATERMAINS & SERVICES SMALLER THAN 100mmØ SHALL BE TYPE 'K' SOFT COPPER OR MUNICIPEX® OR APPROVED EQUIVALENT. MINIMUM FINISHED COVER OVER WATERMAINS & SERVICES SHALL BE 1.7m UNLESS OTHERWISE INDICATED.
13. ALL METAL CROSSES, TEES, BENDS, VALVES AND OTHER FITTINGS SHALL HAVE CATHODIC PROTECTION CONSISTING OF ZINC ANODE 550-12. ALL HYDRANT ASSEMBLIES SHALL HAVE CATHODIC PROTECTION CONSISTING OF ZINC ANODE 1100-24.
14. ALL BENDS, TEES, HYDRANTS & OTHER FITTINGS AS REQUIRED SHALL HAVE THRUST BLOCKS IN ACCORDANCE WITH OPSD 1103.010 & 1103.020.
15. VALVES SHALL CONFORM TO AWWA C500 & C509 & SHALL BE IRON-BODY RESILIENT-SEATED GATE VALVES WITH 'O'-RING STEM PACKING, MECHANICAL JOINTED & SHALL OPEN LEFT-HANDED WITH 50mm SQUARE OPERATING NUT. VALVE BOXES SHALL BE CAST IRON, SLIDE TYPE.
16. ALL WATER SUPPLY PIPING SHALL BE FLUSHED, PRESSURE TESTED & DISINFECTED IN ACCORDANCE WITH OPSS 441 & NPSCD SPC-D13 UNDER THE DIRECTION OF THE TOWN'S ENGINEERING PERSONNEL & TO THE SATISFACTION OF THE TOWN DIRECTOR OF PUBLIC WORKS.
17. FREE-STANDING FIRE HYDRANT CONNECTION TO BE MODEL 207 'SIDEWALK SIAMESE' BY NATIONAL FIRE PROTECTION INC. OR EQUIVALENT APPROVED BY ENGINEER.

SURFACE WORKS

18. FILL FOR ROADWAY AND PARKING AREAS TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 201 IN 200mm THICK LIFTS, USING SUITABLE NATIVE EXCAVATED OR IMPORTED MATERIAL APPROVED BY CONTRACT ADMINISTRATOR AND GEOTECHNICAL ENGINEER. THE SUBSOIL BELOW ANY ROADWAY OR PARKING AREA SHALL BE COMPACTED, PROOF ROLLED AND INSPECTED BY THE GEOTECHNICAL ENGINEER OR HIS DESIGNATE PRIOR TO THE PLACEMENT OF ANY GRANULAR MATERIAL.THE UPPER 0.6m BELOW ANY RIGID OR PAVED SURFACE SHALL BE COMPACTED TO 98% SPD MIN.
19. WHERE DISTURBED OR DAMAGED, REINSTATEMENT OF EXISTING ROADS SHALL COMPLY WITH THE REQUIREMENT OF THE ROAD AUTHORITY. PAVEMENT REINSTATEMENT SHALL COMPLY WITH OPSD 509.010 AND OPSS 310.
20. SUBDRAIN TO BE 100mmø OR 150mmø HDPE PERFORATED FILTER-WRAPPED TILE AS SHOWN, PER OPSD 216.021, DISCHARGING TO AN EXISTING DITCH OR OTHER DRAINAGE OUTLET.
21. MINIMUM ASPHALT AND GRANULAR THICKNESS FOR PER OPSS 310 & 314 FOR DRIVEWAY APRON ON MUNICIPAL ROAD RIGHT-OF-WAY:

SURFACE COURSE	40mm HL3
BINDER COURSE	65mm HL8
GRANULAR BASE	150mm GRAN. 'A'
GRANULAR SUB-BASE	150mm GRAN. 'B'

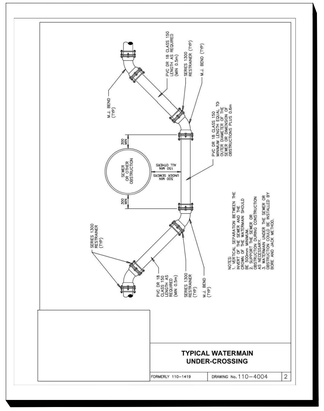
22. MINIMUM CONCRETE AND GRANULAR THICKNESS PER OPSS 353 AND 314 FOR LOADING DOCK DRIVEWAY ON SITE:

SURFACE	200mm 30MPa CONCRETE
GRANULAR BASE	200mm GRAN. 'A'

23. REFER TO SITE PLAN FOR SECURITY GATE DETAILS.
24. REFER TO LANDSCAPE DRAWING FOR SOFT AND HARD LANDSCAPE FINISHES NOT SHOWN ON THIS DRAWING.
25. ALL SIDEWALKS SHALL CONFORM TO OPSD 310.010, AMENDED AS FOLLOWS, SIDEWALK SHALL HAVE WIRE MESH REINFORCEMENT AS SPECIFIED IN SECTION 32 13 13. SIDEWALK SHALL BE MINIMUM 150mm THICK, 30 MPa CONCRETE, WITH COMPACTED 150mm GRANULAR 'A' BASE.

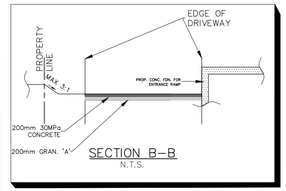
SEWERS

26. ALL SEWERS, LEADS AND LATERALS SHALL HAVE CLASS 'B' BEDDING PER OPSD 802.010, GRANULAR 'A' COVER MATERIAL AND SELECT NATIVE BACKFILL UNLESS OTHERWISE NOTED.
27. ALL STORM SEWERS AND CATCHBASIN LEADS TO BE CONCRETE, CLASS III PER CSA A257.2 WITH CLASS "B" BEDDING TO OPSD 802.030 OR PVC DR-35 PER CSA 182.1 WITH GRANULAR 'A' BEDDING TO OPSD 802.010 UNLESS OTHERWISE NOTED.
28. CATCHBASINS TO BE TO OPSD 705.010 WITH FRAME & GRATE PER OPSD 400.020 (DISHED) IN SOFT LANDSCAPED AREAS AND OPSD 400.010 (FLAT) IN PAVED AREAS. CATCHBASIN MAINTENANCE HOLES TO BE 1200mmØ PER OPSD 701.010 WITH FRAME & COVER OPSD 400.020.
29. CONNECTION OF NEW STORM SEWER TO EXISTING PVC SEWER BY MANUFACTURED CUT-IN-TEE.



TYPICAL WATERMAIN UNDER-CROSSING

FORMERLY 110-1419 | DRAWING No. 110-4004 | 2



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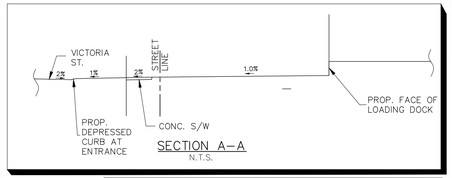

SECTION A-A
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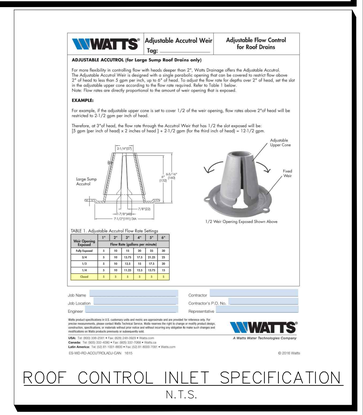
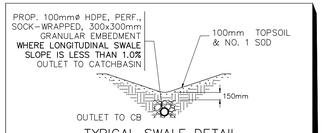


ROOF CONTROL INLET SPECIFICATION
N.T.S.



TYPICAL SWALE DETAIL
N.T.S.

OWNER'S NAME

OWNER'S SIGNATURE

Town of Niagara-on-the-Lake

LORD MAYOR

TOWN CLERK

DATE

issue	issued for	date	init.
B	ZBA SUBMISSION	17 AUG 2025	CJM
A	ZBA/SPA SUBMISSION	28 JUL 2025	CJM

seal

REGISTERED PROFESSIONAL ENGINEER
D. K. PETERS
18 AUG 2025
PROVINCE OF ONTARIO

Do not scale drawings. Report any discrepancies to Quartek Group Inc. before proceeding.

Drawings must be sealed by the Architect and / or Engineer prior to the use for any building permit applications and / or government approval. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.

All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.

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Engineers Project Managers
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89 - 91 St. Paul Street, Suite 100,
St. Catharines, ON, L2R 3M3
www.quartekgroup.com

SHAW FESTIVAL

project title

ROYAL GEORGE THEATRE

85 Queen St, Niagara-on-the-Lake,

drawing title

NOTES AND DETAILS

drawn by	designed by
CJM	CJM/DP

scale	date
1:200	08 DEC 2023

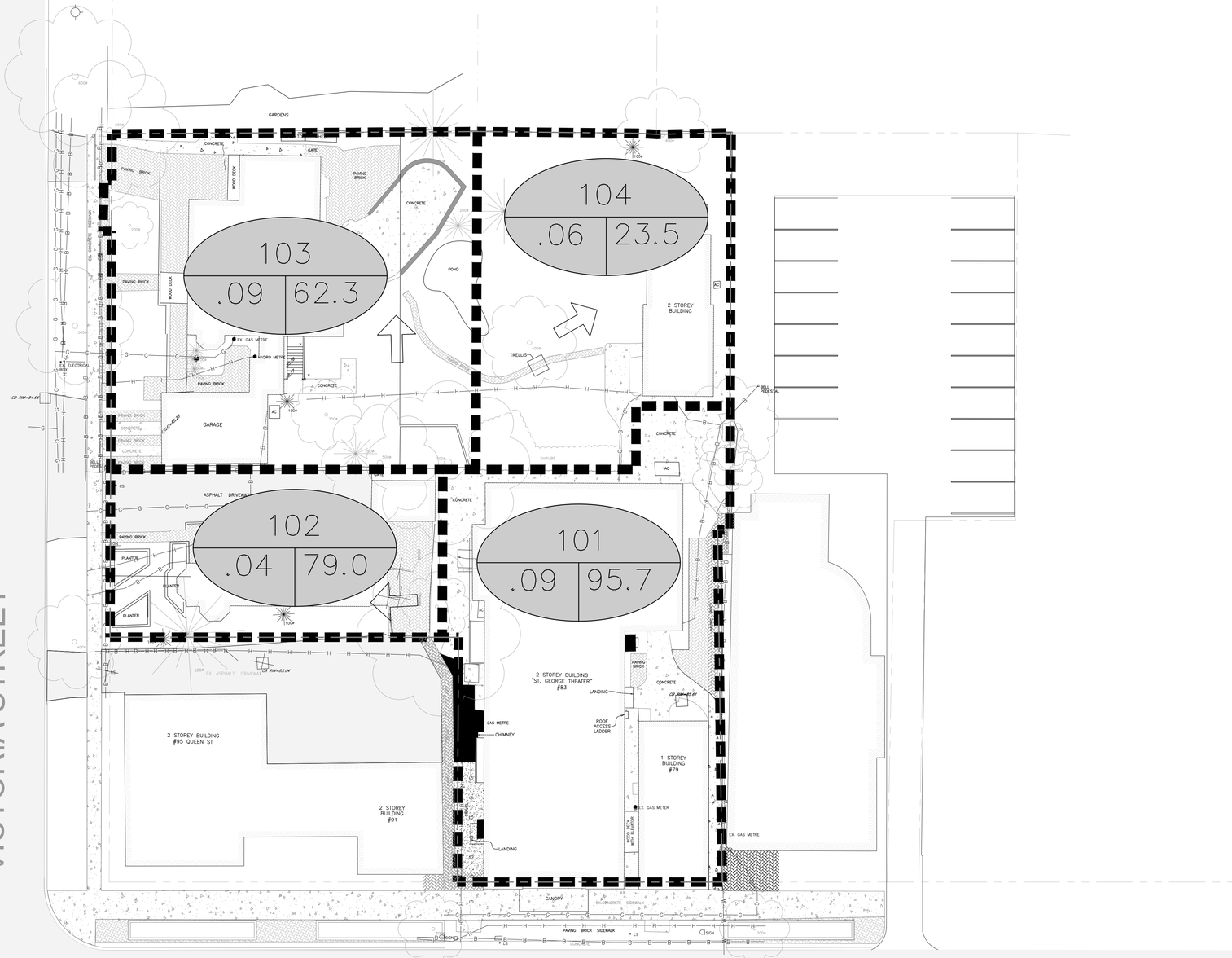
job number	issue
22183	B

drawing number

D-1

plotted by: jmcleod on Aug 17, 2025 - 6:35pm

24"X36" Metric - Metric



LEGEND

- PRE-DEVELOPMENT DRAINAGE AREA BOUNDARY
- 101 / 0.9 / 33.0 — DRAINAGE AREA NUMBER; % IMPERVIOUS; AREA (ha)
- DIRECTION OF POST-DEV. OVERLAND FLOW

B	ZBA/SPA SUBMISSION	28 JUL 2025	CJM
A	ZBA SUBMISSION	08 JAN 2024	CJM
issue	issued for	date	init.

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REGISTERED PROFESSIONAL ENGINEER
D. K. PETERS
18 AUG 2025
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SHAW FESTIVAL

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85 Queen St, Niagara-on-the-Lake,

drawing title

PRE-DEVELOPMENT DRAINAGE AREAS

drawn by	designed by
CJM	CJM/DP
scale	date
1:200	08 DEC 2023
job number	issue
22183	B

drawing number

STM-PRE

OWNER'S NAME

OWNER'S SIGNATURE

Town of Niagara-on-the-Lake

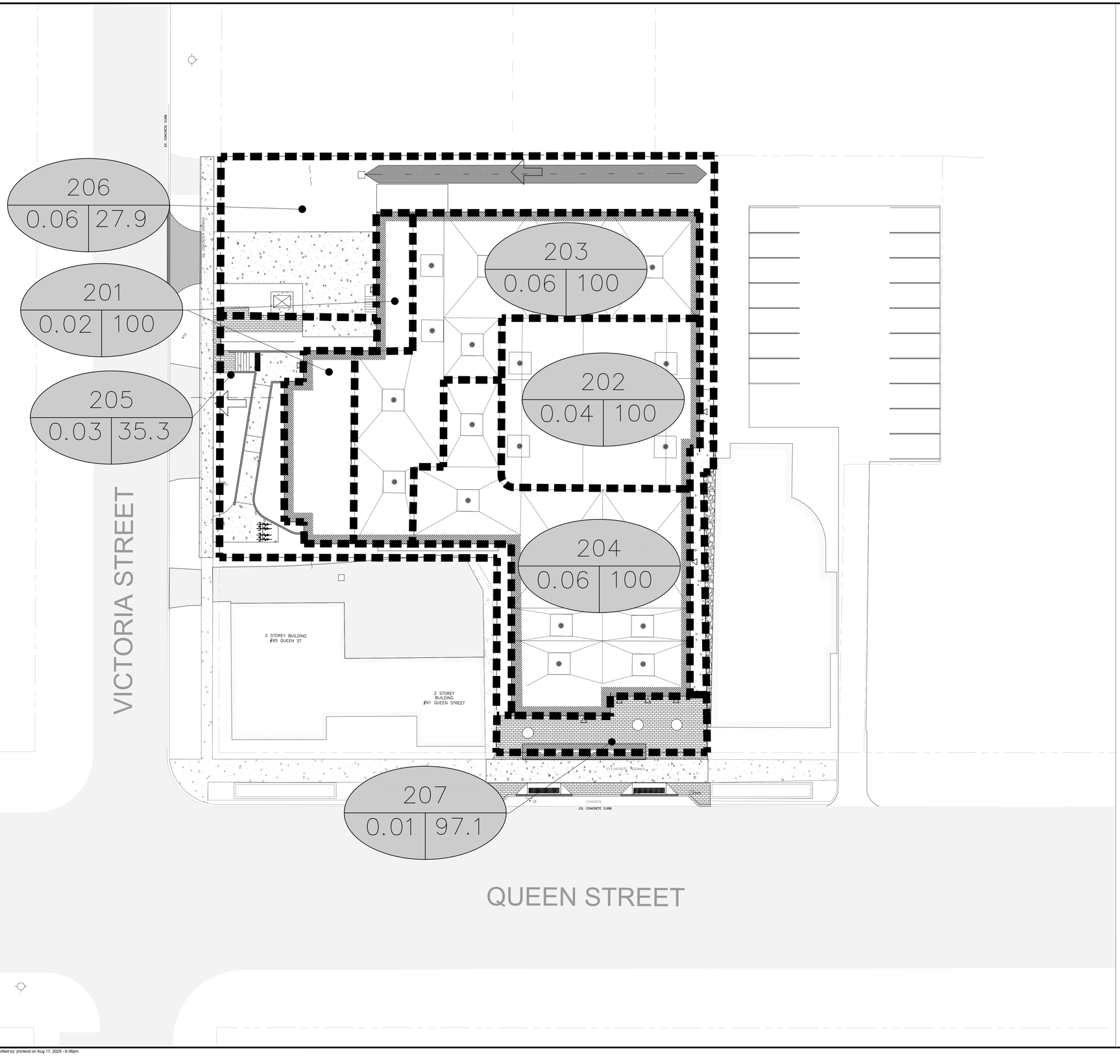
LORD MAYOR

TOWN CLERK

DATE

P:\2022 Projects\22183 Shaw Royal George Theatre\Drawings & Documents\CAD\22183-BP.dwg drawing tab: STM-PRE

plotted by: jmcleod on Jul 30, 2025 - 6:54pm



LEGEND

- POST-DEVELOPMENT DRAINAGE AREA BOUNDARY
- 101 / 0.9 | 33.0 — DRAINAGE AREA NUMBER; % IMPERVIOUS; AREA (ha)
- DIRECTION OF POST-DEV. OVERLAND FLOW

issue	issued for	date	init.
E	ZBA SUBMISSION	17 AUG 2025	CJM
D	ZBA/SPA SUBMISSION	28 JUL 2025	CJM
C	ZBA SUBMISSION	20 MAY 2025	CJM
B	ZBA SUBMISSION	13 MAY 2025	CJM
A	ZBA SUBMISSION	08 JAN 2024	CJM

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18 AUG 2025
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SHAW FESTIVAL

project title

ROYAL GEORGE THEATRE

85 Queen St, Niagara-on-the-Lake,

drawing title

POST-DEVELOPMENT DRAINAGE AREAS

drawn by	designed by
CJM	CJM/DP

scale	date
1:200	08 DEC 2023

job number	issue
22183	E

drawing number

STM-POST

OWNER'S NAME

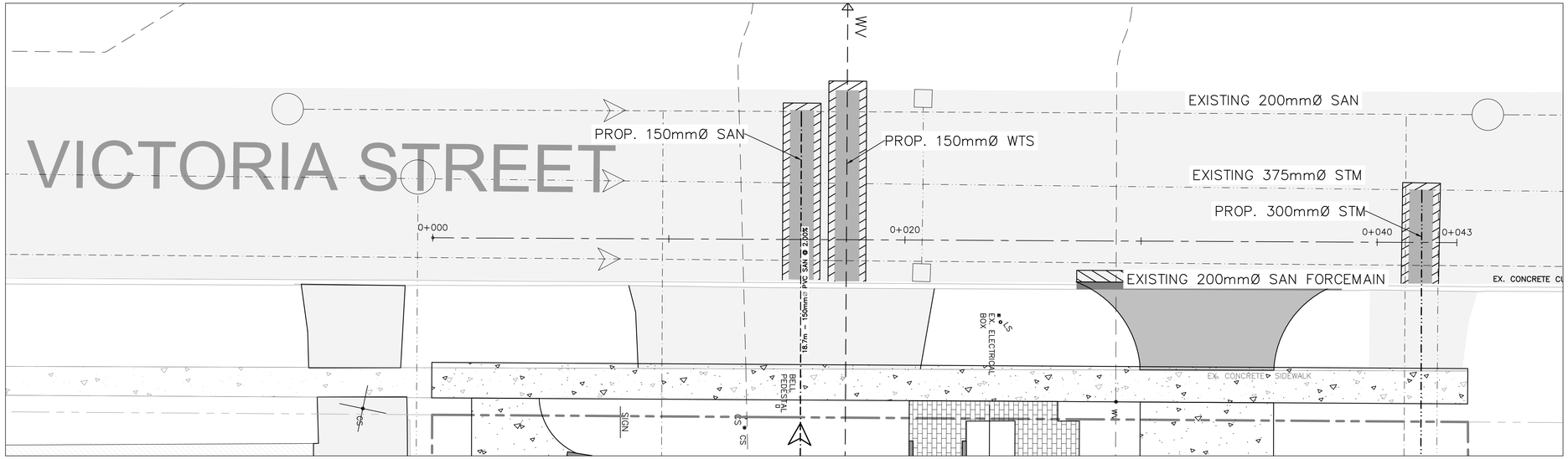
OWNER'S SIGNATURE

Town of Niagara-on-the-Lake
FRUITFUL IN UNITY

LORD MAYOR

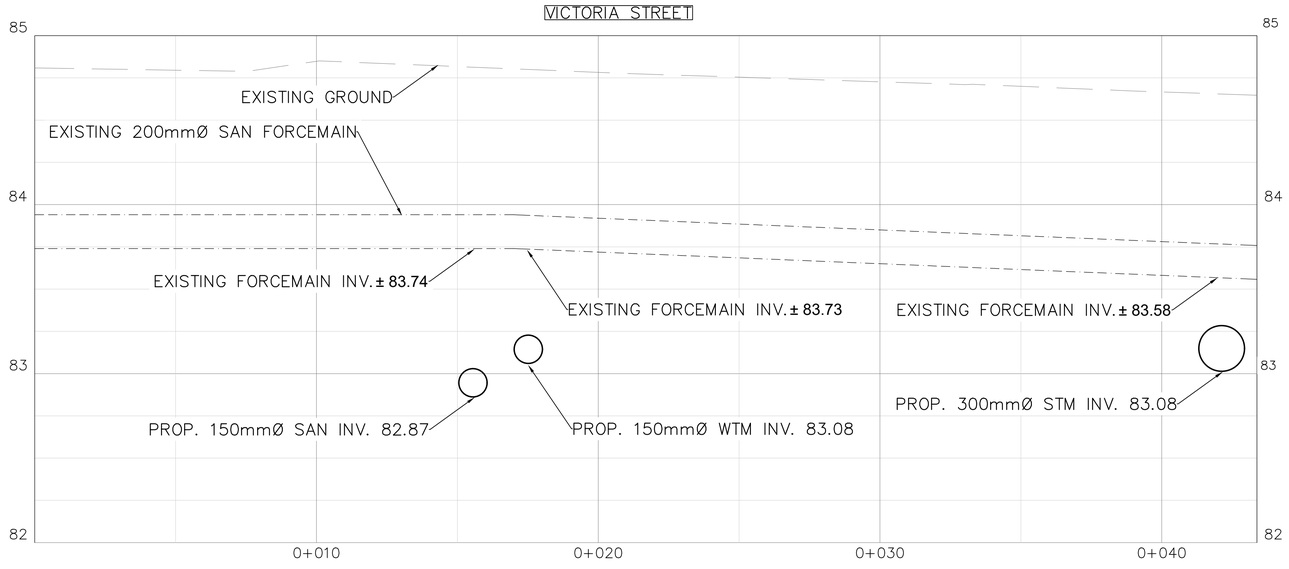
TOWN CLERK

DATE



CONSTRUCTION NOTE:

CONTRACTOR SHALL SUPPORT THE EXISTING REGIONAL SANITARY FORCEMAIN AT ALL SERVICE CROSSINGS DURING EXCAVATION AND INSTALLATION OF PROPOSED SERVICES. SUPPORT SHALL CONSIST OF TIMBER CRIBBING OR APPROVED EQUIVALENT, DESIGNED TO PREVENT SAGGING OR MOVEMENT OF THE FORCEMAIN. EXISTING FORCEMAIN SHALL BE FULLY SUPPORTED AT ALL TIMES UNTIL BACKFILL OPERATIONS ARE COMPLETE. ALL WORKS SHALL BE CARRIED OUT TO THE SATISFACTION OF THE REGION.



issue		issued for	date	init.
A	ZBA		17AUG2025	CJM

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SHAW FESTIVAL

project title: ROYAL GEORGE THEATER
85 QUEEN ST. NIAGARA-ON-THE-LAKE

drawing title: SANITARY ALIGNMENT
STA 0+000 TO 0+043

drawn by	CJM
designed by	CJM
scale	H 1:100 V 1:200
date	17AUG2025
job number	22183
issue	A
drawing number	PP-01