

Draft Functional Servicing Report – Exhibition Integrated Transit Oriented Communities

1-1A Atlantic Avenue and
1 Jefferson Avenue and 2-20 Atlantic
Toronto Ontario

Issued for Rezoning

Contract RFS-2019-NAFC-110

PO 214244

HDR Project 10206938



Ontario Line Technical Advisor

TORONTO, ONTARIO

September 30, 2021

Doug Jackson, PE: Project Manager
Matt DeMarco, PMP: Deputy Project Manager
Tyrone Gan, P. Eng. Principal-In-Charge

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Abbreviations

BMP	Best Management Practice
DRM	Design Requirements Manual
HGL	Hydraulic Grade Line
HGRA	High Volume Groundwater Recharge Areas
IBC	Initial Business Case
IDF	Intensity-Duration-Frequency
IO	Infrastructure Ontario
MECP	Ministry of the Environment, Conservation and Parks
OGS	Oil and Grit Separator
OL	Ontario Line
RCD	Reference Concept Design
SWM	Stormwater Management
SUE	Subsurface Utility Engineering
TGS	Toronto Green Standard
TMC681	Toronto Municipal Code Chapter 681
TOC	Transit Oriented Communities
TSS	Total Suspended Solids
TRCA	Toronto and Region Conservation Authority
WWFMG	Wet Weather Flow Management Guidelines

1 Introduction

The Province of Ontario is planning to build a new 15.5 km rapid transit line serving the City of Toronto. The development of this line is being managed jointly by Metrolinx, the Provincial Transit Agency responsible for the Greater Toronto and Hamilton Area, and Infrastructure Ontario (IO). Transit-Oriented Communities are proposed at the Ontario Line Stations to integrate high density, mixed-use developments with the transit infrastructure.

HDR Inc. has been retained by Metrolinx to prepare a Functional Servicing Report to assess the servicing requirements related to the proposed Ontario Line Transit-Oriented Communities (TOC) at two separate sites in the Liberty Village neighbourhood. This Functional Servicing Report provides a preliminary study for water distribution, electrical service, sanitary sewage, and storm drainage for the developments of the above-mentioned site.

A Stormwater Management Report outlining the proposed stormwater management strategy for this site has been prepared by OneTeam under a separate cover. In preparation of this report, OneTeam staff reviewed the available information for existing utilities and the associated Ontario Line Reference Concept Design (RCD) plans.

1.1 Site Description

There are two proposed developments at the Liberty Village neighbourhood, all of which are located on the north side of the proposed Ontario Line.

Site A is located at the southeastern end of Atlantic Avenue and is bounded by Atlantic Avenue to the west and Hanna Avenue to the east. The existing site consists of a single two-storey mixed-use building and commercial parking spaces on the northerly limit of the site.

Site B is located at the southwestern end of Atlantic Avenue and is situated between Jefferson Avenue to its west, and Atlantic Avenue to its east. This site will also be located north of the proposed location of Ontario Line's Exhibition station and will have direct pedestrian access to the station via an overhead concourse. The site is currently being utilized to house one two-storey commercial building, a single one-storey storage building, and private parking on the southeast and southwest corners of the site.



Figure 1-1. Aerial Map of Subject Site Locations

1.2 Proposed Development

Based on the preliminary reference concept designs, the proposed development at these locations consists of three mixed-use buildings. Site A will have two proposed buildings and Site B will have one proposed building.

The development at Site A is proposed as two separate buildings. The building on the west side of the site (facing Atlantic Avenue) is proposed to be a nineteen-story mixed-use building, with retail space at the ground level. The building on the east side of the site (facing Hanna Avenue) will be a twenty-storey mixed-use building with retail space at the ground level. Both buildings will have a multi-level underground parking garage to accommodate the expected residential, office, and retail vehicle parking requirements, and an east-west access route on the northern side of the property connecting Atlantic Avenue to Hanna Avenue.

Site B will house a twin tower nineteen-story mixed-use building. The proposed design shows three underground parking levels for residential, office and retail parking, and retail space on the ground level. The building will also connect to the overhead concourse of the proposed Ontario Line's Exhibition station. An east-west access route will be located on the northerly limit of the site to connect Jefferson Avenue to Atlantic Avenue.

2 Site Condition

2.1 Existing Topography

Both sites A and B are situated on flat concrete lots with two- to three-storey buildings occupying either the entirety of the site or part of it.

Site A has an approximate area of 0.48 Ha. An existing two-storey building is located on the southwest corner of the site while the northeast section of the property (adjacent to Hanna Avenue) is currently lined with trees. The existing ground condition of the property currently slopes from the northwest towards the southeast, with a generally flat terrain where the existing building is located. The two proposed buildings will be located on the southwest and the southeast corner of the property.

Site B is currently a flat concrete lot with an approximate area of 0.48 Ha. The north side of the property limits is currently being occupied by a two-storey building, and a detached single-storey building is occupying the southwest corner of the lot. The southern limit of the site is lined with trees and a sidewalk separating the site from the adjacent property. The existing site grading provides a gentle slope from north to south, while the east-west direction is generally flat. The proposed building will occupy the entirety of the site.

2.2 Existing Utility Information

The existing utility information surrounding the sites is provided on the Site Servicing Plan attached in Appendix A. Note that all existing utility information is based on Quality Levels B, C and D Subsurface Utility Engineering (SUE) investigation that was carried out in 2020. Prior to detailed design and construction, it is recommended that the OneTeam and Development Co confirm the existing underground and aerial utilities and the vertical elevation information. At the time when this report is prepared, the sewer capacity information was not available.

2.3 Proposed Site Grading

The proposed grading for both developments are provided in Appendix A.

Site A's proposed grading is expected to follow the existing topography of the site, with the high point on the north west corner of the site, gently sloping towards the southeast corner. Water runoff (within allowable limits) will be discharged to the storm sewer on Atlantic Avenue via 300 mm proposed storm sewer connection.

Site B's proposed grading is also expected to follow the existing site topography, with a gentle north to south slope. Water runoff (within allowable limits) will be discharged to the storm sewer on Jefferson Avenue via 300 mm proposed storm sewer connection.

3 Water Supply and Appurtenances

3.1 Existing Condition

There is an existing water service connection of unknown diameter at the southern end of Atlantic Avenue, running perpendicular to the road. This pipe is connected to the watermain and enters Site A at the approximate location of the existing southwest driveway.

An existing 150 mm diameter water main connection is located on the easterly limit of Site B and is connected to the water main running parallel to Atlantic Avenue. A 150 mm diameter water main is also located parallel to Jefferson Avenue on the west side; however, this connection does not appear to tie into Site B at any point.

3.2 Water Supply

Under the Ontario Building Code (OBC), every dwelling unit shall be supplied with a water distribution system where drinking water is available (Section 9.31.3.1). The OBC also states that every water distribution system shall be connected to a watermain that is part of the municipal drinking water system unless otherwise stated in OBC Article 7.1.5.3.

The OBC also requires that both office space and residential space be built from non-combustible construction, and sprinklered, unless otherwise stated in Subsection 3.2.6 and 3.2.2.7 of the Code. In addition, the OBC does not require fire hydrants within a building but mandates that a hydrant is located within 90 m horizontally of any portion of a building perimeter which is required to face a street.

The watermain network will be designed and constructed to the City of Toronto's *Design Criteria for Sewers and Watermains (2019)*. A Site Servicing Plan in **Appendix A** has been prepared to show the potential locations of the watermain service connections to the developments. The water demand for the proposed sites was calculated per City of Toronto's *Design Criteria for Sewers and Watermains (2019)* and using site statistics provided by the architect. Water demand calculation summaries for Sites A and B are provided in **Table 3.1** and **Table 3.2** respectively.

Table 3-1. Site A Development Water Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Average Day Water Consumption Rate	191 L/capita/day	191 L/capita/day
Total Site Area	4777 m ²	
Total GFA	20581 m ²	14265 m ²
Residential units	265	n/a
Residential/ commercial population	461	157
Peaking factor – peak hour	2.5	1.2
Average Water Demand from Site	1.0 L/s	0.3 L/s
Peak Water Demand from Site	2.5 L/s	0.4 L/s

Table 3-2. Site B Development Water Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Average Day Water Consumption Rate	191 L/capita/day	191 L/capita/day
Total Site Area	4742 m ²	
Total GFA	23355 m ²	14652 m ²
Residential units	303	n/a
Residential/ commercial population	527	161
Peaking factor – peak hour	2.5	1.2
Average Water Demand from Site	1.2 L/s	0.4 L/s
Peak Water Demand from Site	2.9 L/s	0.4 L/s

The estimated fire flow requirements for each site were calculated based on recommendations by the *Fire Underwriters Survey Water Supply for Public Fire Protection (1999)* and the City of Toronto’s fire flow requirement. The largest flow between the City’s requirement and Fire Underwriters Survey Guideline was used as the fire flow requirement. These were determined to be 41,068 L/min for Site A and 42,890 L/min for Site B. Detailed calculations can be found in **Appendix A**.

Site A will have a single 300 mm water service connection to the existing 150 mm mainline watermain on Atlantic Avenue. This connection line will split into a 250 mm fire service and a 200 mm domestic service at the development end of the connection.

Site B is proposed to have two separate connections to the existing 150 mm mainline watermain to accommodate future development. One 300 mm connection will connect to the mainline along Jefferson Avenue, while the second 300 mm connection will connect to the mainline along Atlantic Avenue. Each of the 300 mm connections will split into a 250 mm fire service and 200 mm domestic water service per City of Toronto standards.

4 Sanitary Servicing

4.1 Existing Condition

Utility information provided in the Exhibition Station TOC drawings are based on Quality Levels B, C and D SUE, and need to be confirmed on site.

Available SUE surveys of the area do not appear to show any sanitary connections to the existing sites. However, the surveys do show an existing network of mainline combined storm/sanitary sewers along Atlantic Avenue, Fraser Avenue, Mowat Avenue and Dufferin Street. Further investigation on-site may be needed.

4.2 Proposed Sanitary Flow

Sanitary flows for the proposed developments were calculated based on design parameters from the *City of Toronto Design Criteria for Sewers and Watermains (2019)* and site statistics provided by the architect. Table 4-1 and Table 4-2 summarize the sanitary flow calculations for the proposed development on Site A and B respectively. Detailed sanitary flow calculations are included in **Appendix C**.

Table 4-1. Site A Development Sanitary Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Sanitary Demand Rate	450 L/capita/day	0 L/capita/day
Commercial Average Flow	n/a	180 000 L/floor ha/day
Total GFA	20581 m ²	14265 m ²
Peaking Factor	4	n/a
Peak Sanitary Flow	2.40 L/s	2.97 L/s
Groundwater Discharge to Sanitary Sewer	0.12 L/s	
Maximum Cumulative Flow with Peaking Factor	12.70 L/s	

Table 4-2. Site B Development Sanitary Demand Calculation Summary

Parameter/ Items	Residential	Commercial
Sanitary Demand Rate	450 L/capita/day	0 L/capita/day
Commercial Average Flow	n/a	180 000 L/floor ha/day
Total GFA	23355 m ²	14652 m ²
Peaking Factor	4	n/a
Peak Sanitary Flow	2.74 L/s	3.05 L/s
Groundwater Discharge to Sanitary Sewer	0.12 L/s	
Maximum Cumulative Flow with Peaking Factor	14.15 L/s	

4.3 Sanitary Service Connection

Each of the proposed buildings will be connected to the mainline combined sewers. The westerly building at Site A will be connected to the existing 375 mm combined sewer along Atlantic Avenue via a 250 mm connection. Proposed service connections for the easterly building are yet to be determined.

Site B will have a single 250 mm connection to the 375 mm mainline combined sewer along Atlantic Avenue, at the north-west end of the development. A sanitary service connection south of this location, was also previously proposed by others. Details of this previous proposal, and how it impacts the existing design will need to be confirmed.

5 Storm Drainage and Stormwater Management

5.1 Existing Condition

Based on investigation of available information, including site aerial imagery, the Ontario Line corridor will be built along the north side of the existing GO tracks. The existing land use for Exhibition Station sites is primarily developed areas, including roads and parking lots.

Minor flow within the vicinity of the sites is captured via several catch basins and conveyed into existing storm sewers adjacent to the sites which includes a 375mm storm sewer along Atlantic Avenue and a 375mm storm sewer along Jefferson Avenue. The storm sewers along the local streets discharge north into the Liberty Street storm sewer system. This system discharges west to the existing 1875mm brick sewer draining south along the Dufferin Street. Additionally, there are multiple existing combined sewers including a 375mm combined sewer along Atlantic Avenue and a 375mm combined sewer along Jefferson Avenue. Refer to the Existing Conditions Drainage Plan in **Appendix D**.

The City is working on the InfraWorks model for this area, and with limited information that is currently available, it is not possible to further comment on where the existing buildings are draining.

Based on the Environmental Assessment report for the Liberty Village New Street (LEA Consulting Ltd, July 2016), the major flow from the sites is draining from north to south towards the GO / Metrolinx rail corridor. The GO corridor drains east and west from the existing GO transit stop high point located at the south limit of Atlantic Avenue. Major valley systems are located 4.3 km west at Humber River and 5.8 km east at Don River. The excerpt from the ESR report showing the existing drainage pattern is provided in Stormwater Management Report. Within the GO / Metrolinx corridor, stormwater is conveyed along the railway via ditches along the right-of-way and drains uncontrolled to the west into an existing culvert located below the Dufferin Street Bridge and to the east into Don River. Based on the ESR report, the culvert connects to the 1875 mm diameter brick sewer draining south along Dufferin Street. The existing drainage pattern is shown on the Existing Drainage Plan in **Appendix D**. The drainage patterns described herein are to be reviewed and confirmed during detailed design for the project.

5.2 Stormwater Management Criteria

Stormwater management requirements are specified by the authorities having jurisdiction over the Project. These requirements apply to all locations where the proposed design will influence or be influenced by surface water runoff. The stormwater management design criteria are described below and supplemented by the Project Specific Output Specifications (PSOS). The key criteria applicable to this Project are summarized in the following sections.

5.2.1 Quality Control

- Provide a long-term average removal of 80% of total suspended solids (TSS) from the storm runoff of additional impervious areas (TRCA Guidelines).
- Provide a long-term average removal of 80% of total suspended solids (TSS) on an annual loading basis from all the storm runoff leaving the site (WWFMG, TGS).
 - Oil-Grit Separator (OGS) devices are credited with a maximum of 50% TSS removal (WWFMG, TRCA).

5.2.2 Quality/ Flood Control

- Protect against surface flooding from ponding on streets during the 100-year event. Consult Toronto Water – Sewer Asset Planning Section for developments within the City’s chronic basement flooding areas (WWFMG).
- Drainage discharged to the municipal storm sewer must be controlled to the peak release rate from the lower of:
 - the existing conditions peak flow from design event with a 2-year return period assuming a runoff coefficient of 0.5, if the existing imperviousness is greater than 50%; and,
 - the existing capacity of the storm sewer (WWFMG).
- In absence of an approved or adequate overland flow route, all flow from the 2-year up to the 100-year return storm events shall be stored on-site and released at the allowable release rate as defined above (WWFMG).
- Peak flows should be calculated using the intensity-duration-frequency (IDF) information in the WWFMG.

5.2.3 Water Balance

- Retain all runoff from the 5 mm rainfall event on-site through infiltration, evaporation, and/or rainwater reuse (WWFMG, TGS - Tier 1).
- Retain all runoff from the 10 mm rainfall event on-site through infiltration, evaporation, and/or rainwater reuse (TGS - Tier 2).
- For sites located in high volume groundwater recharge areas (HGRA), pre-development groundwater recharge rates should be maintained (TRCA).

5.2.4 Erosion Control

- For infill/redevelopment sites (<2 ha), where the site does not drain to a sensitive watercourse, erosion control should be provided through the retention of a small design rainfall event (typically 5 mm). This is often achieved by satisfying the water balance retention requirement (WWFMG, TRCA).
- For new large development sites (> 5 ha) discharge directly and/or in proximity (within 100 m) of natural watercourses, it is required to complete an Erosion Analysis Report to determine the erosion control criteria for the sites (WWFMG).
- For sites where it is not feasible (this condition must be reviewed and agreed by City staff) to complete an erosion analysis study report, it is typically required that runoff

from a 25 mm design storm shall be detained on-site and released over a minimum of 24 hours (WWFMG).

5.3 Stormwater Management Plan

As per the applicable stormwater management (SWM) criteria summarized in **Section 5.2**, water balance, water quantity, quality and erosion control for the proposed Exhibition development sites is required. The stormwater best management practices (BMP) considered for the site include green roofs, underground detention/retention tanks, and oil/grit separator (OGS) units. The Proposed Conditions Drainage Plan is presented in **Appendix D**.

All building openings should be protected from flooding. During detailed design, the depth of overland flow at these locations should be calculated using dual drainage models to confirm that all openings to the buildings will have sufficient freeboard above the maximum water elevation during a 100-year storm event. The Reference Concept Design (RCD) satisfies stormwater management (SWM) and drainage requirements for the Proposed Exhibition Sites as follows:

- **Quantity Control:**

Storage tank units with orifice control are proposed in the first underground level to provide quantity control.

- **Quality Control:**

Quality control for each site will be provided via the proposed green roof and an Oil Grit Separator unit.

- **Water Balance:**

Green roof and water reuse are proposed to satisfy the 10 mm retention requirement. Summary of the required storage is presented in Table 5-1 below:

Table 5-1. Summary of the Required Storage

ID	Site Area (ha)		Proposed Green Roof (ha)	Required Storage Volume for Quantity Control (m3)	Required Storage Volume for Water Balance Reuse (m3)
	Exist.	Prop.			
Site A	0.4777	0.4777	0.183	154	41.16
Site B	0.4742	0.4742	0.186	153	40.81

For details of the stormwater management requirement and design, refer to the Stormwater Management Report under a separate cover.

6 Site Utilities

All three sites will be serviced by utilities provided by Enbridge Gas, Toronto Hydro, and relevant telecommunications providers. Future utility coordination is required with each utility company to determine the feasibility, requirements, and connection locations for their respective service.

6.1 Electrical Service

Electrical services will be provided by Toronto Hydro. Surveys currently show existing Toronto Hydro conduits within the vicinity of all proposed developments, including an existing electrical service connection to the existing building at Site B. The developer is to initiate discussions with Toronto Hydro to determine the requirements and connection locations for electrical service.

6.2 Gas Service

Gas service will be provided by Enbridge Gas. Available SUE surveys of the area indicate that the existing building at Site B is currently serviced by two gas lines, one to its west connecting to the 100 mm gas main along Jefferson Avenue, and the other to its east connecting to the 100 mm gas main along Atlantic Avenue. The developer is to initiate discussions with Enbridge Gas to determine the connection requirements and locations of gas service to the proposed Sites A and B developments.

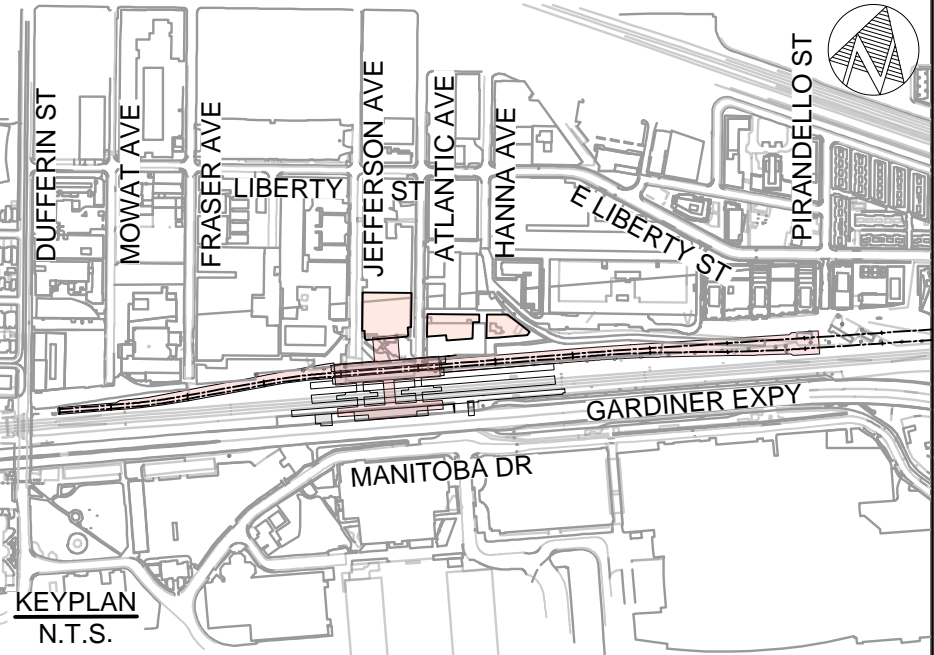
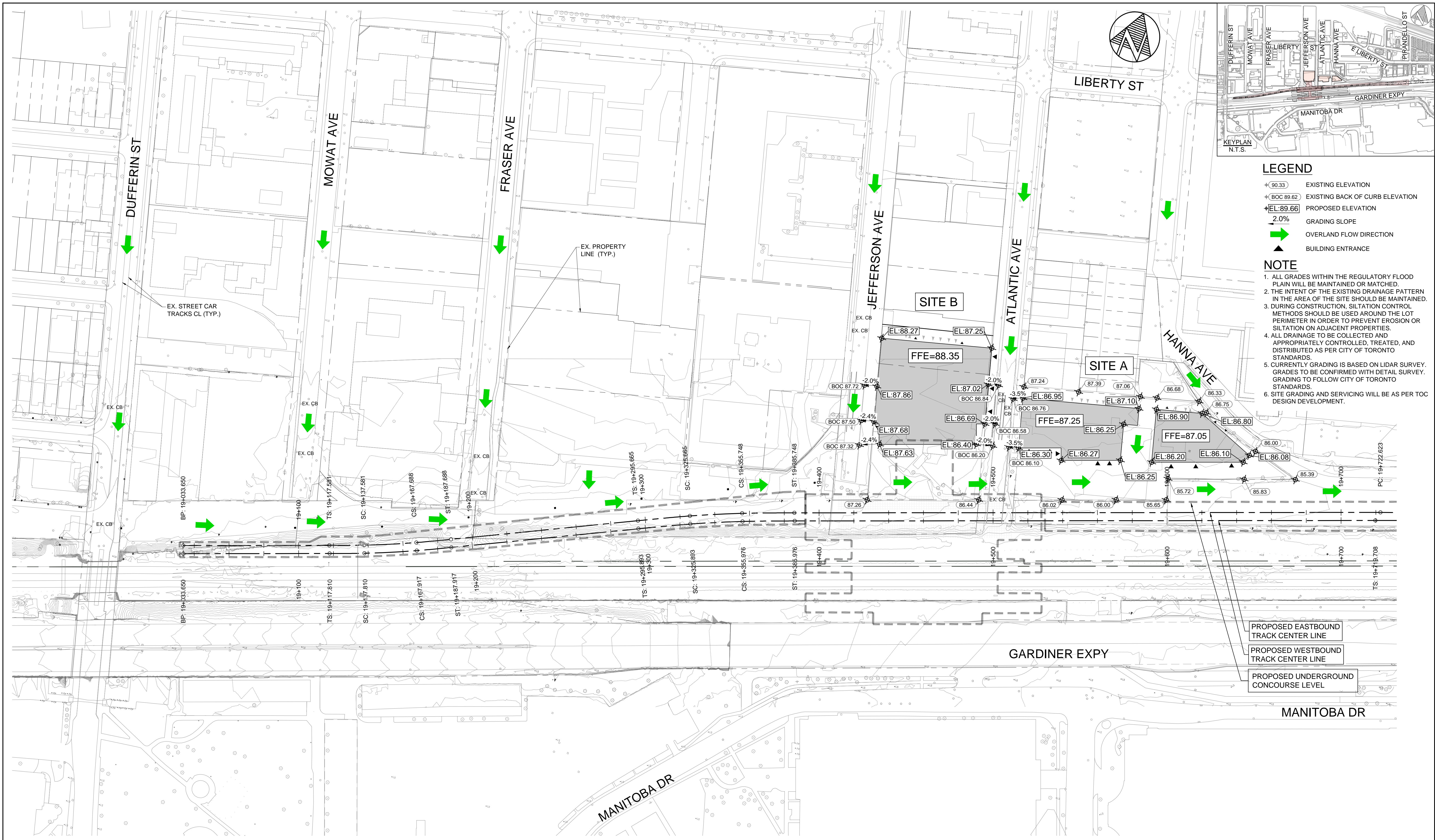
6.3 Communication

Surveys currently show cables from Rogers, Beanfield, and Bell traversing the extent of all sites. The developer is to coordinate with the relevant communication systems provider to determine connection requirements.

7 Conclusions and Summary

A Site Servicing plan has been prepared to support the preliminary rezoning submission for the proposed developments south of East Liberty Street from Jefferson Street to Hanna Avenue along the proposed New Liberty Street, in the City of Toronto as part of the Ontario Line Transit-Oriented Communities. Due to limitations in the available existing utility information, this report focuses on the proposed developments water demand, sanitary demand, and stormwater management design requirements. Coordination and data collection with the City of Toronto is on-going throughout this project to review the existing sewage capacity to accommodate the proposed developments. OneTeam is arranging a flow monitor program to review the existing sewage capacity and water pressure in the proximity of the proposed developments.

Appendix A. Site Servicing Plan and Grading Plan



- LEGEND**
- + 90.33 EXISTING ELEVATION
 - + BOC 89.62 EXISTING BACK OF CURB ELEVATION
 - + EL: 89.66 PROPOSED ELEVATION
 - 2.0% GRADING SLOPE
 - ➔ OVERLAND FLOW DIRECTION
 - ▲ BUILDING ENTRANCE
- NOTE**
1. ALL GRADES WITHIN THE REGULATORY FLOOD PLAIN WILL BE MAINTAINED OR MATCHED.
 2. THE INTENT OF THE EXISTING DRAINAGE PATTERN IN THE AREA OF THE SITE SHOULD BE MAINTAINED.
 3. DURING CONSTRUCTION, SILTATION CONTROL METHODS SHOULD BE USED AROUND THE LOT PERIMETER IN ORDER TO PREVENT EROSION OR SILTATION ON ADJACENT PROPERTIES.
 4. ALL DRAINAGE TO BE COLLECTED AND APPROPRIATELY CONTROLLED, TREATED, AND DISTRIBUTED AS PER CITY OF TORONTO STANDARDS.
 5. CURRENTLY GRADING IS BASED ON LIDAR SURVEY. GRADES TO BE CONFIRMED WITH DETAIL SURVEY. GRADING TO FOLLOW CITY OF TORONTO STANDARDS.
 6. SITE GRADING AND SERVICING WILL BE AS PER TOC DESIGN DEVELOPMENT.

PROPOSED EASTBOUND TRACK CENTER LINE
 PROPOSED WESTBOUND TRACK CENTER LINE
 PROPOSED UNDERGROUND CONCOURSE LEVEL

REVISIONS		REVISIONS	
1		4	
2		5	
3		6	

DRAFT PLAN
 NOT FOR CONSTRUCTION
 30 SEPTEMBER 2021

SCALE(S) 0 15 20 35 40m
 1:1000

STATUS



DESIGNED	M. LI	2020/09/09
DRAWN	H. WANG	2021/09/30
CHECKED	N. ROUSKOV	2021/09/30
APPROVED	APPROVED	2021/09/30

ONTARIO LINE SUBWAY

TITLE
TOC EXHIBITION STATION
 GRADING PLAN

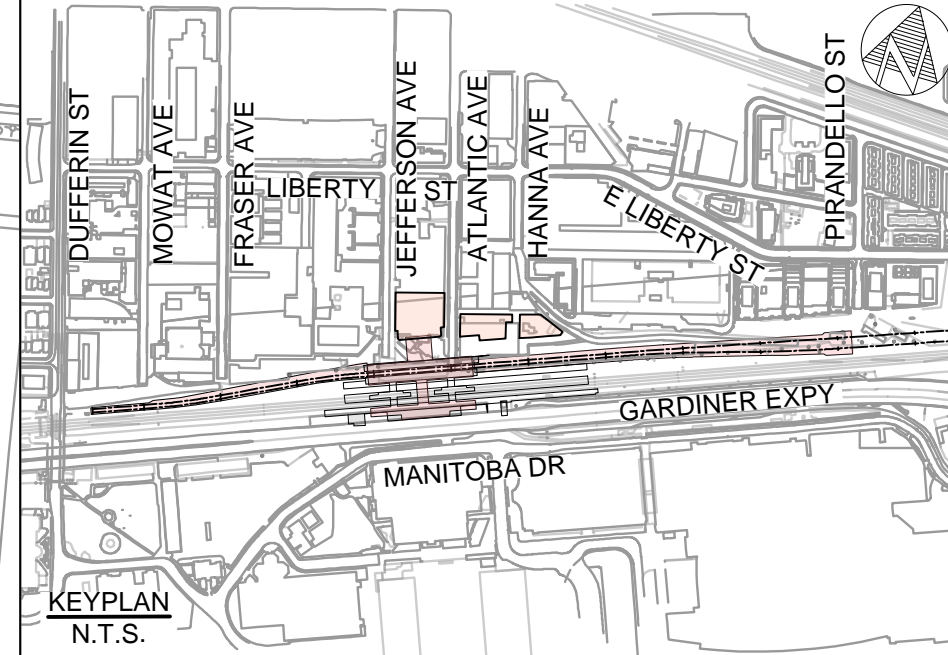
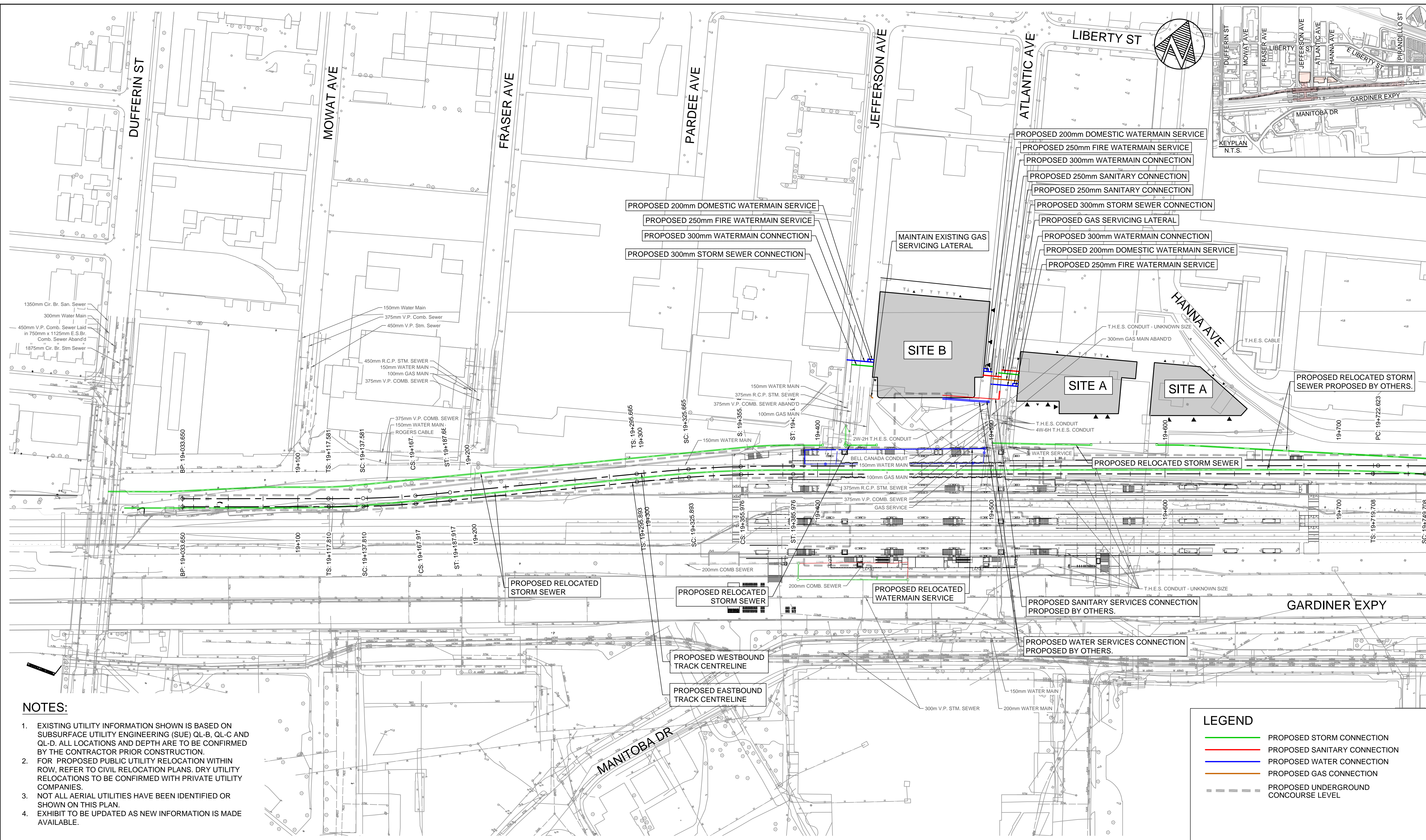
Plot Date:

METROLINX
 Infrastructure Ontario

Dwg. No. GR1000-01-SF001

Sheet No.

FILE: 10206938-ss1000-01-sf001.dwg
 PLOTTED BY: WANG, HENRY



- NOTES:**
- EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
 - FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
 - NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
 - EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.

LEGEND

	PROPOSED STORM CONNECTION
	PROPOSED SANITARY CONNECTION
	PROPOSED WATER CONNECTION
	PROPOSED GAS CONNECTION
	PROPOSED UNDERGROUND CONCOURSE LEVEL

REVISIONS	REVISIONS
1	4
2	5
3	6

DRAFT PLAN
 NOT FOR CONSTRUCTION
 30 SEPTEMBER 2021

SCALE(S) 0 15 20 35 40m
 1:1000

STATUS



DESIGNED	M. LI	2020/09/09
DRAWN	H. WANG	2021/09/30
CHECKED	N. ROUSKOV	2021/09/30
APPROVED	APPROVED	2021/09/30

ONTARIO LINE SUBWAY
TOC EXHIBITION STATION
 SERVICING PLAN

Plot Date:

Infrastructure Ontario

Dwg. No. SS1000-01-SF001

Sheet No.

Appendix B. Water Demand Calculations

DESIGN CALCULATION
Water Demand and Fire Flow Demand

Location: Exhibition TOC
 Site A

Items	Water Demand Calculation		Remark
Site Parameters			
Average Day Water Consumption Rate	191 l/capita/day		Multi-unit high-rise = 191 litres / capita /day (City of Toronto Design Criteria for Sewers and Watermain)
Total Site Area	4777 Sq.m		
Total GFA	Residential	Commercial	
	20581	14265	Sq.m
Residential Units	265	n/a	
Residential/Commercial Population	461	157	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Minimum hour	0.84	0.84	
Peak Hour	2.5	1.2	
Maximum Day Factor	1.3	1.1	
Friction Factors			
300mm to 600mm	120.0 'C' Factor		
	Residential	Commercial	
Average Consumption Rate	1L/s	0.3L/s	Population x Average consumption
Maximum Day Flow Rate	1.3L/s	0.4L/s	Population x Average consumption x Maximum Day Factor
Peak Hour Flow Rate	2.5L/s	0.4L/s	Population x Average consumption x Peak Hour Factor
Items	Fire Flow Demand Calculation		Remark
Fire Flow Requirement (City of Toronto)			
High-rise residential & Commercial over two stories	28450.0 L/min		[number of hydrants] x [5,690 l/min]
Duration	19000.0 L/min		
Minimum number of hydrants	5.0 hours		
Average Spacing between hydrants	4.0 hydrants		(City of Toronto Design Criteria for Sewers and Watermain)
Maximum distance from access point of a building or lot to a hydrant	90.0m		
	55.0m		
Fire Flow Requirement (Fire Underwriter's Survey Guideline)			
	41067.6 L/min		$F=220 C * A^{0.5}$ (Fire Underwriter's Survey Guidelines)
			F= the required fire flow in L/min C= the coefficient related to the type of construction A= the total floor area in square metres (All floors excluding Basement, under 2-Storeys) Coefficient related to Construction=1.0
			<u>Occupancy hazard reduction of surcharge</u>
			Non-combustible Limited combustible Combustible Free burning Rapid burning
minus: 15%	6160.1 L/min		
minus: 50%	17453.7 L/min		Apply Reduction for Automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and system with electronic supervision (10%)
Fire Flow (F)	41067.6 L/min		Takes the largest flow between City's requirement and Fire Underwriter's Survey Guideline

DESIGN CALCULATION
Water Demand and Fire Flow Demand

Location: Exhibition TOC
Site B

Items	Water Demand Calculation		Remark
Site Parameters			
Average Day Water Consumption Rate	191 l/capita/day		Multi-unit high-rise = 191 litres / capita /day (City of Toronto Design Criteria for Sewers and Watermain)
Total Site Area	4742 Sq.m		
Total GFA	Residential	Commercial	
	23355	14652	Sq.m
Residential Units	303	n/a	
Residential/Commercial Population	527	161	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Minimum hour	0.84	0.84	
Peak Hour	2.5	1.2	
Maximum Day Factor	1.3	1.1	
Friction Factors			
300mm to 600mm	120.0 'C' Factor		
	Residential	Commercial	
Average Consumption Rate	1.2L/s	0.4L/s	Population x Average consumption
Maximum Day Flow Rate	1.5L/s	0.4L/s	Population x Average consumption x Maximum Day Factor
Peak Hour Flow Rate	2.9L/s	0.4L/s	Population x Average consumption x Peak Hour Factor
Items	Fire Flow Demand Calculation		Remark
Fire Flow Requirement (City of Toronto)			
High-rise residential & Commercial over two stories	28450.0 L/min		[number of hydrants] x [5,690 l/min]
Duration	19000.0 L/min		
Minimum number of hydrants	5.0 hours		
Average Spacing between hydrants	4.0 hydrants		(City of Toronto Design Criteria for Sewers and Watermain)
Maximum distance from access point of a building or lot to a hydrant	90.0m		
	55.0m		
Fire Flow Requirement (Fire Underwriter's Survey Guideline)			
	42889.8 L/min		$F=220 C * A^{0.5}$ (Fire Underwriter's Survey Guidelines)
			F= the required fire flow in L/min C= the coefficient related to the type of construction A= the total floor area in square metres (All floors excluding Basement, under 2-Storeys) Coefficient related to Construction=1.0
			<u>Occupancy hazard reduction of surcharge</u>
			Non-combustible Limited combustible Combustible Free burning Rapid burning
minus: 15%	6433.5 L/min		
minus: 50%	18228.2 L/min		Apply Reduction for Automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and system with electronic supervision (10%)
Fire Flow (F)	42889.8 L/min		Takes the largest flow between City's requirement and Fire Underwriter's Survey Guideline

Appendix C. Sanitary Flow Demand Calculation

**DESIGN CALCULATION
Sanitary Flow Demand**

 Location: Exhibition TOC
 Site A

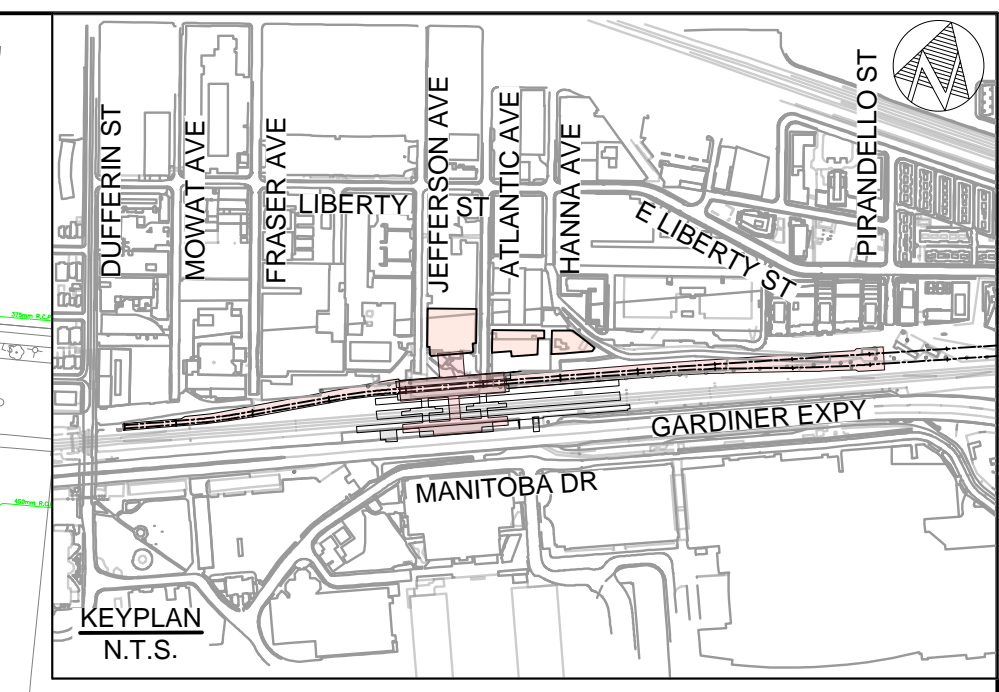
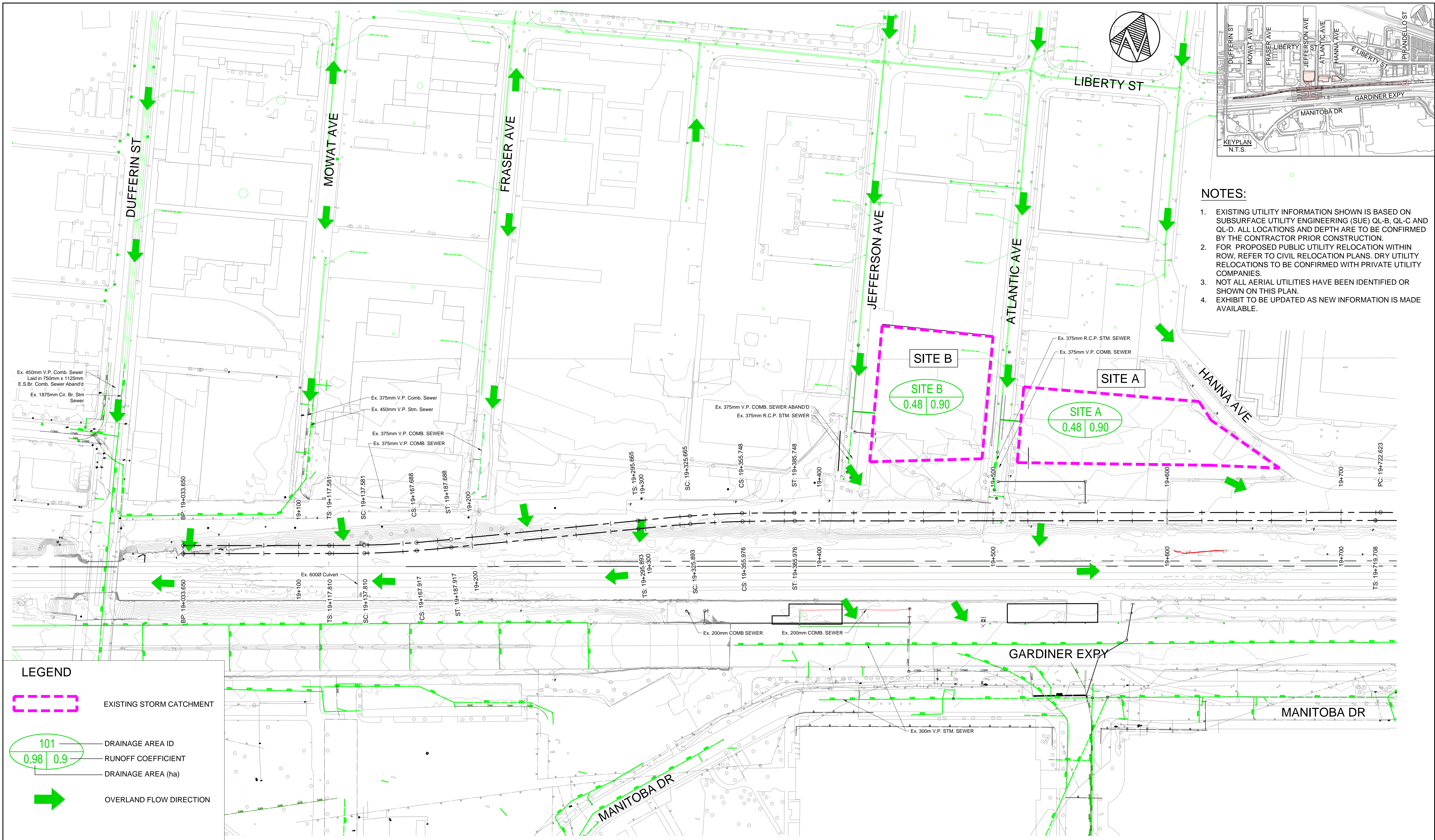
Items	Water Demand Calculation		Remark
Site Parameters			
Average waste water flow	450	l/capita/day	Multi-unit high-rise = 450 litres / capita /day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Commercial average flow	180000	l/floor hectare/day	Commercial = 180000 litres/ floor hectare / day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Total Site Area	4777	Sq.m	
Total GFA	Residential	Commercial	
	20581	14265	Sq.m
Residential Units	265	n/a	
Residential/Commercial Population	461	157	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Residential peak factor (PF=)	4	n/a	<i>Commercial peak factor is included in average flow</i>
Extraneous Flow			
Infiltration allowance (< 10 ha)	0.26	l/s/ha	
Residential Flow	2.40	l/s	
Commercial Flow	2.97	l/s	
Infiltration Flow	0.12	l/s	
Maximum Cumulative Flow with peaking factor	12.70	l/s	

**DESIGN CALCULATION
Sanitary Flow Demand**

 Location: Exhibition TOC
 Site B

Items	Water Demand Calculation		Remark
Site Parameters			
Average waste water flow	450	l/capita/day	Multi-unit high-rise = 450 litres / capita /day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Commercial average flow	180000	l/floor hectare/day	Commercial = 180000 litres/ floor hectare / day <i>(City of Toronto Design Criteria for Sewers and Watermain)</i>
Total Site Area	4742	Sq.m	
Total GFA	Residential 23355	Commercial 14652	Sq.m
Residential Units	303	n/a	
Residential/Commercial Population	527	161	Residential: 1.74 people /unit , Commercial: 1.1 people /100sq. m
Peaking Factor	Residential	Commercial	
Residential peak factor (PF=)	4	n/a	<i>Commercial peak factor is included in average flow</i>
Extraneous Flow			
Infiltration allowance (< 10 ha)	0.26	l/s/ha	
Residential Flow	2.74	l/s	
Commercial Flow	3.05	l/s	
Infiltration Flow	0.12	l/s	
Maximum Cumulative Flow with peaking factor	14.15	l/s	

Appendix D. Drainage Plan



- NOTES:**
- EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
 - FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
 - NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
 - EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.

LEGEND

- EXISTING STORM CATCHMENT
- DRAINAGE AREA ID
RUNOFF COEFFICIENT
DRAINAGE AREA (ha)
- OVERLAND FLOW DIRECTION

FILE: 10206938-dr1000-01-sf001.dwg
PLOTTED BY: WANG, HENRY

REVISIONS		REVISIONS	
1		4	
2		5	
3		6	

DRAFT PLAN
NOT FOR CONSTRUCTION
30 SEPTEMBER 2021



STATUS

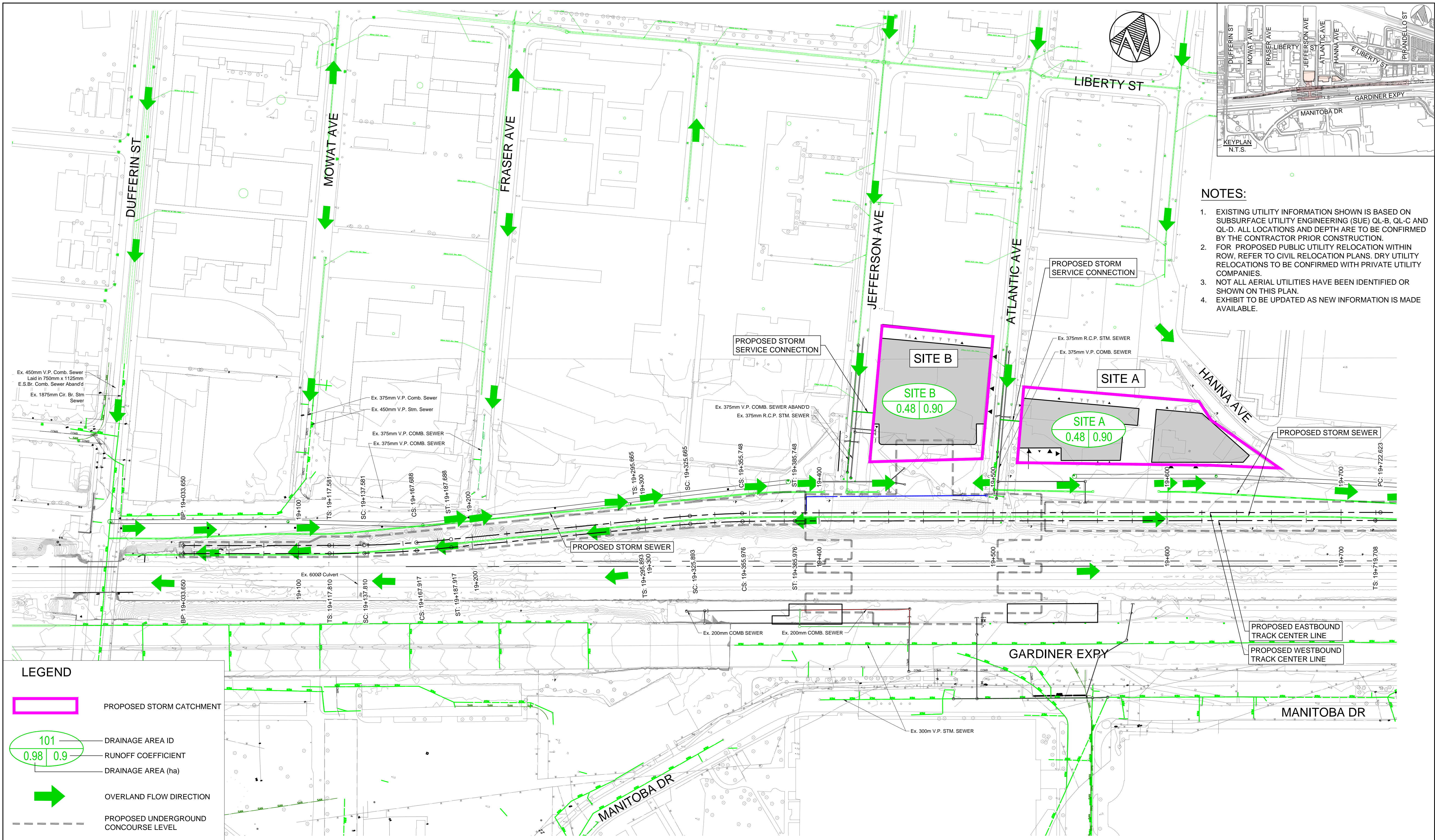


DESIGNED S. KHORSHID 2020/12/08
DRAWN H. WANG 2021/09/30
CHECKED N. ROUSKOV 2021/09/30
APPROVED APPROVED 2021/09/30

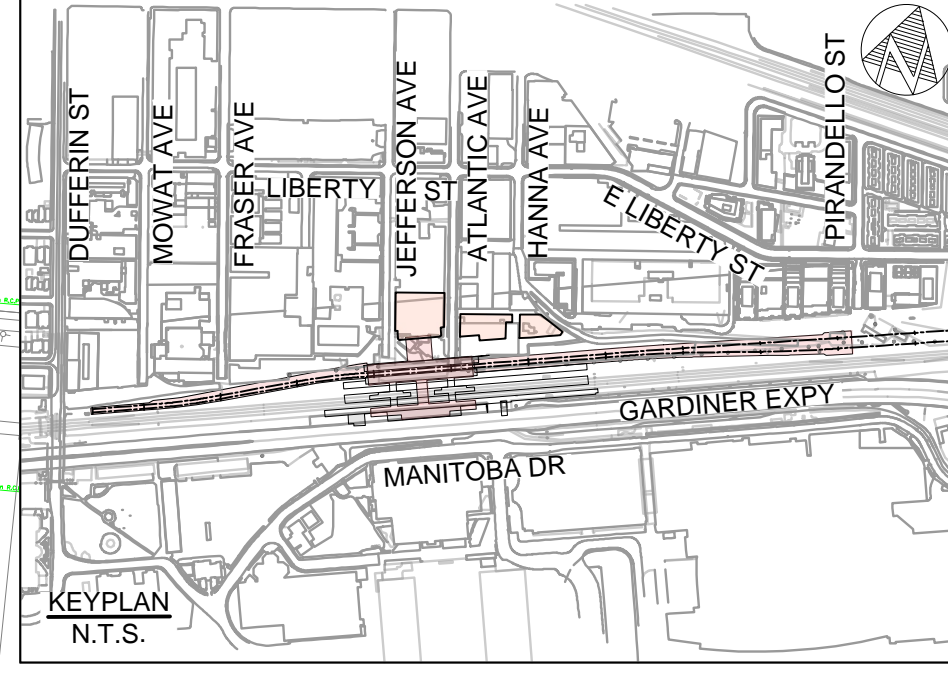
ONTARIO LINE SUBWAY

TITLE
TOC EXHIBITION STATION
EXISTING DRAINAGE PLAN

Plot Date:
METROLINX
Infrastructure Ontario
Dwg. No. DR1000-01-SF001 Sheet No.



- NOTES:**
- EXISTING UTILITY INFORMATION SHOWN IS BASED ON SUBSURFACE UTILITY ENGINEERING (SUE) QL-B, QL-C AND QL-D. ALL LOCATIONS AND DEPTH ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR CONSTRUCTION.
 - FOR PROPOSED PUBLIC UTILITY RELOCATION WITHIN ROW, REFER TO CIVIL RELOCATION PLANS. DRY UTILITY RELOCATIONS TO BE CONFIRMED WITH PRIVATE UTILITY COMPANIES.
 - NOT ALL AERIAL UTILITIES HAVE BEEN IDENTIFIED OR SHOWN ON THIS PLAN.
 - EXHIBIT TO BE UPDATED AS NEW INFORMATION IS MADE AVAILABLE.



LEGEND

- PROPOSED STORM CATCHMENT
- 101 DRAINAGE AREA ID
- 0.98 | 0.9 RUNOFF COEFFICIENT
- 0.48 | 0.90 DRAINAGE AREA (ha)
- ➔ OVERLAND FLOW DIRECTION
- PROPOSED UNDERGROUND CONCOURSE LEVEL

FILE: 10206938-dr1000-01-sf001.dwg
PLOTTED BY: WANG, HENRY

REVISIONS	
1	4
2	5
3	6

DRAFT PLAN
NOT FOR CONSTRUCTION
30 SEPTEMBER 2021



STATUS



DESIGNED S. KHORSHID 2021/05/19
DRAWN H. WANG 2021/09/30
CHECKED N. ROUSKOV 2021/09/30
APPROVED APPROVED 2021/09/30

ONTARIO LINE SUBWAY		Plot Date:
TOC EXHIBITION STATION		METROLINX
PROPOSED DRAINAGE PLAN		Infrastructure Ontario
TITLE		Dwg. No. DR1000-01-SF002
		Sheet No.