ENTUITIVE

PROXIMITY STUDY

GLADSTONE & LORETTA, OTTAWA

C019.1960

FOR: TIP GLADSTONE LP | **DATE:** APRIL 09, 2021

ENTUITIVE

TABLE OF CONTENTS

1. INTRODUCTION

TIP Gladstone LP will be proceeding with the design and construction of a new mixed-use development located at 951 Gladstone Ave. and 145 Loretta Ave. North in Ottawa, Ontario (the Project). The Project includes three residential towers sitting on top of a mixed-use podium with commercial office space and retail units. The ground floor of the development supports the mixed-use component and allows for pedestrian and vehicular access around the complex. The entire mixed-use component will be supported by and built above a below grade parking area. The development is located adjacent to the Trillium LRT line and Gladstone Station.

The proposed development at Gladstone and Loretta will support the City's investment in rapid transit by placing significant density adjacent to the Gladstone Station. The development has been carefully designed to complement the Gladstone Station.

This Proximity Study will address the impact of the proposed development on the following adjacent public infrastructure:

1. Gladstone Station
2. Trillium LRT Line (O-Train) infrastructure

This study is to be read in conjunction with the referenced drawings as included in the report and as attached in the Appendices.

2. PROJECT DESCRIPTION

The Project will include towers of 27, 28, and 31 levels. The total building heights at the towers will be 31, 33, and 36 storeys. The north podium has live/work studios and amenity space on the ground floor with residential units above. The south podium consists of three levels of office space over ground floor retail.

The Project will be designed to the requirements of the Ontario Building Code; the Canadian Highway Bridge Code, with respect to the urban driveways; the Guidelines for New Development in Proximity to Railway Operations prepared for the Federation of Canadian Municipalities and the Railway Association of Canada - May 2013, the Basis of Design Summary prepared by Entuitive for the client; and the appropriate material design standards prepared by the Canadian Standards Association.

The Project is to be constructed generally of reinforced concrete framing with reinforced concrete walls, reinforced concrete columns, and generally conventionally reinforced concrete slab construction. The Project will be founded on the existing rock stratum using conventional strip and spread footings, located generally between elevation 54.70 and 58.10 with the finished ground floor elevation at approximately 65.50.

The ground floor structure will support areas of the public realm which includes driveways and privately-owned publicly accessible spaces (P.O.P.S.) constructed over suspended slab areas. The earth retention system design (shoring piles, lagging and tiebacks) varies with the depth of the excavation and the existing grade. It is generally anticipated that the depth of the excavation relative to the Trillium Line LRT (O-Train) will have negligible impact.

An aerial view of the site (shown in red) is shown in *Figure 1.1* and the site plan is shown on *Figure 1.2*. The site is relatively flat and sloping ground to the rail track at the east and north-east boundary of the property. The urban access is approximately mid site with access from Loretta Avenue at elevation 66.0 approximately. The underground construction consists of two levels of below grade parking. The lowest level of parking (P2) is at approximately elevation 58.5.

The construction of the lower levels of parking generally requires the removal of the existing fill, clay and sandy clay material, and interbedded limestone and shale bedrock. This is done to achieve the depths required and to accommodate the planned parking slab elevations and to construct the building foundation support condition. According to the geotechnical and hydro-geological investigation carried out by DST Consulting Engineers Inc., based on an investigation date of June and July 2017**,** groundwater monitoring wells indicated that groundwater was found at elevations varying from 60 to 63 elevations over the site. The proposed buildings are to be founded on conventional spread footings placed on clean sound rock. The report identifies a requirement for waterproofing below the floor slab and around the basement walls.

The proposed development will be separated from the Trillium LRT line (O-Train) corridor by an area of landscaping – a horizontal distance in excess of 25 metres measured from the centerline of the nearest track.

Figure 1.1 | Aerial View of Site

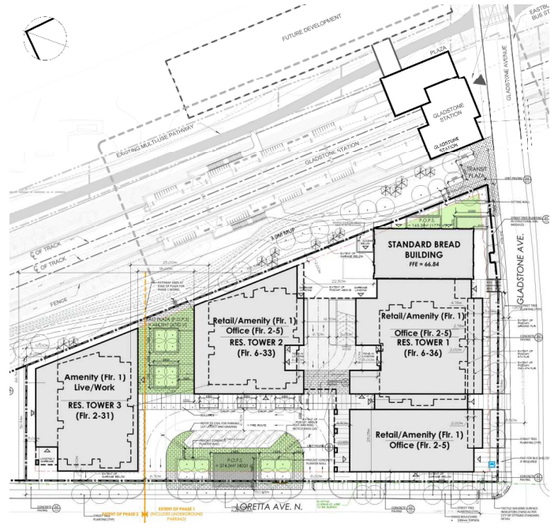


Figure 1.2 | Architectural Ground Floor Plan

2.1 SITE PLAN, PROPERTY AND TOPOGRAPICAL SURVEYS

A Site Plan as prepared by Hobin Architects indicating the centerline of the Trillium Line and the distances between the centerline and easement lines to the proposed structure, is presented in *Figure 2.1* below. The representative drawing prepared by Hobin Architects for SPA Submission is included in **Appendix A1** of this document.

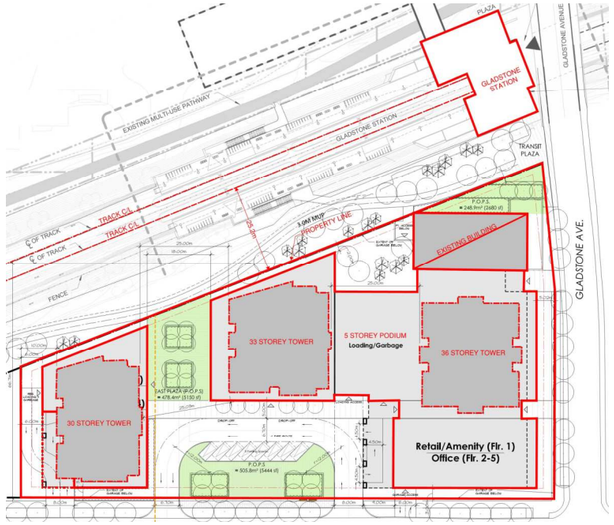


Figure 2.1 | Site Plan

Ventilation for the below grade program areas will be done primarily along the perimeter of the development through area wells with exhaust shafts located on the south and west sides of the development. Ventilation for the above grade program areas is still being developed but is anticipated to done through the roof and louvres in the podium and towers. No impact is anticipated on the Gladstone station and/or platforms based on the location of the intake and exhaust shafts and the distance from the proposed development to the Gladstone station. As well, there is no anticipated operational impacts to the use or maintenance of the Trillium LRT lines from the proposed development.

The survey information from the Topological Survey completed by Stantec Geomatics LTD on Part of Lot 38 Concession 1 (Ottawa Front) and Lots 1, 2 & 3 (West Champagne Avenue) Block C and Lots 1, 2, & 3 (East Loretta Avenue) Block C and Lots 4, 5, 6, 7, 8 Block C and Part of Block C and Part of Champagne Street (Closed by By-Law 4763) Registered Plan 73 City of Ottawa is shown on the Property Survey prepared by Stantec. These drawings indicate the property lines and existing topographic information including the existing surface elevations, location of buildings and rail tracks, as well as the existing contours of the surface elevations and are included in **Appendix A2**.

2.2 DEVELOPMENT DRAWINGS

The Architectural plan (prepared by Hobin Architects) of the lowest levels of the planned development, indicate the centerline of the Trillium Line, the distances between the centerline to the proposed structure for the development. This is presented in *Figure 2.2* below. Drawings can be found in **Appendix B1**.

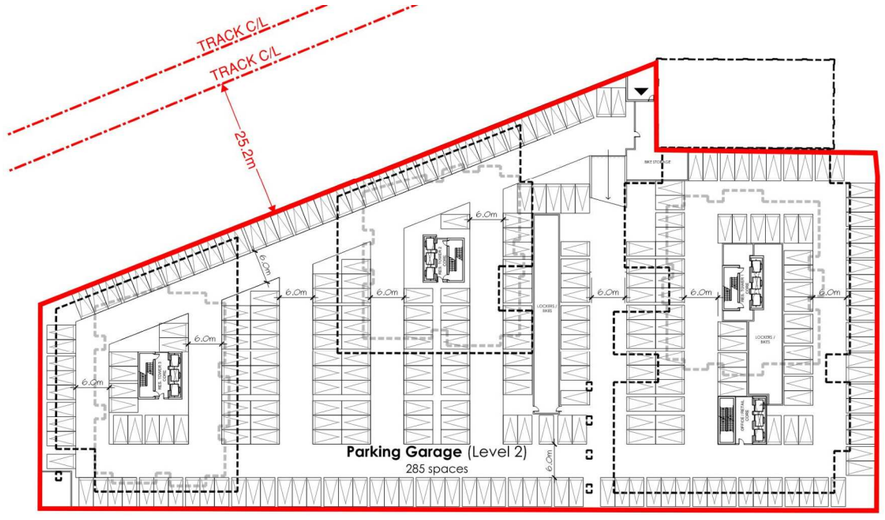


Figure 2.2 | Architectural Plan of Lowest Level

A Proximity Plan prepared by Entuitive, dated April 09, 2021, indicating the centerline and easement line of the Trillium Line; and the distances between the centerlines and easement lines to the proposed structure for the development is presented in *Figure 2.3*. Included in **Appendix B3**, are the available Gladstone Station drawings. The general size of the required foundation for the buildings are indicated in *Figure 2.4*. We have included the Entuitive substructure drawings in **Appendix B4**. These drawings generally indicate that soldier piles with wood lagging will form the temporary vertical wall of the excavation. Drilled and installed rock anchors as the project excavation proceeds will provide lateral support for this shored (Earth Retention) wall. These tie backs are necessary to control the horizontal and vertical deflection and subsidence of the shored wall as the excavation proceeds. The structural sections included in the Entuitive drawings demonstrate that there is no undermining of the rail beds for the O-Train/Trillium Line LRT.

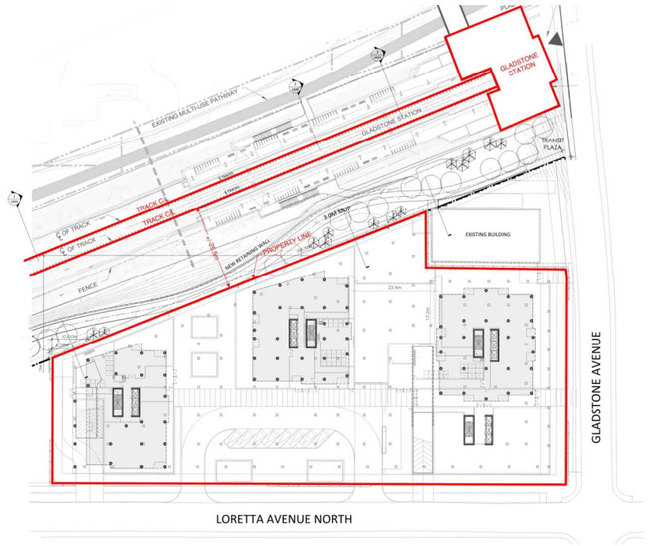


Figure 2.3 | Proximity Plan

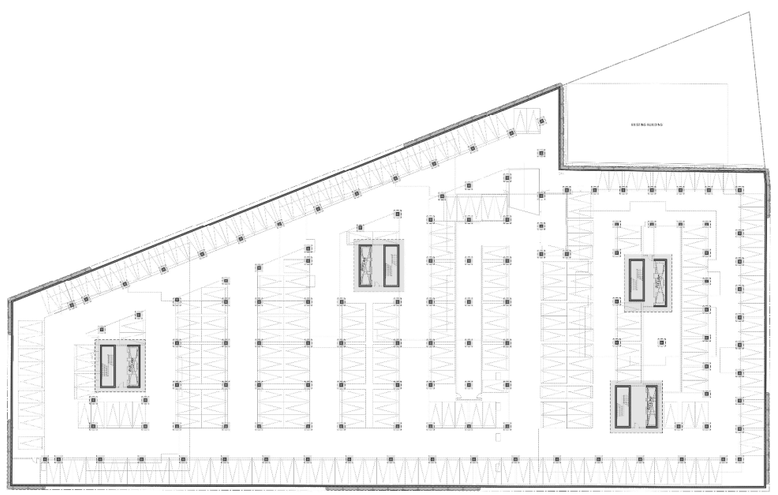


Figure 2.4 | Foundation Plan

Presented in *Figures 2.5, 2.6 and 2.7*, are a series of north-south sections looking east indicating the centerline of the Trillium Line structure, and the distance between the centerline and the proposed development. This separation of over 25 metres indicates that there is effectively no influence of the excavation on the Trillium Line. Additionally, the retaining wall proposed as part of the landscaping is also shown which based on its zone of influence will not impact the existing earth retention wall. The foundation walls for the development adjacent to the Trillium Line property are designed for an at-rest earth pressure coefficient (ko) of 0.5

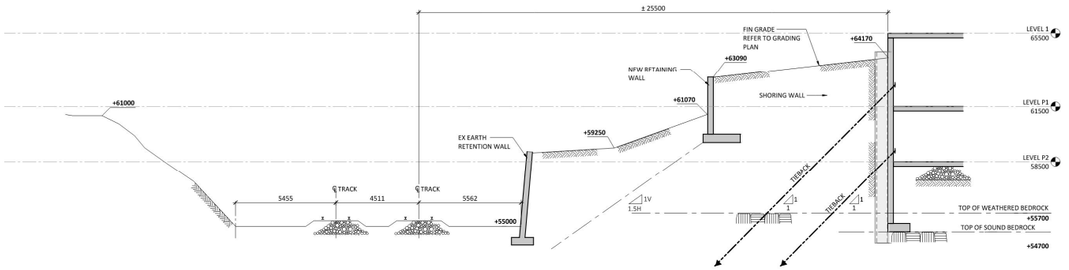


Figure 2.5 | East-West Section at Northern Boundary of Site

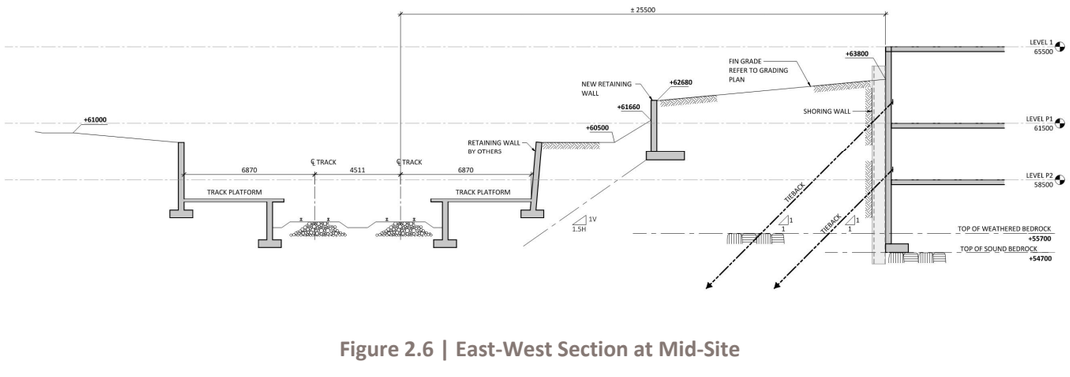


Figure 2.6 | East-West Section at Mid-Site

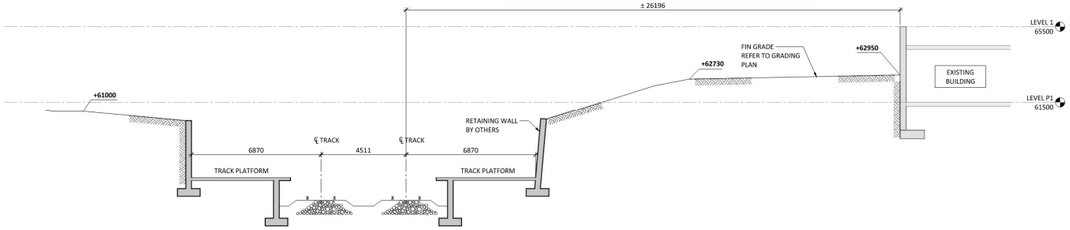


Figure 2.7 | East-West Section at Southern Boundary of Site

3. GEOTECHNICAL BACKGROUND

The following geotechnical report for the proposed development was prepared by DST Consulting Engineers Inc. and is included in **Appendix C**:

- Geotechnical Investigation Report TS-SO-029563, dated August 16, 2017

The site is currently occupied by existing buildings and surface parking lots. The subsurface profile consists of varying fill material overlying fine grained deposits of silt and clay. The clay/sandy clay overlies an interbedded limestone and shale bedrock. Fill depth is from 1 to 4 metres below the existing grade. A clay was encountered, underlying the fill layer. The clay was soft to very stiff in consistency. Bedrock appears to be fair to good quality based on Rock Quality Designation (RQD) results. The groundwater levels measured in the ground water monitor wells are subject to seasonal fluctuations up to 1 or 2 m based on the report.

The building is expected to be founded on conventional spread footings on clean, sound bedrock. Some localized bedrock removal is anticipated to be required to complete the underground parking levels and foundation construction. Line drilling and controlled blasting will be used for the bedrock removal. The blasting operations will be planned and completed under the guidance of a professional engineer with experience in blasting operation.

4. EXCAVATION SUPPORT SYSTEM AND TEMPORARY DEWATERING

Conventional timber lagging with steel piles using a combination of tiebacks and rakers will be used for the excavation system. Only the excavation support system adjacent to the Trillium Line property has been designed using the at-rest earth pressure coefficient (k_o) of 0.5. The remainder of the site will be designed to an active earth pressure coefficient of ka=0.30. Excavation and shoring drawings prepared by a professional engineer will be prepared during the building design phase. The monitoring plan for movement of the excavation support system and Trillium Line structures during construction of the development including an Action Protocol will also be prepared during the building design phase.

5. ELECTRO-MAGNETIC INTERFERENCE AND STRAY CURRENT

The details and quantum of the electro-magnetic interference at the property line and what mitigation measures have been included in the design of the O-Train/Trillium Line system is required from the City as the full design characteristics of the electrification of the O-Train/Trillium Line system would be intrinsic to any proposed solution.

6. GEOTECHNICAL HYDROGEOLOGICAL ANALYSIS

Control and management of the ground water will be required. During the excavation and subsequent construction of the substructure, it is anticipated that there will be a minor drawdown of the water table. The extent of the drawdowns predicted by the geotechnical and hydro-geotechnical engineers is stated to be minor and unlikely to cause settlement of the adjacent building structures, the rail lines and adjacent bridge structures. A ground water control plan, including short-term (during construction) and long-term effects of dewatering on the Trillium Line structures is described below.

6.1 TEMPORARY CONDITION

Local sump pits throughout the site excavation will be necessary for the collection of ground water and any seasonal precipitation. The quality of the collected water will be testing for possible excessive contamination levels. If required, temporary filtering will occur such that disposal water will meet the municipal requirements.

6.2 PERMANENT DESIGN CONDITION

Waterproofing in combination with underfloor and perimeter drainage will be required. The perimeter foundation walls would be founded on strip foundations bearing approximately 1500 mm below the top of the slab on grade for frost protection within a heated parking garage. This perimeter foundation level will be generally through the weathered rock and will act somewhat as a cut off wall to the perimeter ground water condition. Ground settlement analysis and impact assessment due to dewatering will also be analyzed and evaluated during the detailed design stage to avoid impact on Trillium Line system.

7. CONSTRUCTION ACCESS/STAGING

A Construction Logistics and a Traffic Management Plan will be prepared by the Construction Manager indicating site access provisions during and after construction, including limited lane closures. The staging of construction operations will be broken down into excavation, substructure construction and superstructure construction. Drawings/documentation of construction method, hoarding, construction access, and haul routes are not available currently from the Construction Manager.

7.1 EXCAVATION

In advance to the bulk excavation, auguring and installation perimeter shoring piles will commence around the site to facilitate the start of the excavation work. Wood lagging work will proceed with the excavation along the perimeter to the top tie back level. A berm will remain along the perimeter to allow for more interior excavation and allow the drill rig to set up in a stabilized condition so

that the tie-back holes may be drilled and grouted into the rock. Excavation will proceed to the next tie back level and again after tieback installation continues to the bottom of the hole. The soldier piles will be drilled to a depth at least 600 mm below the depth of excavation at the perimeter to provide a toe-anchor to the pile.

7.2 SUBSTRUCTION CONSTRUCTION

With the completion of the bulk excavation, finer excavation work will continue for the building footings and the tower raft foundations. We anticipate the perimeter of the footing or raft will be pre-drilled rather than excavated with a hoe-ram excavator to limit the excavation and to avoid the need for formwork to the excavated hole. As the installation of the foundation proceeds, work will commence with the erection of formwork for the columns and walls, as well as the soffit formwork of the substructure floors. We anticipate that the work in the initial area of substructure construction will tier out (as in a "wedding cake" manner), particularly in the tower and podium areas to facilitate the construction of the podium and tower areas perhaps in advance of the completion of certain areas of the parking garage. The flow of the work will be determined in conversations with the Construction Manager as well as the Trade Contractor in a manner consistent with the required occupancy dates for the lease and sale commitments determined by the Owner. As the ground floor is completed, the need to monitor the perimeter of the excavation for shoring pile movements will be redundant. At this time, where necessary, the shoring tiebacks will be destressed.

7.3 SUPERSTRUCTURE CONSTRUCTION

The superstructure work will commence in the critical path areas as determined by the Owner. The work to complete the substructure may continue in other areas of the development as the schedule requires but the focus of the work will occur where there are lease and sales commitments. Generally, the construction of the podium and tower areas will proceed in a manner that puts a higher priority on the areas of the development that require completion to satisfy the lease and sales requirements. As the structure is completed, the area will be turned over to the follow-on trades such as cladding, building services (mechanical, electrical and plumbing (MEP) as well as other finishing trades.

8. PRE AND POST CONSTRUCTION SURVEYS

Pre-construction condition surveys of the Trillium Line and Gladstone station structure to confirm locations of existing walls and foundations will be undertaken prior to construction. The as-built horizontal and vertical alignment data for the existing Trillium Line and Gladstone station (once constructed) is required from the City of Ottawa.

9. CRANE SWING AND LIFTING LOADS LIMITATIONS

The proposed crane locations and their swings will be subject to the final selection of the Construction Manager and the Formwork Trade Contractor, The Ministry of Labour and the Ontario Occupational Health and Safety Act, and the Construction Health and Safety Manual prepared by Construction Safety Association of Ontario (CSAO). It is important to note that although the crane swing may pass over the Trillium LRT line the lifting and swinging of loads over the rail line is not anticipated.

10. CONSTRUCTION AS-BUILT DRAWINGS

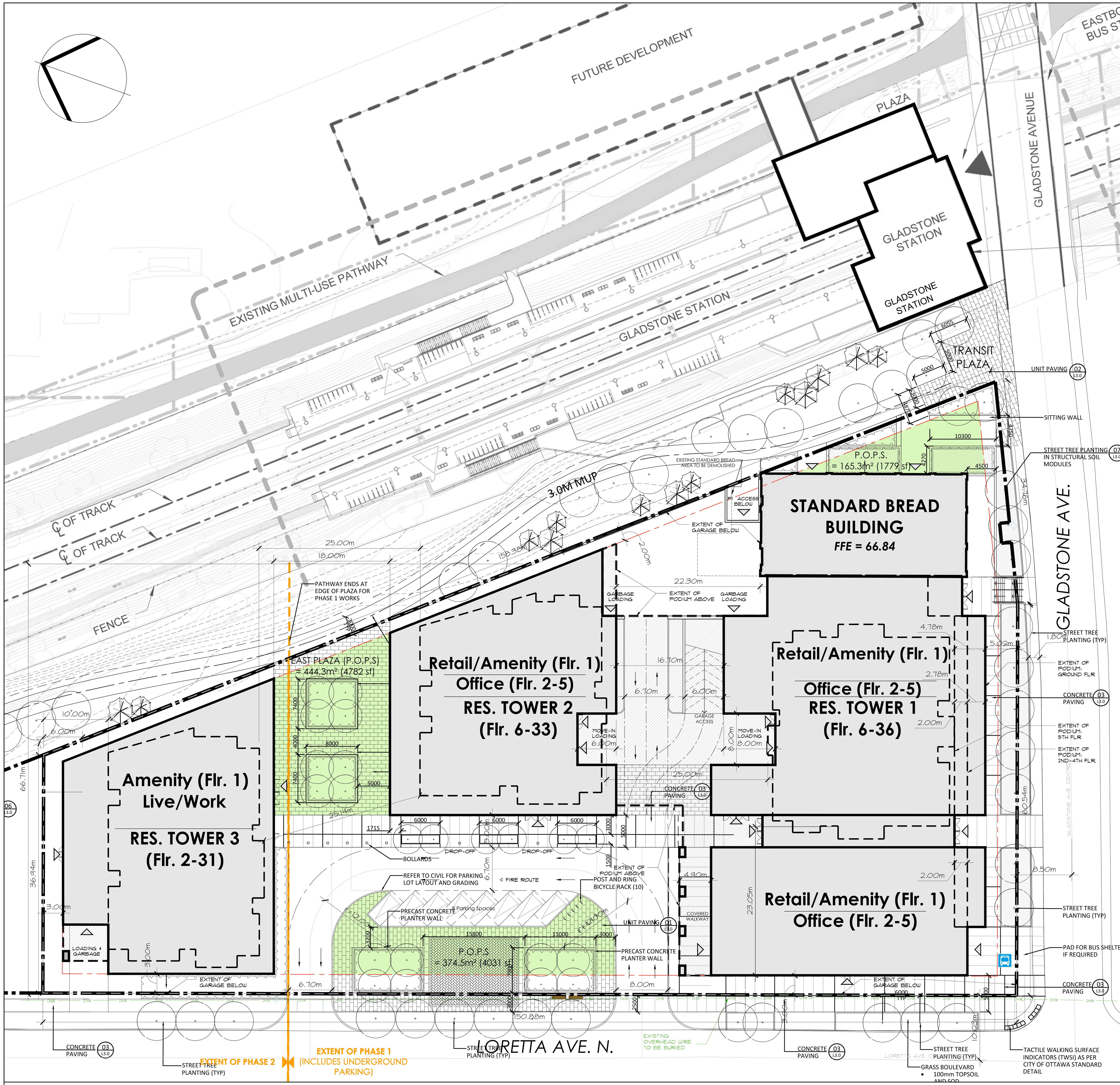
Construction record (as-built) drawings and electronic files for municipal documentation records in PDF and Microstation (.dgn) format will be provided at project completion.

APPENDIX A

SITE DRAWINGS

APPENDIX A1

ARCHITECTURAL SITE PLAN



SITE PLAN
1
A0.01
1:300

LOCATION PLAN

Gladstone and Loretta Mixed-Use Hub
Draft Zoning Table

MC[XXXX] SYYY-h		Requirement	Proposed
Minimum Lot Width (m)		No minimum	Complies
Minimum Lot Area (m²)		No minimum	Complies
Minimum Front Yard Setback (m)		5 metres; aside from Standard Bread Building (See S.YYY)	5m
Minimum Rear Yard Setback (m)		3 metres (See S.YYY)	3m
Interior Side Yard Setback (m)		2 metres, aside from Standard Bread Building (See S.YYY)	2m
Corner Side Yard Setback (m)		3 metres, (See S.YYY)	3m
Minimum Building Height (m)		6.7m (See S. YYY)	Complies
Maximum Building Height (m)		0m to 132m (See S. YYY)	Complies
Maximum Floor Space Index		No maximum	N/A
Minimum Width of Landscaped Area		No minimum, except that where a yard is provided and not used for required driveways, aisles, parking, loading spaces or outdoor commercial patio, the whole yard must be landscaped	Complies
Minimum Tower Separation Distance		23 metres	Complies
Minimum Tower Podium Stepback Distance		2 metres	2m at Gladstone
Parking Requirements (Sec. 101, 102, 106, 111)		**Requirement**	**Proposed**
Area Z of Schedule 1A 0 spaces/unit (resident) 0.1 spaces/unit, less first 12 units (visitor), but no more than 30		Resident: 0 Visitor: 30	Surface: 8 P1: 274 P2: 282 Total: 564
Vehicle Space Dimensions		- Must be 2.6m-3.1m by 5.2m - Up to 40% of required parking aside from visitors spaces may be 2.4m x 4.6m	Complies
Bicycle Parking Res: 0.5/unit Office, Retail, Studio: 1 space per 250m² GFA		0.5 x 846 units = 423 bicycles 79 bicycles Total Bicycle Spaces: 467	502 spaces proposed
Bicycle Space Dimensions		Horizontal: 0.6m by 1.8m	Complies
		Vertical: 0.5m by 1.5m (max 50% of required spaces)	
Drive Aisle Width (Double Traffic Lane)	Parking Lot	Minimum: 6.7m	Complies
	Parking Garage	Minimum: 6m Maximum: 6.7m	Complies
Amenity Space Requirements (Sec. 137)		**Requirement**	**Proposed**
Total: 6m² per unit **Communal: 50% of total required**		Total: 5,076 m² Communal: 2,538 m²	Rooftop Terrace: 1,441.9m² Indoor Communal Amenity: 2,006.8m² Balconies: 3,548.2m²
POPS [Privately Owned Public Space			POPS: 984m²

NOTE: ALL EXISTING SITE INFORMATION AS PER SITE SURVEY PLAN DATED ___, 2018 AND PREPARED BY STANTEC

LEGEND

BUS STOP		PROPERTY LINE	
OVERHEAD WIRE		SETBACK LINE	
FIRE HYDRANT		RETAINING WALL	
EXISTING HYDRO POLE		ROAD CENTRELINE	

0 m 10 m 25 m 50 m

no.	date	revision
03	APR 09, 2021	SITE PLAN
02	FEB 12, 2020	ZONING & OPA
01	DEC 04, 2019	CITY COMMENTS

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

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Canada K1S 3K7
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F: 613-235-2005
E: mail@hobinarc.com
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HOBIN ARCHITECTURE

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
SITE PLAN

DRAWN BY:	DATE:	SCALE:
TD	19/04/17	1:300

PROJECT: 1726

DRAWING NO.: A001

REVISION NO.:

None

APPENDIX A2
SURVEY DRAWINGS

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2011886

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR
In accordance with Regulation 1026, Section 29(3)

SURVEYOR'S REAL PROPERTY REPORT
PART 1 - PLAN OF

LOTS 1, 2 & 3 (WEST CHAMPAGNE AVENUE)
BLOCK C AND
LOTS 1, 2 & 3 (EAST LORETTA AVENUE)
BLOCK C AND
LOTS 4, 5, 6, 7 & 8
BLOCK C AND
PART OF BLOCK C AND
PART OF CHAMPAGNE STREET
(CLOSED BY BY-LAW 4863)
REGISTERED PLAN 73
CITY OF OTTAWA

Scale 1:200
0 5 10 15 METRES

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

BEARING NOTE

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE EASTERLY LIMIT OF LORETTA STREET NORTH AS SHOWN ON PLAN 4R-207, HAVING A BEARING OF N 23° 00' 15" W.

ELEVATION NOTE

POSITION OF SITE BENCHMARKS AS SHOWN HEREON.

ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM CITY OF OTTAWA VERTICAL CONTROL MONUMENTS No.'s 2011-0106 (ELEV=62.968m) AND 2011-0107 (ELEV=55.863m).

UTILITY NOTE

LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE AND ARE PER THE CITY OF OTTAWA SHEET No.'s___AND___ AND MUST BE VERIFIED PRIOR TO CONSTRUCTION.

NOTE

- THIS PLAN OF SURVEY IS TO BE READ IN CONJUNCTION WITH THE REPORT SUMMARY NOTED AS PART 2 HEREON.
- THIS REPORT CAN ONLY BE UPDATED BY THIS OFFICE. NO ADDITIONAL PRINTS OF THIS ORIGINAL REPORT WILL BE ISSUED SUBSEQUENT TO THE DATE OF CERTIFICATION.
- ALL TIES ARE MINIMUM UNLESS OTHERWISE NOTED.
- ALL TIES TO CURVED BOUNDARY ARE RADIAL TO ARC.
- RISK OF UNDERGROUND SERVICES. MONUMENTATION PLANTED ACCORDINGLY.

PART 2

This Report was prepared for _____ and the undersigned accepts no responsibility for the use by other parties.

1. REGISTERED RIGHTS-OF-WAY/EASEMENTS
No rights-of-way or easements were found to be registered against the subject properties.
2. PROPERTY IMPROVEMENTS

3. COMPLIANCE WITH MUNICIPAL ZONING BYLAWS
Compliance is not certified by this report.
4. ADDITIONAL REMARKS

LEGEND (IF APPLICABLE)

■	DENOTES	FOUND MONUMENTS
□	-	SET MONUMENTS
IB	-	IRON BAR
IB#	-	ROUND IRON BAR
SIB	-	STANDARD IRON BAR
SSIB	-	SHORT STANDARD IRON BAR
CC	-	CUT CROSS
CP	-	CONCRETE PIN
WIT	-	WITNESS
PIN	-	PROPERTY IDENTIFICATION NUMBER
MEAS	-	MEASURED
PROP	-	PROPORTIONED
OU	-	ORIGIN UNKNOWN
SG	-	STANTEC GEOMATICS LTD.
P	-	REGISTERED PLAN 73
P1	-	PLAN BY 725 DATED AUGUST 23, 1967
P2	-	PLAN BY 857 DATED AUGUST 10, 1979
P3	-	PLAN BY GCM DATED AUGUST 10, 1951
P4	-	PLAN BY 857 DATED JUNE 21, 2001
P5	-	PLAN BY A&M DATED NOVEMBER 6, 1963
P6	-	PLAN 4R-207
P7	-	PLAN 4R-22151

ACU	-	AIR CONDITIONING UNIT
AN	-	ANCHOR
AP	-	AIR PUMP
ANT	-	ANTENNA
BH	-	BOREHOLE
BIB	-	HOSE BIB
BKP	-	BIKE RACK
BENCH	-	BENCH
BOL	-	BOLLARD
BOUL	-	BOULDER
CB	-	CATCH BASIN
DCB	-	DOUBLE CB
CBMH	-	CB MANHOLE
DCBMH	-	DOUBLE CB MANHOLE
CBSI	-	SIDE INLET CB
CHM	-	CHIMNEY
CSV	-	VALVE CURB STOP
DRN	-	DRAIN
EPOST	-	ELECTRICAL OUTLET
FP	-	FLAG POLE
FL	-	FLOOD LIGHT
FTF	-	FUEL TANK FILLER CAP
GC	-	GARBAGE CAN
GFL	-	PIPE FLANGE (GAS)
GFP	-	GAS FUEL PUMP
GP	-	POLE GUYWIRE
GSR	-	GAS SERVICE REGULATOR
GV	-	GAS VALVE
HHC	-	HICKENBOTTOM
HDS	-	HEADSTONE
HLS	-	LIGHT STANDARD HYDRO
HM	-	HYDRO METER
HTR	-	HYDRO TRANSFORMER
HW	-	HAND WELL
HYD	-	FIRE HYDRANT
JBX	-	JUNCTION BOX
MB	-	MAILBOX
MP	-	MONITORING PIN
MH	-	MAINTENANCE HOLE UNIDENTIFIED
MHB	-	MAINTENANCE HOLE BELL
MHF	-	MAINTENANCE HOLE FIBRE OPTIC
MHH	-	MAINTENANCE HOLE HYDRO
MHI	-	MAINTENANCE HOLE INVERT
MHSA	-	MAINTENANCE HOLE SANITARY
MHST	-	MAINTENANCE HOLE STORM
MHT	-	MAINTENANCE HOLE TRAFFIC
MW	-	MONITORING WELL
NPB	-	NEWS PAPER BOX
OLP	-	LIGHT STANDARD ORNAMENTAL
OHW	-	OVERHEAD UTILITY WIRES
PKM	-	PARKING METER
PLBX	-	PULL BOX
PLQ	-	PLAQUE
PLR	-	PILLAR
PZ	-	PIEZOMETER
RLC	-	RED LIGHT CAMERA
RWSL	-	RAILWAY SIGNAL LIGHT
RWSS	-	RAILWAY SWITCH STAND
SAT	-	SATELLITE DISH
SCLP	-	SCULPTURE
SCP	-	SUMP/CATCH PIT
SCV	-	SPRINKLER CONTROL VALVE
SH	-	SPRINKLER HEAD
SIA	-	SIAMESE CONNECTION
SN	-	SIGN
SPAN	-	SOLAR PANEL
SPT	-	SEPTIC TANK LID
TBL	-	TABLE
TB BELL	-	TERMINAL BOX - BELL
TB CATV	-	TERMINAL BOX - CABLE
TCP	-	TRAFFIC CONTROL BOX
TPIT	-	TEST PIT
TSL	-	TRAFFIC SIGNAL LIGHT
UMB	-	MARKER BELL UNDERGROUND
UMC	-	MARKER CABLE UNDERGROUND
UMG	-	MARKER GAS UNDERGROUND
UMO	-	MARKER OIL UNDERGROUND
UP	-	UTILITY POLE
VB	-	VALVE BOX
VC	-	VALVE CHAMBER
WV	-	WATER VALVE

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :
1. THE SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE _ DAY OF _, 2017.

DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

SRO MAP COORDS: X= 366205, Y= 5029655

Stantec Geomatics Ltd.
CANADA LAND SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE, SUITE 400
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420 FAX. 613.722.2799
stantec.com

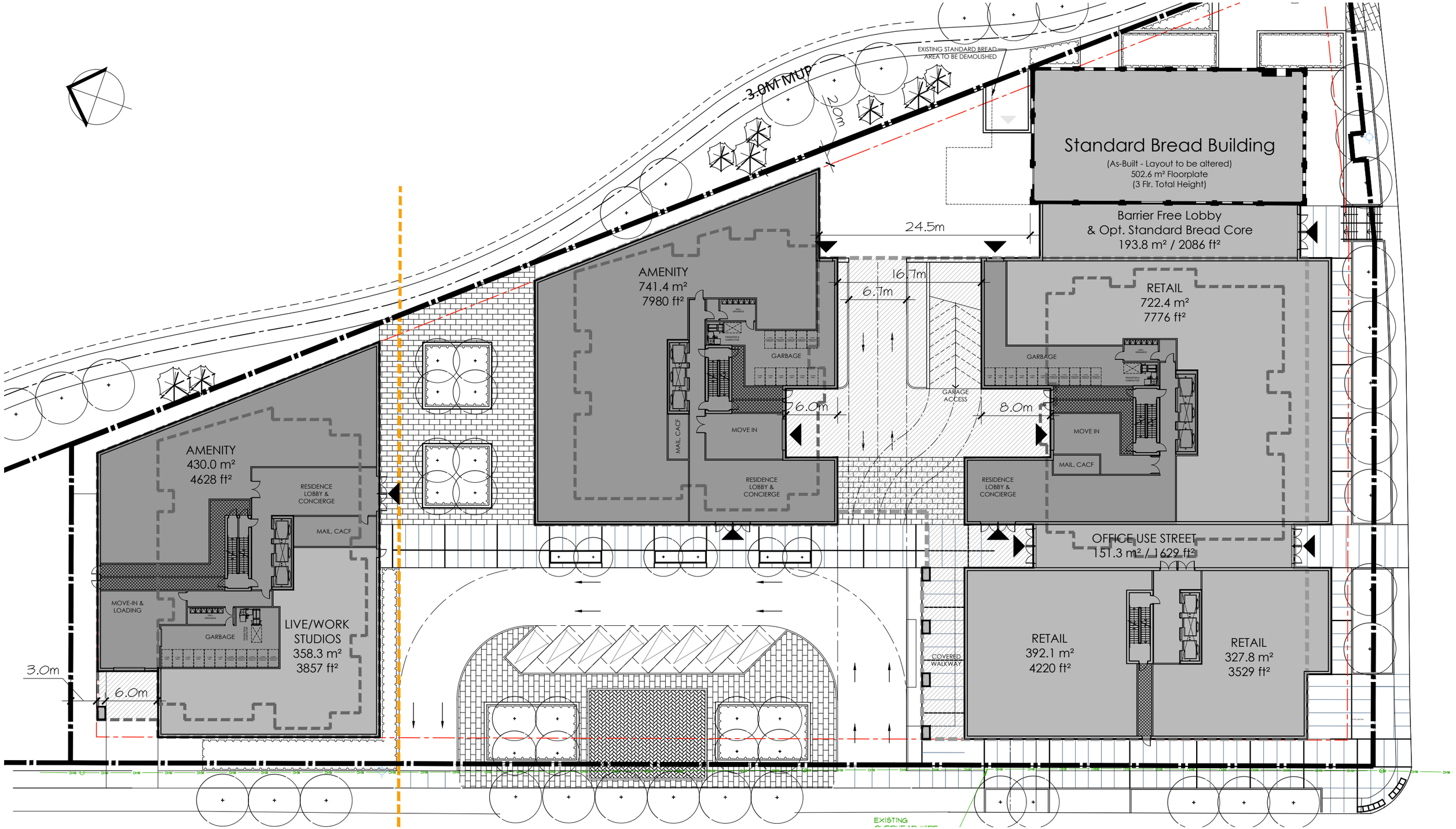
DRAWN: ME | CHECKED: * | PM: BW | FIELD: ES | PROJECT No.: 161613694-110

APPENDIX B

DEVELOPMENT DRAWINGS

APPENDIX B1

ARCHITECTURAL DRAWINGS



HOBIN

GLADSTONE + LORETTA

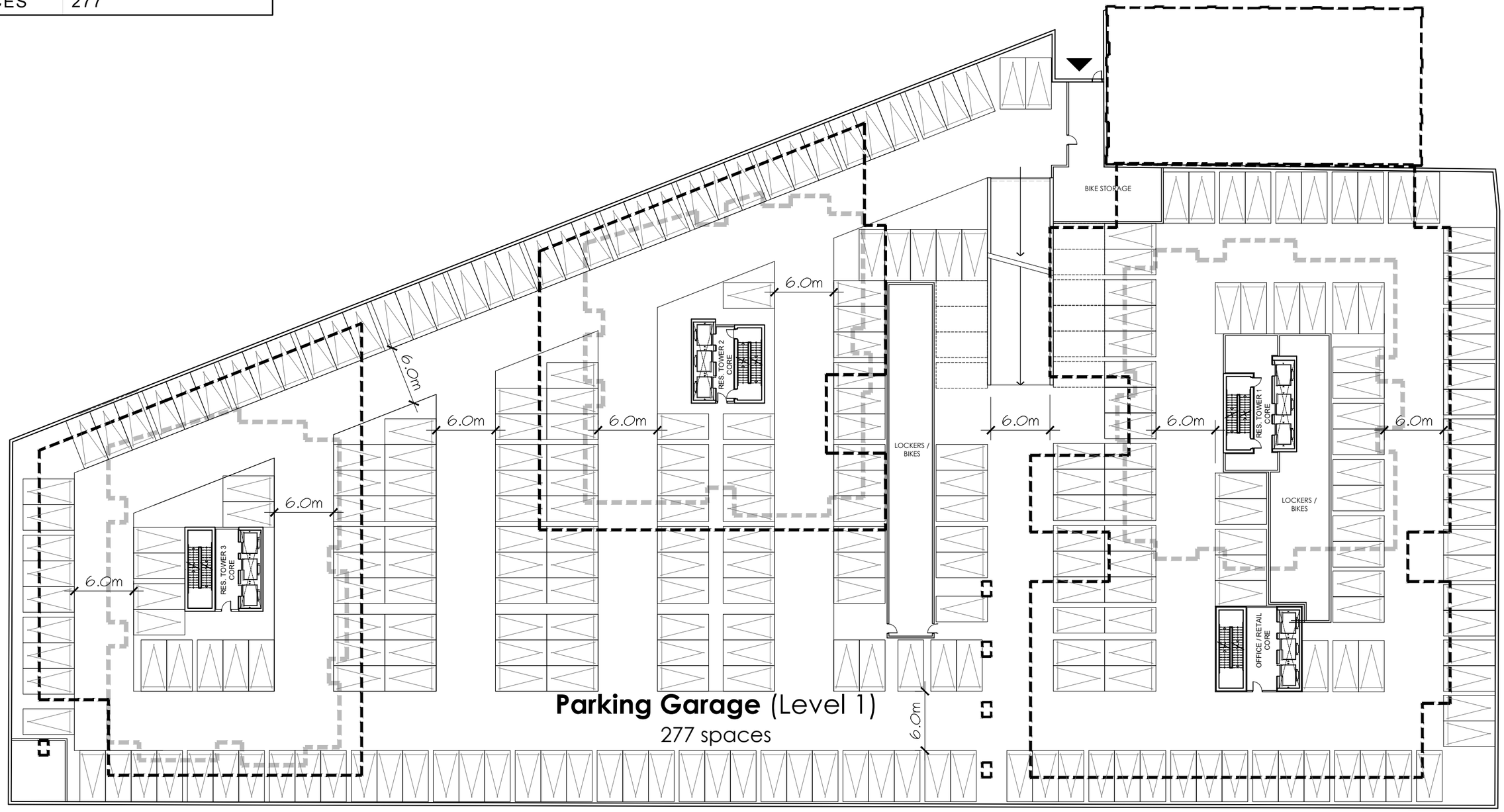
Site Plan Option

MARCH 4, 2021
scale 1:400

PBCGROUP

CLV GROUP

PARKING LEVEL P1	
GFA	98,231 ft²
# SPACES	277



GLADSTONE + LORETTA

Residential Towers 1, 2 & 3

Parking Plan P1

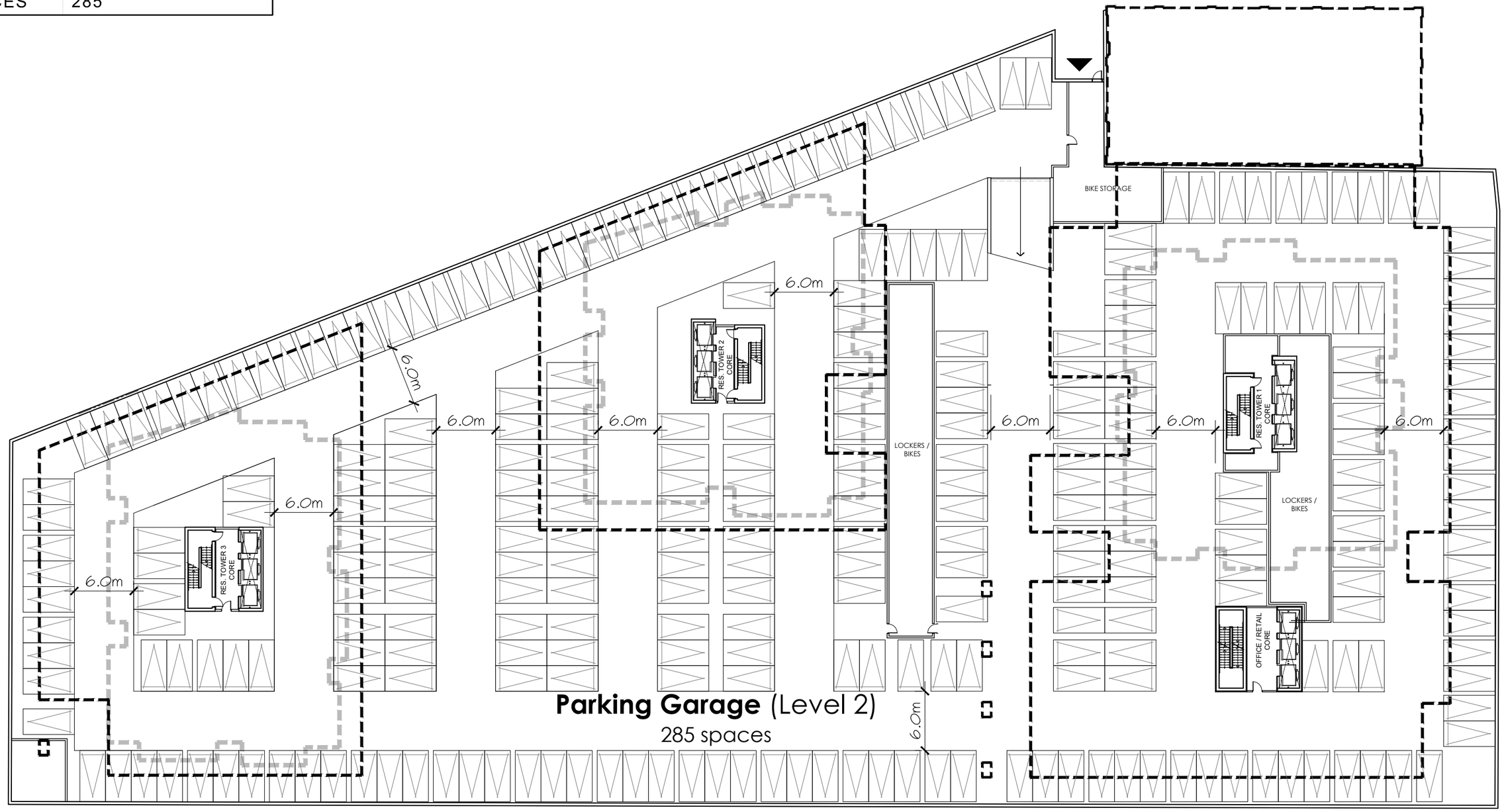
MARCH 4, 2021
scale 1:400

HOBIN

PBCGROUP

CLV GROUP

PARKING LEVEL P2	
GFA	98,231 ft²
# SPACES	285



GLADSTONE + LORETTA

Residential Towers 1, 2 & 3

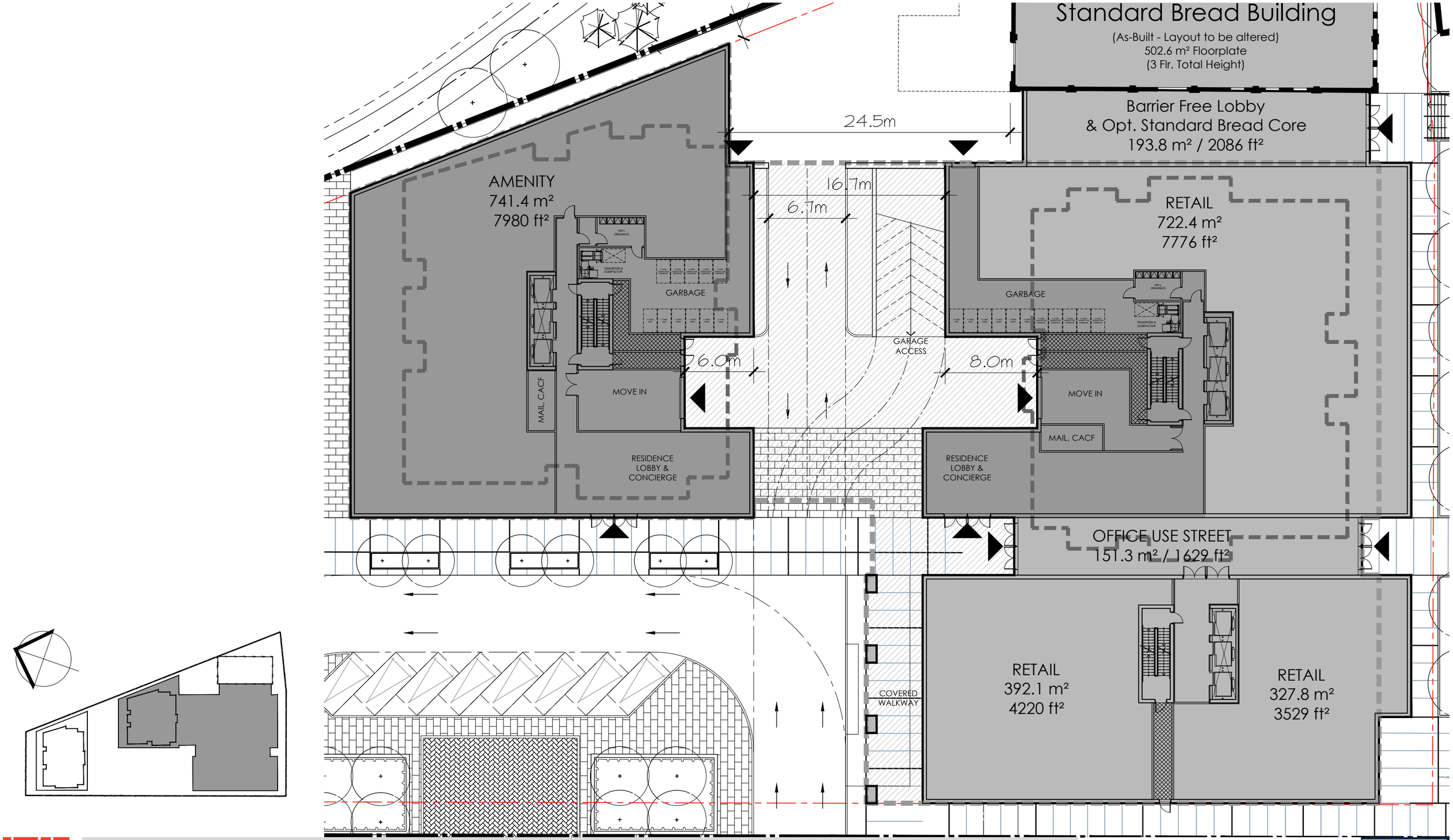
Parking Plan P2

MARCH 4, 2021
scale 1:400

HOBIN

PBCGROUP

CLV GROUP



GLADSTONE + LORETTA

Residential Towers 1 & 2

Ground Floor Plan

MARCH 4, 2021
scale 1:300

HOBIN

PBCGROUP

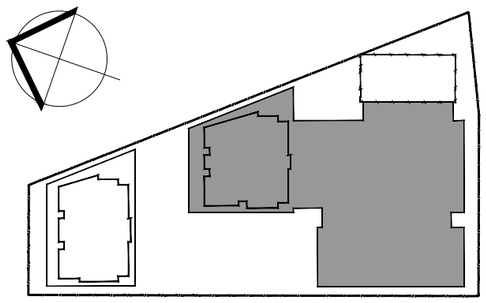
CLV GROUP

Standard Bread Building

502.6 m² Floorplate
(3 Flr. Total Height)

OFFICE

Floorplate GFA =
4,149.6 m^2 / 44,666 ft²
Floorplate GLA =
± 3,928.5 m^2 / 42,286 ft²
(x2)
(5 Flr. Total Height - Retail on Ground Flr.)



HOBIN

GLADSTONE + LORETTA
Residential Towers 1 & 2

Podium Plan (Flr. 2-3)

MARCH 4, 2021
scale 1:300

PBCGROUP

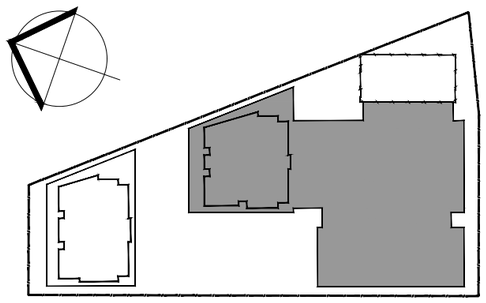
CLV GROUP

Standard Bread Building

502.6 m² Floorplate
(3 Flr. Total Height)

OFFICE

Floorplate GFA =
3992.6 m^2 / 42,976 ft²
Floorplate GLA =
± 3,771.5 m^2 / 40,596 ft²
(x1)
(5 Flr. Total Height - Retail on Ground Flr.)



GLADSTONE + LORETTA
Residential Towers 1 & 2

Podium Plan (Flr. 4)

MARCH 4, 2021
scale 1:300

HOBIN

PBCGROUP

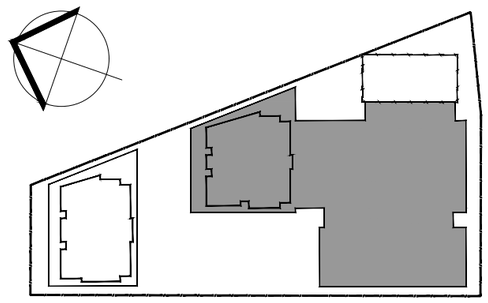
CLV GROUP

Standard Bread Building

502.6 m² Floorplate
(3 Flr. Total Height)

OFFICE

Floorplate GFA =
3,903.6 m^2 / 42,029 ft²
Floorplate GLA =
± 3,683.5 m^2 / 39,649 ft²
(x1)
(5 Flr. Total Height - Retail on Ground Flr.)



GLADSTONE + LORETTA
Residential Towers 1 & 2

Podium Plan (Flr. 5)

MARCH 4, 2021
scale 1:300

HOBIN

PBCGROUP

CLV GROUP

ROOF of STANDARD BREAD BUILDING

2 BED + DEN
91.1 m²
980 ft²

1 BED
49.3 m²
530 ft²

1 BED
61.7 m²
664 ft²

URBAN 1-BED
53.7 m²
578 ft²

AMENITY
245.4 m²
2641 ft²

2 BED
88.2 m²
949 ft²

BACH.
41.2 m²
443 ft²

2 BED
78.2 m²
842 ft²

LEVEL 6 Roof Terrace
1441.9 m²

1 BED
59.9 m²
645 ft²

1 BED
59.9 m²
645 ft²

2 BED
86.5 m²
931.0 ft²

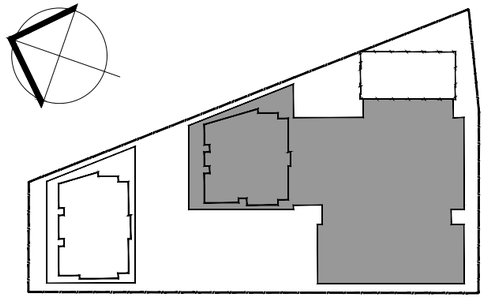
AMENITY
242.8 m²
2613 ft²

URBAN 1-BED
53.9 m²
576.9 ft²

1 BED
59.9 m²
645 ft²

1 BED
59.9 m²
645 ft²

2 BED
88.0 m²
947.2 ft²



HOBIN

GLADSTONE + LORETTA
Residential Towers 1 & 2

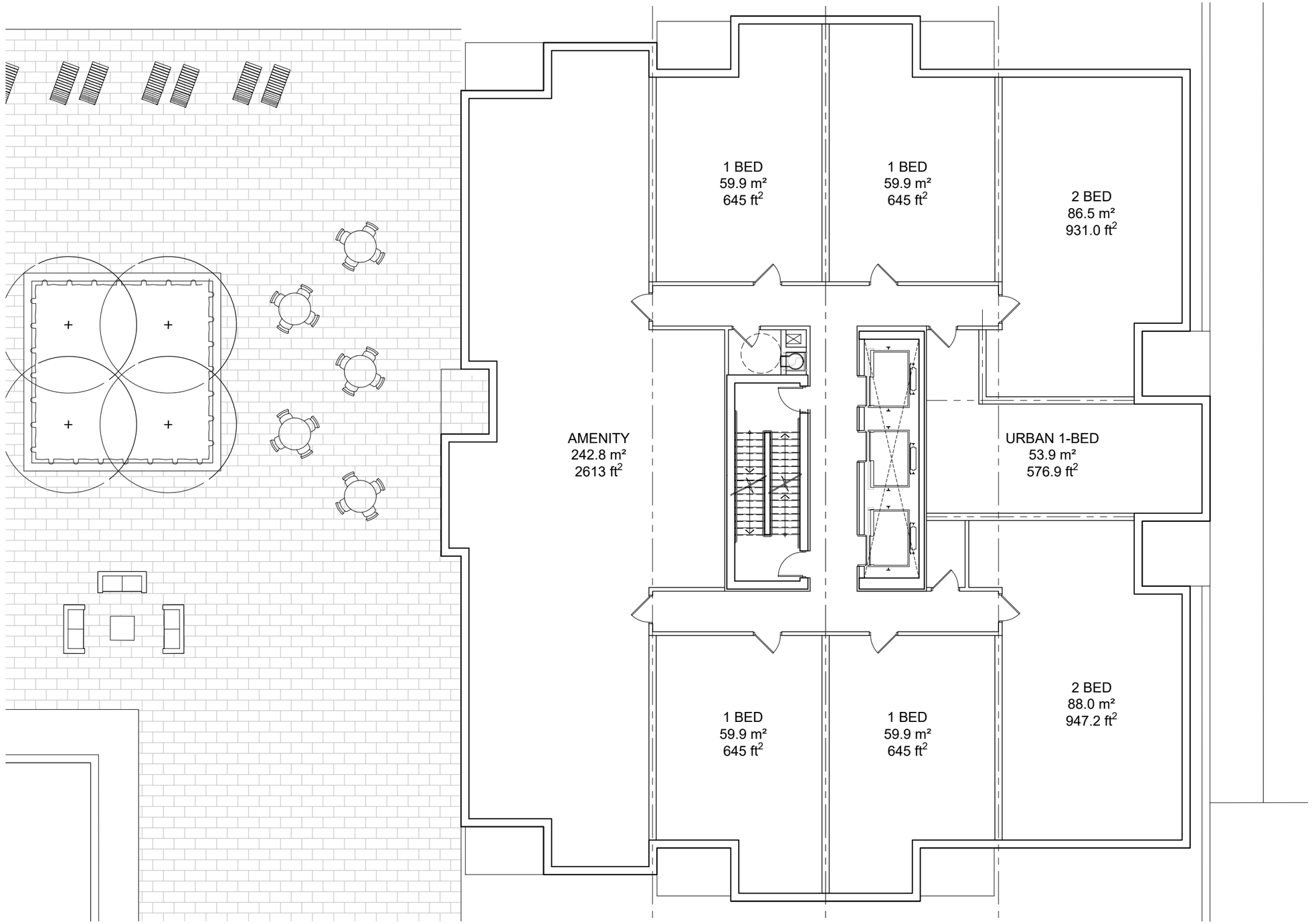
Podium Plan (Flr. 6)

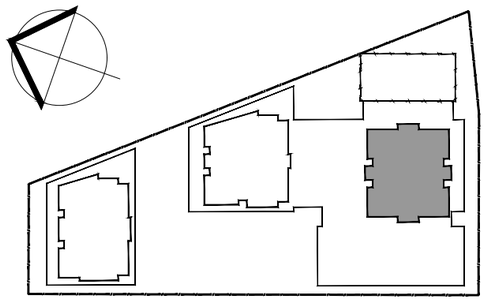
MARCH 4, 2021
scale 1:300

PBCGROUP

CLV GROUP

PODIUM ROOF FLOOR x1 (Flr. 6)	
GFA	8,928 ft²
NET RES.	5,035 ft²
EFFICIENCY	56.4%
UNITS	7
Bachelor	0
Urban 1B	1
1 Bed	4
1B+Den	0
2 Bed	2





HOBIN

GLADSTONE + LORETTA

Residential Tower 1

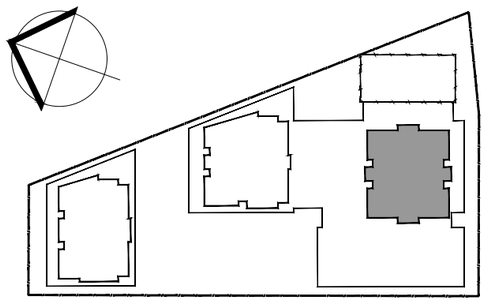
Podium Roof Floor Plan (Flr. 6)

MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

TYPICAL FLOOR A x26 (Flr. 7-32)	
GFA	8,928 ft²
NET RES.	7,598 ft²
EFFICIENCY	85.1%
UNITS	10
Bachelor	0
Urban 1B	1
1 Bed	4
1B+Den	1
2 Bed	4



HOBIN

GLADSTONE + LORETTA
Residential Tower 1

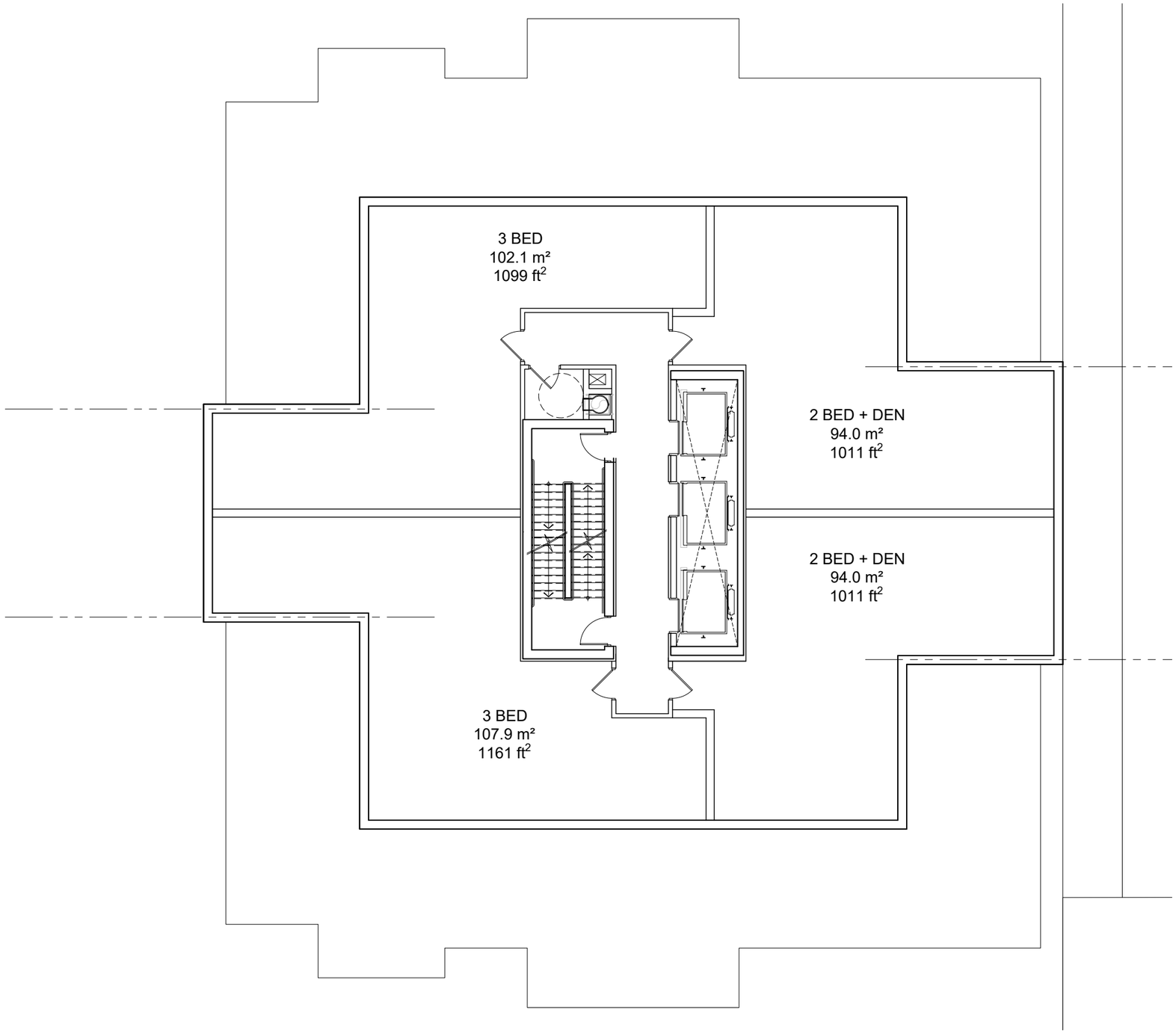
Typical Floor Plan (Flr. 7-32)

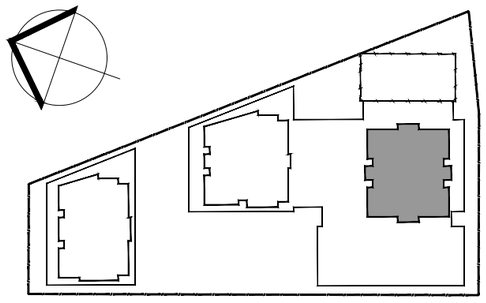
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

PENTHOUSE FLOOR x3 (Flr. 33-35)	
GFA	5,198 ft²
NET RES.	4,282 ft²
EFFICIENCY	82.4%
UNITS	4
2B + Den	2
3 Bed	2





HOBIN

GLADSTONE + LORETTA
Residential Tower 1

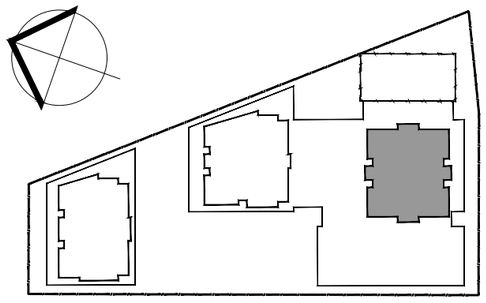
Penthouse Floor Plan (Flr. 33-35)
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

SKYBOX LOUNGE
199.2 m^2
2144 ft^2

MECHANICAL
107.9 m^2
1106 ft^2



HOBIN

GLADSTONE + LORETTA
Residential Tower 1

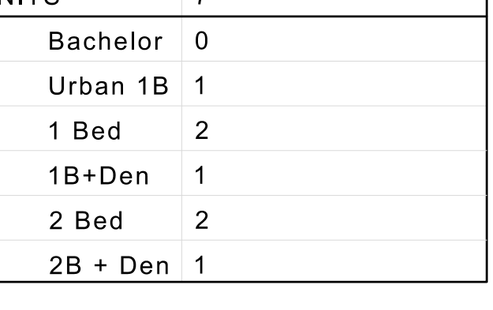
Skybox & Mech Floor Plan
(Flr. 36)

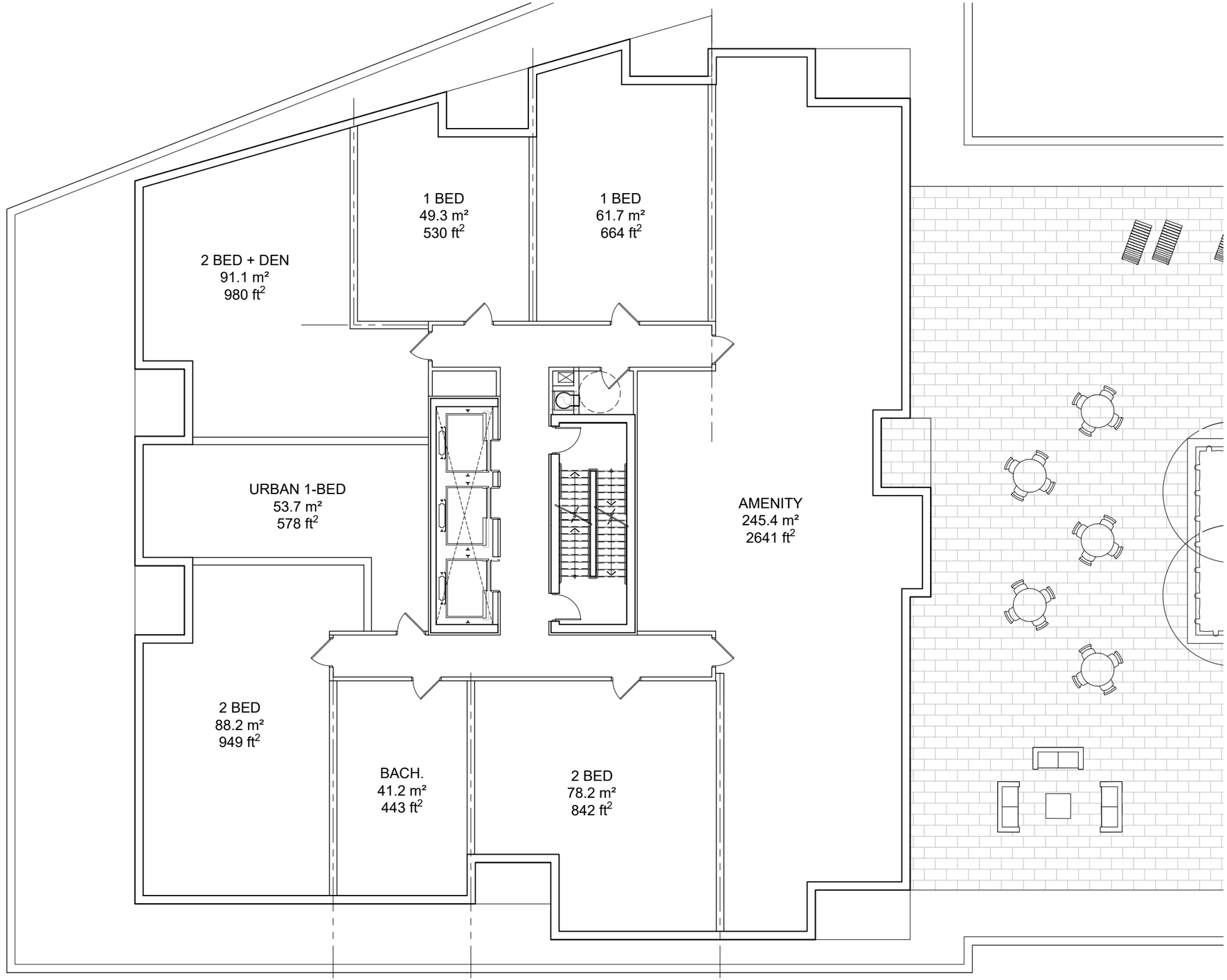
JANUARY 20, 2021
scale 1:150

PBCGROUP

CLV GROUP

PODIUM ROOF FLOOR x1 (Flr. 6)	
GFA	8,807 ft²
NET RES.	4,986 ft²
EFFICIENCY	56.6%
UNITS	7
Bachelor	0
Urban 1B	1
1 Bed	2
1B+Den	1
2 Bed	2
2B + Den	1





HOBIN

GLADSTONE + LORETTA
Residential Tower 2

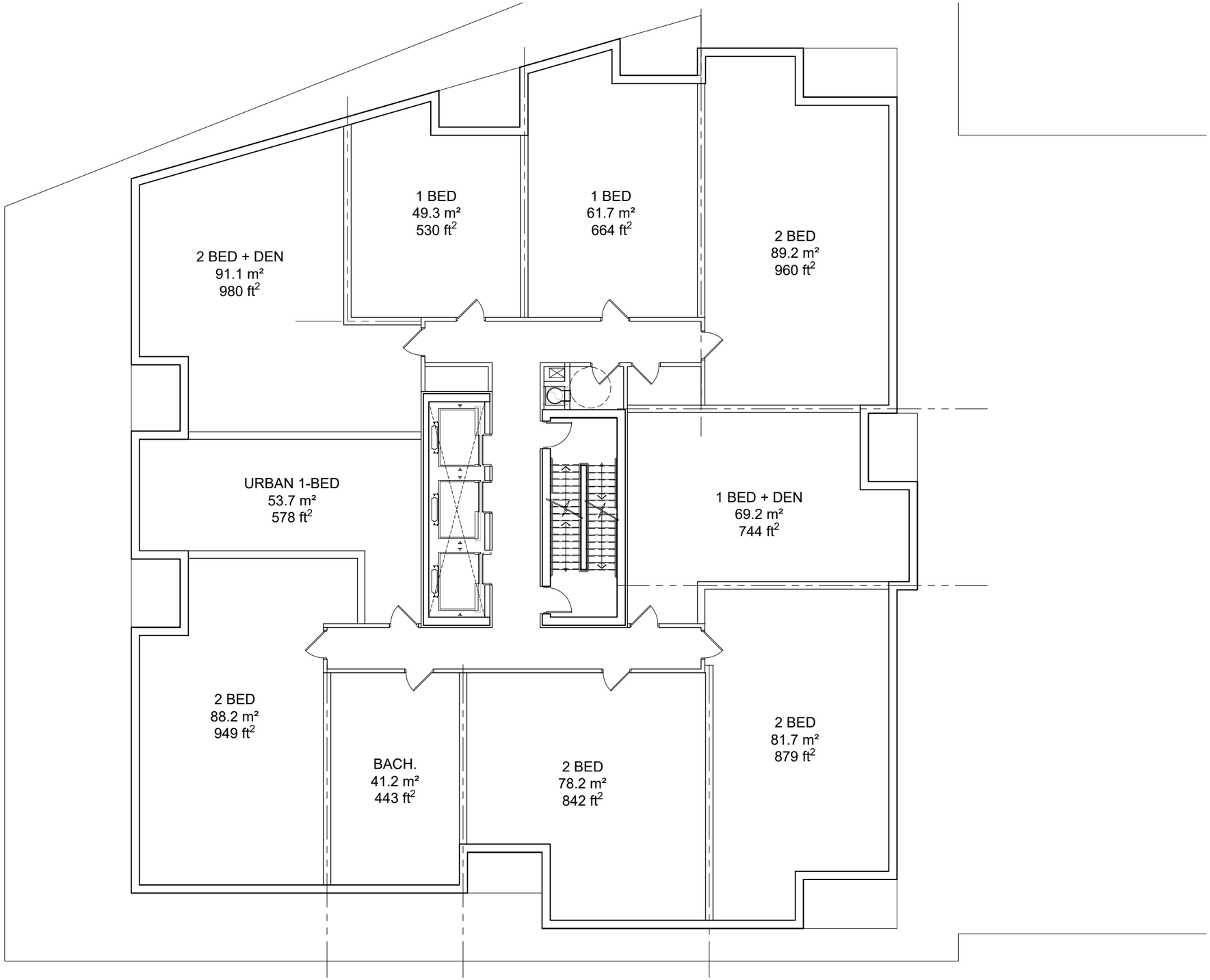
Podium Roof Floor Plan (Flr. 6)

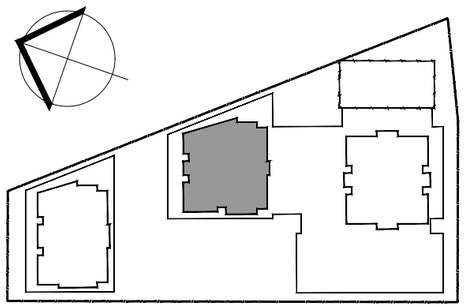
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

TYPICAL FLOOR x24 (Flr. 7-30)	
GFA	8,807 ft²
NET RES.	7,569 ft²
EFFICIENCY	85.9%
UNITS	10
Bachelor	1
Urban 1B	1
1 Bed	2
1B+Den	1
2 Bed	4
2B + Den	1





GLADSTONE + LORETTA
Residential Tower 2

Typical Floor Plan
(Flr. 7-30)

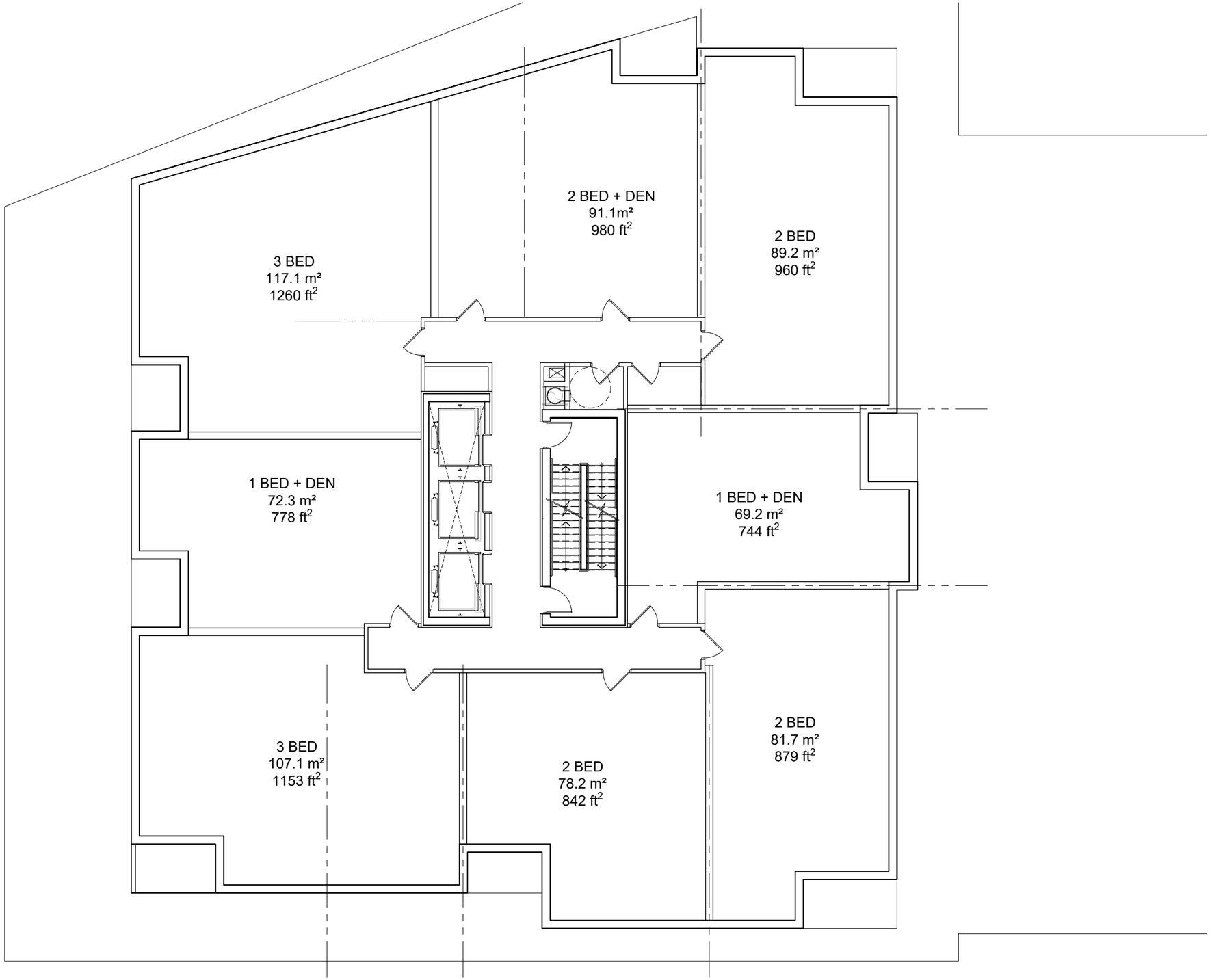
MARCH 4, 2021
scale 1:150

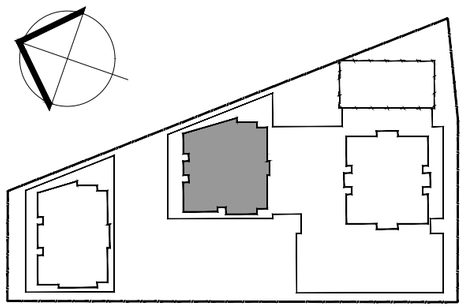
HOBIN

PBCGROUP

CLV GROUP

PENTHOUSE FLOOR x3 (Flr. 31-33)	
GFA	8,864 ft²
NET RES.	7,596 ft²
EFFICIENCY	85.7%
UNITS	8
Bachelor	0
Urban 1B	0
1 Bed	0
1B+Den	2
2 Bed	3
2B + Den	1
3 Bed	2





GLADSTONE + LORETTA
Residential Tower 2

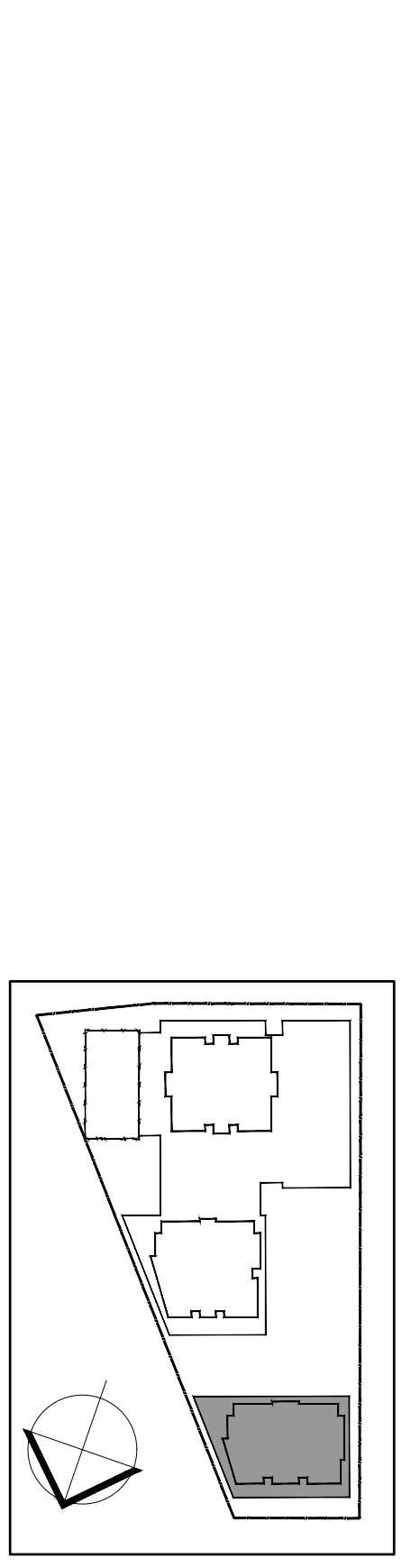
HOBIN

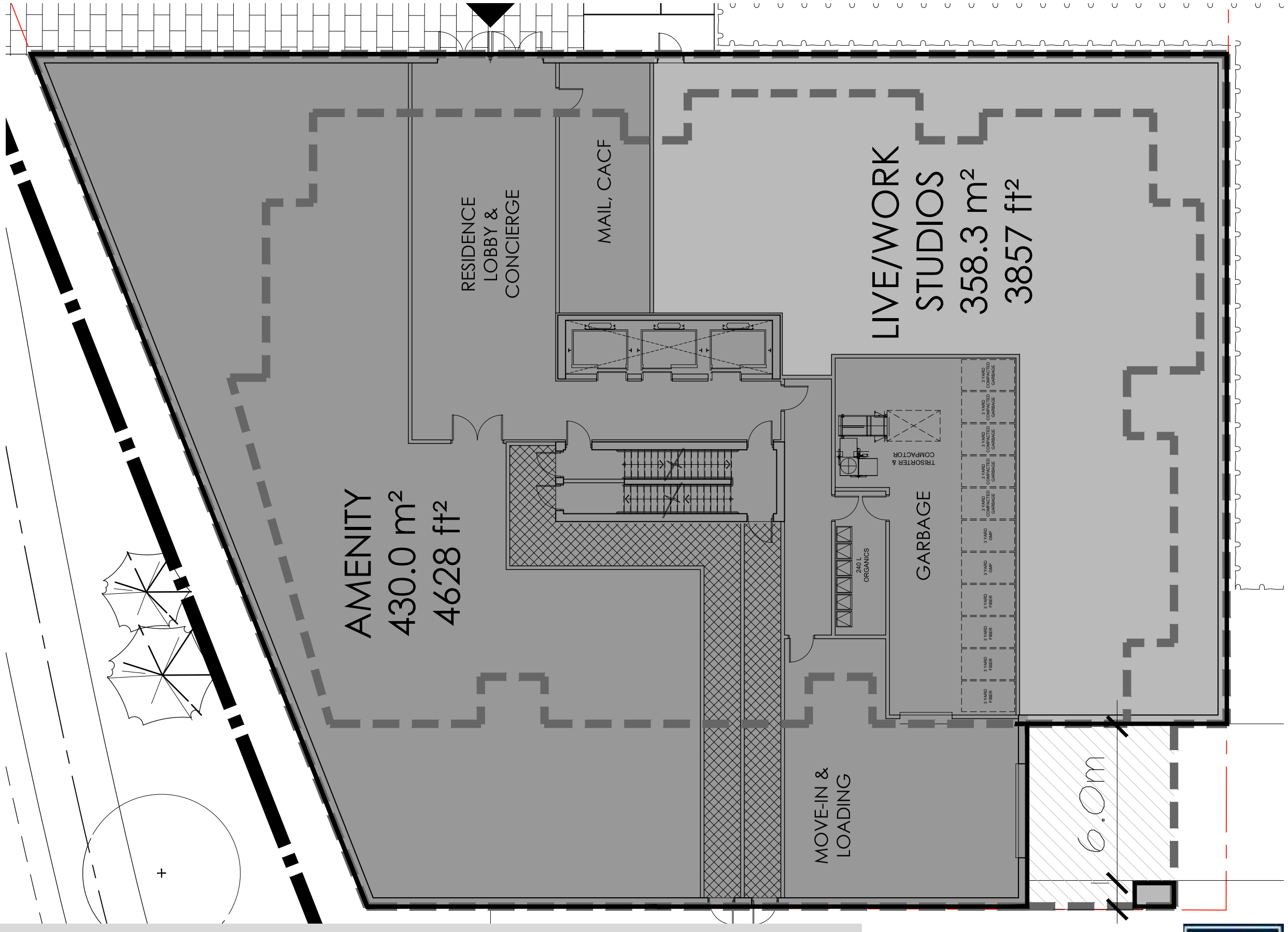
Penthouse Floor Plan (Flr. 31-33)

MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP





GLADSTONE + LORETTA

Residential Tower 3

Ground Floor Plan

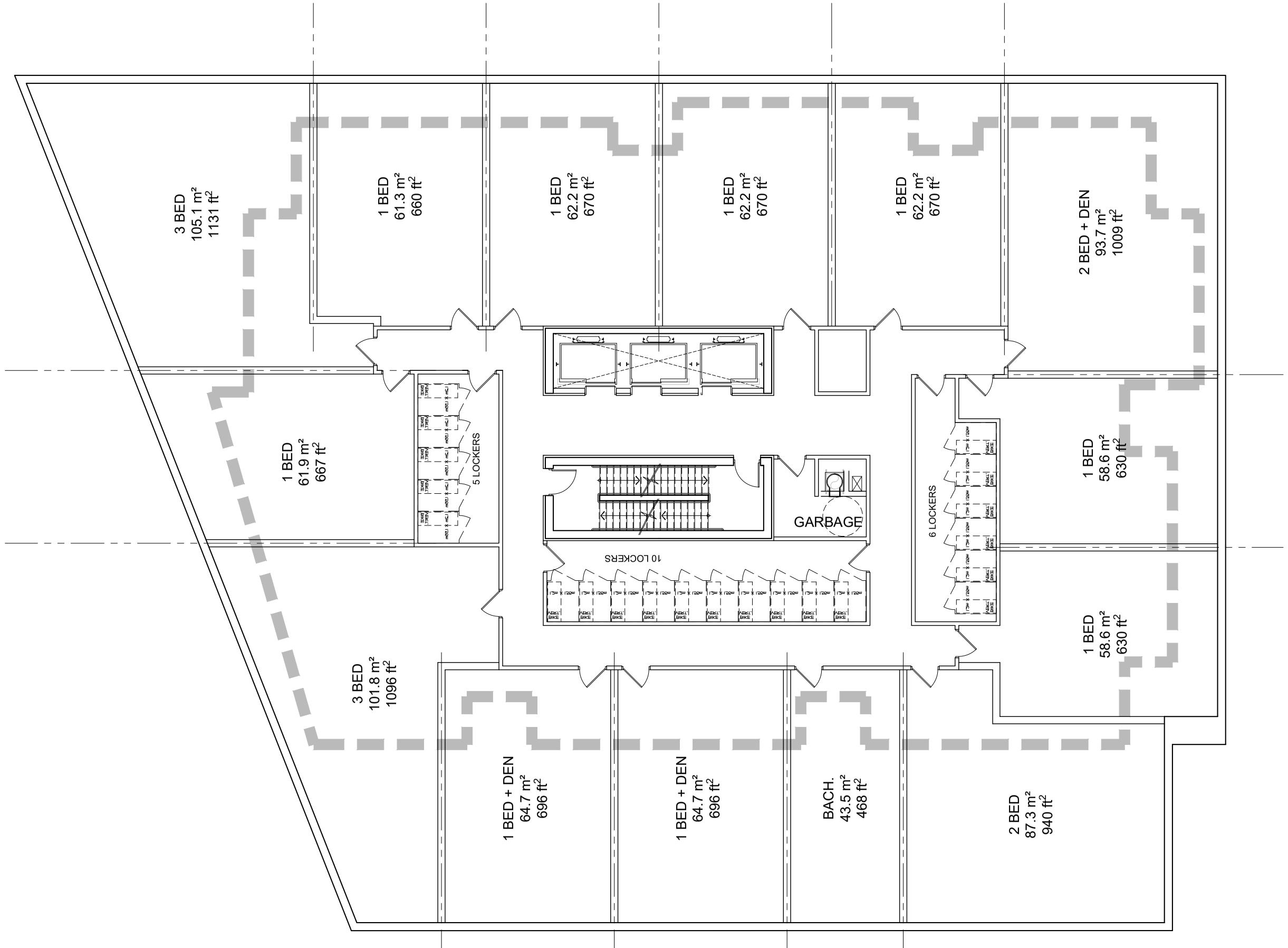
MARCH 4, 2021
scale 1:150

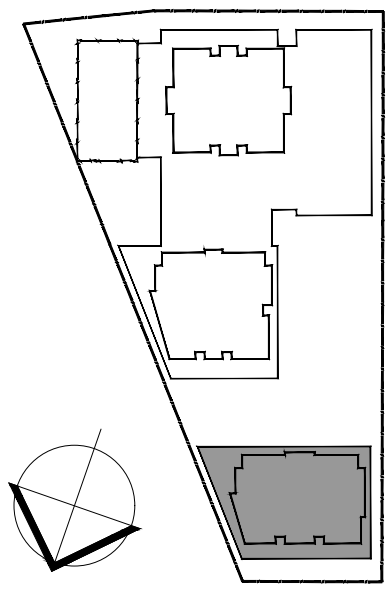
HOBIN

PBCGROUP

CLV GROUP

PODIUM FLOOR x3 (Flr. 2-4)	
GFA	13,433 ft²
NET RES.	10,633 ft²
EFFICIENCY	79.2%
UNITS	14
Bachelor	1
Urban 1B	0
1 Bed	7
1B+Den	2
2 Bed	1
2B + Den	1
3 Bed	2





HOBIN

GLADSTONE + LORETTA

Residential Tower 3

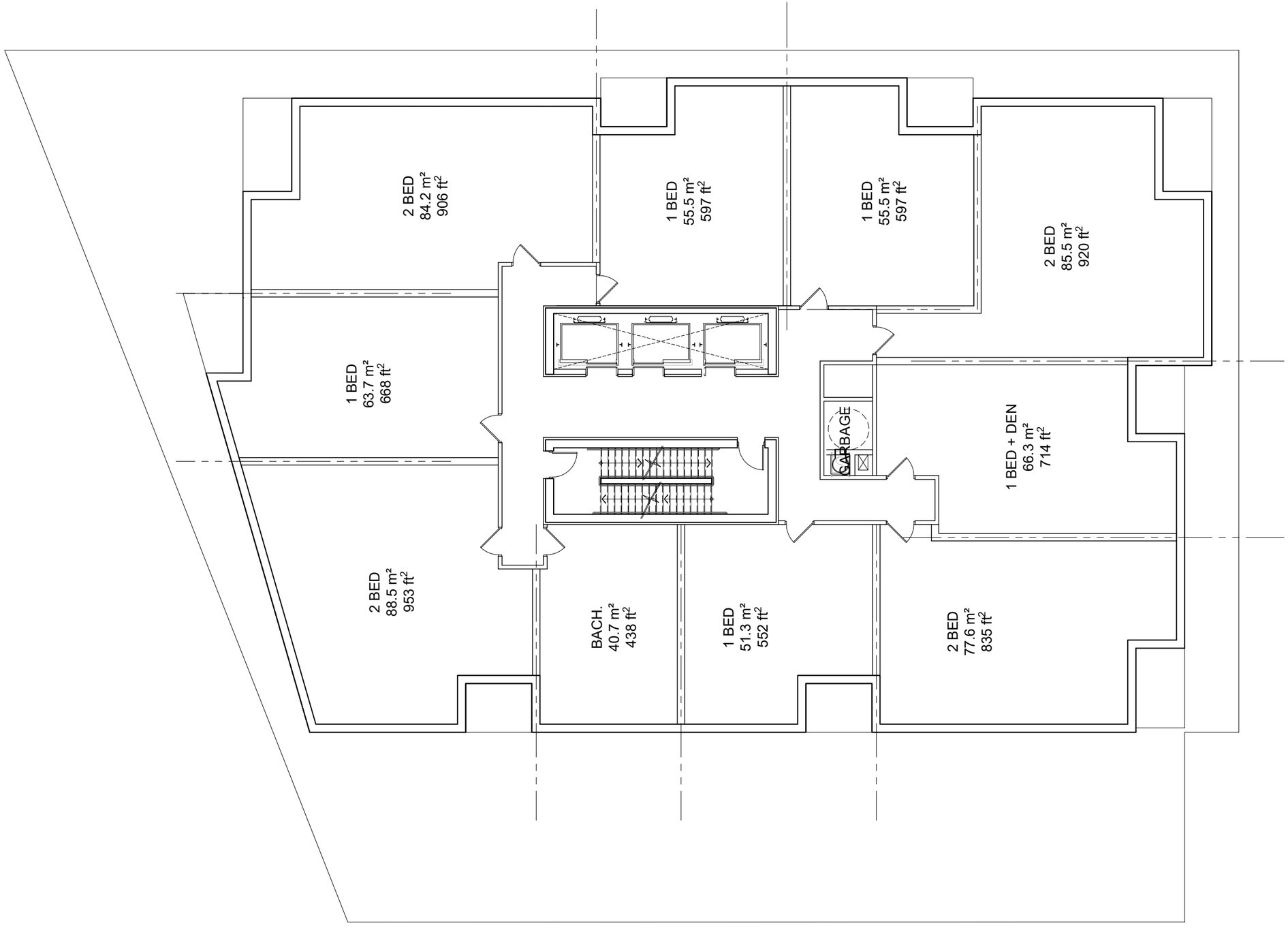
Typical Podium Floor Plan (Flr. 2-4)

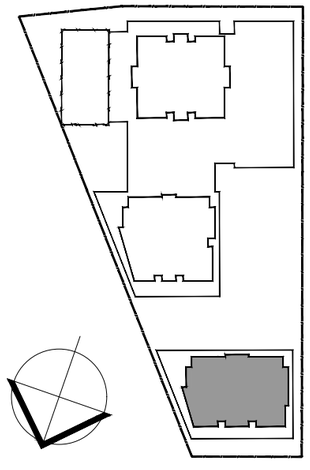
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

TYPICAL FLOOR x23 (Flr. 5-27)	
GFA	8,464 ft²
NET RES.	7,180 ft²
EFFICIENCY	84.8%
UNITS	10
Bachelor	1
Urban 1B	0
1 Bed	4
1B+Den	1
2 Bed	4
2B + Den	0





HOBIN

GLADSTONE + LORETTA
Residential Tower 3

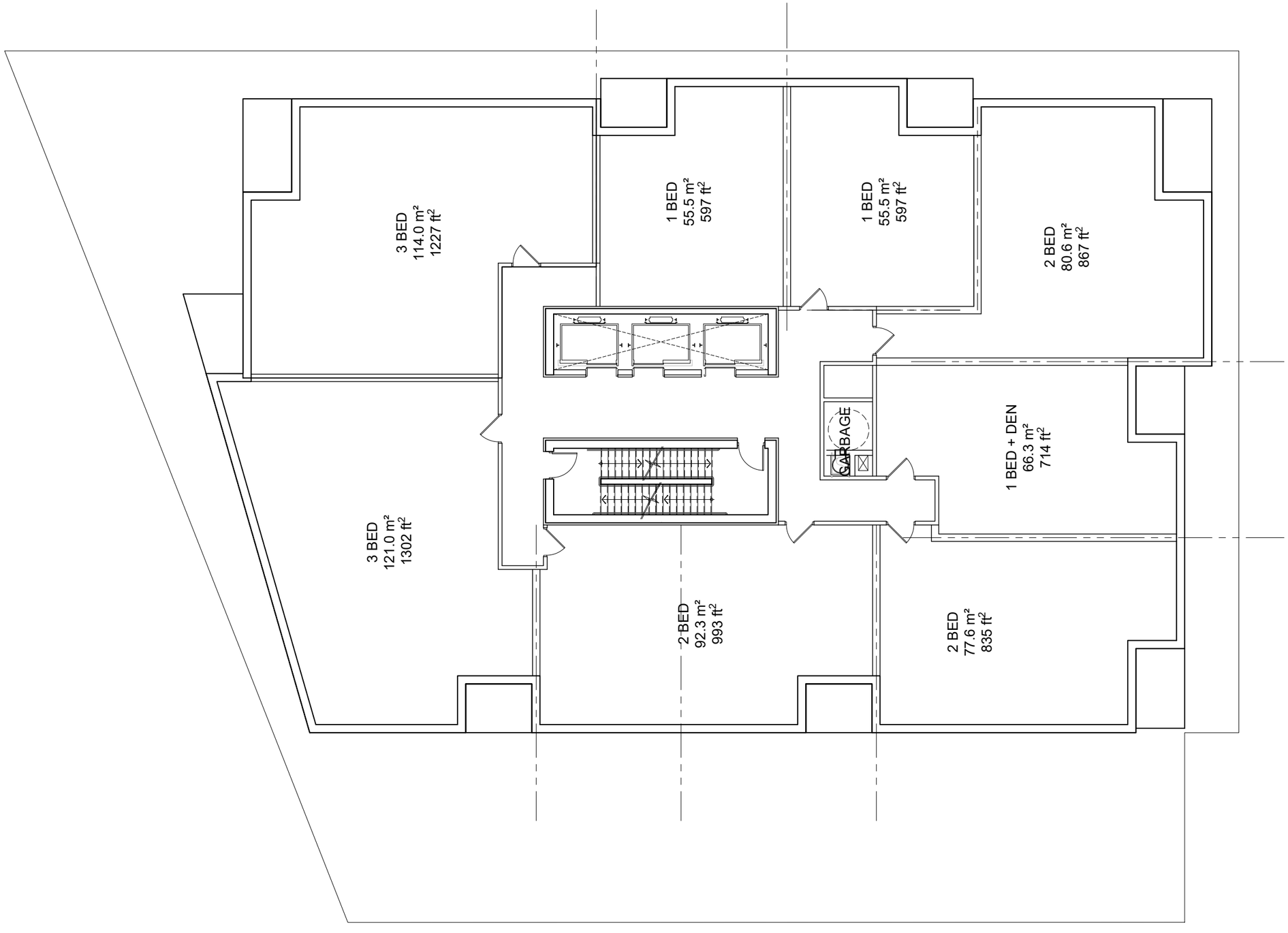
Typical Floor Plan (Flr. 5-27)

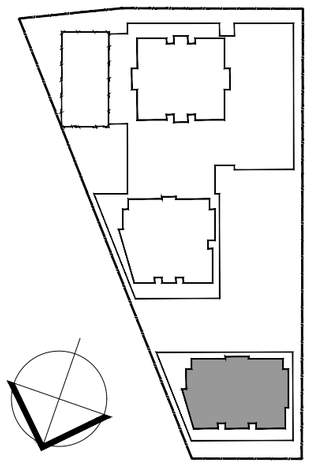
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

PENTHOUSE FLOOR x3 (Flr. 28-30)	
GFA	8,464 ft²
NET RES.	7,180 ft²
EFFICIENCY	84.8%
UNITS	8
Urban 1B	0
1 Bed	2
1B+Den	1
2 Bed	2
2B + Den	1
3 Bed	2





HOBIN

GLADSTONE + LORETTA
Residential Tower 3

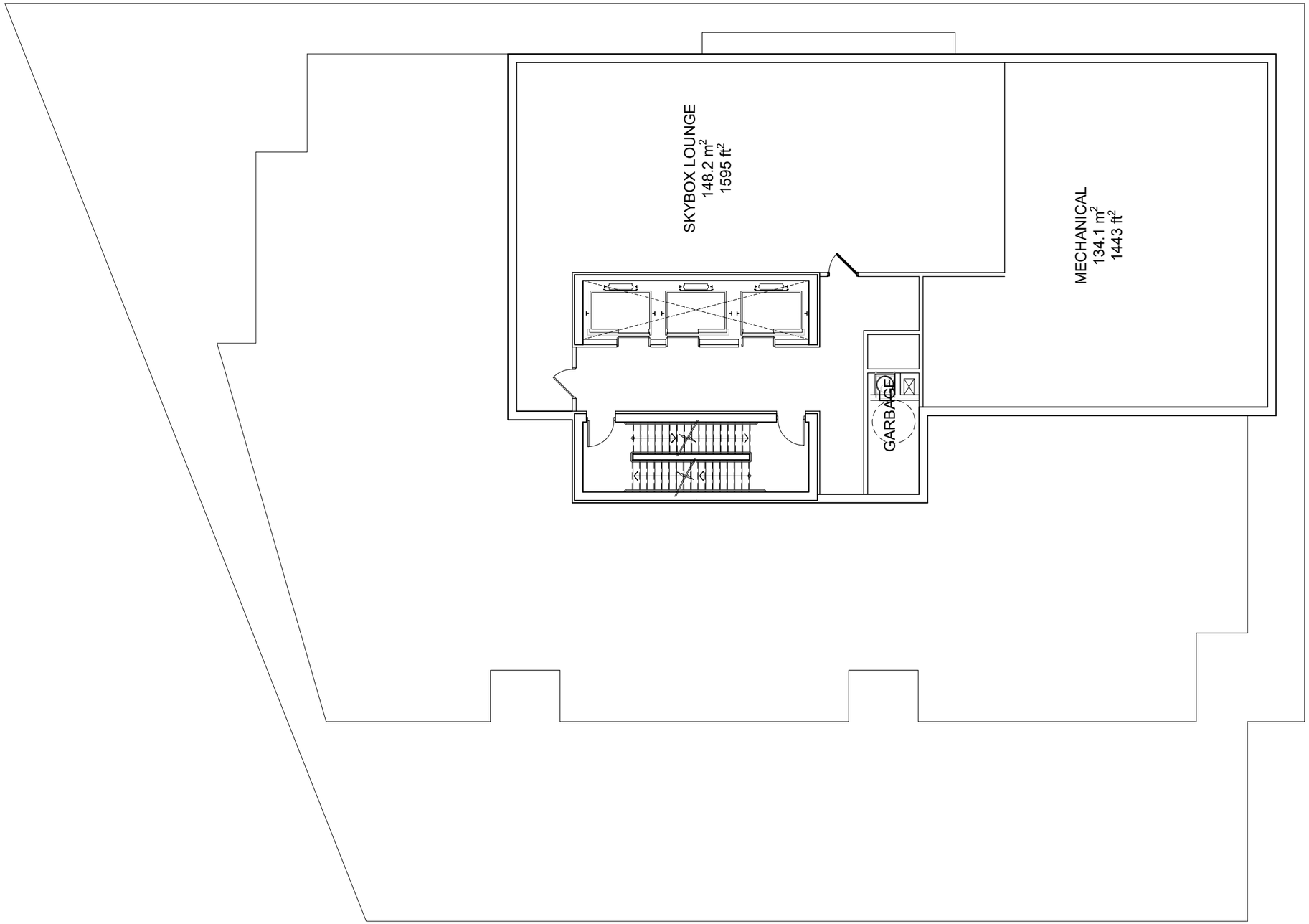
Penthouse Floor Plan
(Flr. 28-30)

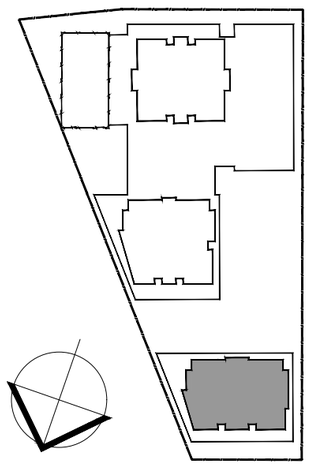
MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

SKYBOX & MECH. x1 (Flr. 31)	
GFA	4,087 ft²





HOBIN

GLADSTONE + LORETTA
Residential Tower 3

Skybox & Mech Floor Plan (Flr. 31)

MARCH 4, 2021
scale 1:150

PBCGROUP

CLV GROUP

APPENDIX B2

COMPOSITE UTILITY DRAWING

LAUREL STREET

LORETTA AVENUE NORTH

GLADSTONE AVENUE

LOT 10

LOT 9

LOT 8

LOT 7

LOT 6

LOT 5

LOT 4

LOT 3

LOT 2

LOT 1

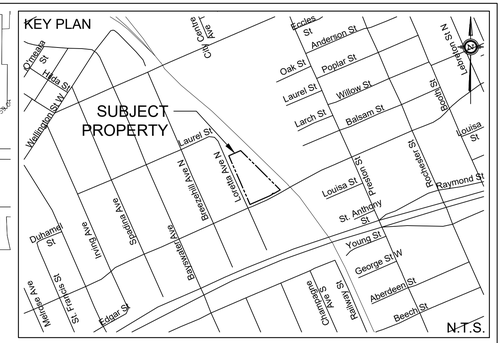
LANE

CHAMPAGNE AVENUE

SITE BENCH MARK 1
TOP OF SPINDLE ON
FIRE HYDRANT
ELEVATION=65.38m

SITE BENCH MARK 2
TOP OF SPINDLE ON
FIRE HYDRANT
ELEVATION=65.35m

KEY PLAN



LEGEND

- PROPERTY LINE
- PROPOSED GAS LINE
- PROPOSED COMMUNICATIONS DUCT
- PROPOSED HYDRO PRIMARY CABLE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING MANHOLE
- EXISTING CATCH BASIN MANHOLE
- EXISTING CATCH BASIN
- EXISTING FIRE HYDRANT
- EXISTING VALVE BOX
- EXISTING 1050mmø SAN TRUNK COLLECTOR
- EXISTING 1350mmø STM SEWER
- EXISTING 1350ø WATERMAIN
- EXISTING BELL
- EXISTING GAS
- EXISTING HYDRO
- EXISTING UTILITY POLE

NOT FOR CONSTRUCTION

NOTE: THIS COMPOSITE UTILITY PLAN WAS PREPARED FOR COORDINATION PURPOSES ONLY. UTILITY DESIGN PREPARED BY OTHERS.

TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD.
PROJ. NO. 161613694-110
DATED JULY 6th, 2017

SITE PLAN INFORMATION
SITE PLAN PROVIDED BY HOBIN ARCHITECTURE
PROJ. NO.
DATED FEBRUARY 2018

STORM, SANITARY, AND WATER SERVICING
DESIGN PREPARED BY DSEL
PLAN TITLE EXISTING COMPOSITE UTILITY PLAN
PROJ. NO. 18-1026
DATED REV MARCH 2019

HYDRO AND TELECOMMUNICATIONS SERVICES
DESIGN PREPARED BY
PLAN TITLE
PROJ. NO.
DATED REV

NATURAL GAS SERVICING
DESIGN PREPARED BY
PLAN TITLE
PROJ. NO.
DATED REV

SITE LIGHTING
DESIGN PREPARED BY
PLAN TITLE
PROJ. NO.
DATED REV

UTILITY LOCATIONS ARE ESTABLISHED USING SURVEY PLAN, AS-BUILT AND UCC PLAN.

BENCH MARK
SITE BENCH MARK 1 LOCATED AT TOP OF SPINDLE ON FIRE HYDRANT
ELEVATION=65.38m
SITE BENCH MARK 2 LOCATED AT TOP OF SPINDLE ON FIRE HYDRANT
ELEVATION=65.35m

DRAFT

No.	BY	YY.MM.DD	DESCRIPTION
1.	A.W.T.	19.03.28	EXISTING COMPOSITE UTILITY PLAN – CIRCULATION 1

PROJECT No18-1026

REVIEWED BY

EXISTING COMPOSITE UTILITY PLAN
145 LORETTA AVE N / 951 GLADSTONE AVE

TRINITY DEVELOPMENT GROUP INC.

3250 Bloor St. W., Suite 1000
Toronto, ON M8X 2X9
Tel. (416) 255-8800 x240

david schaeffer engineering ltd
SMART SUBDIVISIONS™
120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

DRAWN BY:	A.W.T.	CHECKED BY:	A.D.F.	DRAWING NO.	SHEET NO.
DESIGNED BY:	S.L.M.	CHECKED BY:	S.L.M.	CUP-1	1 of 1
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CITY FILE No.: D07-12-XX-XXXX CITY PLAN No.: XXXXX

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APPENDIX B3

GLADSTONE STATION DRAWINGS

Trillium Line SOUTH

bbb architects
400 - 47 Clarence Street, Ottawa, ON K1N 9K1
Tel. (613) 241-6446 Fax. (613) 241-4101

Gladstone Station
Perspective from west showing bridge connection

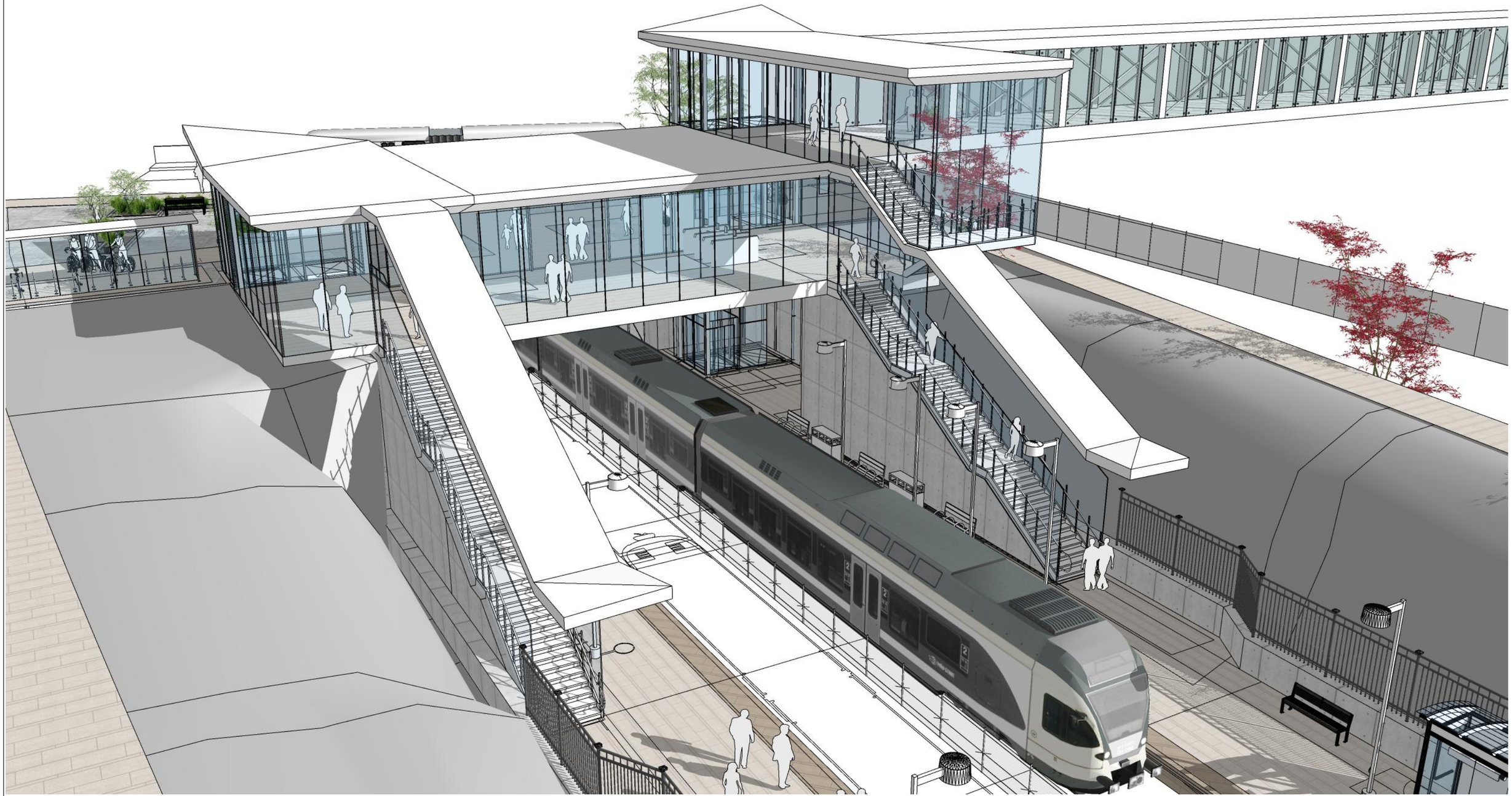
20 March, 2019

Trillium Line SOUTH

bbb architects
400 - 47 Clarence Street, Ottawa, ON K1N 9K1
Tel. (613) 241-8446 Fax. (613) 241-4101

Gladstone Station
Perspective from east showing bridge connection

20 March, 2019

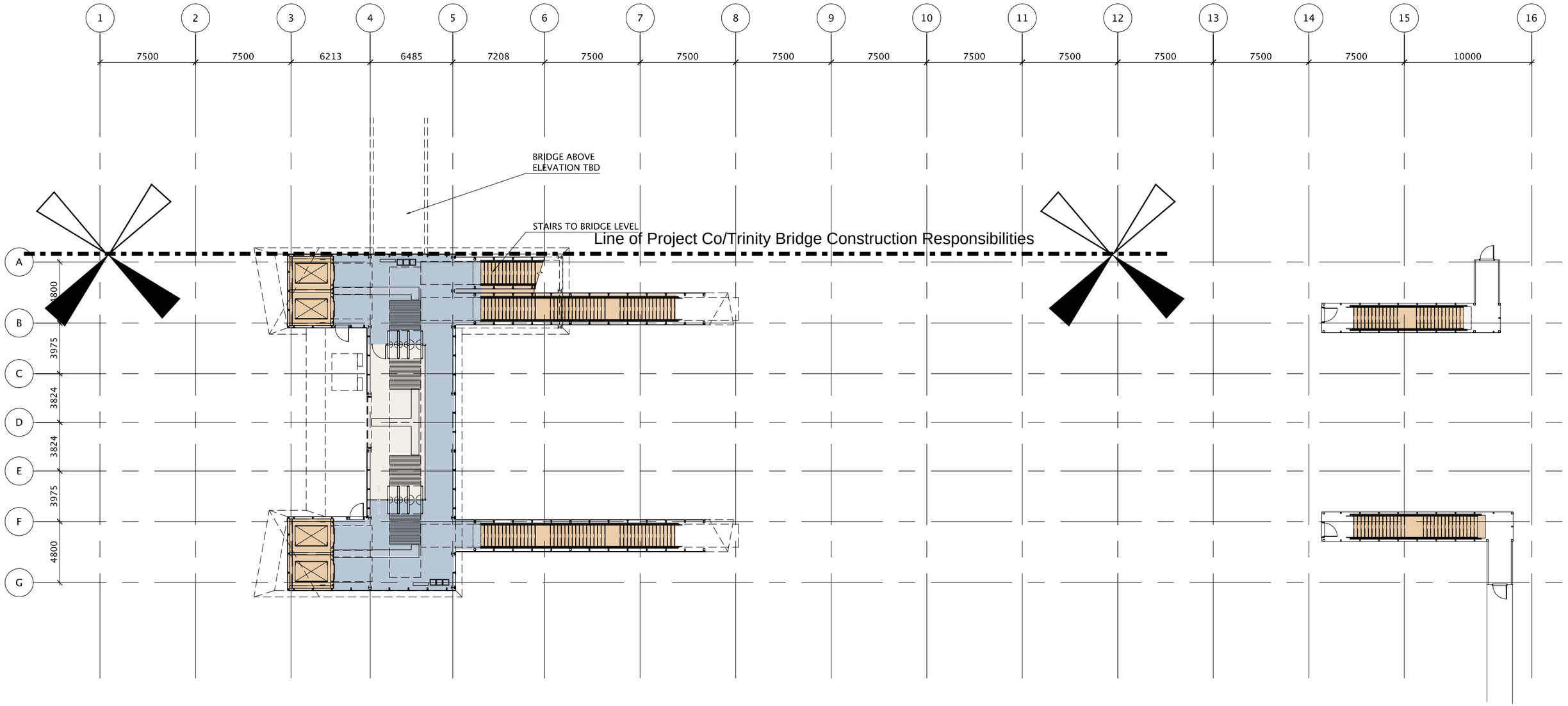


Trillium Line SOUTH

bbb architects
400 - 47 Clarence Street, Ottawa, ON K1N 9K1
Tel. (613) 241-8446 Fax. (613) 241-4101

Gladstone Station
Aerial from north showing bridge connection

20 March, 2019



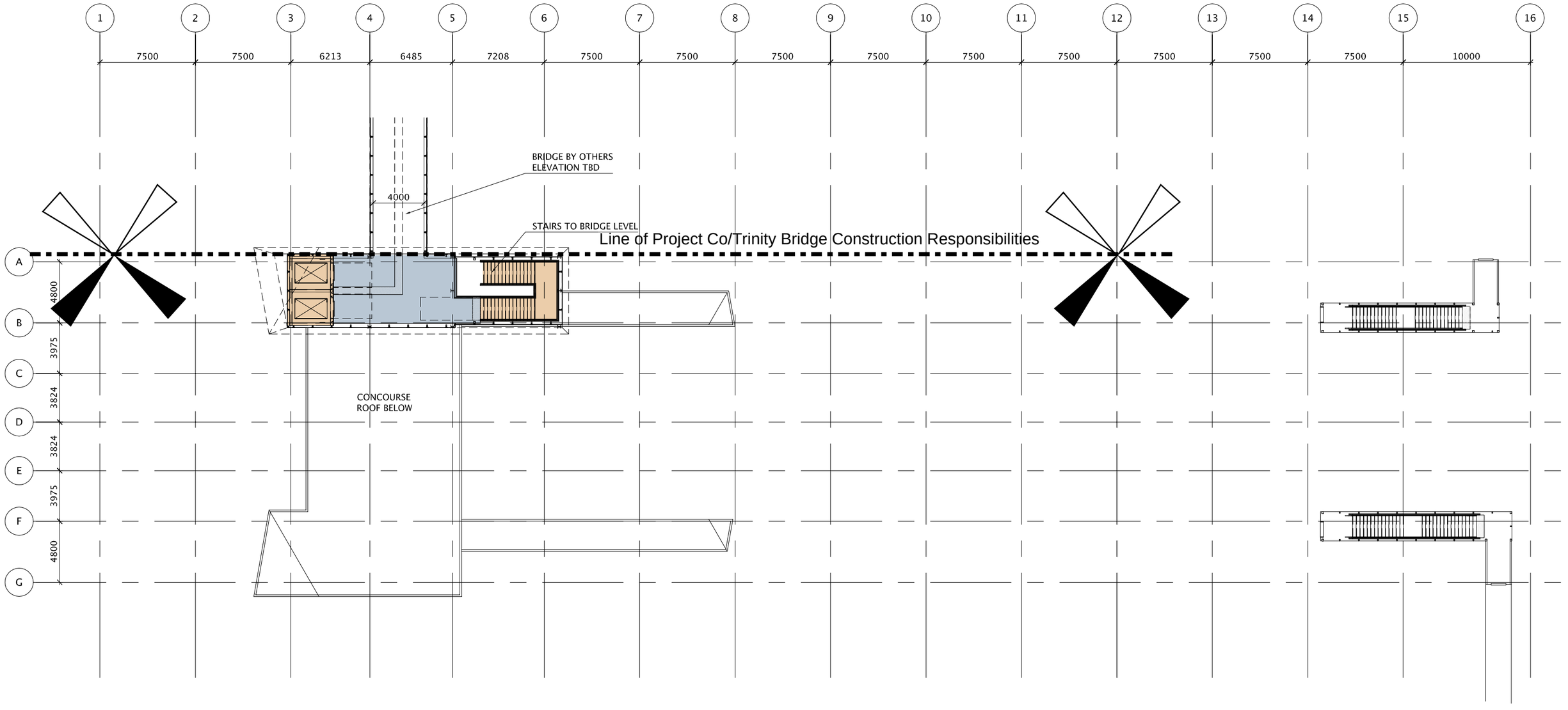
Trillium Line SOUTH

bbb architects
400 - 47 Clarence Street, Ottawa, ON K1N 9K1
Tel. (613) 241-8446 Fax. (613) 241-4101

Gladstone Station
Concourse Plan showing bridge connection

scale 1:300

20 March, 2019



Trillium Line SOUTH

bbb architects
400 - 47 Clarence Street, Ottawa, ON K1N 9K1
Tel. (613) 241-6446 Fax. (613) 241-4101

Gladstone Station
Bridge Plan

scale 1:300

20 March, 2019

TITLEBLOCK: 790mm x 534mm

1 / 9002 EXTERIOR PERSPECTIVE
SCALE NTS

TRILLIUM LINE EXTENSION

ARCHITECTURAL
SEGMENT 2
GLADSTONE STATION
EXERIOR PERSPECTIVE

CONTRACT No. -

DESIGNED K. AITKEN | CHECKED K. AITKEN
DRAWN C. STUMPF | SEALED -

DRAWING NUMBER 646120-BBA-S2GS-44DK-9002

PRIMARY SEAL

DESIGN/BUILDER
TransitNext

ENGINEERING JV

SECONDARY SEAL (IF REQUIRED)

DESIGN FIRM
NORR Architects & Engineers Limited
An Ingenium Group Company

SCALE
HORIZONTAL 1:XXX FULL SIZE / 1:XXX HALF SIZE
VERTICAL 1:X FULL SIZE / 1:X HALF SIZE

ASSET No. -

ASSET GROUP -

REV	DESCRIPTION	BY	DATE
A	TECHNICAL SUBMISSION	K.A	2018/07/18

KEY MAP
N.T.S.

PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN CONSTRUCTION PACKAGE No: FS2GS
TECHNICAL SUBMISSION REQUIREMENT: 2.4(1)(c)(i)(B)

DISCLAIMER:
PROJECT COMPANY RESERVES THE RIGHT TO OPTIMIZE THE DESIGN DURING DETAILED DESIGN WHILE STILL MEETING THE COMPLIANCE REQUIREMENTS OF THE PROJECT AGREEMENT

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TITLEBLOCK 750mm x 534mm

1 / 9003 INTERIOR PERSPECTIVE - PLATFORM
SCALE NTS

TRILLIUM LINE EXTENSION

Ottawa

ARCHITECTURAL
SEGMENT 2
GLADSTONE STATION
INTERIOR PERSPECTIVE - PLATFORM

CONTRACT No. -

DESIGNED K. AITKEN | CHECKED K. AITKEN
DRAWN C. STUMPF | SEALED -

DRAWING NUMBER 646120-BBA-S2GS-44DK-9003

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DESIGN/BUILDER
TransitNext

ENGINEERING JV

SECONDARY SEAL (IF REQUIRED)

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NORR Architects & Engineers Limited
An Ingenium Group Company

SCALE
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KEY MAP
N.T.S.

PRELIMINARY
NOT FOR CONSTRUCTION

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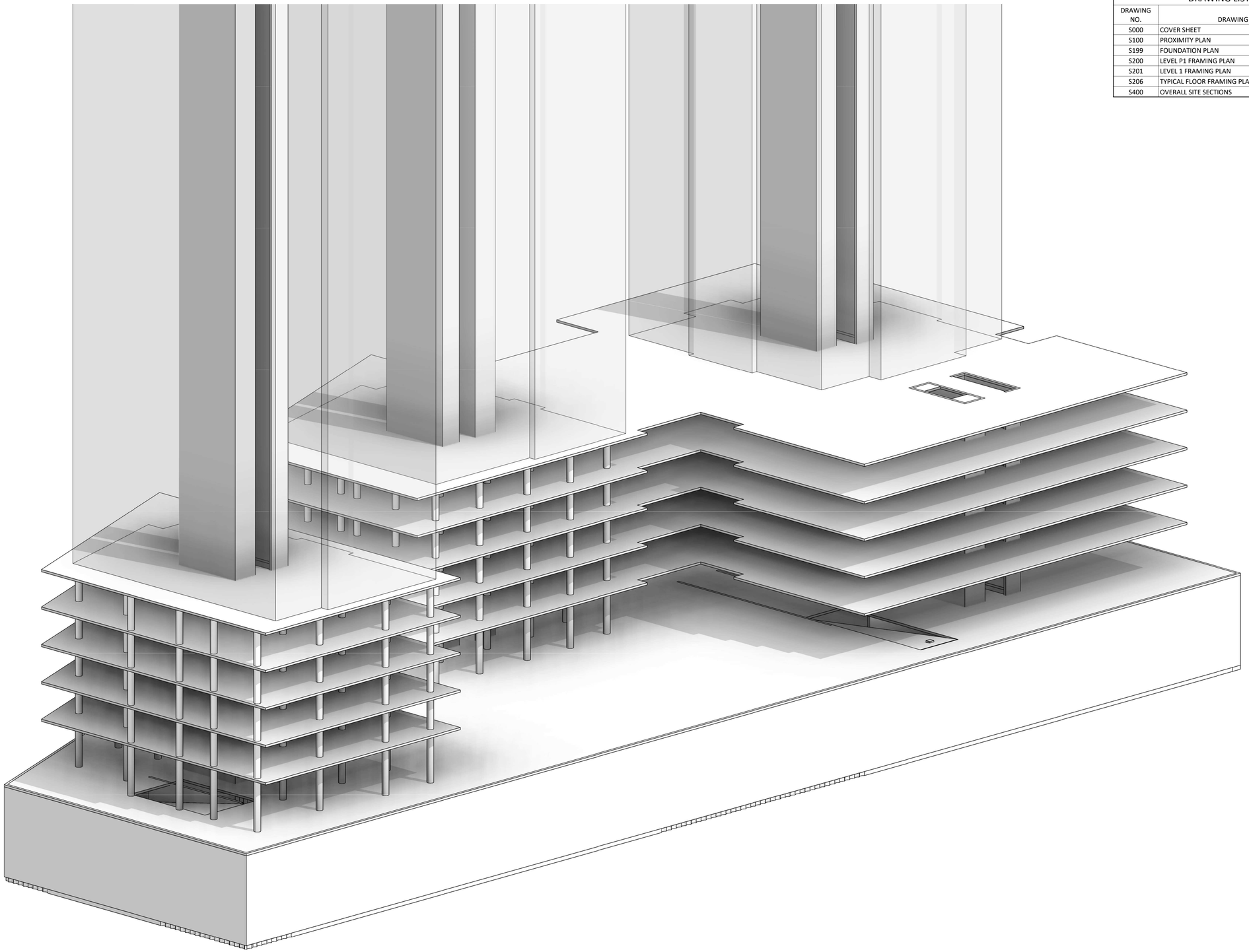
APPENDIX B4

STRUCTURAL DRAWINGS



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DRAWING NO.	DRAWING TITLE
S000	COVER SHEET
S100	PROXIMITY PLAN
S199	FOUNDATION PLAN
S200	LEVEL P1 FRAMING PLAN
S201	LEVEL 1 FRAMING PLAN
S206	TYPICAL FLOOR FRAMING PLAN
S400	OVERALL SITE SECTIONS

ENTUITIVE

NO	DATE	REVISIONS
2	09/04/21	ISSUED FOR PROXIMITY REPORT
1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
COVER SHEET

DRAWN BY:	DATE:	SCALE:
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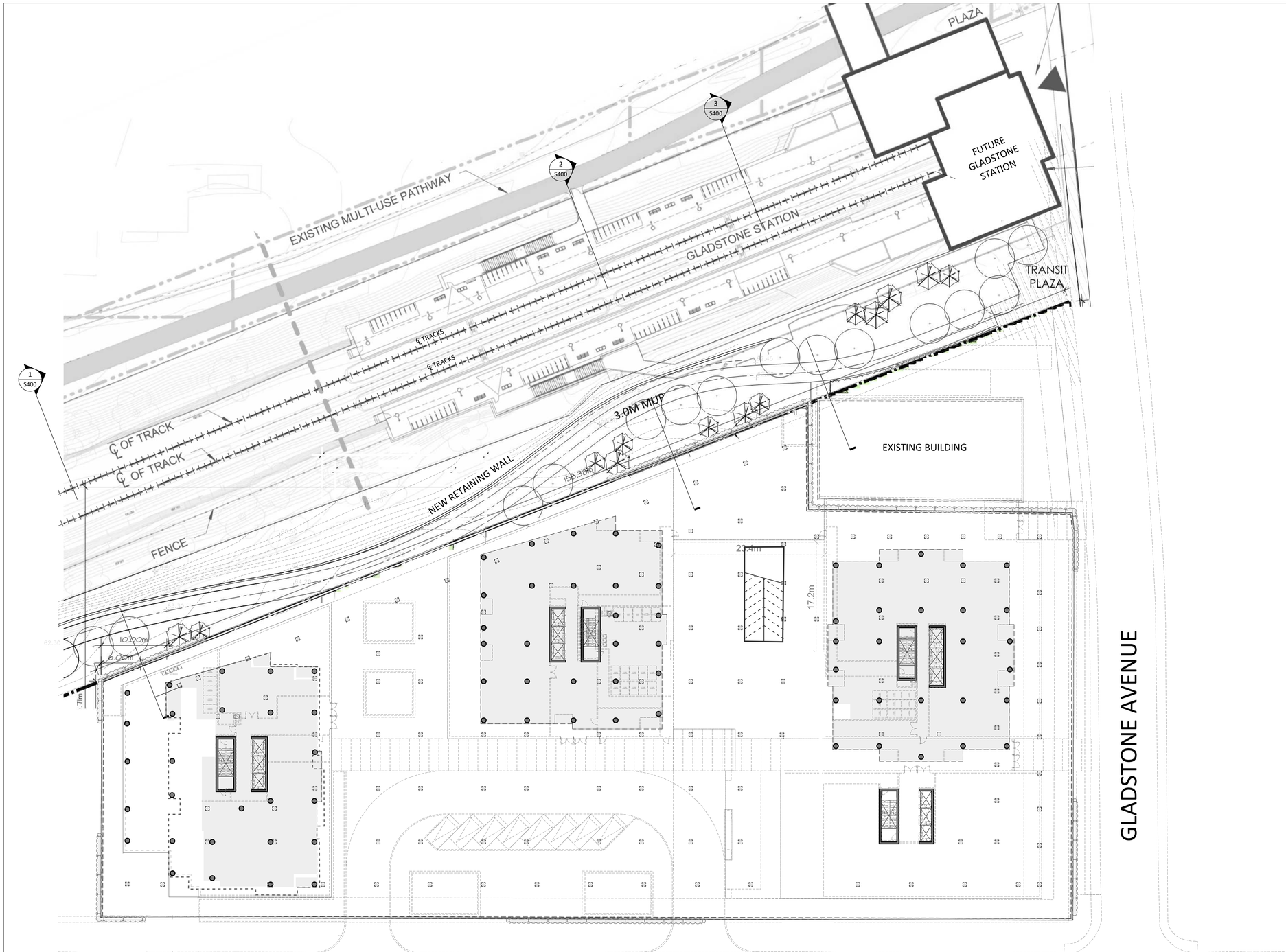
PROJECT: C019-1960

DRAWING NO: S000



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PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

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DRAWN BY:	DATE:	SCALE:
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PROJECT: C019-1960

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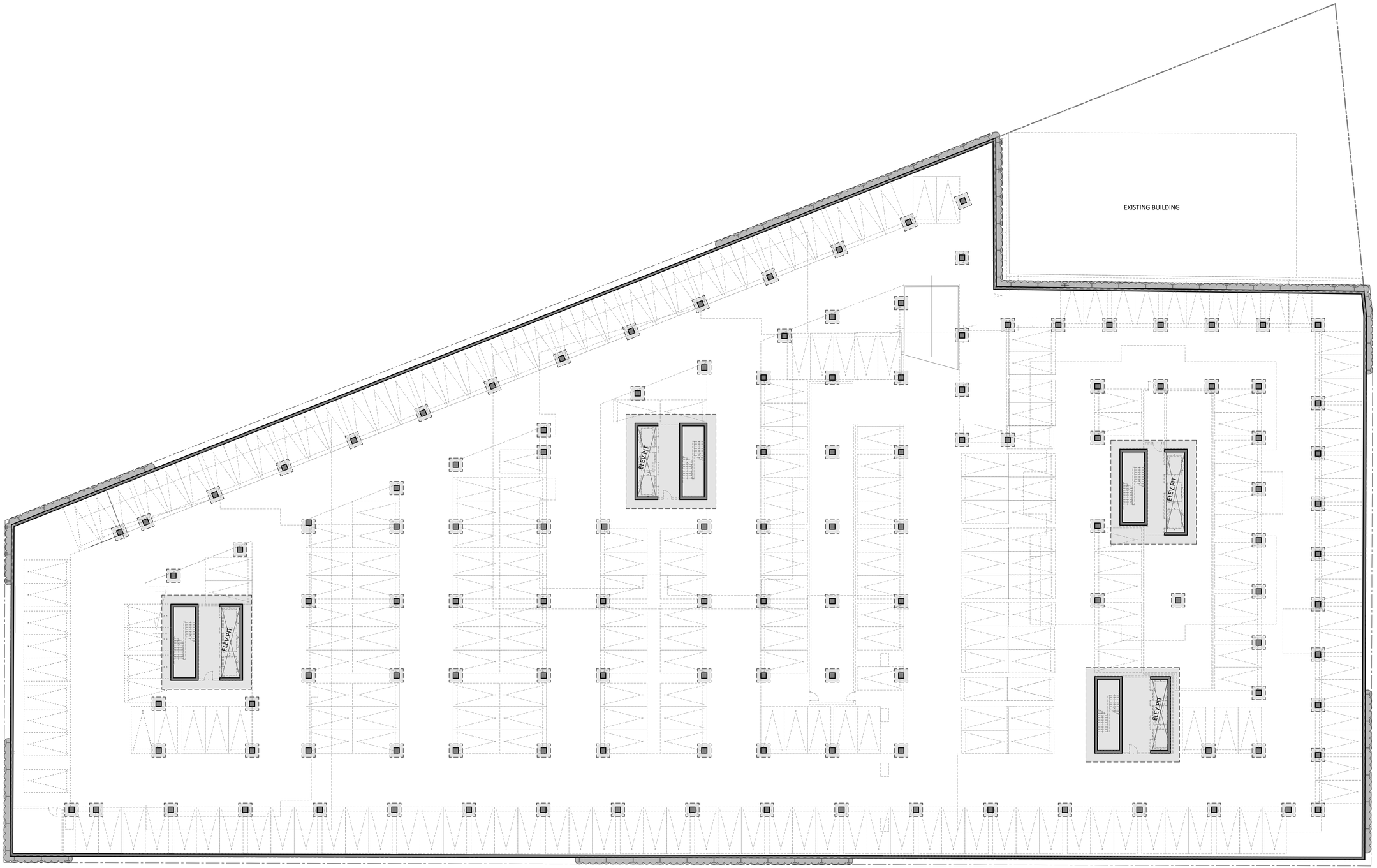

FOUNDATION PLAN
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NO	DATE	REVISIONS
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1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
FOUNDATION PLAN

DRAWN BY:	DATE:	SCALE:
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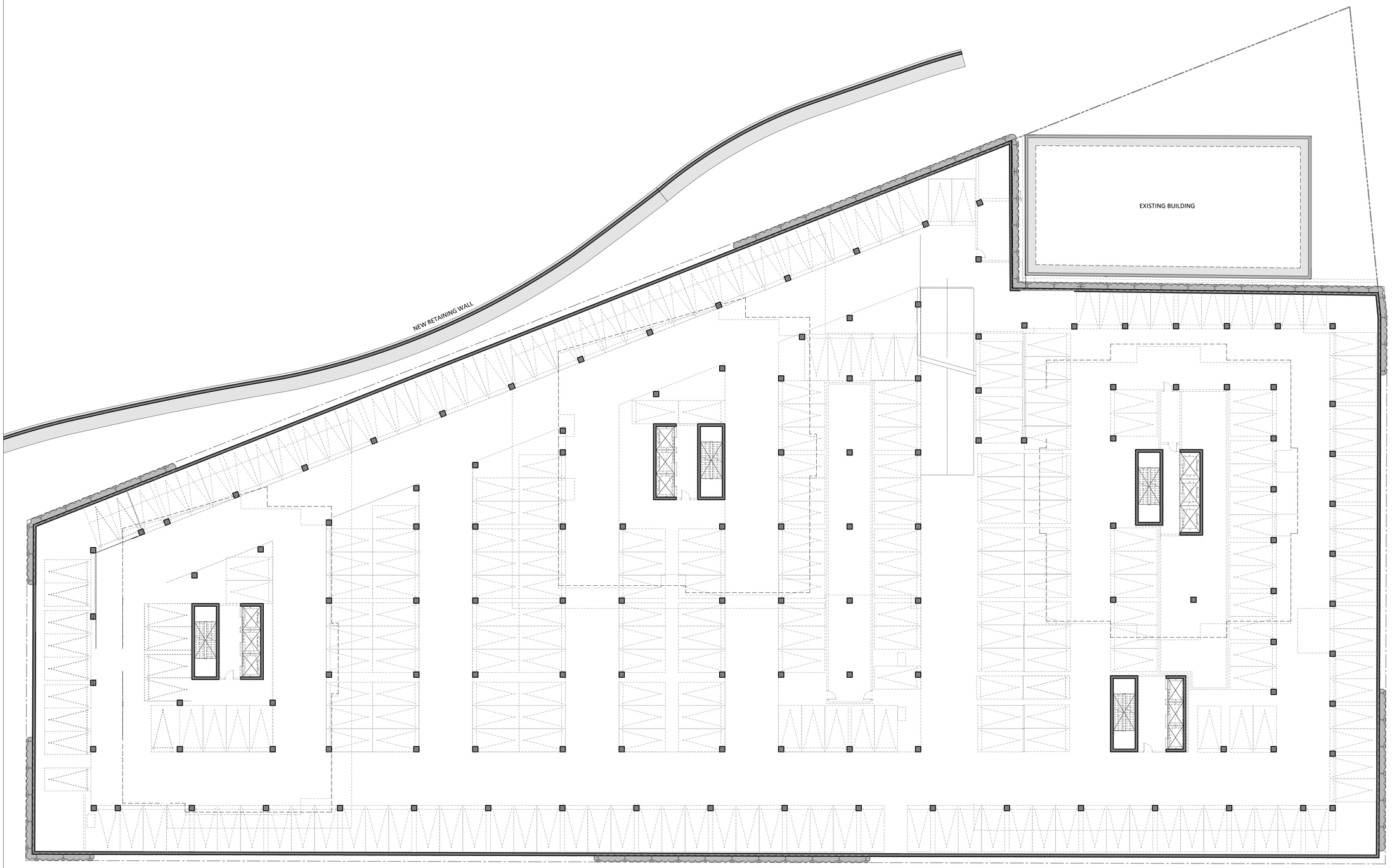
PROJECT: C019-1960

DRAWING NO: S199



LEVEL P1 FRAMING PLAN
1 : 200

NO	DATE	REVISIONS
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1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
LEVEL P1 FRAMING PLAN

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PROJECT:
C019-1960

DRAWING NO:
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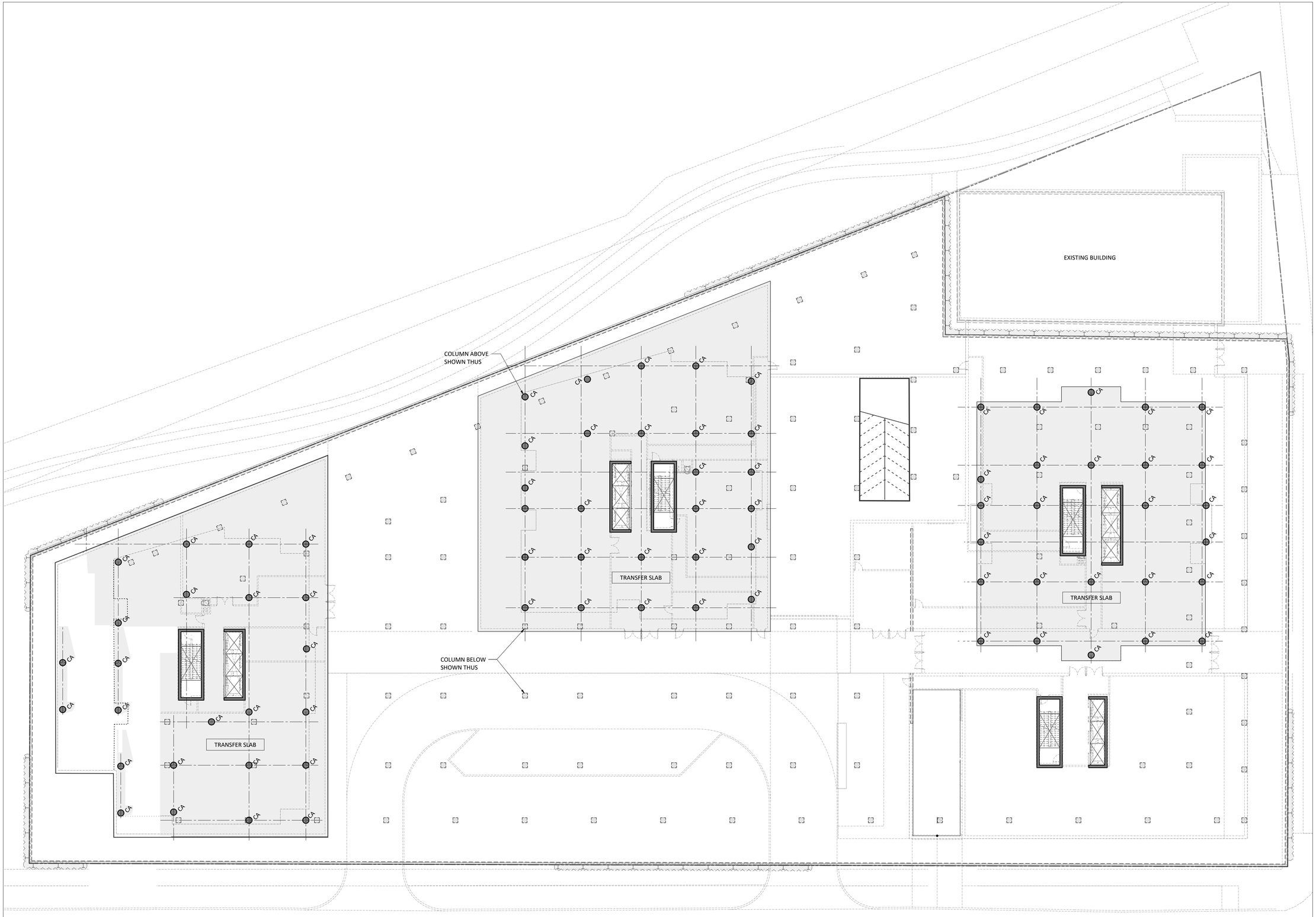

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1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
LEVEL 1 FRAMING PLAN

DRAWN BY:	DATE:	SCALE:
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PROJECT: C019-1960

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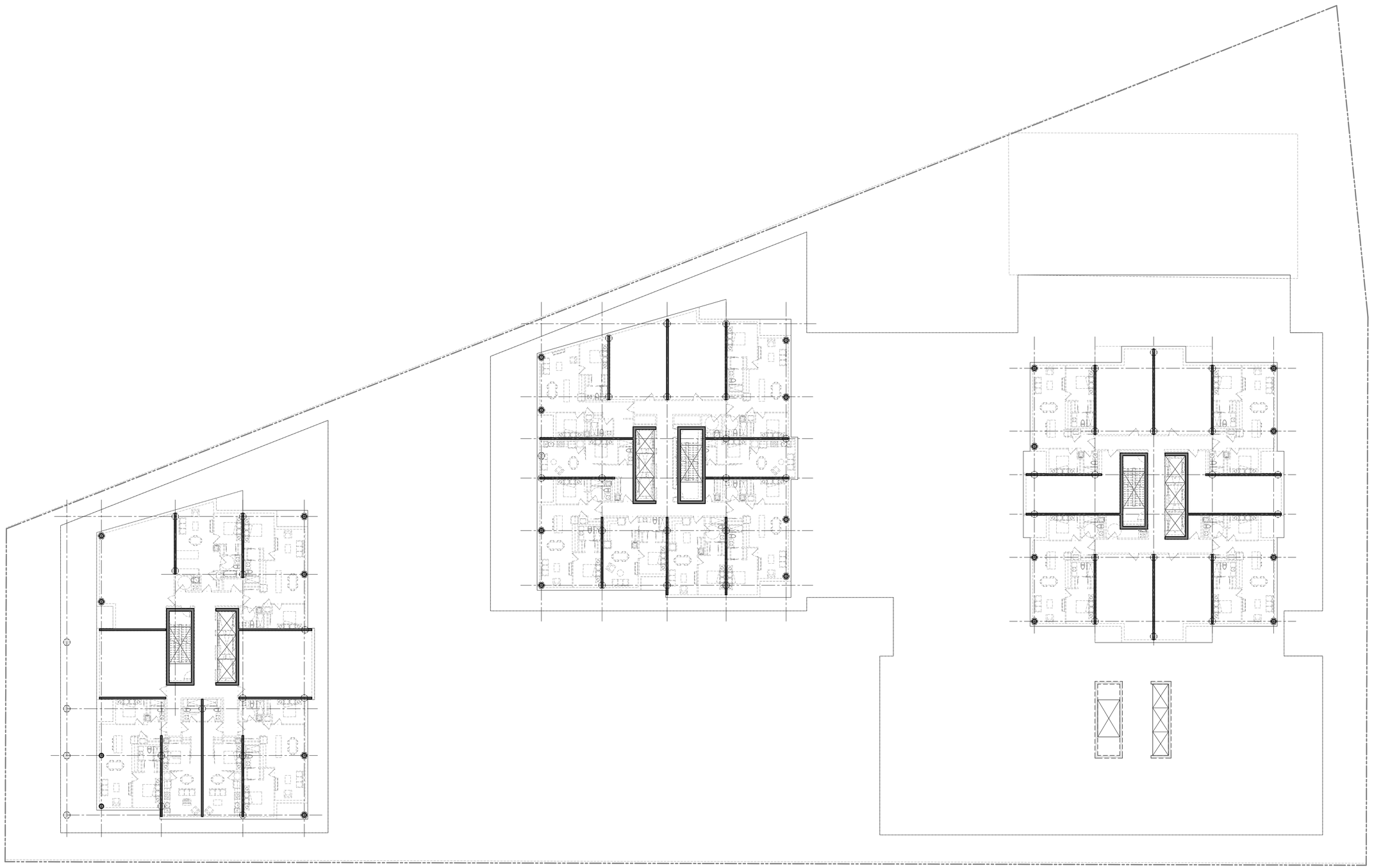

TYPICAL FLOOR FRAMING PLAN
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1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
TYPICAL FLOOR FRAMING PLAN

DRAWN BY:	DATE:	SCALE:
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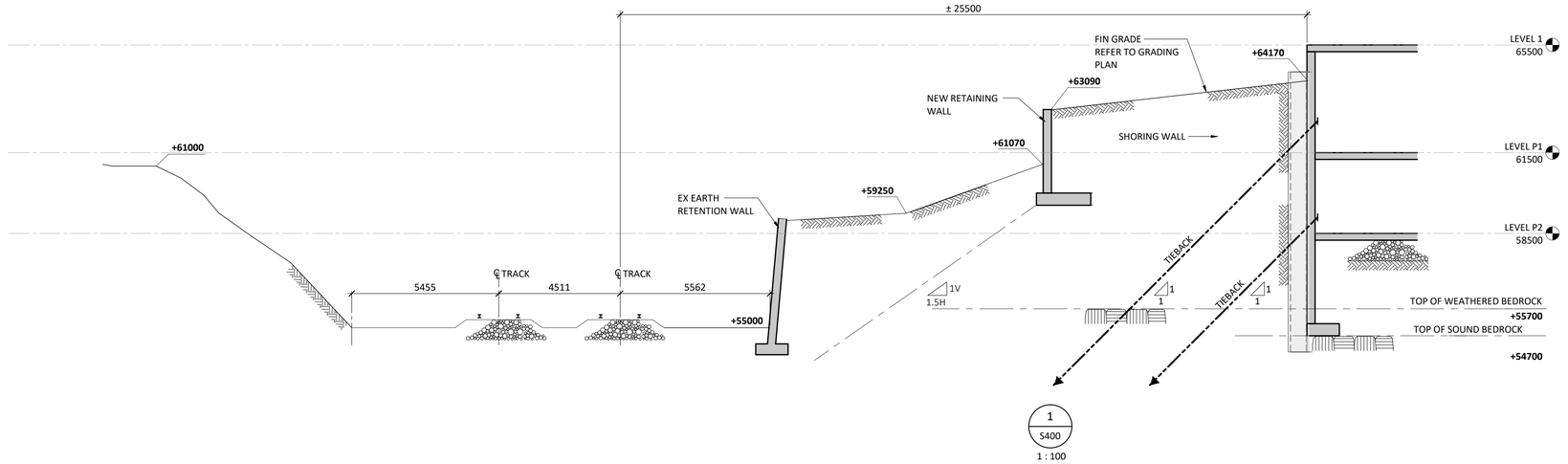
PROJECT: C019-1960

DRAWING NO: S206



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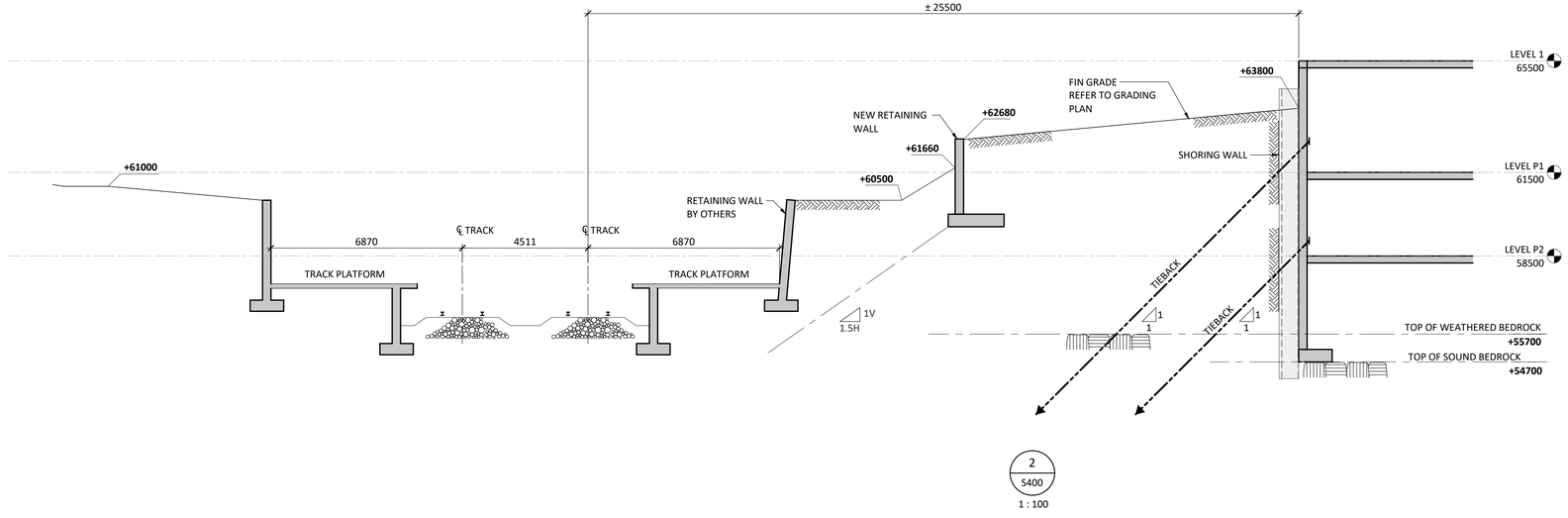
1 : 100



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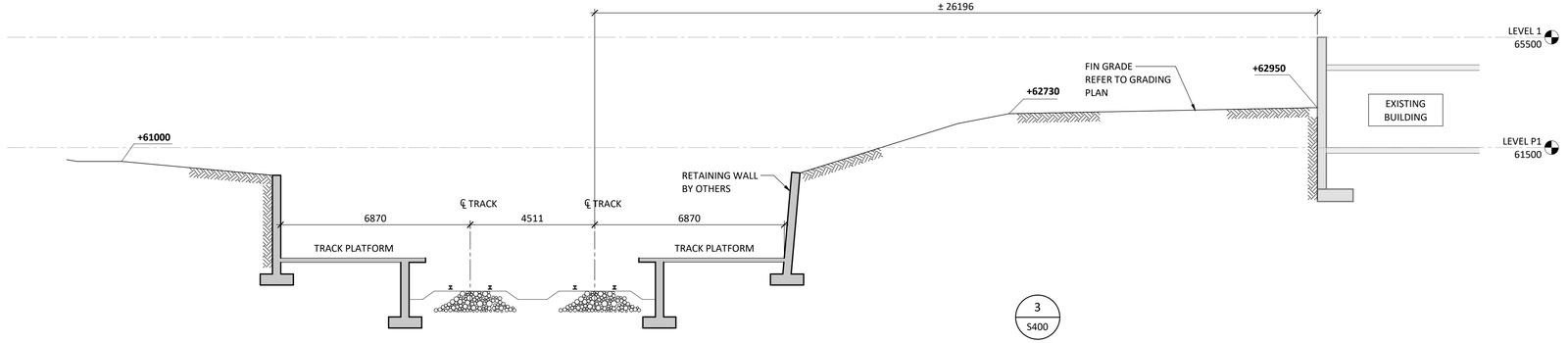

3
S400
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NO	DATE	REVISIONS
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1	10/02/19	ISSUED FOR PROXIMITY REPORT

PBCGROUP

CLV GROUP

ENTUITIVE
200 University Avenue, 7th Floor
Toronto, ON M5H 3C6 Canada
+1 416 477 5832

PROJECT/LOCATION:
951 GLADSTONE AVE.
& 145 LORETTA AVE. NORTH

DRAWING TITLE:
OVERALL SITE SECTIONS

DRAWN BY:	DATE:	SCALE:
FP	10/02/19	1 : 100

PROJECT:
C019-1960

DRAWING NO:
S400

APPENDIX C

GEOTECHNICAL REPORT

DUE DILIGENCE GEOTECHNICAL INVESTIGATION REPORT

FOR THE PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT AT

971 GLADSTONE AVENUE AND 145 LORETTA AVENUE

OTTAWA, ONTARIO

Prepared for:

Trinity Development Group Inc.
Sun Life Financial Centre, East Tower
3250 Bloor Street West, Suite 1000,
Toronto, Ontario
M8X 2X9

16 August 2017

DST File No.: TS-SO-029563

DST Consulting Engineers Inc.

203-2150 Thurston Drive, Ottawa, Ontario, K1G 5T9
Tel.: 1-613-247-2409 Fax: 1-888-979-6772
Web: www.dstgroup.com

Table of Contents

APPENDICES

1. INTRODUCTION

DST Consulting Engineers Inc. (DST) was retained by Trinity Development Group Inc. (TDG) to conduct a geotechnical investigation and provide general foundation and earthworks design recommendations for the potential acquisition and construction of the proposed residential and commercial development with two or four levels of underground parking at the north-east corner of Gladstone Avenue and Loretta Avenue North, Ottawa, Ontario.

A limited preliminary geotechnical investigation was completed by DST in 2009 consisting of three (3) boreholes drilled at the west and the south sides of the 955 and 953 Gladstone Avenue building. That preliminary investigation did not cover the entire area of the proposed development. Therefore, additional geotechnical investigation was required to characterize the subsurface conditions across the site.

The primary objectives of this investigation and report are to obtain the necessary subsurface information and provide the general recommendations for conceptual design of the proposed development and to assist Trinity Development Group Inc. (TDG), in due diligence prior to the property acquisition. The investigation focused on the important issues from both geotechnical and environmental standpoints which could lead to potential cost premiums for the proposed multi-storey development.

The current geotechnical investigation was completed in general accordance with the work plan described in DST's proposal dated May 17, 2017. Written authorization to proceed with the investigation was provided by Mr. Ryan Moore, senior development manager of TDG in an email dated May 29, 2017.

This report is prepared for the sole use of TDG. The use of the report, or any reliance on it by any third party, is the responsibility of such third party. This preliminary geotechnical engineering report is also subject to the limitations shown in Appendix A and is not intended for detailed design purposes. It should be noted that the details of proposed development such as proposed grades, vertical extent of the proposed underground parking structure and anticipated loading information have not been specified by TDG and/or made available to DST at this stage.

2. PROJECT DESCRIPTION

The proposed project for the site is a multi-storey residential and commercial development, including mid and high rise residential buildings, commercial/retail spaces, ground surface parking lots, two to

four levels of below ground parking, sewers and water pipes installation. The proposed new buildings include one 18-storey tower, one 20-storey tower, one building with 20-story at one side and 5-story at another side, and one 5-storey residential building. The proposed buildings are as follows;

1) Building 1, for residential and retail, approximately 160,000 square feet (SF) and 1,900 SF, respectively.
2) Building 2, for residential and retail, approximately 177,000 SF and 4,300 SF, respectively.
3) Building 3, for residential and retail, approximately 216,500 SF and 12,340 SF, respectively.
4) Building 4, for residential and retail, approximately 33,660 SF and 3,600 SF, respectively.

The actual number of underground parking levels and proposed elevations of the underground parking structure had not been provided to DST at this stage. However, the proposed tentative development plan, provided by the client, includes construction of two levels of underground parking and deep excavation to approximately 7 to 8 m below existing grades for the two levels of underground parking option over the entire development site. Another option provided by the client includes four levels of underground parking to approximately 14 m below grade. . The proposed towers and mid-rise residential buildings will be built over the underground parking structure.

This geotechnical investigation is intended to confirm the subsurface conditions in general across the site and to provide preliminary foundation and geotechnical recommendations for the proposed development.

A site plan with the borehole locations are shown in Figure 1, Appendix B.

3. SITE DESCRIPTION

The project site is surrounded by Gladstone Avenue at the south, Loretta Avenue at the west, a small commercial property at the north and rail track at the east and north-east. The site is relatively flat and sloping ground to the rail track at the east and north-east boundary of the property. The project site is approximately 100 m wide at Gladstone Avenue, approximately 30 m wide at the north side, and approximately 150 m long at Loretta Avenue. The site is occupied with Gladstone center buildings and surface parking lots presently.

4. REGIONAL GEOLOGY

Based on the Ontario Geological Survey Open File Report 5770, and the surficial geological map of Ottawa, this general area is predominantly underlain by fine grained deposits of silt and clay. Based on the geological survey report, fine-grained soils are deposited in the potentially marine environment, named by geologists as Champlain Sea deposits.

Bedrock geology in the area is predominantly underlain by limestone, dolostone, shale, arkose, sandstone of Ottawa Group, Simcoe Group, and Shadow Lake Formation, respectively.

5. FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Field Investigation

The geotechnical field investigation was conducted between June 27 and July 10, 2017 and consisted of thirteen (13) boreholes drilling, depths between 1.8 m and 13.5 m. The boreholes were distributed across the site, as shown in the borehole location plan, Figure 1, Appendix B.

Before the drilling work, underground and above ground utility services were located by CCC drilling to make sure the drilling locations are clear of the underground services. Boreholes were drilled using a specialize drilling contractor, CCC Drilling Inc. A truck mounted drill rig was used for the drilling work. Standard Penetration Test (SPT) was carried out at 0.75 m interval up to auger refusal depth. The SPT sampler was advanced by dropping a 63.5 kg hammer (auto trip) for approximately 760 mm height, in accordance with the Standard Penetration Test (SPT) method (ASTM D1586). The results of these penetration tests are reported as SPT ‘N’ values on the borehole logs at the corresponding depths.

Disturbed soil samples were collected from the SPT samplers. All the collected soil samples were inspected upon retrieval and classified the soil types, colour and kept in the airtight plastic bags, labelled the sample identifications and sent back to the DST laboratory using cooler boxes. After arrival of the samples at the laboratory, soil samples were examined by a geotechnical engineer and assigned the appropriate laboratory tests.

Boreholes locations were surveyed using GPS readings and borehole elevations were surveyed using a survey bench mark located at mid of north east of the property (near BH2017-09) marked by Benchmarks (PK nail and S.I.B.), as shown on the borehole location plan on Drawing 1 in Appendix B. Groundwater monitoring wells were installed at eleven (11) drilled boreholes.

All boreholes were backfilled with bentonite pellets to the near ground surface and capped with auger cuttings at the near ground surface. The borehole locations are shown on the borehole location plan on Figure 1 in Appendix B. Summary of borehole coordinates are presented in Table 5.1 below.

Table 5-1: Summary of Boreholes Coordinates and Termination Depths

Borehole/Well ID	Ground Surface Elevation (m)	Location (UTM Zone 18T)		Borehole Termination Depth, m
		Nothing, m	Easting, m	
BH2017-01	104.9	5028029	443991.0	7.6
BH2017-02	104.2	5028045	444017.3	6.5
BH2017-03	103.4	5028054	444056.8	13.5
BH2017-04	100.7	5028076	444057.7	4.6
BH2017-05A	102.7	5028096	444019.2	1.8
BH2017-05	102.7	5028096	444017.3	13.5
BH2017-06	104.3	5028066	443975.0	7.8
BH2017-07	102.4	5028127	443952.3	8.0
BH2017-08	103.9	5028091	443979.6	13.6
BH2017-09	99.6	5028115	444005.2	4.5
BH2017-10	102.3	5028139	443965.7	16.6
BH2017-11	102.1	5028155	443947.7	8.4
BH2017-12	102.1	5028159	443963.2	8.5
BH2017-13	102.2	5028143	443977.7	1.8

5.2 Laboratory Testing Program

The laboratory geotechnical tests were completed for confirmation of soil classification. Chemical analysis were carried out for evaluation of corrossivity of subsoil. The laboratory geotechnical testing program consisted of determination of moisture content (for all recovered soil samples), particle size

analysis, and Atterberg limit test. Compressive strength of rock cores were tested on selected rock core samples.

A total of four (4) particle size analyses, and five (5) Atterberg limit tests were completed. One (1) soil sample was analysed for corrosion package consisting of measurement of chlorides, sulphides, sulphate, conductivity, pH, resistivity of soil, and oxidation-reduction potential to assess the potential for subsoil corrossivity. The results of the moisture content determination and grain size analysis are shown on the borehole logs. The moisture contents and grain size analysis results are shown on the borehole logs in Appendix C and the laboratory test results shown in Appendix D.

6. DESCRIPTION OF SUBSURFACE CONDITIONS

Based on the subsurface conditions encountered in the boreholes, the generalized subsoil profile consists of fill underlain by clay deposit and limestone bedrock. A sand and gravel, and sandy clay layer were also encountered in some boreholes between clay and bedrock, as shown in the borehole logs and summarized in Table 6-1 below.

Table 6-1: Summary of Stratigraphy at Exploratory Boreholes

Borehole ID	Fill (m)	Depth of Clay Layer (m)	Sand and Gravel/Probable Till (m)	Bedrock/Auger Refusal (EOB) (m)
BH2017-01	0 – 2.3	2.3 – 7.3	7.3 – 7.6	Auger Refusal
BH2017-02	0 – 2.1	2.1 – 6.5	-	Auger Refusal
BH2017-03	0 – 2.4	2.4 – 6.4	-	6.4 – 13.5
BH2017-04	0 – 1.8	1.8 – 4.6	-	Auger Refusal
BH2017-05	0 – 3.1	3.1 – 6.9	-	6.9 – 13.5
BH2017-06	0 – 1.4	1.4 – 7.8	-	Auger Refusal
BH2017-07	0 – 4.3	4.3 – 7.3	7.3 – 8.0	Auger Refusal
BH2017-08	0 - 2.5	2.5 – 7.0	-	7.0 – 13.6
BH2017-09	0 – 0.7	0.7 – 4.5	-	Auger Refusal
BH2017-10	0 – 4.3	4.3 – 8.3	8.3 – 9.0	9.0 -16.6
BH2017-11	0 – 3.4	3.4 – 7.3	7.3 – 8.4	Auger Refusal
BH2017-12	0 – 3.0	3.0 – 7.9	7.9 – 8.5	Auger Refusal
BH2017-13	0 – 1.4	1.4 – 1.8 (EOB)	-	Auger Refusal

EOB = Termination Depth/End of Borehole

The details of the subsurface conditions encountered in the boreholes can be reviewed in the borehole logs shown in Appendix C. The soil type was classified in accordance with Unified Soil Classification System and as per Section 3 of 2006 Canadian Foundation Engineering Manual, Fourth Edition (CFEM), entitled identification and classification of soil and rock.

6.1 Fill

A fill layer was encountered in all boreholes. The fill depths were found between 1.4 m and 4.3 m. Fill material generally consisted of sand and gravel, gravelly sand, and sand and clay. A clay fill layer was also encountered in the BH2017-10 at about 3 m depth. Standard penetration test (SPT) N

values varied widely across the site ranging between 1 and over 100 indicating very loose to very dense conditions. The moisture contents of the fill ranged between 1 and 30%. The results of Particle size analyses are summarized in Table 6.2.

Table 6-2: Summary of Particle Size Analysis Result

Sample ID	Sample Depth (m)	Gravel, %	Sand, %	Silt/Clay, %
BH2017-5/SS-4	1.7 – 2.1	52	37	11
BH2017-9/SS-2	0.4 – 1.1	5	42	53
BH2017-10/SS-4	1.7 – 2.1	32	59	9
BH2017-11/SS6	3.0 – 3.6	7	60	43

6.2 Clay

Clay was encountered in all boreholes except Borehole BH2017-5A, where the borehole was terminated in fill at 0.7 m depth. Clay soil layer was encountered at depths between 1.4 and 8.3 m depths. Detailed clay soil depths are shown in Table 6.1.

Standard penetration test (SPT) N values tested in the clay layer ranged between 5 and 30 indicating soft to very stiff in consistency. A few SPT results in the clay layers were below 5 blows, and the result indicating very soft. A few SPT tests at near the bedrock surface are resulted over 100 blows, it could be due to the SPT sampler reached to the bedrock surface during the test. Field vane test results varied from 19 kPa to over 200 kPa. The moisture contents of the clay ranged between 5 and 50 %. The clay soil layer becomes sandy at deeper depth. Atterberg Limit test results are shown in Table 6.3.

Table 6-3: Summary of Atterberg Limit Test Results

Sample ID	Sample Depth (m)	Plastic Limit, %	Liquid Limit, %	Plasticity Index, PI
BH2017-2, SS4	1.7 – 2.1	48	24	24
BH2017-3, SS7	3.6 – 4.1	38	19	19
BH2017-3, SS10	5.4 – 5.9	33	15	18
BH2017-6, SS-8	4.1 – 4.6	15	12	3
BH2017-8, SS7	3.6 – 4.1	47	24	23

6.3 Sand and Gravel

A sand and gravel layer was encountered between clay and bedrock in Boreholes BH2017-1 at between 7.3 m to 7.6 m depth, BH2017-7 at between 7.3 m and 8.0 m depth, BH2017-10 at between 8.3 m and 9.0 m depth, and BH2017-11 at between 7.3 m and 8.4 m depth. Standard penetration test (SPT) N values tested in the sand and gravel layers ranged between 17 and 100+ indicating compact to very dense in compactness. The moisture content of the sand and gravel ranged between 6 and 11 %.

6.4 Sandy Clay Till

Sandy clay till was encountered in BH2017-12 at between 7.9 m and 8.5 m depth, below the clay soil layer. Standard penetration test (SPT) N value tested in the sandy clay layer was 100+. However, SPT test is partially on the bedrock, therefore, SPT blow count number is not representative to soil compactness condition. The sandy clay is evaluated as firm in consistency. The moisture content of the sandy clay was 15 %.

6.5 Bedrock

Bedrock coring was completed in Boreholes BH2017-3 (7.0 m to 13.5 m depth), BH2017-5 (6.9 m to 7.4 m depth), BH2017-8 (6.9 m to 13.6 m depth) and BH2017-10 (9.0 m to 16.6 m depth). All the recovered cores are classified as grey limestone. Total core recovery, solid core recovery and rock quality designation of the rock cores were evaluated and reported in the rock core photos (Appendix E) and shown in Table 6.4. Unconfined compressive strength (UCS) of the rock test was carried out on the selected rock core samples. Summary of UCS test results is shown in Table 6.5. The UCS test results are provided in Appendix D.

Table 6-4: Summary of Rock Cores Logging

BH No.	Core Run No.	Depth (m)	TCR (%)	SCR (%)	RQD (%)
BH2017-03	1	6.4 – 7.5	100	79	58
BH2017-03	2	7.5 – 9.0	100	92	90
BH2017-03	3	9.0 – 10.4	93	93	92
BH2017-03	4	10.4 – 11.9	100	100	92

BH2017-03	5	11.9 – 13.5	100	100	95
BH2017-05	1	6.9 – 7.4	100	100	100
BH2017-05	2	7.4 – 8.8	100	98	95
BH2017-05	3	8.8 – 10.3	100	100	100
BH2017-05	4	10.3 – 11.8	100	100	96
BH2017-05	5	11.8 – 13.5	100	100	100
BH2017-08	1	7.0 – 7.6	100	96	93
BH2017-08	2	7.6 – 9.1	85	78	75
BH2017-08	3	9.1 – 10.6	100	100	98
BH2017-08	4	10.6 – 12.1	98	98	90
BH2017-08	5	12.1 – 13.6	100	100	100
BH2017-10	1	9.0 – 10.5	98	92	85
BH2017-10	2	10.5 – 12.1	100	100	100
BH2017-10	3	12.1 – 13.6	98	98	98
BH2017-10	4	13.6 – 15.1	100	100	100
Bh2017-10	5	15.1 – 16.6	100	100	100

Table 6-5: Summary of Limestone Bedrock Field and Laboratory Test Results

BH No.	Core Run No.	Depth, (m)	Unconfined Compressive Strength, (MPa)
BH2017-3	1	96.1 – 95.9	127.6
BH2017-3	5	90.1 – 89.8	125.7
BH2017-5	2	94.5 – 94.1	121.5
BH2017-8	3	93.5 – 93.3	113.1
BH2017-10	1	93.2 – 92.9	97.2
BH2017-10	4	88.1 – 87.8	129.6

6.6 Groundwater

The groundwater depths were measured in the installed monitoring wells. The measured groundwater depths are summarized in Table 6.6. The groundwater elevations varied with location and over time between 1.7 m and 4.4 m below grade (Elevations 101.0 m and 97.9 m).

Table 6-6: Summary of Groundwater Measurement in the Installed Monitoring Wells

Borehole/Well ID	Ground Surface Elevation (m)	Measured Date	Groundwater Depth (m)	Groundwater Elevation (m)
BH2017-02	104.2	July 17, 2017	4.4	99.8
BH2017-03	103.4	July 20, 2017	5.0	98.4
BH2017-04	100.7	July 17, 2017	2.2	98.5
BH2017-05	102.7	July 20, 2017	3.3	99.4
BH2017-06	104.3	July 17, 2017	3.3	101.0
BH2017-07	102.4	July 17, 2017	4.1	98.3
BH2017-08	103.9	July 20, 2017	5.6	98.3
BH2017-09	99.6	July 17, 2017	1.7	97.9
BH2017-10	102.3	July 20, 2017	4.1	98.2
BH2017-11	102.1	July 17, 2017	3.9	98.2

It shall be noted that the groundwater levels measured at the time of geotechnical field investigation may not be representative of the stabilized groundwater conditions at the site during the construction period. It should be noted that the groundwater levels are transient and tend to fluctuate with the seasons and periods of precipitation potentially up to 1 or 2 m compared to the recorded short-term measurements.

7. PRELIMINARY GEOTECHNICAL DESIGN RECOMMENDATIONS

The geotechnical recommendations presented herein are intended for conceptual design of the proposed development and for the sole use of the designers/planners of the project and are also subject to the limitations in Appendix A. All recommendations presented in this report are based on the assumptions that preliminary foundation design will be reviewed by DST during subsequent detailed design stage and an adequate level of construction monitoring of excavations and installations will be provided at the time of construction.

An adequate level of construction monitoring is expected to include periodic to full time monitoring of excavations and shoring installations, footing base evaluations, inspection and testing by a professional engineer specialized in geotechnical engineering.

7.1 Geotechnical Design parameters

The general site stratigraphy found in the boreholes consists of fill underlain by native clay deposit and some till/sand and gravel and limestone bedrock, as summarized in Table 6.1. A layer of sand & gravel (0.3 to 0.7 m thick) was encountered between clay and bedrock formation. The clay layer was found sandy at the deeper depth. The detailed subsurface conditions can be seen in the borehole logs, which are provided in Appendix C.

The stratigraphy and engineering parameters recommendations are provided for Tables 7.1. The internal friction angles of granular materials were estimated from standard penetration tests (SPTs) applying Wolff (1989) which provides an empirical correlation between SPT and internal friction angle. Internal friction angles of normally consolidated clay were estimated from the Plasticity Index of the sample. Undrained shear strengths of the cohesive soils were estimated based on the in-situ vane shear test results as well as from the SPT test results.

Table 7-1: Geotechnical Soil Design Parameters

Soil Type	Depths, m	Elevation, m	Unit weight, γ (kN/m³)	c, kPa	ϕ	K_0	K_a	K_p
Fill	0 – 4.3	104.8 – 98.0	18	-	(30) 28 - 42	0.50	0.33	3.00
Clay	1.4 – 8.3	102.9 – 94.0	17	-	(26)* 26 - 30	0.56	0.39	2.56
Sand & Gravel	7.3 – 9.0	94.8 – 93.3	20	-	(32)* 32 - 33	0.47	0.30	3.25
Sandy Clay Till	7.9 – 8.5	94.2 – 93.6	19	-	30	0.50	0.33	3.00

*value in ( ) are recommended value

7.2 Bedrock Profile and Bedrock Quality

7.2.1 Bedrock Profile

The bedrock depths were estimated from the rock core data and the depth of auger refusal encountered in the boreholes. The bedrock could be encountered at depths between 4.5 m and 9.0 m (Elevations 97.7 m and 93.3 m). The depths and elevations of the bedrock are tabulated and shown in the Table 7.2.

Bedrock excavation quantities for foundation preparation were estimated and provided in the Table 7.3. Used total area of the bedrock excavation for the volume calculation is 10,030 m². Bedrock excavation quantity will vary with the elevation of the bedrock excavation. Based on the boreholes data, bedrock surface was found to be sloping to the northeast side. It should be noted that actual bedrock depths may vary between the boreholes, and therefore the estimated volume may vary from the actual excavation volume.

Table 7-2: Inferred and Confirmed Bedrock Depths and Elevations

Borehole/Well ID	Ground Surface Elevation (m)	Inferred Bedrock Depth, (m)	Inferred Bedrock Elevation (m)	Remark
BH2017-01	104.9	7.6	97.3*	Possible bedrock/Auger Refusal
BH2017-02	104.2	6.5	97.7*	Possible bedrock/Auger Refusal
BH2017-03	103.4	6.4	97.0	Confirmed Top of Bedrock
BH2017-04	100.7	4.6	96.1*	Possible bedrock/Auger Refusal
BH2017-05	102.7	6.9	95.8	Confirmed Top of Bedrock
BH2017-06	104.3	7.8	96.5*	Possible bedrock/Auger Refusal
BH2017-07	102.4	8.0	94.4*	Possible bedrock/Auger Refusal
BH2017-08	103.9	7.0	96.9	Confirmed Top of Bedrock
BH2017-09	99.6	4.5	95.1*	Possible bedrock/Auger Refusal
BH2017-10	102.3	9.0	93.3	Confirmed Top of Bedrock
BH2017-11	102.1	8.4	93.7*	Possible bedrock/Auger Refusal
BH2017-12	102.1	8.5	93.6*	Possible bedrock/Auger Refusal

*No bedrock coring was carried out – Top of bedrock elevation to be confirmed during detailed stage and/or construction.

Table 7-3: Possible Bedrock Excavation Volumes

Assumed Excavation to Elevation (m)	Cumulative Rock Excavation Volume (m^3)	-15% estimate (m^3)	+ 15% estimate (m^3)	Remark
104.9	-	-	-	The highest ground surface elevation at BH2017-01 location
101.0	-	-	-	-
99.0	-	-	-	-
97.4	165	143	190	-
96.4	2,670	2,322	3,071	-
95.4	8,545	7,430	9,827	-
94.4	16,100	14,000	18,515	-
93.4	25,205	21,917	28,986	-
92.4	35,230	30,634	40,514	-
91.4	45,260	39,356	52,049	-
90.4	55,290	48,078	63,584	-
89.4	65,320	56,800	75,118	-

7.2.2 Bedrock Quality

Type of the bedrock are predominantly grey limestone bedrock. The rock core samples collected were logged for Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) and provided in Table 6.4 and the rock core photos, provided in the Appendix E. The TCR of rock cores were between 85% and 100 %, SCR of rock cores were between 78 % and 100 %, RQD of rock cores were between 58 % and 100 % and indicating fair to good quality. The unconfined compressive strengths of the tested samples were between 97.2 MPa and 129.6 MPa, indicating strong to very strong rocks and can be classified as Grade R4, accordance with ISRM (1981) classification, (Ref.: Table 3.5 of CFEM 2006 document).

The Rock mass qualities of recovered rock core samples were generally evaluated as fair (near top) to good rock below. It is recommended that further detailed evaluation bedrock quality should be carried out once the elevation of the bottom of excavation for underground parking structure is known and can be rated using Rock Mass Rating (RMR) System (After Bieniawski, 1989). The RMR rating will include the compressive strength of rock core, RQD, the bedrock fracture spacing, fracture condition, groundwater conditions at all cored locations across the site.

If the extent of bedrock excavation is deemed to be limited to the top bedrock, the upper bedrock could potentially be ripped with heavy duty rock rippers, due of the weaker and fractured rock at the top layer of limestone bedrock. It is recommended that the rippability of top of the bedrock (whether fractured rocks up to excavation depth) should be further evaluated when the bedrock exact depth is confirmed.

7.2.3 Bedrock Excavation by Blasting

The limestone bedrock mass below overburden and at depth is found to be generally strong to very strong and the fracture frequency generally drops with depth. Rock mass quality of rock cores could be rated as Class I to III. Rock mass quality Classes I to III required rock blasting, to loosen or fracture the bedrock for the excavation. Where relatively sound bedrock is encountered, blasting is generally required for fragmentation of very strong bedrock, as per OPSS 120 (governing the procedure for blasting).

A pre-construction survey of all buildings and facilities located within 50 meters of the excavation site shall be carried out by the firm specializing in pre-construction surveys and is independent of the contractor (similar to pre-blast survey as described in OPSS 120). Vibration monitoring will be required for the blasting work. Acceptable vibration levels induced by the excavation operations shall be determined following a risk assessment carried out by the independent vibration specialist.

7.3 Foundation Recommendations

Based on the information provided by the client, excavation for the entire site area for about 8 m depth (Elevation 96.7 m) is anticipated for the construction of two-levels underground parking. Therefore, the subsurface condition below the foundation for the proposed building could be on the bedrock and partially on the soil (e.g. 3 m of clay soil between foundation and bedrock at BH2017-10, if foundation is at Election 96.7 m).

It shall be noted that the clay soil is not recommended for the foundation bearing soil since it has low bearing resistance as well as it may cause excessive settlement for the proposed development. Clay soil shall be removed up to the bedrock surface depth. Foundation could be founded directly on the bedrock surface.

7.3.1 Spread Footings and Mat Foundation on Bedrock

Based on the borehole log, the type of bedrock encountered at the foundation depth is limestone. Limestone has fair to good RQD in first core run of BH2017-03, BH2017-10 and second core run of BH2017-08. Other core runs were excellent RQD condition (RQD 90 – 100).

The compressive strengths of tested sound rock core samples were 97 MPa to 129 MPa. Where spread footings/mat foundations are considered to support commercial building, due to the fair rock mass quality at the upper rock cores, an allowable design bearing pressure of 1,000 kPa is recommended for the foundation on the upper limestone bedrock formation. At this preliminary design stage, a modulus of deformation of 20 GPa can be used for the rock formation.

If more than 1,000 kPa design bearing capacity of the foundation is required, the mat foundations or cast-in-place concrete caissons, founded on competent bedrock could be considered. Competent bedrock has excellent rock mass quality and provide higher bearing capacity for the foundation. It is recommended that the potential for the presence of fractured/rubble zones should be checked for the entire footprint of the proposed tower. Further foundation consultations will be required for the detailed foundation design.

Limestone bedrock is susceptible to chemical erosion and may develop underground cavity. However, no significant open fractures or cavity was encountered in the four (4) boreholes cored up to 6.5 to 7.6 m below top of the bedrock (for). Therefore, relatively intact bedrock is expected underneath the proposed two levels of underground parking structure and the building foundation. A geophysical method such as ground-penetrating-radar (GPR), electromagnetic conductivity measurement (EM), could be used for detecting the cavities at a deeper depth.

Prepared bearing surface for the foundation should be free of disturbed soil, and free of unsuitable materials such as organic material, loose materials. All the disturbed soil during excavation should be removed for off side removal. A minimum 300 mm thick Granular A material, compacted to 100%

standard proctor maximum dry density, shall be prepared on top of the prepared foundation bedrock surface. The mat/raft foundation could be founded on the prepared 300 mm thick Granular “A” layer.

Considering the reported high ground water table, waterproofing layer is required below the floor slab and around the basement wall. The waterproofing design for the basement wall is required to protect from the water and moisture intrusion into the basement. Waterproofing design and specifications should be incorporated in the basement floor and walls construction design drawings.

Preparation and construction of mat/raft foundation requires shoring system and dewatering work for the anticipated deep excavations. Foundation shoring system should be designed to provide the sufficient support for the lateral earth pressure. Significant dewatering work is expected and further discussed in Section 7.6.2.

7.4 Slab-on-Grade

Should the basement foundation be on the bedrock, slab-on-grade construction will not be required for the basement floor construction. However, if foundation is planned on the overburden soil, the slab-on-grade for the foundation could be required.

Clay soil layer encountered in the boreholes at before the bedrock surface is not suitable for the foundation. Therefore, this unsuitable soil shall be removed up to bedrock surface and backfilled with engineered fills. Once the exposed excavated bedrock surface has been inspected and approved, the site grades within the floor slab area could be raised by the placement of engineered fill to the underside of the granular base of the slab. The engineered fill should consist of Ontario Provincial Standard Specification (OPSS) Granular “A”, placed in 300 mm maximum loose lift thicknesses, with each lift compacted to 100% standard Proctor maximum dry density (SPMDD). The slab subgrade could be constructed on a 300 mm thick bed of OPSS Granular material. The subgrade beneath the slab-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying, and the ingress of water. This applies during and after the construction period. The prepared subgrade should be inspected by a geotechnical engineer prior to the placement of the engineered fill.

If the ground is disturbed, the disturbed soil should be removed and replaced with Granular “A” and compacted to 100 % maximum standard Proctor dry density.

The finished exterior grade at the ground surface of the surrounding building, should be sloped away from the building to prevent ponding of surface water close to the exterior walls of the building.

7.5 Lateral Earth Pressure

Shoring for excavation support and foundation walls require design with resistance to the lateral earth pressures and groundwater pressures. The lateral earth pressure for the static condition, could be estimated using the following equation:

$$P = K_O \gamma h + K_O (\gamma - \gamma_w)(H-h) + \gamma_w (H - h) + K_O q$$

Where:

P	=	Total static lateral earth pressure in kPa;
K_o	=	coefficient of earth pressure for at rest condition
γ	=	estimated bulk unit weight of soil
γ_w	=	unit weight of water = 9.81 kN/m^3
H	=	height of wall (m)
h	=	depth of groundwater table below ground surface (m)
q	=	any surcharge pressure at ground level (kPa)

The thrust against the foundation wall during a seismic event may be estimated from the following equation (Wood, 1973):

$$P = \gamma H^2 (ah/g)$$

Where:

P = dynamic thrust component (kN/m)
γ = unit weight
H = height of wall (m)
(ah/g) = dimensionless horizontal pseudostatic coefficient

Active and passive earth pressures coefficients for the various soil types encountered at the site are provided in the Table 7.1.

7.6 Excavation and Dewatering

7.6.1 Excavations and Shoring System

Excavation must be undertaken in accordance with the Occupational Health and Safety Act (OHSA). The soil between ground surface and up to 8 m depth could be considered as Types 2 to 4 soils for excavation work as per Occupational Health and Safety Act and Regulation for Construction Projects. The excavation in overburden may be carried out with a cut slope of 2H:1V or using a suitable shoring system designed by a professional engineer.

Deep excavations of 8 - 9 m deep for the 2-levels basement parking construction and up to 14 m for 4-level parking option will require a specially designed shoring system. The potential shoring systems are tangent pile wall and secant pile wall. Given the reported bedrock elevations, it will be difficult to drive sufficient embedment pile lengths to anchor soldier piles into the bedrock. However, boring into the upper fractured bedrock may be considered given the reported bedrock qualities. Bracing, raking, anchoring should be considered for the excavation support of tangent and secant pile shoring systems. Shoring system should be considered for the needs for groundwater control (cut off wall) and the needs for the temporary and permanent retaining for the basement parking structure. The base heave during excavation with shoring is not expected for bedrock formation at the base of the excavation.

Instrumentation and monitoring during excavation will be required to monitor the performance of the shoring system as well as monitoring ground movement. The instrumentation and monitoring plan should be prepared for the shoring excavation.

7.6.2 Dewatering

Based on the groundwater levels encountered during the geotechnical investigations and subsequent groundwater monitoring results, perched groundwater could be encountered at shallow depth between 1.7 m and 5.6 m (Elevations 101.0 m and 97.9 m) above clay deposit, as well as below the clay deposit in the fractured limestone bedrock. Therefore, potentially significant groundwater control work will be required during construction and potentially afterwards. Evaluation of the hydraulic properties of the bedrock and overburden soil formations will be required for the dewatering analysis. Hydrogeological investigation is recommended for the detailed dewatering analysis and groundwater control work.

It shall be noted that the groundwater elevations vary with location, precipitation and seasons. Groundwater elevations at the site varied from elevation 101 m at west of the property to elevation 97.9 m at northeast of the property.

Based on present information, the potential dewatering/groundwater control systems are cut-off walls with collection pond and sump pump system or cut-off wall with wells points system. It should be noted that dewatering effort will depend on a number of factors, including excavation depth, season and weather conditions and the length of time the excavation is left open. The suitable dewatering system should be selected based on the size, depth, and required volume of groundwater removal during the excavation work. It is recommended that the dewatering work be designed and inspected by an experienced hydrogeologist/qualified professional engineer for the dewatering work. Ground settlement analysis and impact assessment due to dewatering shall also be analysed and evaluated during detailed design stage.

Note that dewatering volumes in excess of 50,000 L/day will require a Permit to Take Water (PTTW) or Environmental Activity Sector Registry (EASR), depending on the total dewatering volumes. PTTW application require supporting document of a hydrogeological assessment report as well as impact assessment by dewatering work carried out by a qualified person.

7.7 Pipe Installations

Installation of utilities services including pipes will be in overburden soils. Based on the depth of the pipe installation, dewatering requirements should be evaluated for the installation of the utilities. If installation trench is in the clay soil, it may be possible to use sump pumping techniques for dewatering, since clay has low permeability and less water to handle. It should be determined by the contractor on the methods of dewatering necessary to meet the project requirements and align with their construction methodology and schedule.

It should be noted that soft clay soil was encountered in the boreholes. Therefore, the pipe, which is installed in the clay formation, may encounter ground settlement and pipes shall be designed to resist and allow the large ground settlement.

7.7.1 Pipe Bedding

Pipe bedding should be in accordance with the following Ontario Provincial Standard Drawings (OPSD) design standards for the class and size of pipe being used as well as manufactures recommendations. The applicable standards for the pipe bedding are:

- OPSD 0802.010 Flexible Pipe Embedment and Backfill – Earth Excavation
- OPSD 0802.013 Flexible Pipe Embedment and Backfill – Rock Excavation
- OPSD 0802.030 Rigid Pipe Bedding, Cover and Backfill – Type 1 and 2 Soil - Earth Excavation
- OPSD 0802.031 Rigid Pipe Bedding, Cover and Backfill – Type 3 Soil - Earth Excavation
- OPSD 0802.033 Rigid Pipe Bedding, Cover and Backfill – Rock Excavation

Other OPSD Standards or manufacturer requirements may apply to the construction of the buried services and the designer should consult these as appropriate for the materials being employed.

It is recommended that a minimum 0.3 m of compacted bedding below the pipe shall be included in the bedding design.

Clear stone could be used for bedding and backfilling; if bedding is placed below groundwater.

7.7.2 Trench Backfill and Compaction Standard

Compaction of the trench backfill will be necessary in some cases for the following reasons:

- To control settlement of the trench fill;
- To provide lateral support to the trench sidewall; and
- To minimize soil loads on the pipe.

A Granular “B” Type I material could be used for the backfill above the pipe. Trench backfill should be compacted to 95% of standard Proctor maximum dry density. Heavy compaction equipment should not be used until at least 1 m of compacted backfill exists above the pipe. During backfilling, care should be taken to ensure the backfill proceeds in equal stages simultaneously on both sides of the pipe. If organic soils are encountered at the pipe bedding surface, this organic soil should be removed. No frozen material should be used as backfill; neither should the trench base be allowed

to freeze. The quality and workmanship in the construction is as important as the compaction standards themselves. It is imperative that the guidelines for the compaction be followed for the full depth of the trench to achieve satisfactory performance.

7.8 Corrosiveness of Soil

A selected soil sample at potential foundation depth was submitted to Maxxam Analytics, for chemical analyses to assess the potential sulphate attack on buried concrete and ductile iron structures (Soluble Chloride - Cl, Conductivity, Available pH, Resistivity, Soluble Sulphate – SO4). The Laboratory Certificate of analysis from Maxxam is provided in Appendix G. A summary of the results is provided in Table 7.4. The analytical results of the soil samples were compared with applicable Canadian Standards Association (CSA) standards and are given in Table 7.5.

Table 7-4: Summary of Corrosivity Analytical Test Results

Sample ID	pH	Soluble Sulphate (%)	Resistivity, ohm-cm	Soluble Chloride (20:1) (ug/g)	Conductivity (mS/cm)
BH2017-10, SS10	7.83	0.038	690	700	1.5

Table 7.5 Sulphate Content and Exposure Class

Class of Exposer	Degree of Exposure	Water soluble Sulphate in soil sample (%)	Cementing Material to be used
S-1	Very Severe	> 2.0	HS or HSb
S-2	Severe	0.20 – 2.0	HS or HSb
S-3	Moderate	0.10 – 0.20	MS, MSb, LH, HS, or HSb

*Information from Table 3 of CSA Standards A23.1-04

The sulphate content for the selected soil sample resulted a concentration of 0.038 %. The result was compared with Canadian Standards Association (CSA) Standards A23.1 for sulphate attack potential on concrete structures and possess a “negligible” risk for sulphate attack on concrete material. Accordingly, conventional GU or MS Portland cement may be used in the construction of the proposed concrete elements. pH result was 7.8 and it indicates it is not a corrosive environment for ductile iron pipes.

Soluble chloride content result was 700 ug/g and considered as negligible harmful environment for concrete or steel reinforcement. The resistivity of clay soil was 700 ohm-cm, which indicate poor drainage soil condition and could be considered as corrosive environment.

7.9 Seismic Site Classification

Based on the soil profile above the bedrock formation, it could be concluded that seismic site class for the overburden clay soil formation is classified as Site Class E. However, if the foundation is to be founded on the bedrock, seismic site class for the bedrock could be classified as Site Class “B”.

The site coefficients Fa and Fv could be assumed based on Table 6.1B and Table 6.1C of the Canadian Foundation Engineering Manual (CFEM, 4th edition, 2006) as well as NBCC 2005 Table 4.1.8.4.B and Table 4.1.8.4.C.

The seismic hazard from 2015 National Building Code Seismic Hazard Calculation for the site is provided in Appendix F.

7.10 Liquefaction Potential of Soils

The soil formation at the site is soft to hard clay soils. Majority of tested clay samples resulted plasticity index of 19 to 24 and therefore clay soil is considered non-liquefiable soil.

Two tests results of soil samples from sandy clay layer, resulted plasticity index 3 and non-plastic clay. The sandy clay soil, could be considered as liquefiable soil, therefore, DST recommend not to use as foundation bearing formation on sandy clay soil. It shall be further tested for the liquification potential and seismic loading capacities.

If the proposed development will use the bedrock formation as the foundation bearing, further analyses for liquefaction potential of the sandy clay soil may not be required.

7.11 Frost Protection and Foundation Insulation Requirements

Based on the Ministry of Environment published data, which is based on an 85% probability, the design freezing index for Ottawa area has been estimated to be 1,050 degrees-days Celsius (1,922

degree-days Fahrenheit). The estimated frost penetration depth for an engineered fill is approximately 1.8 m. The soil at the site is silt/clay in nature and highly frost susceptible soil.

All footings subject to frost action should be provided with the minimum 1.8 m of soil cover. If required soil cover over foundation footing is not feasible, foundation insulation can be used. Insulation detail design shall be prepared with the insulation product manufacture's design guidelines.

Present proposed development with foundation at below 10 m depth, will not require insulation for the foundation since the foundation will be beyond the potential frost penetration depth. However, the project requires shallow foundations, DST can review the foundation and provide design recommendation for frost protection.

7.12 Pavement

DST provided pavement structure recommendations for parking lot and drive way for light and heavy vehicle and provided in Table 7.6 and Table 7.7.

Table 7.6 Pavement Structure Recommendation for Parking Lot and Drive Way (car only)

Pavement Layer	Compaction Requirement	Recommended Minimum Thickness (mm)
Surface Course, Asphaltic Concrete	As per OPSS 310	40
Binder Course, Asphaltic Concrete	As per OPSS 310	60
Granular 'A', Base Course (OPSS 1010)	100 % SPMDD	150
Granular 'B', Type II, Subbase (OPSS 1010)	100 % SPMDD	300

Table 7.7 Pavement Structure Recommendation for Truck and Heavy Vehicle

Pavement Layer	Compaction Requirement	Recommended Minimum Thickness (mm)
Surface Course, Asphaltic Concrete	As per OPSS 310	40
Upper Binder Course, Asphaltic Concrete	As per OPSS 310	50
Lower Binder Course, Asphaltic Concrete	As per OPSS 310	50
Granular 'A', Base Course (OPSS 1010)	100 % SPMDD	150
Granular 'B', Type II, Subbase (OPSS 1010)	100 % SPMDD	450

Note:

1) OPSS – Ontario Provincial Standard Specifications
2) All pavement layer materials should meet OPSS requirements and/or municipality standards.
3) Granular materials should be compacted to 100% standard Proctor maximum dry density (SPMDD) and placed in lifts not exceeding 150 mm thick.
4) SPMDD – Standard Proctor Maximum Dry Density (ASTM-D698)
5) All granular and asphalt construction methods are to meet local standards (City of Ottawa OPSS).

8. MONITORING DURING CONSTRUCTION

All foundation and earth works recommendations presented in this report are based on the assumptions that an adequate level of construction monitoring by qualified geotechnical personnel during construction will be provided. An adequate level of construction monitoring is considered to be:

a) Foundations: full-time monitoring and design review during construction.
b) Earthworks: full-time quality control and compaction testing.

An important purpose of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the Site. To provide an adequate level of construction monitoring, qualified geotechnical personnel should manage and supervise the following tasks during construction:

Foundations:

- Confirm that materials and methods meet specifications.
- Inspect foundation subgrades.
- Inspect excavation.
- Inspect shoring structures.
- Review shallow foundation installation/testing methods.
- Review compaction testing records.
- Provide review comments, including any discrepancies found with respect to specifications as well as this report, and the need for any modifications to the design or methods.

Earthworks:

- Confirm that materials and methods meet specifications.
- Inspect subgrade prior to fill placement.
- Quality control of fill material.
- Review compaction testing records.

DST can review the final design and layout of structures and foundation elements for the proposed development. DST can be contacted to offer additional recommendations.

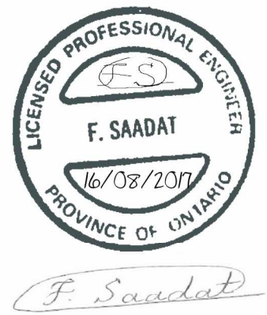
9. CLOSURE

We trust this report meets your present requirements. Should you have any questions, please do not hesitate to contact our office. A description of limitations which are inherent in carrying out site investigation studies is given in Appendix A and forms an integral part of this report.

Sincerely,

For DST CONSULTING ENGINEERS INC.

Tun Lwin, P.Eng., P.Geo, M.Eng., M.Sc.
Senior Geotechnical Engineer



Farbod Saadat, Ph.D., P.Eng.
Chief Geotechnical Engineer

10. REFERENCES

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APPENDIX A

LIMITATIONS OF REPORT

LIMITATIONS OF REPORT

GEOTECHNICAL STUDIES

The data, conclusions and recommendations which are presented in this report, and the quality thereof, are based on a scope of work authorized by the Client. Note that no scope of work, no matter how exhaustive, can identify all conditions below ground. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the specific locations tested, and conditions may become apparent during construction which were not detected and could not be anticipated at the time of the site investigation. Conditions can also change with time. It is recommended practice that DST Consulting Engineers Inc. be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the boreholes.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid. Unless otherwise noted, the information contained herein in no way reflects on environmental aspects of either the site or the subsurface conditions.

The comments given in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs, e.g. the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

Any results from an analytical laboratory or other subcontractor reported herein have been carried out by others, and DST Consulting Engineers Inc. cannot warranty their accuracy. Similarly, DST cannot warranty the accuracy of information supplied by the Client.

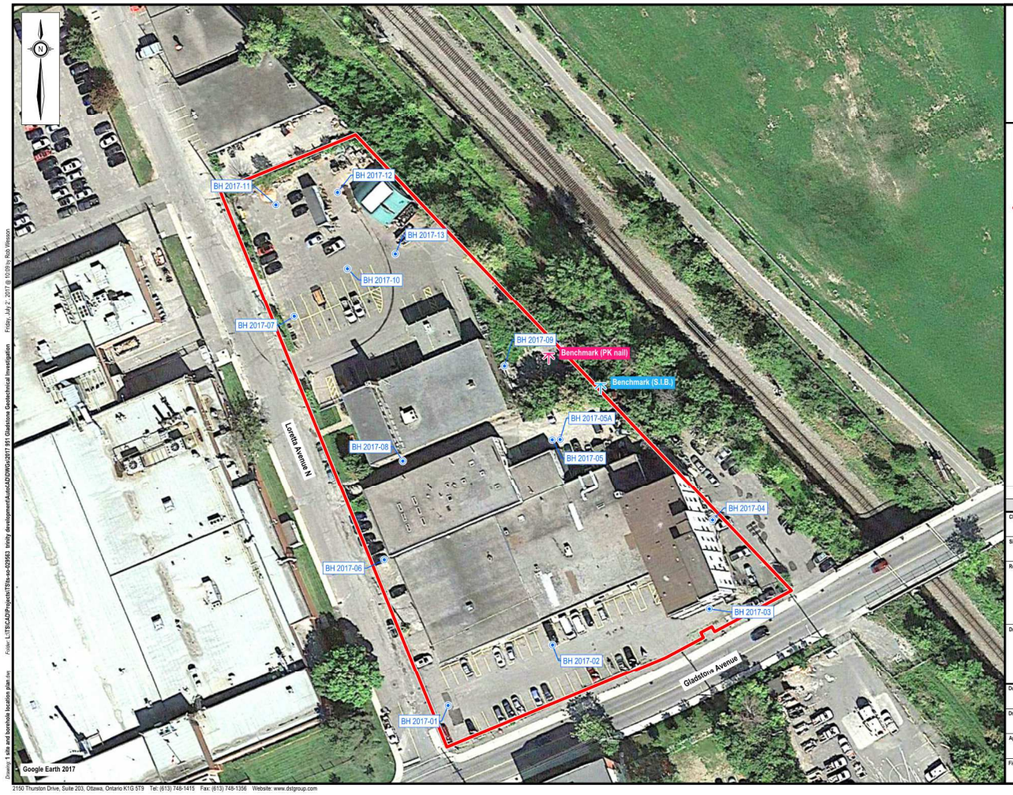
Geotechnical Investigation Report
Gladstone Avenue and Loretta Avenue North, Ottawa, Ontario
DST Reference No. TS-SO-029563

APPENDIX B

SITE AND BOREHOLES

LOCATION PLAN

DST CONSULTING ENGINEERS INC.



DST consulting engineers

Notes

1. This drawing shall be read in conjunction with the associated technical report.
2. Do not scale drawing.

Legend

- Property boundary
- Borehole location
- Benchmark

0 5 10 20 30 m

Scale 1:750

Revision	Date	Issue	Approval
A	17.07.17	Preliminary	S.V.

Client: Trinity

Site: 951 Gladstone Avenue, Ottawa, Ontario

Report Title: Geotechnical Investigation
Gladstone Avenue and Loretta Avenue North, Ottawa

Drawing Title: Site and Borehole Location Plan

Designed By: S.V.	Scale: As shown
Drawn By: R.W.	Date: July 2017
Approved By: S.V.	Project No.: TS-SO-029563

Figure No. 1

DRAFT

Dwang: 1 site and borehole locations plan.dwg Plotted: Friday, July 7, 2017 @ 10:09 by Rob Wesson

2150 Thurston Drive, Suite 203, Ottawa, Ontario K1G 5T9 Tel: (613) 749-1415 Fax: (613) 749-1356 Website: www.dstgroup.com

APPENDIX C
BOREHOLE LOGS &
CROSS SECTION

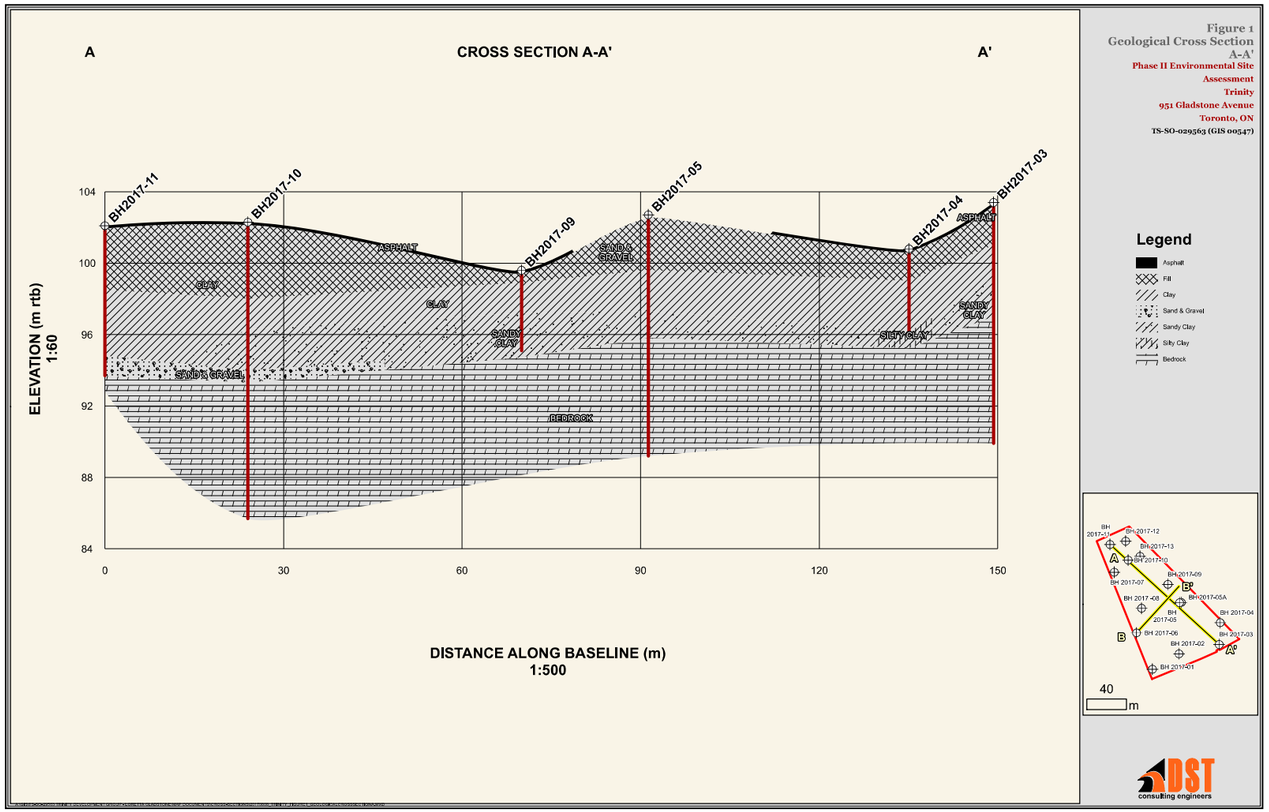


Figure 1
Geological Cross Section
A-A'
Phase II Environmental Site
Assessment
Trinity
951 Gladstone Avenue
Toronto, ON
TS-SO-029563 (GIS 00547)

DST consulting engineers

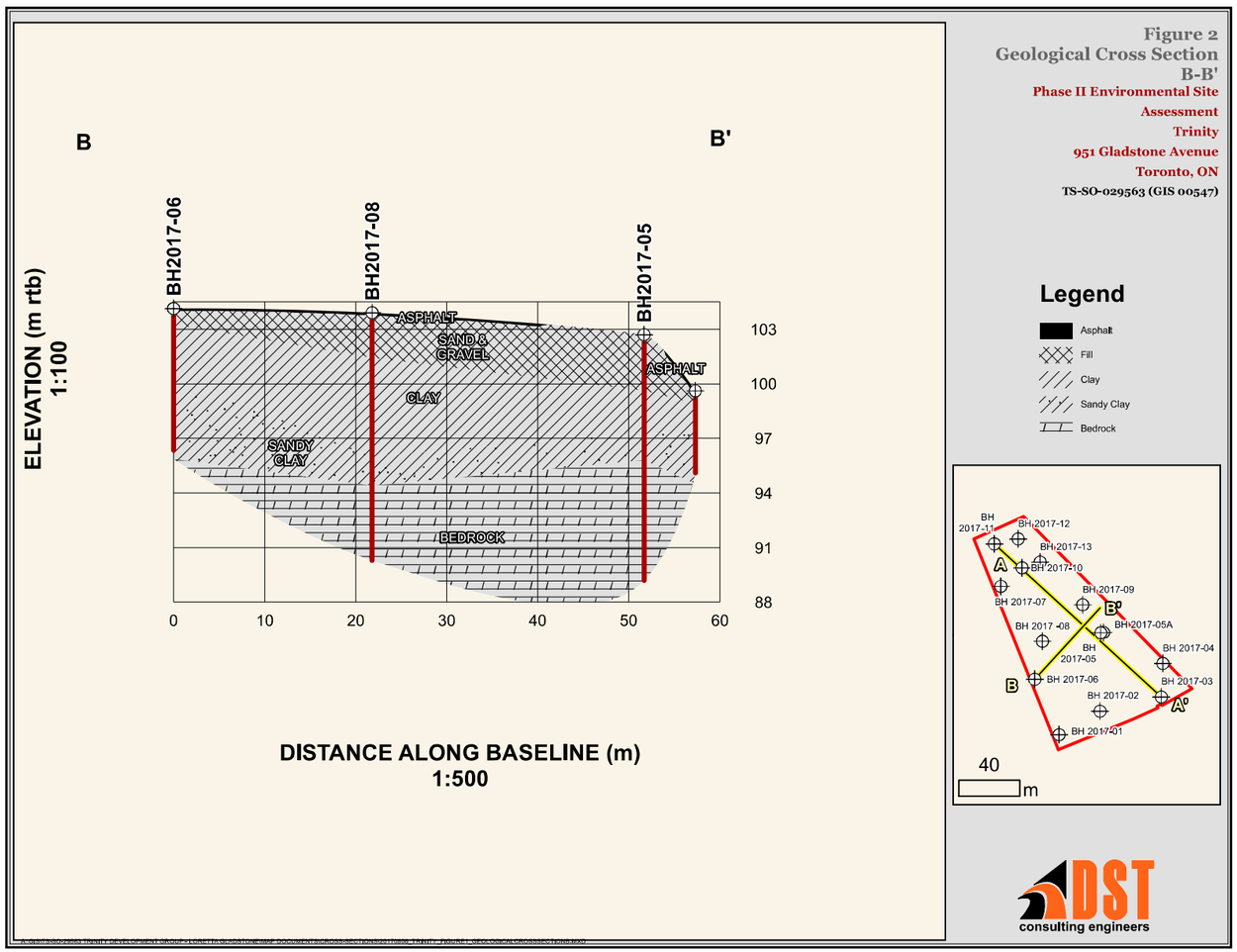


Figure 2
Geological Cross Section
B-B'
Phase II Environmental Site
Assessment
Trinity
951 Gladstone Avenue
Toronto, ON
TS-SO-029563 (GIS 00547)

DST consulting engineers

LOG OF BOREHOLE BH2017-01

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **104.9 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/5/2017**
COMPLETION DATE: **7/5/2017**
COORDINATES: **5028029** m N, **443991** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	104.9				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL to trace Gravel, Brown, Loose to Compact	SS1		17		
1.0	104					SS2		5		
						SS3		16		
2.0	103					SS4		14		
					CLAY, Brown to Grey, Firm to Very Stiff	SS5		9		
3.0	102					SS6		6		Odour in samples from 3.7 m to 7.6 m
						SS7		23		
4.0	101				SANDY, trace Gravel	SS8		3		
						SS9		6		
5.0	100					SS10		6		
						SS11		7		
6.0	99					SS12		5		
						SS13		100+		
7.0	98				SAND and GRAVEL, Grey, Very Dense					
					End of Borehole at 7.6 m due to Auger Refusal.					
8.0	97									
	96									

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Email: ottawa@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; x^3 Numbers refers to Sensitivity

ENCLOSURE 1

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

LOG OF BOREHOLE BH2017-02

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **104.2 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/6/2017**
COMPLETION DATE: **7/6/2017**
COORDINATES: **5028045** m N, **444017** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	104				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL, Brown, Compact to Dense	SS1		19		
1.0	103					SS2		29		
						SS3		30		
2.0	102				CLAY, Brown to Grey, Firm to Very Stiff	SS4		25		
						SS5		12		
3.0	101					SS6		10		
						SS7		14		
4.0	100	▼			SANDY, some Rock Fragment	SS8		2	>>x^3	> 200 kPa
						SS9		8		
5.0	99					SS10		10		Odour in sample # SS10
						SS11		100+		
6.0	98				Rock Fragment					
					End of Borehole at 6.5 m due to Auger Refusal.					
7.0	97									
8.0	96									

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; x^3 Numbers refers to Sensitivity

ENCLOSURE 2

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

LOG OF BOREHOLE BH2017-03

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **103.4 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/5/2017**
COMPLETION DATE: **7/5/2017**
COORDINATES: **5028054** m N, **444057** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	103				ASPHALT (85 mm)					
					FILL - SAND and GRAVEL, Brown, Very Loose to Compact	SS1		1		
1.0	102					SS2		4		
						SS3		21		
2.0	101					SS4		28		
					CLAY, trace Sand, trace Gravel, Brown to Grey, Firm to Very Stiff	SS5		14		
3.0	100					SS6		13		
						SS7		18		
4.0	99				SANDY, trace Rock Fragment	SS8		5	>>×5	> 200 kPa
5.0	98	▼				SS9		13		
						SS10		4		
6.0	97					SS11		100+		Odour in sample # SS11
					BEDROCK Limestone, Grey	RC1				TCR = 100% SCR = 79% RQD = 58%
7.0	96									
8.0	95					RC2				TCR = 100% SCR = 92% RQD = 90%

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SAMPLE TYPE LEGEND

Auger Sample · Rock Core · Bentonite
Split Spoon Sample · Hiller Peat Sampler · Sand
Bulk Sample · Shelby Tube · ×3 Numbers refers to Sensitivity

ENCLOSURE 3

LOG OF BOREHOLE BH2017-03

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **103.4 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/5/2017**
COMPLETION DATE: **7/5/2017**
COORDINATES: **5028054** m N, **444057** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
10.0	94					RC3				TCR = 93% SCR = 93% RQD = 92%
	93									
11.0	92					RC4				TCR = 100% SCR = 100% RQD = 92%
12.0	91									
						RC5				TCR = 100% SCR = 100% RQD = 95%
13.0	90				End of Borehole at 13.5 m					
14.0	89									
15.0	88									
16.0	87									
17.0	86									

TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17
BOREHOLE (OTTAWA)

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample · Rock Core · Bentonite
Split Spoon Sample · Hiller Peat Sampler · Sand
Bulk Sample · Shelby Tube · ×3 Numbers refers to Sensitivity

ENCLOSURE 4

LOG OF BOREHOLE BH2017-04

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **100.8 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/6/2017**
COMPLETION DATE: **7/6/2017**
COORDINATES: **5028076** m N, **444058** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_P W W_I)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	100				ASPHALT (25 mm)					
					FILL - SAND and GRAVEL, Brown, Compact to Loose	SS1		12		
1.0						SS2		100+		
	99					SS3		5		
2.0					CLAY, some Sand, some Gravel, Brown to Grey, Firm to Very Stiff	SS4		4		
	98				Rock Fragment	SS5		6		
3.0						SS6		4		
	97				SILTY, with Sand and Gravel	SS7		16		
4.0						SS8		100+		
	96				End of Borehole at 4.6 m due to Auger Refusal.					
5.0										
	95									
6.0										
	94									
7.0										
	93									
8.0										
	92									

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SAMPLE TYPE LEGEND

Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 5

LOG OF BOREHOLE BH2017-05

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.7 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/7/2017**
COMPLETION DATE: **7/7/2017**
COORDINATES: **5028096** m N, **444017** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_P W W_I)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	102				FILL - SAND and GRAVEL, Brown, Loose to Compact	SS1		24		
1.0						SS2		11		
	101					SS3		9		
2.0						SS4		15		52 37 (11)
	100					SS5		27		
3.0		▼			CLAY, trace Sand, trace Gravel, Brown to Grey, Firm to Very Stiff	SS6		12		
	99					SS7		19		
4.0						SS8		4	>>×3	> 200 kPa
	98					SS9		7	>>×	> 200 kPa
5.0										
	97				SANDY	SS10		1		
6.0						SS11		7		
	96					SS12		100+		
7.0					BEDROCK Limestone, Grey	RC1				TCR = 100% SCR = 100% RQD = 100%
	95									
8.0						RC2				TCR = 100% SCR = 98% RQD = 96%
	94									

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Email: ottawa@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 6

LOG OF BOREHOLE BH2017-05

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.7 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/7/2017**
COMPLETION DATE: **7/7/2017**
COORDINATES: **5028096** m N, **444017** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
10.0	93					RC3				TCR = 100% SCR = 100% RQD = 100%
11.0	92					RC4				TCR = 100% SCR = 100% RQD = 96%
12.0	91									
13.0	90					RC5				TCR = 100% SCR = 100% RQD = 100%
14.0	89				End of Borehole at 13.5 m					
15.0	88									
16.0	87									
17.0	86									
	85									

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample · Split Spoon Sample · Bulk Sample · Rock Core · Hiller Peat Sampler · Shelby Tube · Bentonite · Sand · ×3 Numbers refers to Sensitivity

ENCLOSURE 7

LOG OF BOREHOLE BH2017-05A

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.7 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/7/2017**
COMPLETION DATE: **7/7/2017**
COORDINATES: **5028096** m N, **444019** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
1.0	102				FILL - SAND and GRAVEL, Brown, Loose to Compact	SS1		11		
2.0	101					SS2		12		
3.0	100				End of Borehole at 1.8 m due to Auger Refusal.	SS3		4		Hit possibly old engine tank; smells like engine oil
4.0	99									
5.0	98									
6.0	97									
7.0	96									
8.0	95									
	94									

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SAMPLE TYPE LEGEND

Auger Sample · Split Spoon Sample · Bulk Sample · Rock Core · Hiller Peat Sampler · Shelby Tube · Bentonite · Sand · ×3 Numbers refers to Sensitivity

ENCLOSURE 8

LOG OF BOREHOLE BH2017-06

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **104.3 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/7/2017**
COMPLETION DATE: **7/7/2017**
COORDINATES: **5028066** m N, **443975** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_P W W_I)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	104				FILL - SAND and GRAVEL, Brown, Compact	SS1		14		
1.0	103					SS2		11		
					CLAY, trace Sand, trace Gravel, Brown to Grey, Firm to Very Stiff	SS3		9		
2.0	102					SS4		15		
3.0	101					SS5		10		
						SS6		9	>>×	> 200 kPa
4.0	100				SANDY	SS7		12	>>×3	> 200 kPa
5.0	99					SS8		15	>>×	> 200 kPa
						SS9		9		
6.0	98					SS10		4		
7.0	97					SS11		4		
						SS12		7		
8.0	96				End of Borehole at 7.8 m due to Auger Refusal.	SS13		100+		

% MOISTURE: 20 40 60 80 — VANE (kPa) ×: 40 80 120 160 — SPT (N) □ Blows/0.3m / DCPT ◆: 20 40 60 80

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- Auger Sample
- Split Spoon Sample
- Bulk Sample
- Rock Core
- Hiller Peat Sampler
- Shelby Tube
- Bentonite
- Sand
- ×3 Numbers refers to Sensitivity

ENCLOSURE 9

LOG OF BOREHOLE BH2017-07

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.4 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **6/27/2017**
COMPLETION DATE: **6/27/2017**
COORDINATES: **5028127** m N, **443952** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_P W W_I)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	102				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL, trace Silt, Brown, Compact to Very Dense	SS1		11		
1.0	101					SS2		13		
						SS3		35		
2.0	100					SS4		11		
3.0	99					SS5		53		
						SS6		32		
4.0	98				SILTY CLAY, Brown to Grey, Soft to Very Stiff	SS7		13		
						SS8		5		
5.0	97					SS9		6	×	
6.0	96				SANDY, trace Gravel	SS10		2	×3	
						SS11		12		
7.0	95					SS12		18		
					SAND and GRAVEL, Dark Grey, Compact	SS13		24		
8.0	94				End of Borehole at 8.0 m due to Auger Refusal.	SS14		100+		

% MOISTURE: 20 40 60 80 — VANE (kPa) ×: 40 80 120 160 — SPT (N) □ Blows/0.3m / DCPT ◆: 20 40 60 80

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- Auger Sample
- Split Spoon Sample
- Bulk Sample
- Rock Core
- Hiller Peat Sampler
- Shelby Tube
- Bentonite
- Sand
- ×3 Numbers refers to Sensitivity

ENCLOSURE 10

LOG OF BOREHOLE BH2017-08

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **103.9 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/10/2017**
COMPLETION DATE: **7/10/2017**
COORDINATES: **5028091** m N, **443980** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (Wp + W + Wl)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	103				ASPHALT (25 mm)					
					FILL - SAND and GRAVEL, Brown, Loose to Compact	SS1		20		
1.0	102					SS2		8		
2.0						SS3		8		
						SS4		11		
3.0	101				CLAY, some Sand, some Gravel, Brown to Grey, Soft to Very Stiff	SS5		8		
						SS6		10		
4.0	100					SS7		9	>>	> 200 kPa
						SS8		6	>>3	> 200 kPa
5.0	99					SS9		13	>>	> 200 kPa
					SANDY, trace Rock Fragment	SS10		3		
6.0	98					SS11		10		
						SS12		100+		
7.0	97				BEDROCK Limestone, Grey	RC1				TCR = 100% SCR = 96% RQD = 93%
8.0	96					RC2				TCR = 85% SCR = 78% RQD = 75%
	95									

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SAMPLE TYPE LEGEND

Auger Sample · Split Spoon Sample · Bulk Sample · Rock Core · Hiller Peat Sampler · Shelby Tube · Bentonite · Sand · ×3 Numbers refers to Sensitivity

ENCLOSURE 11

LOG OF BOREHOLE BH2017-08

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **103.9 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/10/2017**
COMPLETION DATE: **7/10/2017**
COORDINATES: **5028091** m N, **443980** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (Wp + W + Wl)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
10.0	94					RC3				TCR = 100% SCR = 100% RQD = 98%
11.0	93									
						RC4				TCR = 98% SCR = 98% RQD = 90%
12.0	92									
13.0	91					RC5				TCR = 100% SCR = 100% RQD = 100%
					End of Borehole at 13.6 m.					
14.0	90									
15.0	89									
16.0	88									
17.0	87									
	86									

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SAMPLE TYPE LEGEND

Auger Sample · Split Spoon Sample · Bulk Sample · Rock Core · Hiller Peat Sampler · Shelby Tube · Bentonite · Sand · ×3 Numbers refers to Sensitivity

ENCLOSURE 12

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

LOG OF BOREHOLE BH2017-09

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **99.6 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/6/2017**
COMPLETION DATE: **7/6/2017**
COORDINATES: **5028115** m N, **444005** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (Wp + W + Wl)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	99.6				ASPHALT (125 mm)					
					FILL - SAND and GRAVEL, Brown, Compact	SS1		17		
1.0	98.6				CLAY, trace Sand, trace Gravel, Brown to Grey, Soft to Very Stiff	SS2		11		5 42 (53)
						SS3		7		
2.0	97.6					SS4		17	>>×2	> 200 kPa
					SANDY, some Gravel	SS5		4	>>×	> 200 kPa
3.0	96.6					SS6		26		
					some Gravel	SS7		11		
4.0	95.6					SS8		100+		
					End of Borehole at 4.5 m due to Auger Refusal.					
5.0	94.6									
6.0	93.6									
7.0	92.6									
8.0	91.6									

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SAMPLE TYPE LEGEND
Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 13

LOG OF BOREHOLE BH2017-10

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.3 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **6/27/2017**
COMPLETION DATE: **6/27/2017**
COORDINATES: **5028139** m N, **443966** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (Wp + W + Wl)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	102.3				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL, Brown, Very Loose to Dense	SS1		36		
1.0	101.3					SS2		35		
						SS3		17		
2.0	100.3					SS4		13		32 59 (9)
					FILL - CLAY	SS5		3		
3.0	99.3					SS6		5		
					CLAY, Brown to Grey, Soft to Stiff	SS7		11		
4.0	98.3					SS8		8		
						SS9		7	×	
5.0	97.3					SS10		3	×	
					SANDY, trace Gravel	SS11		1	×	
6.0	96.3					SS12		9		
					Rock Fragment	SS13		8		
7.0	95.3					SS14		29		
8.0	94.3				SAND and GRAVEL, Grey	SS15		100+		

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SAMPLE TYPE LEGEND
Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 14

LOG OF BOREHOLE BH2017-10

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.3 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **6/27/2017**
COMPLETION DATE: **6/27/2017**
COORDINATES: **5028139** m N, **443966** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
	93				BEDROCK Limestone, Grey					
10.0	92					RC1				TCR = 98% SCR = 92% RQD = 85%
11.0	91					RC2				TCR = 100% SCR = 100% RQD = 100%
12.0	90									
13.0	89					RC3				TCR = 98% SCR = 98% RQD = 98%
14.0	88					RC4				TCR = 100% SCR = 100% RQD = 100%
15.0	87									
16.0	86					RC5				TCR = 100% SCR = 100% RQD = 100%
17.0	85				End of Borehole at 16.6 m.					

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SAMPLE TYPE LEGEND
Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 15

LOG OF BOREHOLE BH2017-11

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.1 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/4/2017**
COMPLETION DATE: **7/4/2017**
COORDINATES: **5028155** m N, **443948** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
	102				ASPHALT					
					FILL - SAND and GRAVEL, Brown, Loose to Compact	SS1		10		
1.0	101					SS2		8		
						SS3		11		
2.0	100					SS4		16		
						SS5		14		
3.0	99				CLAYEY	SS6		9		7 50 (43)
					CLAY, Brown to Grey, Soft to Very Stiff	SS7		19		
4.0	98					SS8		8		
5.0	97					SS9		9		
						SS10		3	×3	
6.0	96					SS11		2		
						SS12		13		
7.0	95					SS13		17		
8.0	94				SAND and GRAVEL, Grey, Compact to Very Dense	SS14		100+		
					End of Borehole at 8.4 m due to Auger Refusal.					

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SAMPLE TYPE LEGEND
Auger Sample; Split Spoon Sample; Bulk Sample; Rock Core; Hiller Peat Sampler; Shelby Tube; Bentonite; Sand; ×3 Numbers refers to Sensitivity

ENCLOSURE 16

LOG OF BOREHOLE BH2017-12

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.1 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **7/4/2017**
COMPLETION DATE: **7/4/2017**
COORDINATES: **5028159** m N, **443963** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	102				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL, Black, Loose to Dense	SS1		11		
1.0	101					SS2		6		
						SS3		45		
2.0	100					SS4		11		
						SS5		4		
3.0	99				CLAY, Brown to Grey, Soft to Very Stiff	SS6		9		
						SS7		22		
4.0	98					SS8		6		
5.0	97					SS9		5	×	
						SS10		1	×	
6.0	96					SS11		2	×2	
						SS12		3		
7.0	95					SS13		5	×2	
8.0	94				SANDY CLAY, some Gravel, Grey, Loose	SS14		100+		
					End of Borehole at 8.5 m due to Auger Refusal.					

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SAMPLE TYPE LEGEND

Auger Sample · Rock Core · Bentonite
Split Spoon Sample · Hiller Peat Sampler · Sand
Bulk Sample · Shelby Tube · ×3 Numbers refers to Sensitivity

ENCLOSURE 17

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

LOG OF BOREHOLE BH2017-13

DST REF. No.: **TS-SO-29563**
CLIENT: **Trinity Development Group Inc.**
PROJECT: **Geotechnical Drilling for the Proposed Development**
LOCATION: **951 Gladstone Avenue, Ottawa, ON**
SURFACE ELEV.: **102.2 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
START DATE: **6/28/2017**
COMPLETION DATE: **6/28/2017**
COORDINATES: **5028143** m N, **443978** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) × / SPT (N) □ Blows/0.3m / DCPT ◆	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	102				ASPHALT (75 mm)					
					FILL - SAND and GRAVEL, Brown	SS1		15		
1.0	101					SS2		14		
					CLAY, trace Gravel, Brown, Stiff	SS3		9		
2.0	100				End of Borehole at 1.8 m due to Auger Refusal.					
3.0	99									
4.0	98									
5.0	97									
6.0	96									
7.0	95									
8.0	94									

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SAMPLE TYPE LEGEND

Auger Sample · Rock Core · Bentonite
Split Spoon Sample · Hiller Peat Sampler · Sand
Bulk Sample · Shelby Tube · ×3 Numbers refers to Sensitivity

ENCLOSURE 18

BOREHOLE (OTTAWA) TS-SO-29563.GPJ DATA TEMPLATE.GDT 28/7/17

APPENDIX D

GEOTECHNICAL LABORATORY TEST RESULTS

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 2017-07-18 **TECH :** E.RP.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-1 SS-1	Refer to borehole logs	2017-07-05	282.7	273.2	70		4.7	Refer to borehole logs
BH2017-1 SS-2	Refer to borehole logs	2017-07-05	262.8	252.8	109.8		7.0	Refer to borehole logs
BH2017-1 SS-3	Refer to borehole logs	2017-07-05	298.6	289.9	109.1		4.8	Refer to borehole logs
BH2017-1 SS-4	Refer to borehole logs	2017-07-05	262.8	230.3	110.4		27.1	Refer to borehole logs
BH2017-1 SS-5	Refer to borehole logs	2017-07-05	257.2	218	110.3		36.4	Refer to borehole logs
BH2017-1 SS-6	Refer to borehole logs	2017-07-05	277.6	239.9	123.5		32.4	Refer to borehole logs
BH2017-1 SS-7	Refer to borehole logs	2017-07-05	308.7	288.7	98.6		10.5	Refer to borehole logs
BH2017-1 SS-8	Refer to borehole logs	2017-07-05	323	306.6	115.6		8.6	Refer to borehole logs
BH2017-1 SS-9	Refer to borehole logs	2017-07-05	353	331.8	93.3		8.9	Refer to borehole logs
BH2017-1 SS-10	Refer to borehole logs	2017-07-05	288.7	273.3	120.9		10.1	Refer to borehole logs
BH2017-1 SS-11	Refer to borehole logs	2017-07-05	283.5	276.8	126.7		4.5	Refer to borehole logs
BH2017-1 SS-12	Refer to borehole logs	2017-07-05	628.5	609.8	403.5		9.1	Refer to borehole logs
BH2017-1 SS-13	Refer to borehole logs	2017-07-05	511.3	505.2	402.2		5.9	Refer to borehole logs

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 2017-07-18 **TECH :** E.RP.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-2 SS-1	Refer to borehole logs	2017-07-06	140.71	136.56	4.25	M36	3.1	Refer to borehole logs
BH2017-2 SS-2	Refer to borehole logs	2017-07-06	148.14	141.84	4.28	M33	4.6	Refer to borehole logs
BH2017-2 SS-3	Refer to borehole logs	2017-07-06	108.73	105.31	4.24	M6	3.4	Refer to borehole logs
BH2017-2 SS-4	Refer to borehole logs	2017-07-06	137.25	128.28	4.25	M21	7.2	Refer to borehole logs
BH2017-2 SS-5	Refer to borehole logs	2017-07-06	31.53	24.01	4.39	M29	38.3	Refer to borehole logs
BH2017-2 SS-6	Refer to borehole logs	2017-07-06	1046.67	761.27	85.33	A4	42.2	Refer to borehole logs
BH2017-2 SS-7	Refer to borehole logs	2017-07-06	110.82	81.77	4.24	M4	37.5	Refer to borehole logs
BH2017-2 SS-8	Refer to borehole logs	2017-07-06	200.08	174.2	4.3	M3	15.2	Refer to borehole logs
BH2017-2 SS-9	Refer to borehole logs	2017-07-06	145.22	127.76	4.28	M7	14.1	Refer to borehole logs
BH2017-2 SS-10	Refer to borehole logs	2017-07-06	124.22	111.48	4.28	M38	11.9	Refer to borehole logs
BH2017-2 SS-11	Refer to borehole logs	2017-07-06	131.44	124.52	4.32	M15	5.8	Refer to borehole logs
BH2017-3 SS-1	Refer to borehole logs	2017-07-05	93.06	90.89	4.33	M5	2.5	Refer to borehole logs
BH2017-3 SS-2	Refer to borehole logs	2017-07-05	108.97	101.84	4.56	M11	7.3	Refer to borehole logs
BH2017-3 SS-3	Refer to borehole logs	2017-07-05	86.48	78.79	4.18	M23	10.3	Refer to borehole logs
BH2017-3 SS-4	Refer to borehole logs	2017-07-05	177.3	169.06	4.86	M2	5.0	Refer to borehole logs
BH2017-3 SS-5	Refer to borehole logs	2017-07-05	149	110.31	4.49	M35	36.6	Refer to borehole logs
BH2017-3 SS-6	Refer to borehole logs	2017-07-05	176.7	133.26	4.37	M32	33.7	Refer to borehole logs
BH2017-3 SS-7	Refer to borehole logs	2017-07-05	862.93	686.16	167.33	B16	34.1	Refer to borehole logs
BH2017-3 SS-8	Refer to borehole logs	2017-07-05	184.43	161.38	4.18	M18	14.7	Refer to borehole logs
BH2017-3 SS-9	Refer to borehole logs	2017-07-05	210.03	178.23	4.2	M22	18.3	Refer to borehole logs
BH2017-3 SS-10	Refer to borehole logs	2017-07-05	228.03	209.48	4.25	M25	9.0	Refer to borehole logs
BH2017-3 SS-11	Refer to borehole logs	2017-07-05	113.53	104.98	4.39	M12	8.5	Refer to borehole logs
BH2017-4 SS-1	Refer to borehole logs	2017-07-06	89.35	86.89	4.38	M31	3.0	Refer to borehole logs
BH2017-4 SS-2	Refer to borehole logs	2017-07-06	107.97	103.06	4.67	M39	5.0	Refer to borehole logs
BH2017-4 SS-3	Refer to borehole logs	2017-07-06	107.66	103.38	4.46	M40	4.3	Refer to borehole logs
BH2017-4 SS-4	Refer to borehole logs	2017-07-06	146.85	113.02	4.56	M26	31.2	Refer to borehole logs
BH2017-4 SS-5	Refer to borehole logs	2017-07-06	92.78	82.83	4.29	M17	12.7	Refer to borehole logs

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 7/18/2017 & 7/24/17 **TECH :** E.RP. / M.C.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-4 SS-6	Refer to borehole logs	2017-07-06	167.91	143.81	4.33	M37	17.3	Refer to borehole logs
BH2017-4 SS-7	Refer to borehole logs	2017-07-06	173.17	153.86	4.37	M14	12.9	Refer to borehole logs
BH2017-4 SS-8	Refer to borehole logs	2017-07-06	92.91	84.41	4.32	M27	10.6	Refer to borehole logs
BH2017-5 SS-1	Refer to borehole logs	2017-07-07	139.51	136.67	4.34	M30	2.1	Refer to borehole logs
BH2017-5 SS-2	Refer to borehole logs	2017-07-07	144.94	138.12	4.29	M9	5.1	Refer to borehole logs
BH2017-5 SS-3	Refer to borehole logs	2017-07-07	120.79	112.97	4.3	M10	7.2	Refer to borehole logs
BH2017-5 SS-4	Refer to borehole logs	2017-07-07	546.28	517.73	179.86	B11	8.4	Refer to borehole logs
BH2017-5 SS-5	Refer to borehole logs	2017-07-07	109.67	107.51	4.27	M8	2.1	Refer to borehole logs
BH2017-5 SS-6	Refer to borehole logs	2017-07-07	95.07	72.85	4.38	M16	32.5	Refer to borehole logs
BH2017-5 SS-7	Refer to borehole logs	2017-07-07	103.67	78.08	4.24	M34	34.7	Refer to borehole logs
BH2017-5 SS-8	Refer to borehole logs	2017-07-07	83.21	63.42	4.28	M24	33.5	Refer to borehole logs
BH2017-5 SS-9	Refer to borehole logs	2017-07-07	201.28	164.95	4.37	M41	22.6	Refer to borehole logs
BH2017-5 SS-10	Refer to borehole logs	2017-07-07	206.99	184.28	4.36	M13	12.6	Refer to borehole logs
BH2017-5 SS-11	Refer to borehole logs	2017-07-07	172.3	150.2	4.4	M11	15.2	Refer to borehole logs
BH2017-5 SS-12	Refer to borehole logs	2017-07-07	159.5	141.6	4.1	M23	13.0	Refer to borehole logs
BH2017-6 SS-1	Refer to borehole logs	2017-07-07	124.4	117	4.2	M36	6.6	Refer to borehole logs
BH2017-6 SS-2	Refer to borehole logs	2017-07-07	111.5	110.2	4.1	M33	1.2	Refer to borehole logs
BH2017-6 SS-3	Refer to borehole logs	2017-07-07	155.7	117	4	M6	34.2	Refer to borehole logs
BH2017-6 SS-4	Refer to borehole logs	2017-07-07	158.7	114.3	4.2	M21	40.3	Refer to borehole logs
BH2017-6 SS-5	Refer to borehole logs	2017-07-07	159.9	117.3	4.3	M29	37.7	Refer to borehole logs
BH2017-6 SS-6	Refer to borehole logs	2017-07-07	157.8	112.4	4.3	M41	42.0	Refer to borehole logs
BH2017-6 SS-7	Refer to borehole logs	2017-07-07	161.9	114.5	4.2	M3	43.0	Refer to borehole logs
BH2017-6 SS-8	Refer to borehole logs	2017-07-07	801.1	747.48	177.02	B7	9.4	Refer to borehole logs
BH2017-6 SS-9	Refer to borehole logs	2017-07-07	160	145	4.3	M15	10.7	Refer to borehole logs
BH2017-6 SS-10	Refer to borehole logs	2017-07-07	159.6	146.4	4.3	M5	9.3	Refer to borehole logs
BH2017-6 SS-11	Refer to borehole logs	2017-07-07	161.8	148	4.1	M38	9.6	Refer to borehole logs
BH2017-6 SS-12	Refer to borehole logs	2017-07-07	158.9	146.6	4.4	M35	8.6	Refer to borehole logs

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 2017-07-24 **TECH :** M.C.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-6 SS-13	Refer to borehole logs	2017-07-07	158.1	144.7	4.1	M32	9.5	Refer to borehole logs
BH2017-7 SS-1	Refer to borehole logs	2017-06-27	99.1	96.3	4.1	M11	3.0	Refer to borehole logs
BH2017-7 SS-2	Refer to borehole logs	2017-06-27	154	136.5	4.4	M23	13.2	Refer to borehole logs
BH2017-7 SS-3	Refer to borehole logs	2017-06-27	107.1	101.4	4.1	M18	5.9	Refer to borehole logs
BH2017-7 SS-4	Refer to borehole logs	2017-06-27	107.8	105.6	4.3	M23	2.2	Refer to borehole logs
BH2017-7 SS-5	Refer to borehole logs	2017-06-27	156.8	145.3	4.3	M22	8.2	Refer to borehole logs
BH2017-7 SS-6	Refer to borehole logs	2017-06-27	161.9	153.8	4.2	M25	5.4	Refer to borehole logs
BH2017-7 SS-7	Refer to borehole logs	2017-06-27	158	140.5	4.3	M12	12.8	Refer to borehole logs
BH2017-7 SS-8	Refer to borehole logs	2017-06-27	158	114.7	4.3	M31	39.2	Refer to borehole logs
BH2017-7 SS-9	Refer to borehole logs	2017-06-27	159.3	115.5	4.4	M39	39.4	Refer to borehole logs
BH2017-7 SS-10	Refer to borehole logs	2017-06-27	128.8	114.3	4.2	M40	13.2	Refer to borehole logs
BH2017-7 SS-11	Refer to borehole logs	2017-06-27	159.4	144.2	4.4	M26	10.9	Refer to borehole logs
BH2017-7 SS-12	Refer to borehole logs	2017-06-27	164	148.3	4.5	M17	10.9	Refer to borehole logs
BH2017-7 SS-13	Refer to borehole logs	2017-06-27	158	145.8	4.2	M37	8.6	Refer to borehole logs
BH2017-7 SS-14	Refer to borehole logs	2017-06-27	162.8	150.7	4.2	M14	8.3	Refer to borehole logs
BH2017-8 SS-1	Refer to borehole logs	2017-07-10	154.9	150.8	4.2	M10	2.8	Refer to borehole logs
BH2017-8 SS-2	Refer to borehole logs	2017-07-10	160.7	151.4	4.2	M9	6.3	Refer to borehole logs
BH2017-8 SS-3	Refer to borehole logs	2017-07-10	151.6	143.3	4.1	M8	6.0	Refer to borehole logs
BH2017-8 SS-4	Refer to borehole logs	2017-07-10	170	161.7	4.2	M34	5.3	Refer to borehole logs
BH2017-8 SS-5	Refer to borehole logs	2017-07-10	154.1	113.2	4.1	M24	37.5	Refer to borehole logs
BH2017-8 SS-6	Refer to borehole logs	2017-07-10	157	109.9	4.2	M41	44.6	Refer to borehole logs
BH2017-8 SS-7	Refer to borehole logs	2017-07-10	1323.85	973.91	169.39	B5	43.5	Refer to borehole logs
BH2017-8 SS-8	Refer to borehole logs	2017-07-10	157.2	115.8	4.2	M16	37.1	Refer to borehole logs
BH2017-8 SS-9	Refer to borehole logs	2017-07-10	160.8	121.4	4.3	M13	33.6	Refer to borehole logs
BH2017-8 SS-10	Refer to borehole logs	2017-07-10	168.1	144.3	4.2	M28	17.0	Refer to borehole logs
BH2017-8 SS-11	Refer to borehole logs	2017-07-10	158	141.3	4.3	M1	12.2	Refer to borehole logs
BH2017-8 SS-12	Refer to borehole logs	2017-07-10	253.8	235.7	89.6	A3	12.4	Refer to borehole logs

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 7/24/2017 & 7/25/17 **TECH :** M.C.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-9 SS-1	Refer to borehole logs	2017-07-10	253.5	251.1	94.8	A8	1.5	Refer to borehole logs
BH2017-9 SS-2	Refer to borehole logs	2017-07-10	394.4	347.53	168.98	B2	26.3	Refer to borehole logs
BH2017-9 SS-3	Refer to borehole logs	2017-07-10	257.7	213.8	94	A1	36.6	Refer to borehole logs
BH2017-9 SS-4	Refer to borehole logs	2017-07-10	240.6	208.6	84.5	A6	25.8	Refer to borehole logs
BH2017-9 SS-5	Refer to borehole logs	2017-07-10	53	49.1	14.2	A6	11.2	Refer to borehole logs
BH2017-9 SS-6	Refer to borehole logs	2017-07-10	320.4	306.5	169.5	B5	10.1	Refer to borehole logs
BH2017-9 SS-7	Refer to borehole logs	2017-07-10	321.1	306.2	164	B17	10.5	Refer to borehole logs
BH2017-9 SS-8	Refer to borehole logs	2017-07-10	No Recovery					Refer to borehole logs
BH2017-10 SS-1	Refer to borehole logs	2017-06-27	324.9	319.9	164.6	B8	3.2	Refer to borehole logs
BH2017-10 SS-2	Refer to borehole logs	2017-06-27	253.1	247	166.6	B10	7.6	Refer to borehole logs
BH2017-10 SS-3	Refer to borehole logs	2017-06-27	320.4	303.9	173.5	B6	12.7	Refer to borehole logs
BH2017-10 SS-4	Refer to borehole logs	2017-06-27	586.57	518.01	171.22	B3	19.8	Refer to borehole logs
BH2017-10 SS-5	Refer to borehole logs	2017-06-27	88.1	80.05	4.2	M15	10.6	Refer to borehole logs
BH2017-10 SS-6	Refer to borehole logs	2017-06-27	155.6	124.88	4.2	M3	25.5	Refer to borehole logs
BH2017-10 SS-7	Refer to borehole logs	2017-06-27	111	98.62	4.2	M32	13.1	Refer to borehole logs
BH2017-10 SS-8	Refer to borehole logs	2017-06-27	163	124.71	4.2	M6	31.8	Refer to borehole logs
BH2017-10 SS-9	Refer to borehole logs	2017-06-27	166.8	114.07	4.3	M35	48.0	Refer to borehole logs
BH2017-10 SS-10	Refer to borehole logs	2017-06-27	158.6	119.58	4.2	M38	33.8	Refer to borehole logs
BH2017-10 SS-11	Refer to borehole logs	2017-06-27	160	137.92	4	M18	16.5	Refer to borehole logs
BH2017-10 SS-12	Refer to borehole logs	2017-06-27	168.6	153.26	4.1	M23	10.3	Refer to borehole logs
BH2017-10 SS-13	Refer to borehole logs	2017-06-27	163	151.16	4.3	M11	8.1	Refer to borehole logs
BH2017-10 SS-14	Refer to borehole logs	2017-06-27	165.4	152.01	4.2	M22	9.1	Refer to borehole logs
BH2017-10 SS-15	Refer to borehole logs	2017-06-27	380.66	367.03	164.82	B8	6.7	Refer to borehole logs
BH2017-11 SS-1	Refer to borehole logs	2017-07-04	166.5	149.23	4.3	M25	11.9	Refer to borehole logs
BH2017-11 SS-2	Refer to borehole logs	2017-07-04	70.1	64.64	4.4	M2	9.1	Refer to borehole logs
BH2017-11 SS-3	Refer to borehole logs	2017-07-04	114.1	98.12	4.2	M39	17.0	Refer to borehole logs
BH2017-11 SS-4	Refer to borehole logs	2017-07-04	146	142.18	4.2	M31	2.8	Refer to borehole logs

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MOISTURE CONTENT DATA SHEET

PROJECT NO.: TS-SO-29563 **PROJECT:** Trinity Development Group Geotech Investigation

TEST DATE: 2017-07-25 **TECH :** M.C.

SAMPLE #	DEPTH (m)	DATE SAMPLED (mm/dd/yy)	WET WT. + TARE	DRY WT. + TARE	TARE	PAN #	% MOISTURE	DESCRIPTION
BH2017-11 SS-5	Refer to borehole logs	2017-07-04	169.5	136.17	4.3	M12	25.3	Refer to borehole logs
BH2017-11 SS-6	Refer to borehole logs	2017-07-04	914.4	726.02	173.88	B20	34.1	Refer to borehole logs
BH2017-11 SS-7	Refer to borehole logs	2017-07-04	157.4	113.4	4.2	M33	40.3	Refer to borehole logs
BH2017-11 SS-8	Refer to borehole logs	2017-07-04	161.8	118.26	4.3	M36	38.2	Refer to borehole logs
BH2017-11 SS-9	Refer to borehole logs	2017-07-04	161.8	101.76	4.1	M4	61.5	Refer to borehole logs
BH2017-11 SS-10	Refer to borehole logs	2017-07-04	166.3	121.91	4.4	M29	37.8	Refer to borehole logs
BH2017-11 SS-11	Refer to borehole logs	2017-07-04	165.2	139.5	4.3	M21	19.0	Refer to borehole logs
BH2017-11 SS-12	Refer to borehole logs	2017-07-04	186.2	159.56	4.2	M5	17.1	Refer to borehole logs
BH2017-11 SS-13	Refer to borehole logs	2017-07-04	200.5	180.66	4.3	M14	11.2	Refer to borehole logs
BH2017-11 SS-14	Refer to borehole logs	2017-07-04	172.4	163.2	4.2	M17	5.8	Refer to borehole logs
BH2017-12 SS-1	Refer to borehole logs	2017-07-04	156.4	152.52	4.3	M37	2.6	Refer to borehole logs
BH2017-12 SS-2	Refer to borehole logs	2017-07-04	178.1	146.42	4.5	M40	22.3	Refer to borehole logs
BH2017-12 SS-3	Refer to borehole logs	2017-07-04	156.7	125.59	4.3	M26	25.6	Refer to borehole logs
BH2017-12 SS-4	Refer to borehole logs	2017-07-04	161.8	124.92	4.3	M30	30.6	Refer to borehole logs
BH2017-12 SS-5	Refer to borehole logs	2017-07-04	167.3	136.59	4.3	M27	23.2	Refer to borehole logs
BH2017-12 SS-6	Refer to borehole logs	2017-07-04	165.3	122.82	4.2	M10	35.8	Refer to borehole logs
BH2017-12 SS-7	Refer to borehole logs	2017-07-04	161.9	117.66	4.1	M9	39.0	Refer to borehole logs
BH2017-12 SS-8	Refer to borehole logs	2017-07-04	163.3	115.72	4	M8	42.6	Refer to borehole logs
BH2017-12 SS-9	Refer to borehole logs	2017-07-04	160.6	102.62	4.2	M34	58.9	Refer to borehole logs
BH2017-12 SS-10	Refer to borehole logs	2017-07-04	1523.12	1105.73	163.96	B17	44.3	Refer to borehole logs
BH2017-12 SS-11	Refer to borehole logs	2017-07-04	168.4	113.66	4.2	M24	50.0	Refer to borehole logs
BH2017-12 SS-12	Refer to borehole logs	2017-07-04	155	125.1	4.1	M41	24.7	Refer to borehole logs
BH2017-12 SS-13	Refer to borehole logs	2017-07-04	164.1	145.58	4.4	M16	13.1	Refer to borehole logs
BH2017-12 SS-14	Refer to borehole logs	2017-07-04	164.2	144.01	4.3	M13	14.5	Refer to borehole logs

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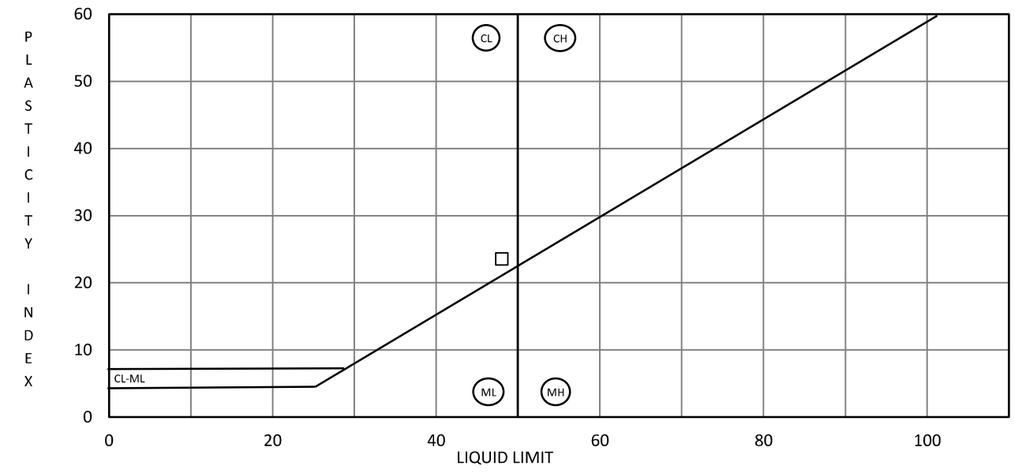
DST Ref. No.:	TS-SO-29563	**Date Sampled:**	
Project:	Trinity Development Group Geotech Investiga	**Sampled By:**	
Client:	Trinity Development Group	**Source:**	BH2017-2, SS-4
Project Location:		**Location:**	
Sample #:	**KWG-016-4**		
Description:			



ATTERBERG LIMIT AND MOISTURE RESULTS:

SUMMARY OF ATTERBERG AND MOISTURE CONTENT:	
Liquid Limit, LL	48
Plastic Limit, PL	24
Plasticity Index, PI	24
In Place Moisture Content (ASTM D2216) %	0.0

TESTING EQUIPMENT USED		
Plastic Limit	Hand Rolled	X
	Mechanical Rolling Device	
Liquid Limit Apparatus	Manual	X
	Mechanical	
Casagrande ASTM Tool	Metal	X
	Plastic	

SPECIMEN PREPARATION			
Wet		Washed on #40 Sieve	
Dry (Air)		Dry Sieved on #40 Sieve	X
Dry (Oven)	X		

DISTRIBUTION:

25-Jul-17
Hugh Arthur - Laboratory Supervisor

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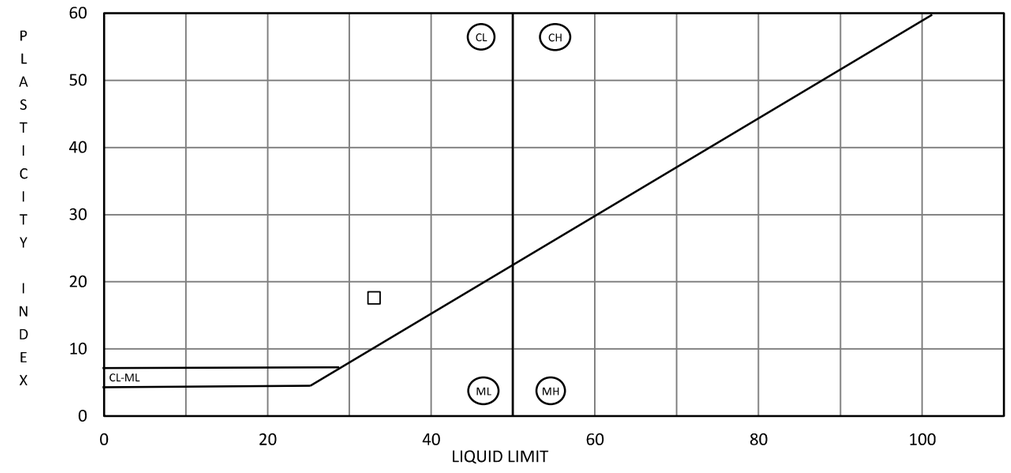
DST Ref. No.:	TS-SO-29563	**Date Sampled:**	
Project:	Trinity Development Group Geotech Investiga	**Sampled By:**	
Client:	Trinity Development Group	**Source:**	BH2017-3, SS-10
Project Location:		**Location:**	
Sample #:	**KWG-016-13**		
Description:			



ATTERBERG LIMIT AND MOISTURE RESULTS:

SUMMARY OF ATTERBERG AND MOISTURE CONTENT:	
Liquid Limit, LL	33
Plastic Limit, PL	15
Plasticity Index, PI	18
In Place Moisture Content (ASTM D2216) %	0.0

TESTING EQUIPMENT USED		
Plastic Limit	Hand Rolled	X
	Mechanical Rolling Device	
Liquid Limit Apparatus	Manual	X
	Mechanical	
Casagrande ASTM Tool	Metal	X
	Plastic	

SPECIMEN PREPARATION			
Wet		Washed on #40 Sieve	
Dry (Air)		Dry Sieved on #40 Sieve	X
Dry (Oven)	X		

25-Jul-17
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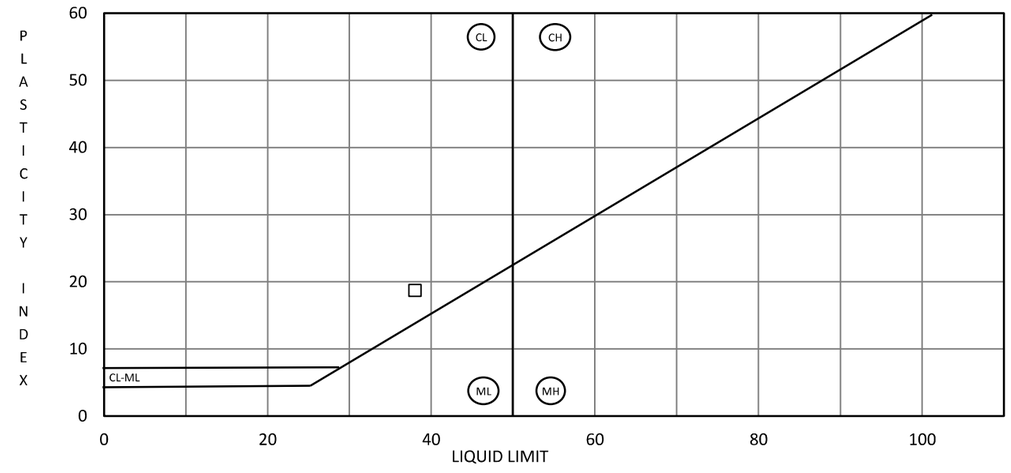
DST Ref. No.:	TS-SO-29563	**Date Sampled:**	
Project:	Trinity Development Group Geotech Investiga	**Sampled By:**	
Client:	Trinity Development Group	**Source:**	BH2017-3, SS-7
Project Location:		**Location:**	
Sample #:	**KWG-016-5**		
Description:			



ATTERBERG LIMIT AND MOISTURE RESULTS:

SUMMARY OF ATTERBERG AND MOISTURE CONTENT:	
Liquid Limit, LL	38
Plastic Limit, PL	19
Plasticity Index, PI	19
In Place Moisture Content (ASTM D2216) %	0.0

TESTING EQUIPMENT USED		
Plastic Limit	Hand Rolled	X
	Mechanical Rolling Device	
Liquid Limit Apparatus	Manual	X
	Mechanical	
Casagrande ASTM Tool	Metal	X
	Plastic	

SPECIMEN PREPARATION			
Wet		Washed on #40 Sieve	
Dry (Air)		Dry Sieved on #40 Sieve	X
Dry (Oven)	X		

25-Jul-17
Hugh Arthur - Laboratory Supervisor

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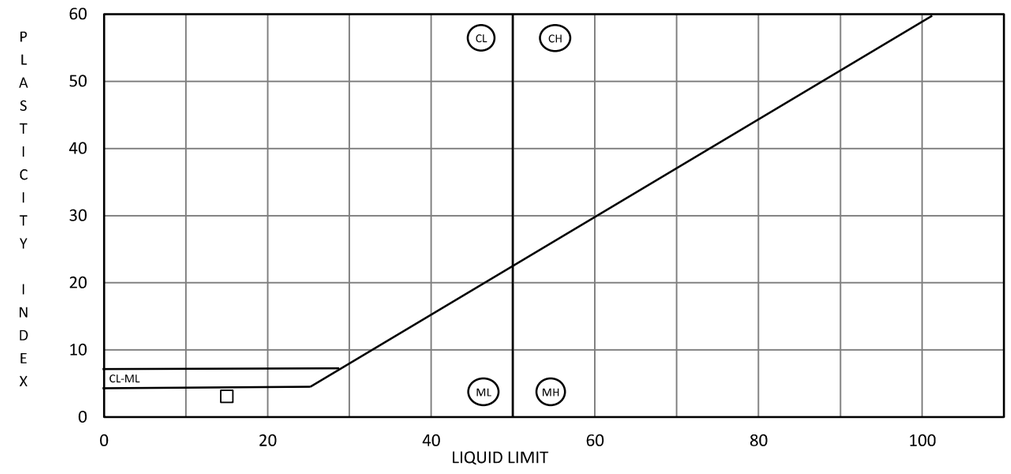
DST Ref. No.:	TS-SO-29563	**Date Sampled:**	
Project:	Trinity Development Group Geotech Investiga	**Sampled By:**	
Client:	Trinity Development Group	**Source:**	BH2017-6, SS-8
Project Location:		**Location:**	
Sample #:	**KWG-016-7**		
Description:			



ATTERBERG LIMIT AND MOISTURE RESULTS:

SUMMARY OF ATTERBERG AND MOISTURE CONTENT:	
Liquid Limit, LL	15
Plastic Limit, PL	12
Plasticity Index, PI	3
In Place Moisture Content (ASTM D2216) %	0.0

TESTING EQUIPMENT USED		
Plastic Limit	Hand Rolled	X
	Mechanical Rolling Device	
Liquid Limit Apparatus	Manual	X
	Mechanical	
Casagrande ASTM Tool	Metal	X
	Plastic	

SPECIMEN PREPARATION			
Wet		Washed on #40 Sieve	
Dry (Air)		Dry Sieved on #40 Sieve	X
Dry (Oven)	X		

25-Jul-17
Hugh Arthur - Laboratory Supervisor

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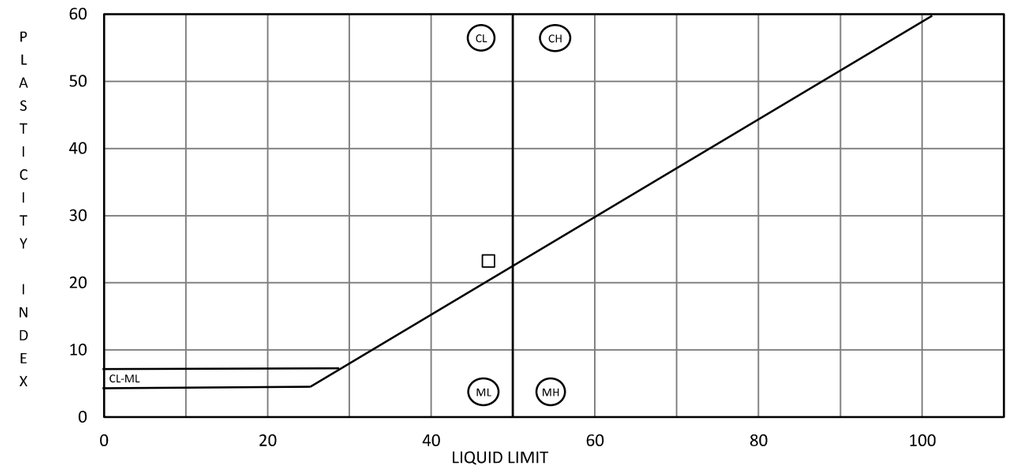
DST Ref. No.:	TS-SO-29563	**Date Sampled:**	
Project:	Trinity Development Group Geotech Investiga	**Sampled By:**	
Client:	Trinity Development Group	**Source:**	BH2017-8, SS-7
Project Location:		**Location:**	
Sample #:	**KWG-016-8**		
Description:			



ATTERBERG LIMIT AND MOISTURE RESULTS:

SUMMARY OF ATTERBERG AND MOISTURE CONTENT:	
Liquid Limit, LL	47
Plastic Limit, PL	24
Plasticity Index, PI	23
In Place Moisture Content (ASTM D2216) %	0.0

TESTING EQUIPMENT USED		
Plastic Limit	Hand Rolled	X
	Mechanical Rolling Device	
Liquid Limit Apparatus	Manual	X
	Mechanical	
Casagrande ASTM Tool	Metal	X
	Plastic	

SPECIMEN PREPARATION			
Wet		Washed on #40 Sieve	
Dry (Air)		Dry Sieved on #40 Sieve	X
Dry (Oven)	X		

25-Jul-17
Hugh Arthur - Laboratory Supervisor

DISTRIBUTION:

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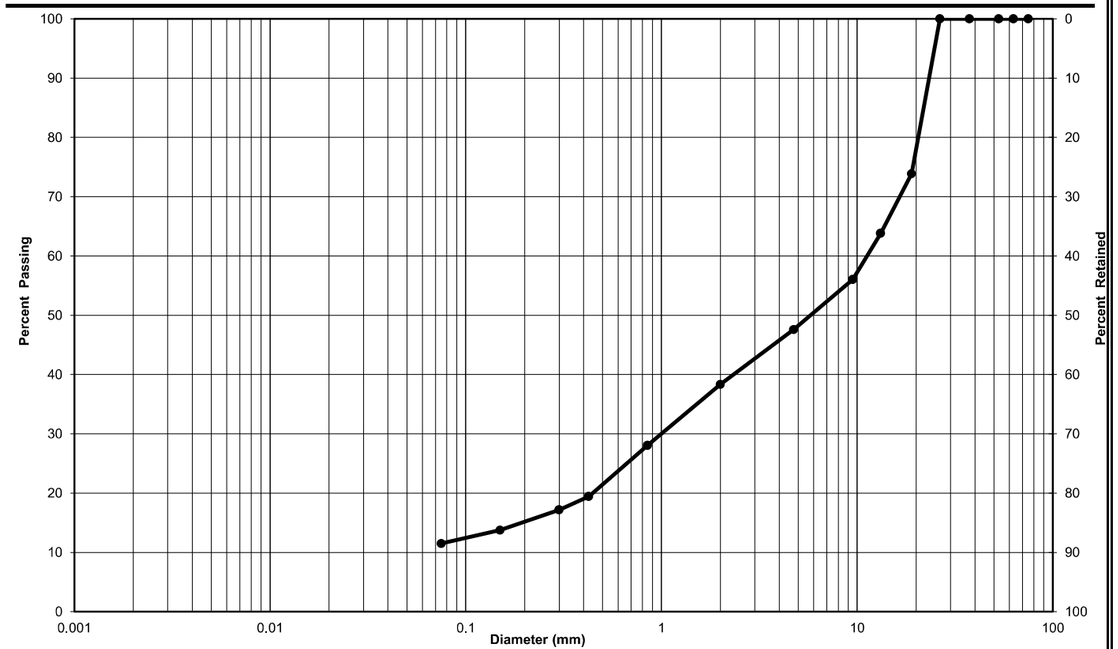
www.dstgroup.com

PARTICLE SIZE ANALYSIS OF SOILS

DST Ref. No.:	TS-SO-29563	**Date Sampled:**	January 0, 1900
Project:	Trinity Development Group Geotech Investig	**Sampled By:**	1900-01-00
Client:	Trinity Development Group	**Source:**	BH2017-5, SS-4
Project Location:	Ottawa, ON	**Location:**	0
Sample #:	KWG-016-6	**Description:**	Gravel and Sand, trace Clay/Silt



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravel and Sand, trace Clay/Silt	52	37	11

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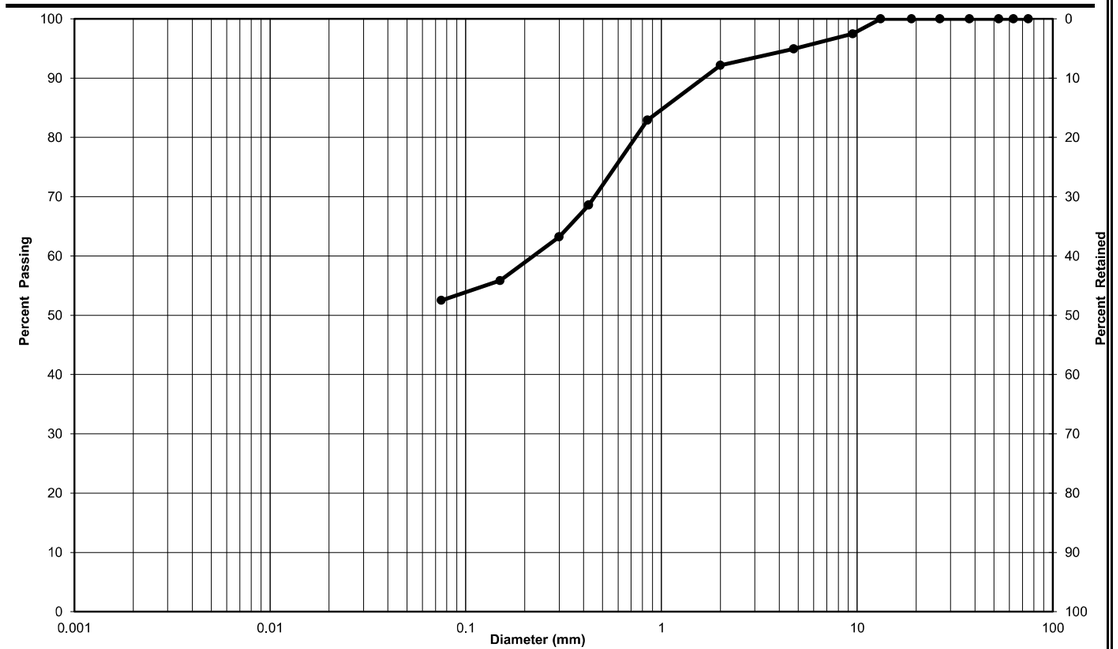
waterloo@dstgroup.com
www.dstgroup.com

PARTICLE SIZE ANALYSIS OF SOILS

DST Ref. No.:	TS-SO-29563	**Date Sampled:**	January 0, 1900
Project:	Trinity Development Group Geotech Investig	**Sampled By:**	1900-01-00
Client:	Trinity Development Group	**Source:**	BH2017-9, SS-2
Project Location:	Ottawa, ON	**Location:**	0
Sample #:	KWG-016-9	**Description:**	Sand and Clay/Silt, trace Gravel



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Clay/Silt, trace Gravel	5	42	53

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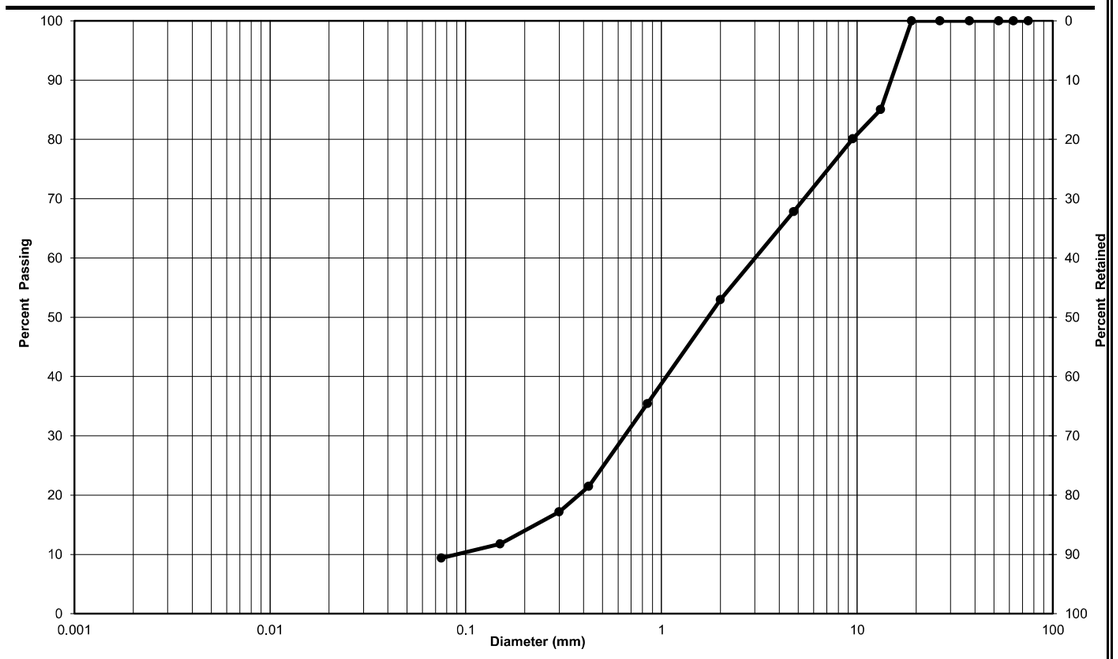
PARTICLE SIZE ANALYSIS OF SOILS

DST Ref. No.:	TS-SO-29563	**Date Sampled:**	January 0, 1900
Project:	Trinity Development Group Geotech Investig	**Sampled By:**	1900-01-00
Client:	Trinity Development Group	**Source:**	BH2017-10, SS-4
Project Location:	Ottawa, ON	**Location:**	0
Sample #:	KWG-016-10	**Description:**	Gravelley Sand, trace Clay & Silt



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravelley Sand, trace Clay & Silt	32	59	9

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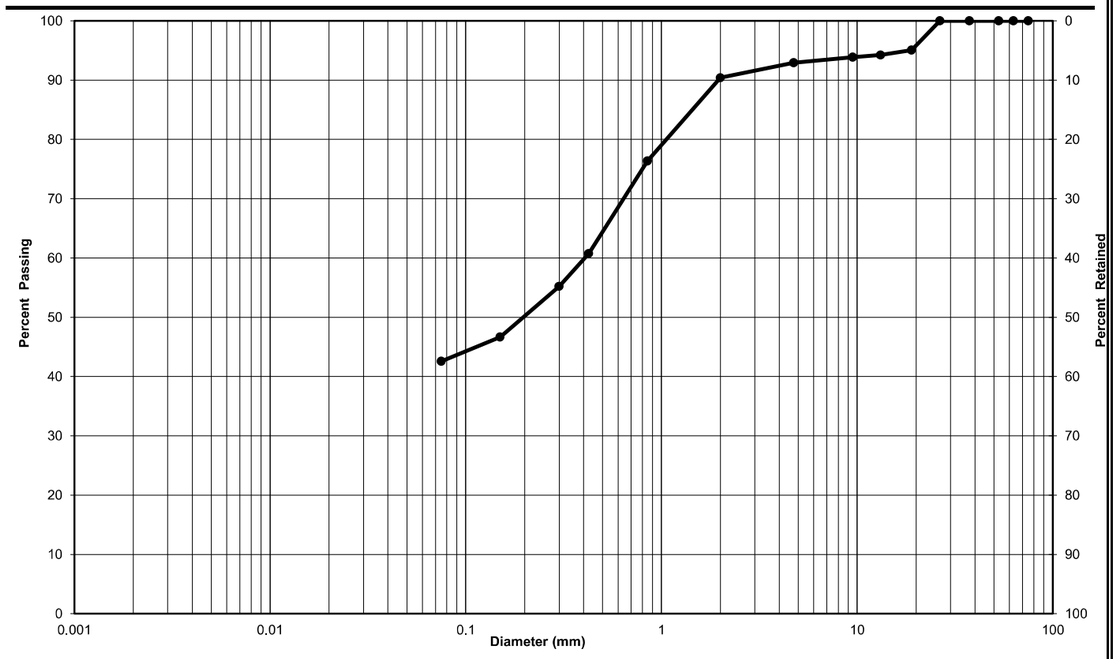
waterloo@dstgroup.com
www.dstgroup.com

PARTICLE SIZE ANALYSIS OF SOILS

DST Ref. No.:	TS-SO-29563	**Date Sampled:**	January 0, 1900
Project:	Trinity Development Group Geotech Investig	**Sampled By:**	1900-01-00
Client:	Trinity Development Group	**Source:**	BH2017-11, SS-6
Project Location:	Ottawa, ON	**Location:**	0
Sample #:	KWG-016-12	**Description:**	Clay/Silt and Sand, trace Gravel



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Clay/Silt and Sand, trace Gravel	7	50	43

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TESTING LABORATORIES INC.

CONSULTING ENGINEERS •
Materials Testing and Inspection

File: L17-0460RC

July 19, 2017

DST Consulting Engineers Inc.
2150 Thurston Drive, Suite 203
Ottawa, Ontario
K1G 5T9

Attn: Mr. Amer Mohammad
amohammad@dstgroup.com

Dear Sir;

Unconfined Compressive Strength Testing
Rock Core Sample
Trinity Development – Geotechnical Investigation
DST Project No.: TS-SO-29563

Further to receipt of six (6) 60.5 to 63.5 mm diameter size rock core samples in our laboratory on July 18, 2017, Davroc Testing Laboratories Inc. is pleased to report the results of our tests.

As instructed, the core sample ends were ground, and the prepared core samples were tested for compressive strength in accordance with ASTM D 7012 Standard Test Method for "Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures".

Test Results

The results of our tests are summarized on the following Table No. 1, and detailed test data are shown on the attached Rock Core Test Certificates.

2051 Williams Parkway
Unit 20 And Unit 21
Brampton, Ontario
Canada, L6S 5T4
Tel: (905) 792-7792
Fax: (905) 792-7829
www.davroc.com

Table No. 1
Trinity Development – Geotechnical Investigation
DST Project No.: TS-SO-29563
Rock Core Unconfined Compressive Strength Test Result Summary

Davroc Sample No.	Borehole/Core No.	Depth	Unconfined Compressive Strength (MPa)
C974-1	BH2017-3/CR1	96.081 – 95.916	*127.6
C974-2	BH2017-3/CR5	90.124 – 89.845	125.7
C974-3	BH2017-5/CR2	94.468 – 94.138	121.5
C974-4	BH2017-8/CR3	93.526 – 93.348	*113.1
C974-5	BH2017-10/CR1	93.198 - 92.919	97.2
C974-6	BH2017-10/CR4	88.117 – 87.787	129.6

*- L/D ratio for these samples were <2.0.

We trust the above is satisfactory. Should you require any further information, please do not hesitate to contact the undersigned.

Yours very truly,
Davroc Testing Laboratories Inc.

Kateryna Fiyalko, C.E.T.
Concrete Laboratory Supervisor

Sal Fasullo, C.E.T.
Vice President

SF/kf
17-0460-1RC

ROCK CORE TEST REPORT

File No.: L17-0460RC
Davroc Sample No.: C974
DST Project No.: TS-SO-29563
Project Name: Trinity Development – Geological Investigation

Core No.	1	2	3
Borehole/Core No.	BH2017-3/CR1	BH2017-3/CR5	BH2017-5/CR2
Depth	96.081 – 95.916	90.124 – 89.845	94.468 – 94.138
Date Cored	N/R	N/R	N/R
Date Tested	July 19, 2017	July 19, 2017	July 19, 2017
Height (mm)	95.4	151.0	151.0
Average Diameter (mm)	62.5	60.5	60.5
L/D Ratio	1.53	2.50	2.50
Density (kg/m^3)	-	-	-
Compressive Strength (MPa)	127.6	125.7	121.5
Mode of Failure	*	*	*
Direction of Loading	Not Known	Not Known	Not Known
Moisture Condition at Time of Test	As Received	As Received	As Received

Remarks: * - See attached photographs.

Date: July 19, 2017 **Signed:** _____
Sal Fasullo, C.E.T.

ROCK CORE TEST REPORT

File No.: L17-0460RC
Davroc Sample No.: C974
DST Project No.: TS-SO-29563
Project Name: Trinity Development – Geological Investigation

Core No.	4	5	6
Borehole/Core No.	BH2017-8/CR3	BH2017-10/CR1	BH2017-10/CR4
Depth	93.526 – 93.348	93.198 – 92.919	88.117 – 87.787
Date Cored	N/R	N/R	N/R
Date Tested	July 19, 2017	July 19, 2017	July 19, 2017
Height (mm)	115.0	152.5	152.5
Average Diameter (mm)	62.5	63.5	63.5
L/D Ratio	1.84	2.40	2.40
Density (kg/m^3)	-	-	-
Compressive Strength (MPa)	113.1	97.2	129.6
Mode of Failure	*	*	*
Direction of Loading	Not Known	Not Known	Not Known
Moisture Condition at Time of Test	As Received	As Received	As Received

Remarks: * - See attached photographs.

Date: July 19, 2017 **Signed:** _____
Sal Fasullo, C.E.T.

Photograph No. 1, Davroc Sample C974 -1 to 6 before testing.

Photograph No. 1, Davroc Sample C974 -1 to 6, break failure after testing.

APPENDIX E
CORE PHOTOS

Project: Geotechnical Investigation – Gladstone and Loretta Avenue, Ottawa

Client: Trinity Development Group Inc.

BH2017-03

Core Run	Depth, m	Description	TCR	SCR	RQD
CR1	6.4 – 7.5	Limestone, grey	100%	79%	58%
CR2	7.5 – 9.0	Limestone, grey	100%	92%	90%
CR3	9.0 – 10.4	Limestone, grey	93%	93%	92%
CR4	10.4 – 11.9	Limestone, grey	100%	100%	92%
CR5	11.9 – 13.5	Limestone, grey	100%	100%	95%

BH2017-05

Core Run	Depth, m	Description	TCR	SCR	RQD
CR1	6.9 – 7.4	Limestone, grey	100%	100%	100%
CR2	7.4 – 8.8	Limestone, grey	100%	98%	96%
CR3	8.8 – 10.3	Limestone, trace calcite, grey	100%	100%	100%
CR4	10.3 – 11.8	Limestone, trace calcite, grey	100%	100%	96%
CR5	11.8 – 13.5	Limestone, trace calcite, grey	100%	100%	100%

BH2017-08

Core Run	Depth, m	Description	TCR	SCR	RQD
CR1	7.0 – 7.6	Limestone, grey	100%	96%	93%
CR2	7.6 – 9.1	Limestone, grey	85%	78%	75%
CR3	9.1 – 10.6	Limestone, grey	100%	100%	98%
CR4	10.6 – 12.1	Limestone, grey	98%	98%	90%
CR5	12.1 – 13.6	Limestone, grey	100%	100%	100%

BH2017-10

Core Run	Depth, m	Description	TCR	SCR	RQD
CR1	9.0 – 10.5	Limestone, grey	98%	92%	85%
CR2	10.5 – 12.1	Limestone, grey	100%	100%	100%
CR3	12.1 – 13.6	Limestone, grey	98%	98%	98%
CR4	13.6 – 15.1	Limestone, grey	100%	100%	100%
CR5	15.1 – 16.6	Limestone, grey	100%	100%	100%

APPENDIX F

2015 NATIONAL BUILDING CODE SEISMIC HAZARD CALCULATION

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

July 17, 2017

Site: 45.4039 N, 75.7154 W User File Reference: Gladstone

Requested by: , DST Consulting Engineers Inc.

National Building Code ground motions: 2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.05)	Sa(0.1)	**Sa(0.2)**	Sa(0.3)	**Sa(0.5)**	**Sa(1.0)**	**Sa(2.0)**	**Sa(5.0)**	**Sa(10.0)**	**PGA (g)**	**PGV (m/s)**
0.445	0.521	**0.437**	0.332	**0.236**	**0.117**	**0.056**	**0.015**	**0.0054**	**0.279**	**0.196**

Notes. Spectral (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s. Values are for "firm ground" (NBCC 2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are specified in **bold** font. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. ***These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.***

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.05)	0.044	0.147	0.245
Sa(0.1)	0.060	0.185	0.298
Sa(0.2)	0.055	0.160	0.253
Sa(0.3)	0.043	0.123	0.194
Sa(0.5)	0.031	0.088	0.138
Sa(1.0)	0.015	0.044	0.069
Sa(2.0)	0.0061	0.020	0.032
Sa(5.0)	0.0012	0.0047	0.0081
Sa(10.0)	0.0006	0.0019	0.0032
PGA	0.032	0.101	0.162
PGV	0.021	0.067	0.110

References

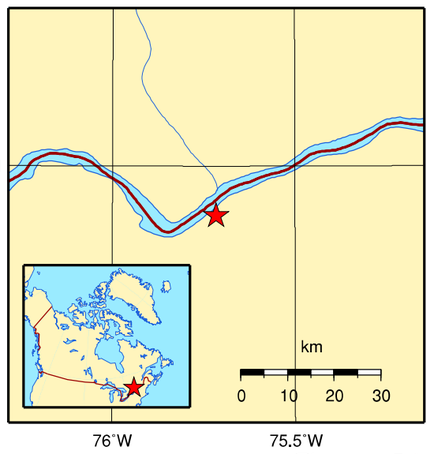
National Building Code of Canada 2015 NRCC no. 56190;
Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

User's Guide - NBC 2015, Structural Commentaries NRCC no. xxxxxx (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information

Aussi disponible en français



Natural Resources Canada Ressources naturelles Canada

Canada

APPENDIX G

CORROSION ANALYSES (SOIL) TEST RESULTS

Your Project #: TS-SO-29563
Your C.O.C. #: 100264

Attention:Tun Lwin

DST Consulting Engineers Inc
Waterloo - Standing Offer
550 Parkside Drve
Unit C10
Waterloo, ON
CANADA N2L 5V4

Report Date: 2017/07/28
Report #: R4618965
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7F4617
Received: 2017/07/20, 15:09

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chloride (20:1 extract)	1	N/A	2017/07/26	CAM SOP-00463	EPA 325.2 m
Conductivity	1	2017/07/25	2017/07/25	CAM SOP-00414	OMOE E3530 v1 m
pH CaCl2 EXTRACT	1	2017/07/25	2017/07/25	CAM SOP-00413	EPA 9045 D m
Resistivity of Soil	1	2017/07/20	2017/07/25	CAM SOP-00414	SM 22 2510 m
Sulphate (20:1 Extract)	1	N/A	2017/07/26	CAM SOP-00464	EPA 375.4 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: TS-SO-29563
Your C.O.C. #: 100264

Attention:Tun Lwin

DST Consulting Engineers Inc
Waterloo - Standing Offer
550 Parkside Drve
Unit C10
Waterloo, ON
CANADA N2L 5V4

Report Date: 2017/07/28
Report #: R4618965
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7F4617
Received: 2017/07/20, 15:09

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7F4617
Report Date: 2017/07/28

DST Consulting Engineers Inc
Client Project #: TS-SO-29563

RESULTS OF ANALYSES OF SOIL

Maxxam ID		EUC556	EUC556		
Sampling Date		2017/06/27	2017/06/27		
COC Number		100264	100264		
	UNITS	BH2017-10, SS-10	BH2017-10, SS-10 Lab-Dup	RDL	QC Batch
Calculated Parameters					
Resistivity	ohm-cm	690			5085001
Inorganics					
Soluble (20:1) Chloride (Cl)	ug/g	700	690	20	5090772
Conductivity	mS/cm	1.5		0.002	5089376
Available (CaCl2) pH	pH	7.83			5088780
Soluble (20:1) Sulphate (SO4)	%	0.038	0.039	0.002	5090773

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Job #: B7F4617
Report Date: 2017/07/28

DST Consulting Engineers Inc
Client Project #: TS-SO-29563

TEST SUMMARY

Maxxam ID: EUC556
Sample ID: BH2017-10, SS-10
Matrix: Soil

Collected: 2017/06/27
Shipped:
Received: 2017/07/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	5090772	N/A	2017/07/26	Alina Dobreanu
Conductivity	AT	5089376	2017/07/25	2017/07/25	Xuanhong Qiu
pH CaCl2 EXTRACT	AT	5088780	2017/07/25	2017/07/25	Tahir Anwar
Resistivity of Soil		5085001	2017/07/25	2017/07/25	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	5090773	N/A	2017/07/26	Alina Dobreanu

Maxxam ID: EUC556 Dup
Sample ID: BH2017-10, SS-10
Matrix: Soil

Collected: 2017/06/27
Shipped:
Received: 2017/07/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	5090772	N/A	2017/07/26	Alina Dobreanu
Sulphate (20:1 Extract)	KONE/EC	5090773	N/A	2017/07/26	Alina Dobreanu

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C

Results relate only to the items tested.

Maxxam Job #: B7F4617
Report Date: 2017/07/28

DST Consulting Engineers Inc
Client Project #: TS-SO-29563

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5088780	TA1	Spiked Blank	Available (CaCl2) pH	2017/07/25		99	%	97 - 103
5088780	TA1	RPD	Available (CaCl2) pH	2017/07/25	0.083		%	N/A
5089376	XQI	Spiked Blank	Conductivity	2017/07/25		101	%	90 - 110
5089376	XQI	Method Blank	Conductivity	2017/07/25	<0.002		mS/cm	
5089376	XQI	RPD	Conductivity	2017/07/25	6.5		%	10
5090772	ADB	Matrix Spike [EUC556-01]	Soluble (20:1) Chloride (Cl)	2017/07/26		NC	%	70 - 130
5090772	ADB	Spiked Blank	Soluble (20:1) Chloride (Cl)	2017/07/26		103	%	70 - 130
5090772	ADB	Method Blank	Soluble (20:1) Chloride (Cl)	2017/07/26	<20		ug/g	
5090772	ADB	RPD [EUC556-01]	Soluble (20:1) Chloride (Cl)	2017/07/26	0.74		%	35
5090773	ADB	Matrix Spike [EUC556-01]	Soluble (20:1) Sulphate (SO4)	2017/07/26		NC	%	70 - 130
5090773	ADB	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2017/07/26		104	%	70 - 130
5090773	ADB	Method Blank	Soluble (20:1) Sulphate (SO4)	2017/07/26	<0.002		%	
5090773	ADB	RPD [EUC556-01]	Soluble (20:1) Sulphate (SO4)	2017/07/26	1.6		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

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A Bureau Veritas Group Company

Maxxam Job #: B7F4617
Report Date: 2017/07/28

DST Consulting Engineers Inc
Client Project #: TS-SO-29563

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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CAM FCD-01191/3

CHAIN OF CUSTODY RECORD 100264 Page 1 of 1

Invoice Information
Company Name: PST Consulting Engineers
Contact Name: Tun Dan Lwin
Address: 550 Parkside Dr, unit C1-B Waterloo ON, N2L 5V4
Phone: (519) 772-4521 Fax: (519) 725-3789
Email: Hlwin@dstgroup.com

Report Information (if differs from invoice)
Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

Project Information (where applicable)
Quotation #:
P.O. #/ AFE#:
Project #: TS-SO-29563
Site Location:
Site #:
Sampled By:

Turnaround Time (TAT) Required
[X] Regular TAT (5-7 days) Most analyses
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
[ ] 1 Day [ ] 2 Days [ ] 3-4 Days
Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153
[ ] Table 1 [ ] Res/Park [ ] Med/ Fine
[ ] Table 2 [ ] Ind/Comm [ ] Coarse
[ ] Table 3 [ ] Agri/ Other
[ ] Table ____
FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations
[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] MISA [ ] Storm Sewer Bylaw
[ ] PWQO Region
[ ] Other (Specify)
[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

LABORATORY USE ONLY
Custody Seal Y / (N) — Present: N; Intact: N
Cooler Temperatures: 6/6/6; 23/23/23 NOTE; # 401207
Cooling Media Present: Y / (N) NO ICE

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	pH	Chloride Content	Sulphate Content	Water Soluble Sulphates	Conductivity	Resistivity			HOLD- DO NOT ANALYZE	COMMENTS
1	BH207-10, SS-10	2017/06/27		Soil									X	X	X	X	X	X				Please test against these standards:
2																						pH - MOEE E3137A
3																						Chlorides - EPA 300.0
4																						Sulphates - EPA 300.0
5																						Soluble Sulphates - CSA A23.2-3B (concrete)
6																						Conductivity - MOEE E3138
7																						Resistivity - APHA 2510B
8																						
9																						
10																						

20-Jul-17 15:09
Augustyna Dobosz
B7F4617
SSR ENV-883

REC'D IN WATERL

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Hugh Arthur	2017/07/20	15:06	Waverly Kozak Waverly Kozak	17/07/20	15:09	

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms. Sample container, preservation, hold time and packages information can be viewed at http://maxxam.ca/wp-content/uploads/Ontario-COC.pdf.

COC-1004 (03/17)

White: Maxxam - Yellow: Client

APPENDIX D

PROXIMITY STUDY CHECKLIST

Proximity Study Checklist

Legend

1.# Level 1 Project Requirements as listed in Confederation Line Proximity Guidelines dated October 23, 2013
2.# Level 2 Project Requirements as listed in Confederation Line Proximity Guidelines dated October 23, 2013
3.# Level 3 Project Requirements as listed in Confederation Line Proximity Guidelines dated October 23, 2013
4.# Conditions of Approval Requirements as listed in Confederation Line Proximity Guidelines dated October 23, 2013
Item that is, in our professional opinion, not applicable or will not be required to be submitted for the development
Item received and incorporated into Proximity Report/Drawings
Item requires information/input from the City before it can be provided by the responsible party.
Item outstanding but requires further development of the design before it can be provided by the responsible party.
Item outstanding.

Item	Description	Comments	Report Location/Status
1.1	**Site plan** with the centerline or reference line of the Trillium Line structure and/or right-of-way located and the relevant distances between the Trillium Line and developer's structure shown clearly		**Section 2.1 & Appendix A1**
1.2	**Plan and cross-sections of the development** locating the Trillium Line structure/right-of-way and founding elevations relative to the development, including any underground storage tanks and associated piping		**Section 2.2 & Appendix B4**
1.3	**Geotechnical investigation report** showing up-to-date geotechnical conditions at the site of the development. The geotechnical investigation shall be prepared in accordance with the Geotechnical Investigation and Reporting Guidelines for Development Applications in the City		**Section 3 & Appendix C**
1.4a	**Structural/foundation drawings**		**Appendix B4**
1.4b	**Excavation and shoring drawings**	Indicative information shown on structural foundation drawings	**Appendix B4**
1.6a	Acknowledgement that the potential for **electro-magnetic interference and stray current** from Trillium Line operations have been considered in the design of the project, and appropriate mitigation measures applied	Details and quantum of the electro-magnetic interference at the property line and what mitigation measures have been included in the design of the Trillium Line and O-Train system are required.	
1.6b	Acknowledgement that the potential for **noise and vibration** from Trillium Line operations have been considered in the design of the project, and appropriate mitigation measures applied		
1.7a	**Architectural drawings**		**Appendix A1**
1.7b	**Mechanical drawings**		**N/A**
1.7c	**Electrical drawings**		**N/A**
1.7d	**Utility drawings**		**Appendix B2**
1.8	**National Fire Prevention Association (NFPA) 130 Standard review** to ensure design requirements in relation to Confederation Line infrastructure are met		**N/A**
1.9	**Crane locations, loadings**	To be provided prior to construction.	**Section 9**
1.10a	**Property survey** of existing and proposed property lines prepared to Strata Reference Plan Standards	Hard copies together with CAD files.	**Section 2.1 & Appendix A2**
1.10b	**Topographic survey** of existing surface items, such as buildings, contours, roads, tracks	Hard copies together with CAD files.	**Section 2.1 &**

			Appendix A2
1.10c	**Utility survey** of existing building gridlines, including those of Trillium Line structures	Hard copies together with CAD files	
1.10d	**Preliminary gridline layout survey** of proposed building gridlines on architectural and structural drawings		**Appendix A1 & B4**
1.11	**Staging of operations**	To be provided prior to construction.	**Section 7**
1.12	**Traffic management plan**, which shall include site access provisions during and after construction (ultimate), lane closures and staging of traffic management plan	To be provided prior to construction.	**Section 7**
1.13	**As-designed or as-built horizontal and vertical alignment data for the Trillium Line structures**.	City to provide information	**Section 8**
2.1	**Structural analysis or calculations** of the effects of loadings, including construction loading, on the Confederation Line structure, and demonstrating that the Confederation Line structure will not be adversely affected by the development, including solutions to mitigate any impact on the Confederation Line structure. The documentation must include identification of the "affected" Confederation Line structural units		**N/A**
2.2a	**Documentation showing that the excavation support system adjacent to the Trillium Line property is designed for at-rest earth pressures.**	At-rest pressures will be determined using a pressure coefficient of 0.5 (Ko = 0.5).	**Section 4**
2.2b	**Documentation showing that the permanent structure adjacent to the Trillium Line property is designed for at-rest earth pressures.**	At-rest pressures will be determined using a pressure coefficient of 0.5 (Ko = 0.5).	**Section 2.2**
2.3	**Structural drawings**, including caisson/foundation plans, sections and details, floor plans, column and wall schedules and loads on foundation for the development.	Relationship of the development to the Trillium Line structure is depicted in both plan and section	**Appendix B4**
2.4	**Shoring design criteria and description of excavation and shoring method**		**Section 4 & Appendix B4**
2.5	**Ground water control plan**, including the determination of the short-term (during construction) and long-term effects of dewatering on the Trillium Line structure, and provision of assurances that the influences of dewatering will have no impact on the Trillium Line structure		**Section 6**
2.6	**Proposal to replace/repair waterproofing system** of the affected Trillium Line structure, including the Trillium Line expansion joint		**N/A**
2.7	**Identification of utility installations** proposed through or adjacent to Trillium Line property.	See composite utility plan	**Appendix B2**
2.8	**Identification of the exhaust air quality and relationship of air in-take/discharge** to the Trillium Line at-grade vent shaft openings and station entrance openings.	Air intakes, exhausts, entrances or other similar features within the development are not located within 12 metres of the Confederation Line's ventilation structures.	**N/A**
2.9	**Pre-construction condition survey proposal** for the Trillium Line structure, including a survey to confirm locations of existing walls and foundations		**Section 8**
2.10	**Monitoring Plan** for movement of the shoring and Trillium Line structure prior to and during construction of the development, including an Action Protocol.		**Section 4**
3.1	**Ontario Building Code (OBC) compliance review**, specifically including Section 3.13 Rapid Transit Stations, and including a plan depicting egress routes from the station.		**N/A**
3.2	**Wind and snow load analyses**		**N/A**
3.3	**Drawings/documentation of construction method, hoarding, construction access, and haul routes**	To be provided prior to construction.	**N/A**
3.4	**Details of remedial work to municipal structures** to support roof at wall openings, including structural loads, and calculations		**N/A**

3.5a	**Details of stairs and doors for the development connection**		**N/A**
3.5b	**Details of sprinklers and ventilation for the development connection**		**N/A**
3.6	**Architectural finish material selection, including samples**		**N/A**
3.7	**Wayfinding and signage plans**		**N/A**
3.8	**Landscape plans**		**N/A**
3.9a	**Drawings of collector booth and easier access elevator** all designated in conformance with the relevant OC Transpo Design Guidelines, including accessibility requirements		**N/A**
3.9b	**Drawings of CCTV, intercom, and fire alarm** all designated in conformance with the relevant OC Transpo Design Guidelines, including accessibility requirements		**N/A**
3.10	**Construction record (as-built) drawings** and electronic files for municipal documentation records.	To be provided post-construction in Microstation (.dgn) format.	**N/A**
4.1	**Pre and post-construction surveys of Trillium Line infrastructure and assets**	To be provided prior to construction.	**N/A**
4.2	**Crane swing diagram**	To be provided prior to construction.	**N/A**
4.3	**Insurance requirements for large developments over Trillium Line infrastructure and assets**	No construction proposed over the Trillium Line	**N/A**

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