ATTACHMENT 5

MUNICIPALITY OF NORTH Cowichan

Duncan, BC V9L 6A1
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Development Permit with Variance

Permit No:	DP000302
Applicant:	Total Concept Developments Ltd.
Registered Owners:	Somenos Views Residences Inc., Somenos Views Holdings 2 Inc. and Somenos Views Holdings 3 Inc.
Subject Property:	2591 Beverly Street **Folio:** 01242-003
Description of Lands:	
Parcel Identifier	030-594-715
Legal Description	Lot 3, Section 19, Range 6, Quamichan District, Plan EPP85394
Proposal:	**Development Permit with Variance (DPA-1, DPA-2, DPA-3, DPA-4, DPA-6) for the construction of a Mixed-Use Building with Ground Floor Commercial Use and 210 Residential Apartment Units**

Conditions of Permit:

1. This permit is issued subject to compliance with all relevant District of North Cowichan bylaws, except as specifically varied or supplemented by this Permit.

2. This permit applies to the lands described above, and any buildings, structures, and other development thereon (hereinafter called 'the Lands').

3. The Lands and building which are subject to this Permit shall be developed strictly in accordance with the terms and conditions of this Permit and in accordance with the following schedules:

   Schedule 1 – Site Plan, Elevations, Lighting, Energy Attestation
   Schedule 2 – Civil Plan, Stormwater Management Memo
   Schedule 3 – Landscape, Estimate, Environmental Assessment Plan
   Schedule 4 – Aquifer Protection
   Schedule 5 – Floodplain Hazard Protection
   Schedule 6 – Parking Variance Report

4. Pursuant to Section 490 (1) of the *Local Government Act* this permit varies Section 24 (2)(a) of Zoning Bylaw 1997, No. 2950 by decreasing the minimum width of parking stalls at posts from 3.0 metres to 2.6 metres in the underground parkade.

5. Pursuant to Section 504 (1) of the *Local Government Act*, this permit will lapse two years from the date of the Development Permit approval unless construction, in accordance with the terms and conditions of this permit, has substantially started.

6. This permit is not a building permit.

7. Further to condition 5, construction is considered to be substantially started when a valid building permit for the development has been issued and shall not have lapsed; and excavation or construction works associated with the development hereby approved must have commenced to the satisfaction of the Director of Planning and Building. Demolition does not constitute construction.

8. As a condition of issuance of this permit, security, as authorized by Section 502 of the *Local Government Act*, is required to ensure that any conditions with respect to landscaping are satisfied.

9. Where the District of North Cowichan considers that a condition in the Permit with respect to landscaping has not been satisfied the District of North Cowichan may undertake and complete the works required to satisfy the landscaping condition at the cost of the Permit holder and may apply the security in payment of the cost of the works with any excess to be returned to the Permit holder.

10. Where the development authorized by this Permit has lapsed prior to commencement of any work pursuant to this Permit, the security shall be returned to the Permit holder.

Authorized Works

11. Authorization for works within Development Permit Area 1 (Multi-Unit & Intensive Residential Development), 2 (Commercial & Industrial Development), 3 (Natural Environment, Aquifer Vulnerability), 4 (Hazard Lands, Floodplain), 6 (GHG Reduction, Energy & Water Conservation) is limited to the siting and construction of a mixed-use building and associated works.

Landscape Bond

12. Security for landscaping in the amount of $143,465.00 is to be provided by the permit holder at the time of building permit application submission and to be administered and released in accordance with the *North Cowichan Landscape Policy* as per the Landscape Estimate provided in SCHEDULE 3.

Monitoring and Site Inspections

13. Site inspections by Development Services staff may take place to confirm compliance with this permit.

Date of Development Permit Approval/Issue by Council or its Delegate:

This permit was approved on **(date of approval)** and issued on **(date of issue).**

This permit expires on **(2 years from date of issue)**.

The Corporation of the District of North Cowichan

_____

Amanda J. Young
Director, Planning and Building

ADVISORY COMMENTS

The following comments are provided for information purposes only:

1. This Permit does not constitute a building, sign or awning permit or a subdivision approval. The applicant may contact the Planning Department to determine whether further permits are required in association with the development hereby approved.

2. Section 13 of the *Heritage Conservation Act* protects heritage sites and heritage objects (which may also be referred to as archaeological sites or objects). This permit does not authorize the alteration of any such site or object. The permit holder is responsible for ensuring compliance with the *Heritage Conservation Act*, including taking any steps required to determine whether or not a heritage site or object is present on the subject property. Under section 36 of the *Heritage Conservation Act*, it is an offence to alter heritage site or heritage object without first obtaining a permit to do so from the Province of British Columbia

SCHEDULE 1
Site Plan, Building Elevations

SOMENOS VIEW RESIDENCES

ARCHITECTURAL DRAWINGS:
RE-ISSUED FOR DP
2024-03-26

PROJECT ADDRESS: 2591 BEVERLY ST.
DUNCAN, BC.

1
A001
ARTIST CONCEPT - SOUTH WEST CORNER

2
A001
ARTIST CONCEPT - EAST ELEVATION -YORK STREET

LIST OF DRAWINGS:

Total Concept

OWNER

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ARCHITECT

SEAL

NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06-15	ISSUED FOR DP

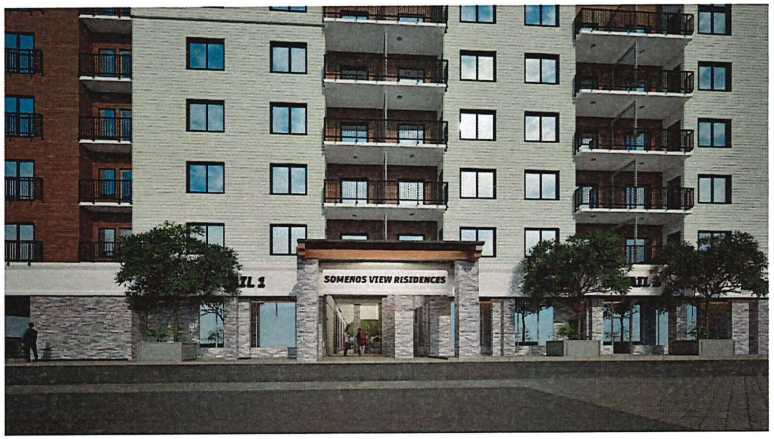
NO.	DATE	RECORD OF ISSUES

Projects
SOMENOS VIEW RESIDENCES

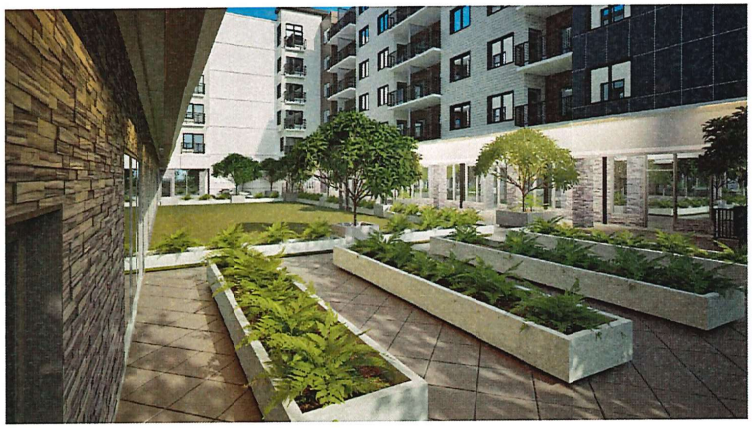
Sheet Title
COVER SHEET

Job Number BC-277
Date 2024-03-26
Scale:
Revision Number
Drawing Number
A001

1 / A002 — ARTIST CONCEPT - SOUTH ELEVATION



2 / A002 — ARTIST CONCEPT - WEST ELEVATION AT ENTRANCE



3 / A002 — ARTIST CONCEPT - COURTYARD VIEW

4 / A002 — ARTIST CONCEPT - SOUTH WEST CORNER

OWNER

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NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO.	DATE	RECORD OF ISSUE

Projects
Somenos View Residences

Sheet Title
ARTIST CONCEPT

Job Number

Date 2024-03-26

Scale: 1/8" = 1' 0"

Revision Number

Drawing Number
A002

BIRDSEYE VIEW 01

BIRDSEYE VIEW 02

BIRDSEYE VIEW 03

BIRDSEYE VIEW 04

Total Concept

OWNER

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SEAL

NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
2	2024-03-14	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO	DATE	RECORD OF ISSUE

Projects

Somenos View Residences

Sheet Title

BIRDSEYE VIEWS

Job Number

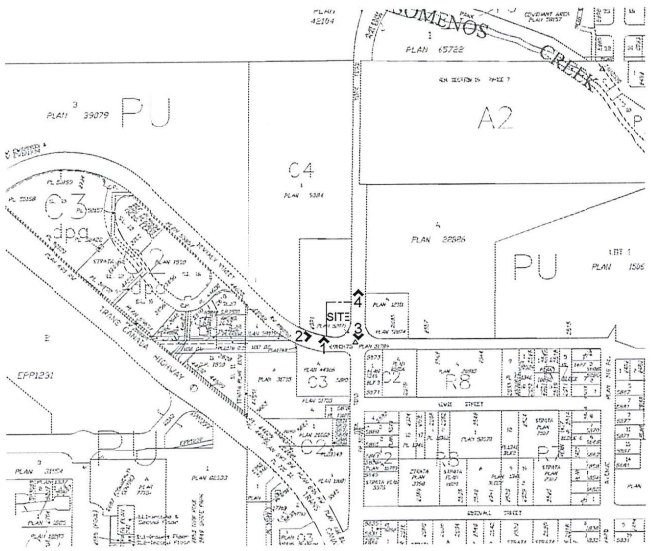
Date 2024-03-26

Scale: 1/8" = 1'-0"

Revision Number

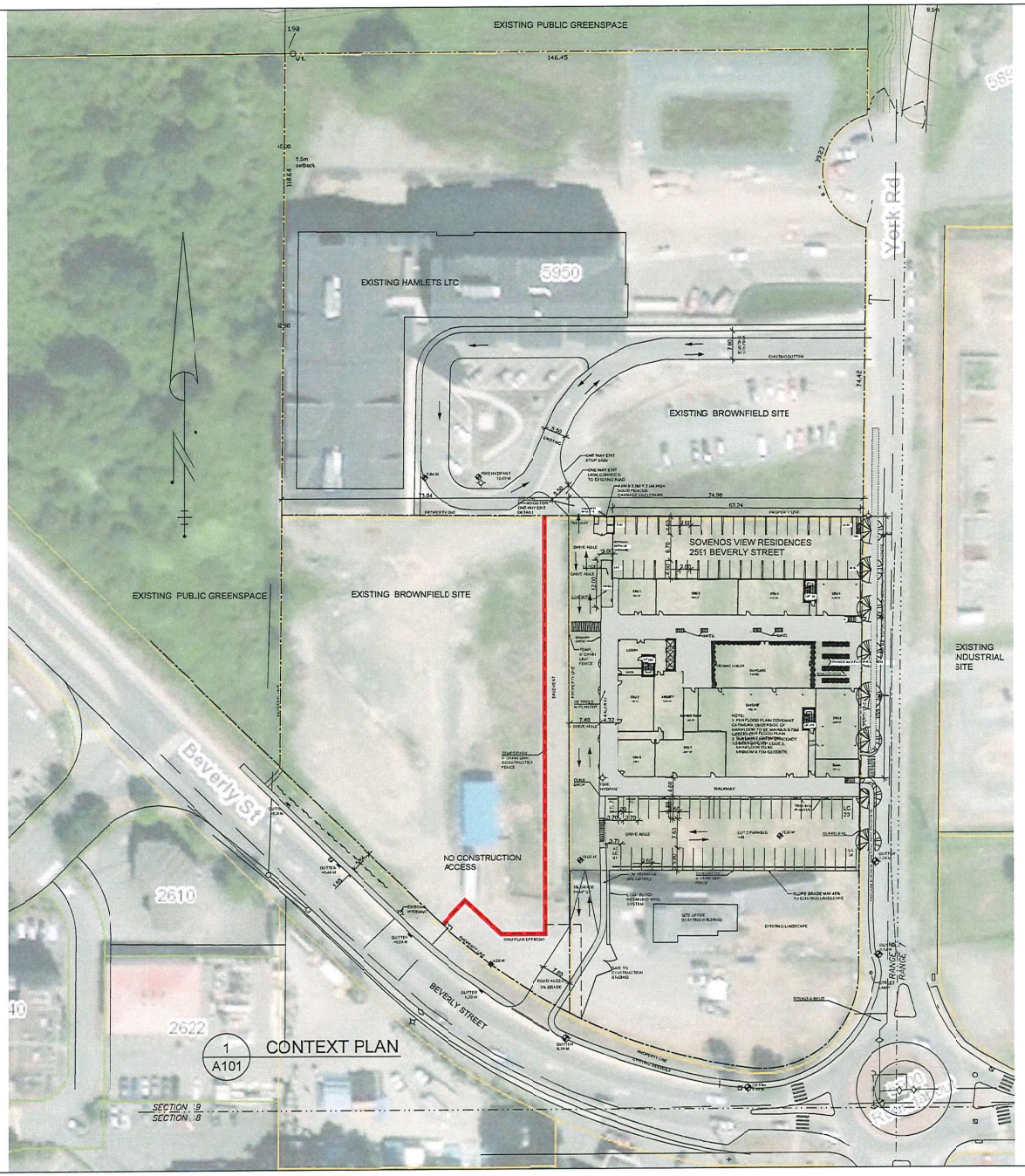
Drawing Number

A003



1 / A100 NEIGHBORHOOD PLAN
NTS

2 / A100 ADJACENT PROPERTIES
NTS



1 / A101 CONTEXT PLAN

Total Concept

OWNER

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NO	DATE	RECORD OF REVISIONS
A	2024-04-09	GARBAGE REVISED
A	2024-04-05	GARBAGE REVISED
A	2024-02-16	SITE ACCESS REVISED
A	2023-06-19	FLOOR AREAS REVISED PER A201
B		
7	2024-04-09	RE-ISSUED FOR DP
6	2024-03-28	RE-ISSUED FOR DP
5	2024-02-16	RE-ISSUED FOR DP
4	2023-06-19	RE-ISSUED FOR DP
3	2023-06-15	ISSUED FOR DP
2	2023-06-13	ISSUED FOR REVIEW
1	2023-05-30	ISSUED FOR REVIEW

NO	DATE	RECORD OF ISSUES

Projects
SOMENOS VIEW RESIDENCES

Sheet Title
CONTEXT PLAN

Job Number

Date 2023-05-30

Scale:

Revision Number

Drawing Number
A-100

SOMENOS LANDING ZONING ANALYSIS BASED ON CD19 ZONE		ALLOWED CD19	ACTUAL SM	VARIANCE	2023-06-15
PERMITTED USES:	AREA 1: MIXED USE BUILDING			N/A	
MIN LOT SIZE		600	10121	N/A	
MIN LOT FRONTAGE		15	207	N/A	
DENSITY		MAX 3:1	1.81	N/A	
PROPOSED SETBACKS	AREA 1	0	0	N/A	
MAX BUILDING HEIGHT	AREA 1	26m/6 storey	26m/6storey	N/A	
OFF-STREET PARKING	AREA 1				
	MULTI-FAMILY	1/UNIT			
	COMMERCIAL	1/30M2			
	ACCESSIBLE	1/100 STALLS			
LANDSCAPE & AMENITY		SM			
TOTAL LANDSCAPE & HARDSCAPE		4735			
LANDSCAPE COVERAGE %		46.8			
FLOOR AREA RATIO (FAR					
Somenos View Residences		SQFT	SM		
GROUND FLOOR		23680.6	2200.0		
2ND FLOOR		34561.0	3210.8		
3RD FLOOR		34561.0	3210.8		
4TH FLOOR		34561.0	3210.8		
5TH FLOOR		34561.0	3210.8		
6TH FLOOR		34561.0	3210.8		
TOTAL FLOOR AREA		196485.6	18254.1		
SITE AREA		108941.00	10121.0		
FAR:		1.80	1.80		

2 A101 BY-LAW ANALYSIS

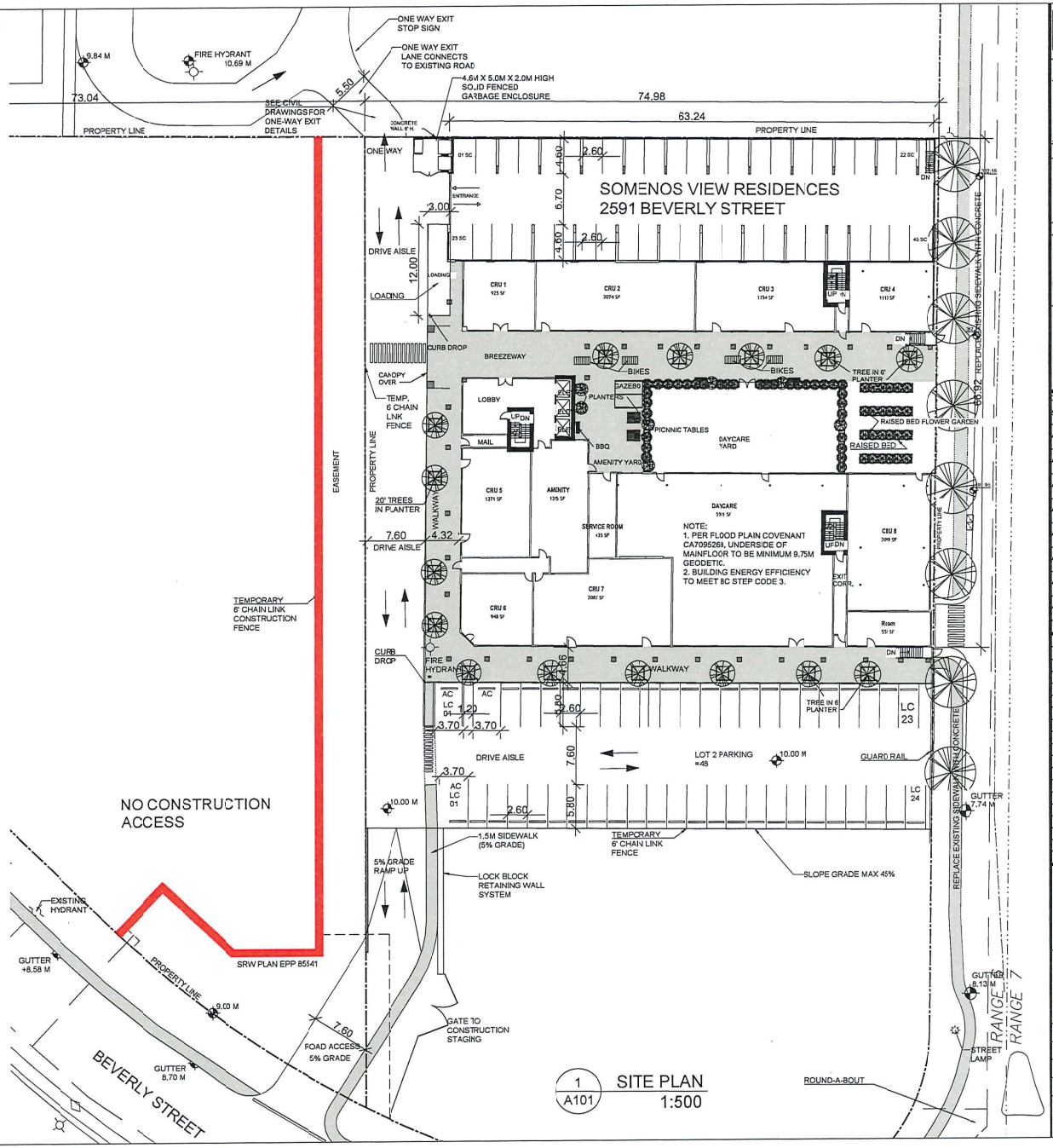
SOMENOS VIEW RESIDENCES - AREA/UNIT COUNT				R2024-03-28
LEVEL 100	SQFT	SQM	PARKING	
CRU-1	928	86.2		
CRU-2	2069	192.2		
CRU-3	1764	163.9		
CRU-4	1074	99.8		
CRU-5	1417	131.6		
CRU-6	921	85.6		
CRU-7	2060	191.4		
CRU-8	2058	191.2		
DAYCARE	5964	554.1		
TOTAL CRU AREA	18255	1695.9	1 SPOT/30M	57

RESIDENTIAL	STUDIO	1 BDR	2 BDR	TOTAL
LEVEL 200	14	22	6	42
LEVEL 300	14	22	6	42
LEVEL 400	14	22	6	42
LEVEL 500	14	22	6	42
LEVEL 600	14	22	6	42
TOTAL UNITS	70	110	30	210

SOMENOS VIEW RESIDENCES PARKING REQUIRED:				267	
SOMENOS VIEW RESIDENCES PARKING PROVIDED					
	U/G	SURFACE	CARPORT	TOTAL	
STANDARD	158	45	0	203	
SMALL CAR	67	0	42	109	
ACCESSIBLE	5	2	0	7	2/100
				319	
TOTAL PROVIDED	230	47	42	319	

	Required	Provided	Excess
Total Parking	267	319	52
Large Car	194	204	10
25% Small Car	67	109	42
Accessible	6	7	1

3 A101 UNIT COUNT & PARKING CALCULATIONS



1 A101 SITE PLAN 1:500

Total Concept

OWNER

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ARCHITECT

SEAL

NO	DATE	RECORD OF REVISIONS
4	2024-04-09	GARBAGE REVISED
3	2024-04-05	GARBAGE REVISED
2	2024-02-16	SITE ACCESS REVISED
1	2023-06-19	FLOOR AREAS REVISED PER A201
8		
7	2024-04-08	RE-ISSUED FOR DP
6	2024-03-26	RE-ISSUED FOR DP
5	2024-02-16	RE-ISSUED FOR DP
4	2023-06-19	RE-ISSUED FOR DP
3	2023-06-15	ISSUED FOR DP
2	2023-06-13	ISSUED FOR REVIEW
1	2023-05-30	ISSUED FOR REVIEW

NO DATE RECORD OF ISSUES

Projects
SOMENOS VIEW RESIDENCES

Sheet Title
SITE PLAN

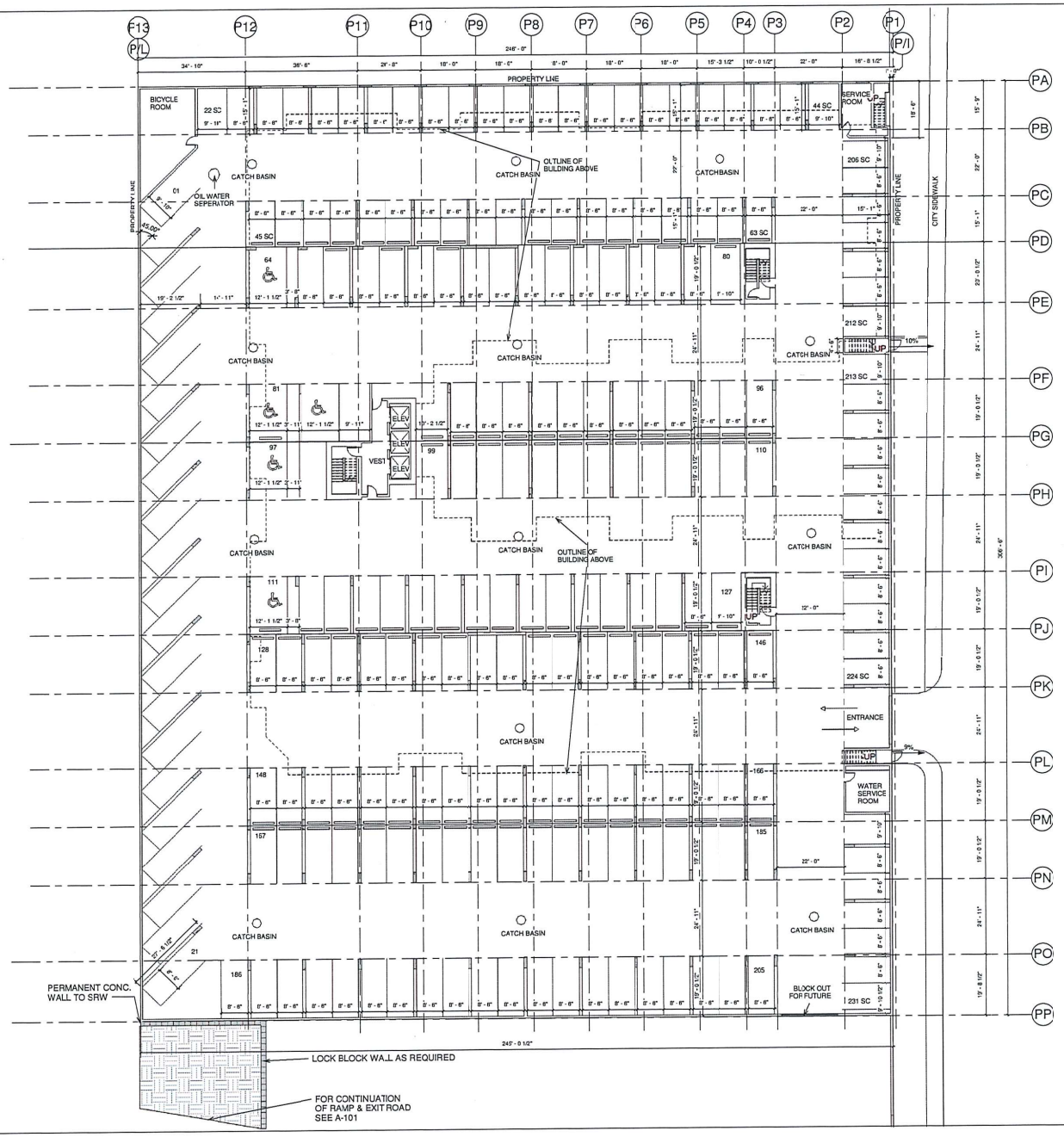
Job Number

Date 2023-05-30

Scale: 1:500

Revision Number

Drawing Number
A-101



Total Concept

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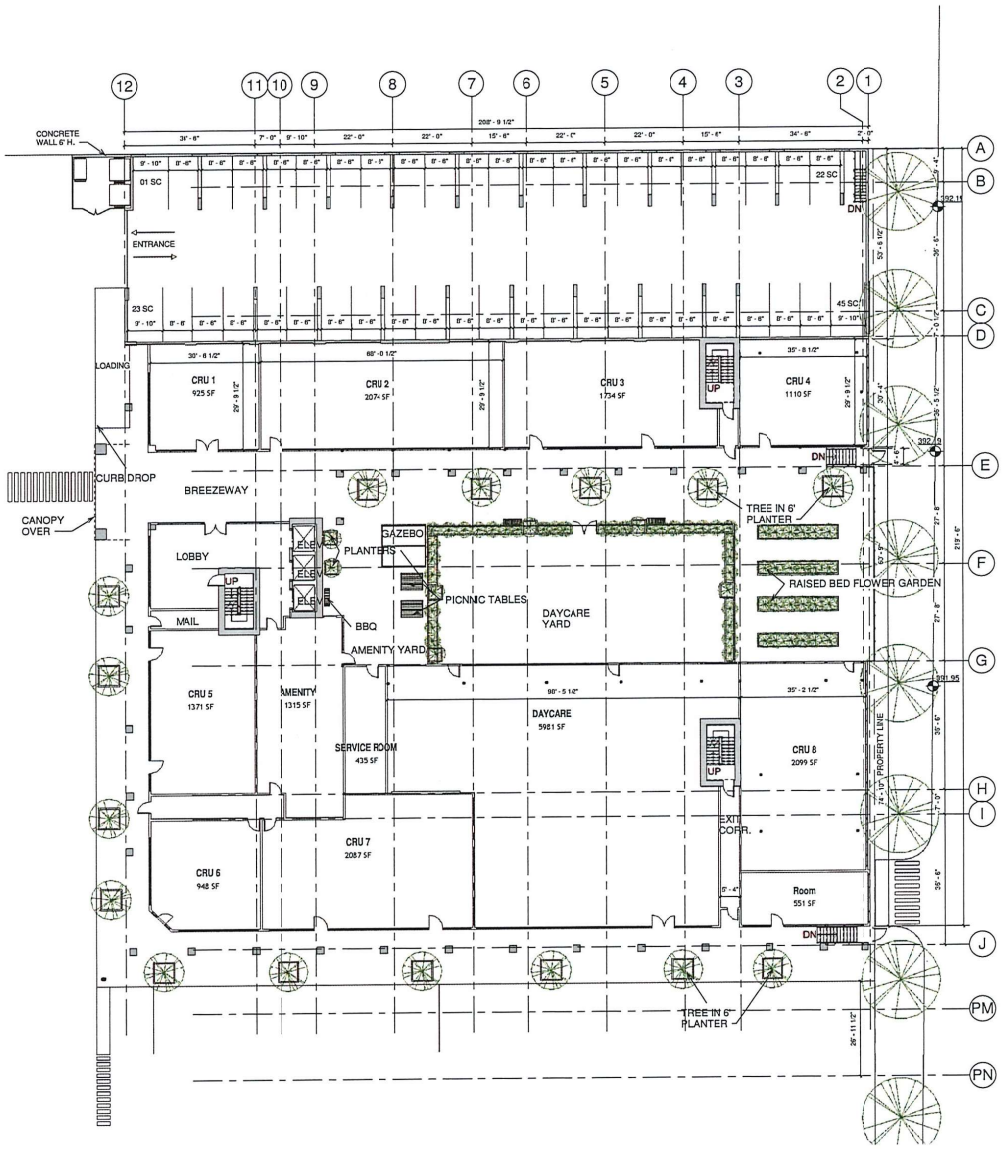
NO	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
2	2024-02-16	RE-ISSUED FOR DP
1	2023-06-19	ISSUED FOR DP

NO	DATE	RECORD OF ISSUES

Project
SOMENOS VIEW RESIDENCES (2591)

Sheet Title
PARKADE LEVEL

Job Number BC-277
Date 2024-03-26
Scale: 1/16" = 1'-0"
Revision Number
Drawing Number
A200



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NO.	DATE	RECORD OF REVISIONS
2	2024-04-09	RE-ISSUED FOR DP
2	2024-02-16	RE-ISSUED FOR DP
1	2023-06-19	ISSUED FOR DP

NO	DATE	RECORD OF ISSUES

Project
SOMENOS VIEW RESIDENCES (2591)

Sheet Title
100 LEVEL FLOOR PLAN

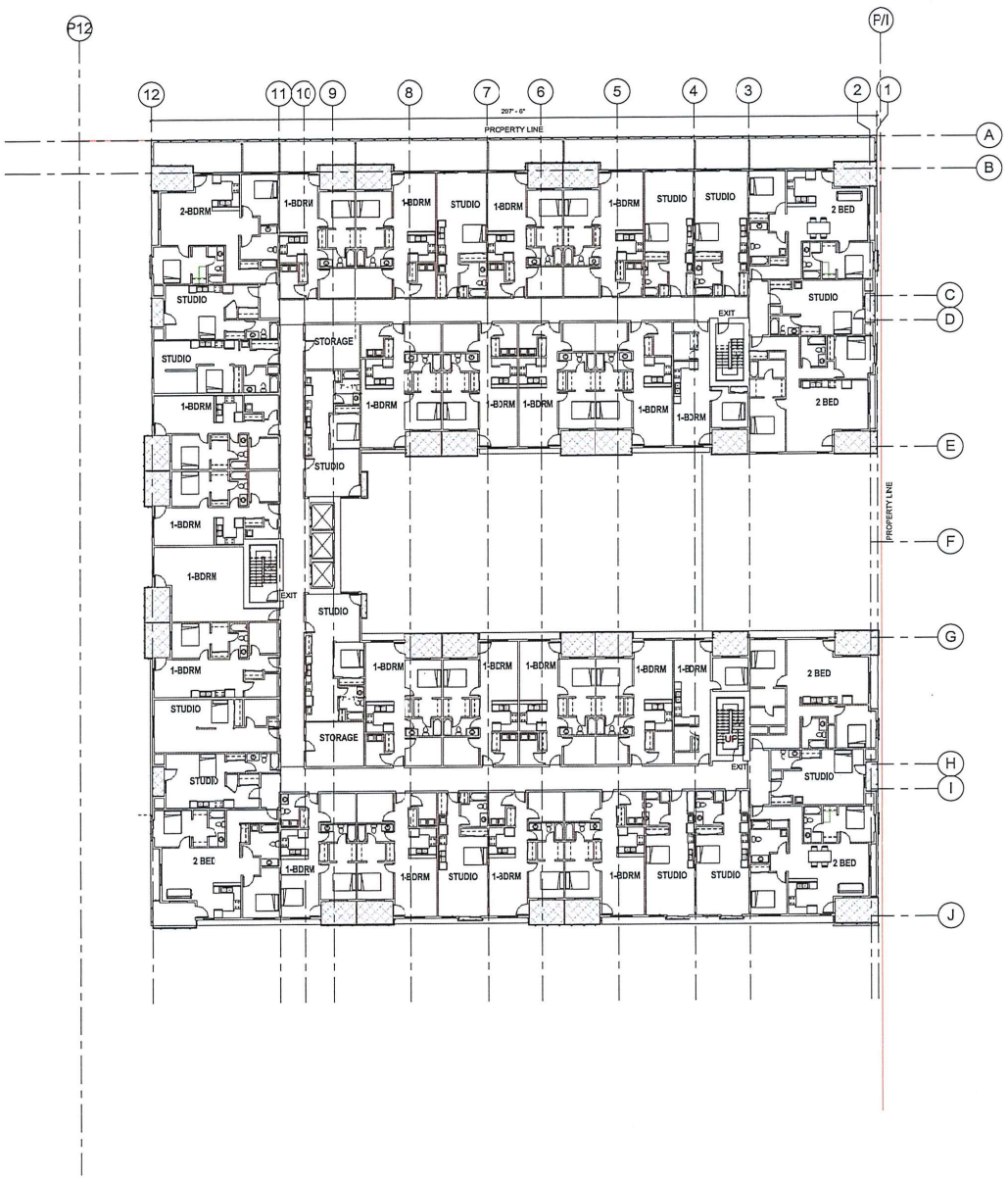
Job Number BC-277

Date 2024-04-05

Scale: 1/16" = 1'-0"

Revision Number

Drawing Number
A201



Total Concept

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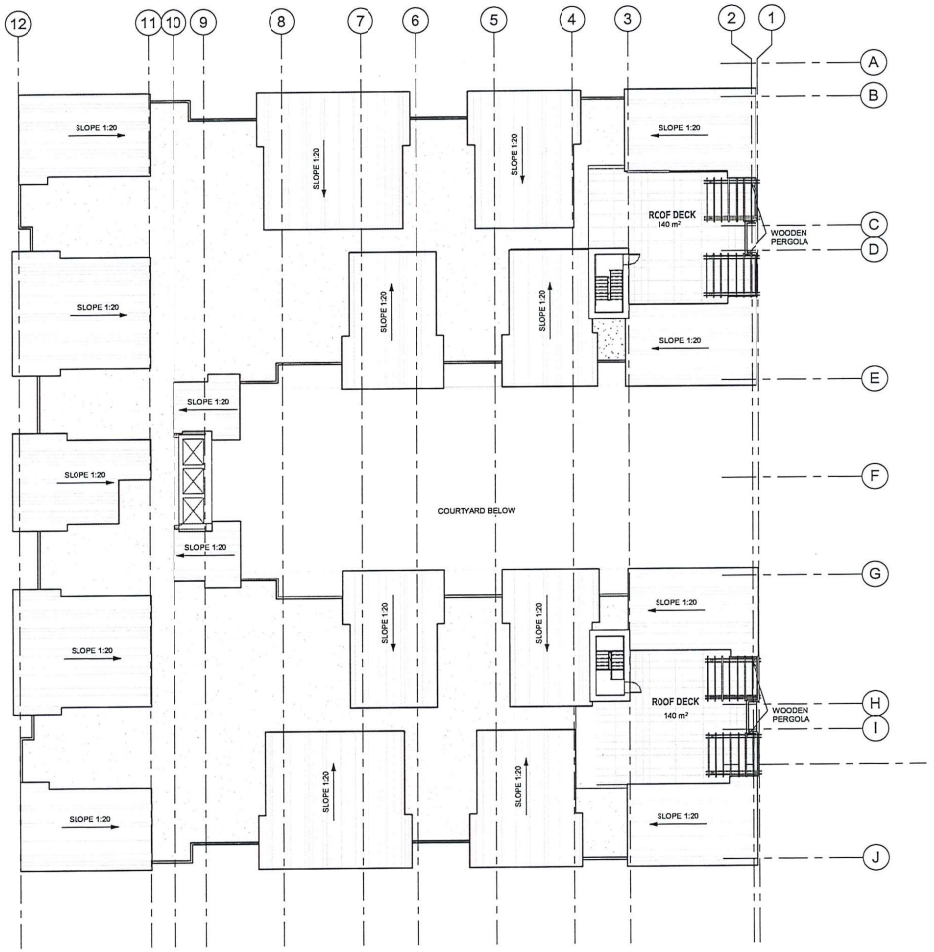
NO	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06-19	ISSUED FOR DP

NO	DATE	RECORD OF ISSUE

Project
SOMENOS VIEW RESIDENCES (BUILDING B)

Sheet Title
TYPICAL FLOOR PLAN

Job Number 8C-277
Date 2024-03-26
Scale: 1/16" = 1'-0"
Revision Number
Drawing Number
A202



Total Concept

OWNER

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SEAL

NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06-19	ISSUED FOR DP

NO	DATE	RECORD OF ISSUES

Project
SOMENOS VIEW RESIDENCES (BUILDING B)

Sheet Title
ROOF PLAN

Job Number	BC-277
Date	2024-02-12
Scale:	1/16" = 1'-0"
Revision Number	
Drawing Number	A203

WEST ELEVATION

1/8" = 1'-0"

KEYNOTES:	
A	Hardie Lap Sliding - Wood tone Cedar
B	Hardie Panels - Deep Ocean w/ Black Easy Trim
C	Hardie Lap Sliding - Arctic White
D	Stucco Grey
E	Cedar Wooden Pergola
F	Veneer Stone Tile
H	Cap Flashing - Iron Gray or Artic White
I	Anodized Aluminum Handrail - Black
J	42" High Anoddized Aluminum Picket Railing - Black
K	72" Anodized Aluminum Privacy Panel with Frosted Glass
L	Glulam Beam
M	Sliding Door - Black
N	Exposed Concrete - Sealed
O	72" High Wood Fence
P	Fire Rated Overhead Door

Total Concept

OWNER

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NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
2	2024-03-16	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO.	DATE	RECORD OF ISSUE

Projects

Somenos View Residences

Sheet Title

WEST ELEVATION

Job Number

Date 2024-03-26

Scale: 1/8" = 1' 0"

Revision Number

Drawing Number

A300

SOUTH ELEVATION

1/8" = 1'-0"

KEYNOTES:	
A	Hardie Lap Sliding - Wood tone Cedar
B	Hardie Panels - Deep Ocean w/ Black Easy Trim
C	Hardie Lap Sliding - Arctic White
D	Stucco Grey
E	Cedar Wooden Pergola
F	Veneer Stone Tile
H	Cap Flashing - Iron Gray or Artic White
I	Anodized Aluminum Handrail - Black
J	42" High Anoddized Aluminum Picket Railing - Black
K	72" Anodized Auminum Privacy Panel with Frosted Glass
L	Glulam Beam
M	Sliding Door - Black
N	Exposed Concrete - Sealed
O	72" High Wood Fence

Total Concept

OWNER

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NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
2	2024-02-16	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO.	DATE	RECORD OF ISSUES

Projects

Somenos View Residences

Sheet Title

SOUTH ELEVATION

Job Number

Date 2024-03-26

Scale: 1/8" = 1'-0"

Revision Number

Drawing Number

A301

EAST ELEVATION

1/8" = 1'-0"

KEYNOTES:	
A	Hardie Lap Sliding - Wood tone Cedar
B	Hardie Panels - Deep Ocean w/ Black Easy Trim
C	Hardie Lap Sliding - Arctic White
D	Stucco Grey
E	Cedar Wooden Pergola
F	Veneer Stone Tile
H	Cap Flashing - Iron Gray or Artic White
I	Anodized Aluminum Handrail - Black
J	42" High Anodcized Aluminum Picket Railing - Black
K	72" Anodized Aluminum Privacy Panel with Frosted Glass
L	Glulam Beam
M	Sliding Door - Black
N	Exposed Concrete - Sealed
O	72" High Wood Fence

Total Concept

OWNER

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ARCHITECT

SEAL

NO	DATE	RECORD OF REVISIONS
2	2024-03-25	RE-ISSUED FOR DP
2	2024-02-16	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO	DATE	RECORD OF ISSUES

Projects

Somenos View Residences

Sheet Title

EAST ELEVATION

Job Number

Date 2024-03-24

Scale: 1/8" = 1' 0"

Revision Number

Drawing Number

A302

NORTH ELEVATION

1/8" = 1'-0"

KEYNOTES:	
A	Hardie Lap Sliding- Wood tone Cedar
B	Hardie Panels - Deep Ocean w/ Black Easy Trim
C	Hardie Lap Sliding - Arctic White
D	Stucco Grey
E	Cedar Wooden Pergola
F	Veneer Stone Tile
H	Cap Flashing - Iron Gray or Artic White
I	Anodized Aluminum Handrail - Black
J	42" High Anoddized Aluminum Picket Railing - Black
K	72" Anodized Aluminum Privacy Panel with Frosted Glass
L	Glulam Beam
M	Sliding Door - Black
N	Exposed Concrete - Sealed
O	72" High Wood Fence

Total Concept

OWNER

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2	2024-03-26	RE-ISSUED FOR DP
2	2024-03-16	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO	DATE	RECORD OF ISSUE

Project:
Somenos View Residences

Sheet Title:
NORTH ELEVATION

Job Number:

Date: 2024-03-26

Scale: 1/8" = 1'-0"

Revision Number:

Drawing Number:
A303

1 / A400 BUILDING SECTION
1/8" = 1'-0"

Total Concept

OWNER

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NO.	DATE	RECORD OF REVISIONS
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO.	DATE	RECORD OF ISSUES

Projects
Somenos View Residences

Sheet Title
BUILDING SECTIONS 01

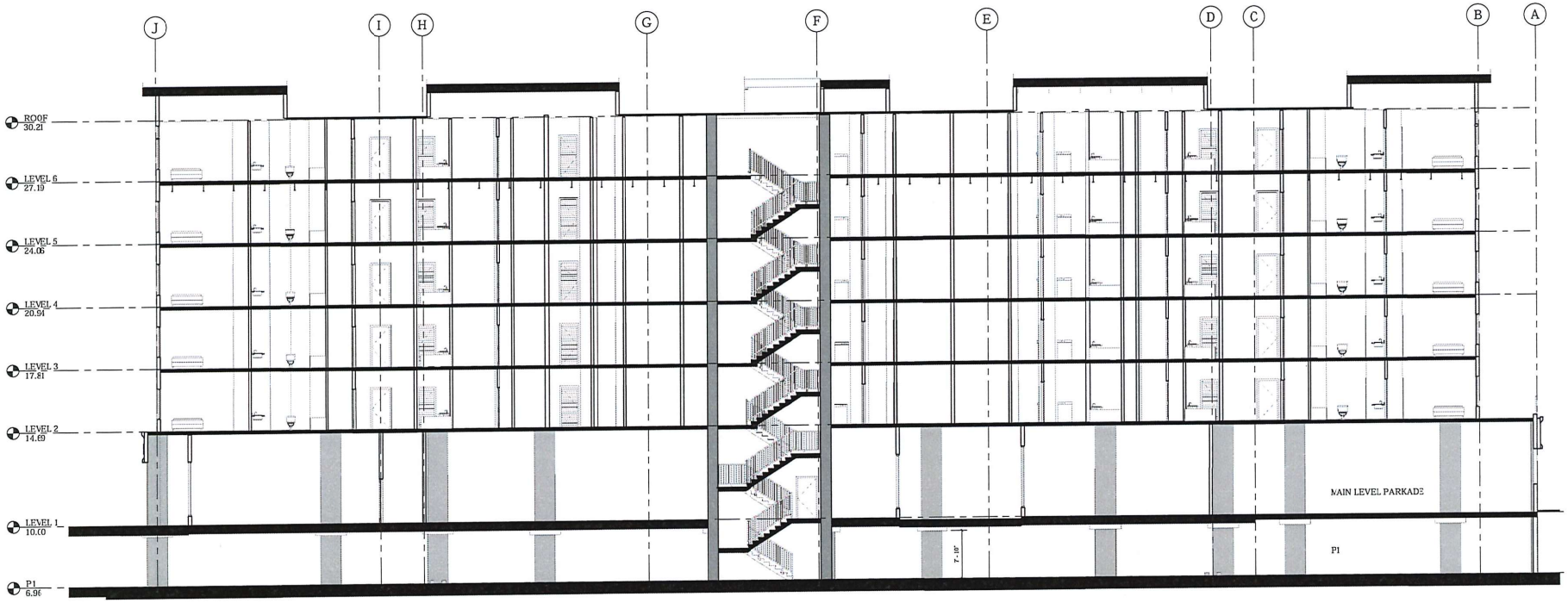
Job Number

Date 2024-03-26

Scale: 1/8" = 1' 0"

Revision Number

Drawing Number
A400



2 / A401 N/S BUILDING SECTION THROLGH STAIRS
1/8" = 1'-0"

Total Concept

OWNER

SHAUNA NOYES ARCHITECT
AIBC
2032 PINANTAN-PRITCHARD RD
PINANTAN LAKE, B.C. V0E 3E1
P. 250-573.3457
C. 250-378-7136
E. shaunya@telus.net

ARCHITECT

SEAL

NO	DATE	RECORD OF REVISIONS

NO	DATE	RECORD OF ISSUES
2	2024-03-26	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

Projects
Somenos View Residences

Sheet Title
BUILDING SECTIONS 01

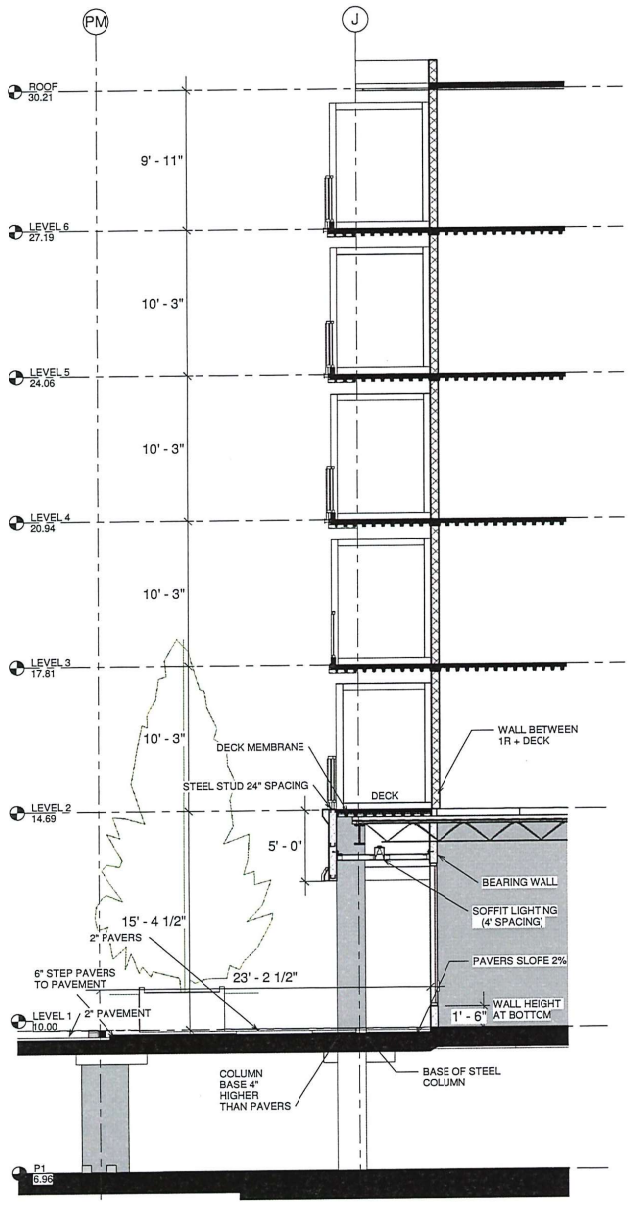
Job Number

Date: 2024-03-26

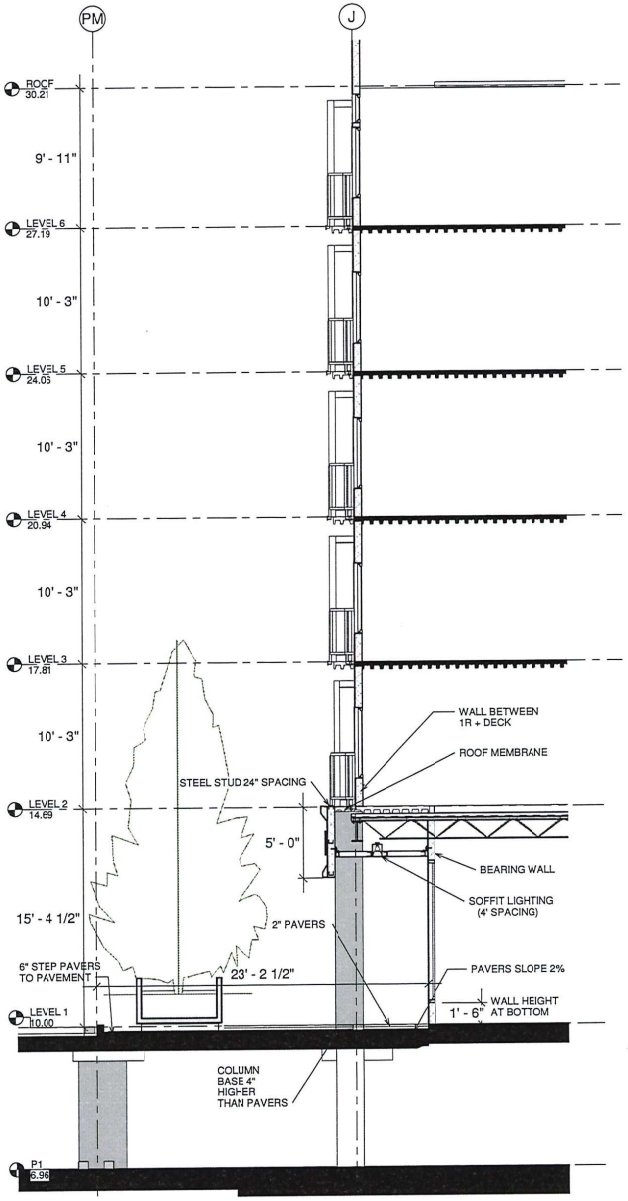
Scale: 1/8" = 1' 0"

Revision Number

Drawing Number
A401



ENLARGED SECTION BETWEEN PLANTERS AND DECK



ENLARGED SECTION AT PLANTER

Total Concept

OWNER

SHAUNA NOYES ARCHITECT
AIBC
2932 PINANTAN-PRITCHARD RD
PINANTAN LAKE, B.C. V0E 2E1
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ARCHITECT

SEAL

NO.	DATE	RECORD OF REVISIONS
3	2024-03-26	RE-ISSUED FOR DP
2	2024-03-12	RE-ISSUED FOR DP
1	2023-06	ISSUED FOR DP

NO	DATE	RECORD OF ISSUES

Projects

Somenos View Residences

Sheet Title

WALL SECTIONS

Job Number

Date: 2024-03-26

Scale: 1/4" = 1' 0"

Revision Number

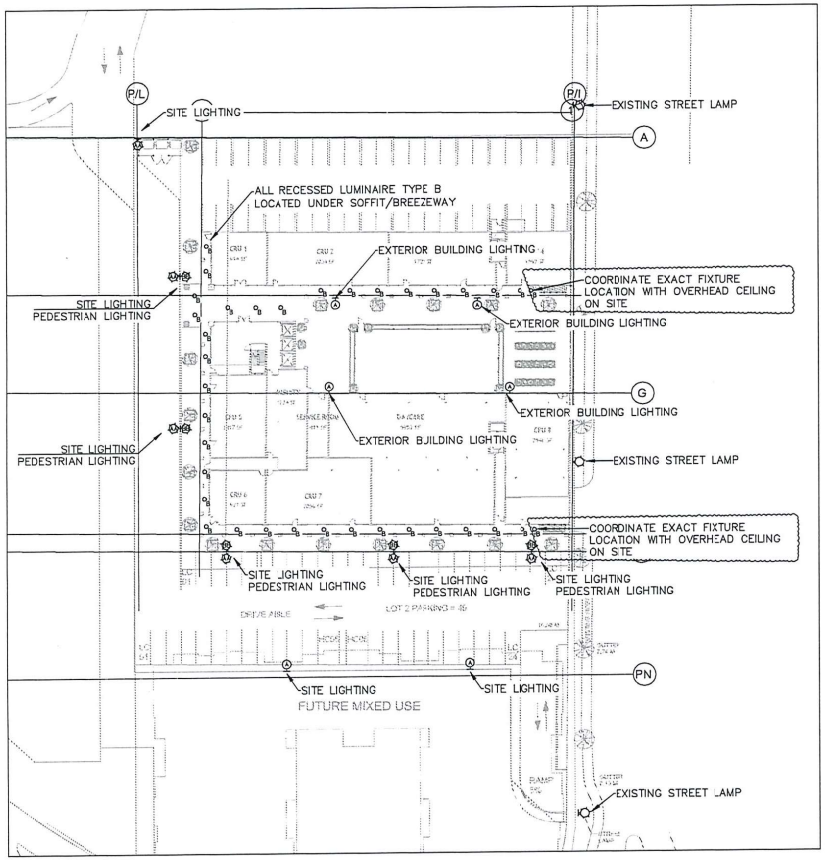
Drawing Number

A500

SCHEDULE 1 Site Lighting

SOMENOS VIEW

RESIDENCES
2591 BEVERLY STREET, DUNCAN
(BUILDING B)
SITE LIGHTING



1 / E0.1 SITE PLAN
SCALE: 1/32"=1'-0"

WARNING:

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE LATEST ARCHITECTURAL, MECHANICAL AND STRUCTURAL DRAWINGS.

BEFORE ROUGH-IN WIRING, REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT LAYOUTS, DIMENSIONS AND ELEVATIONS.

- ALL EXTERIOR LIGHTS TO BE CONTROLLED BY A PHOTOCELL/TIMECLOCK CONTROL CIRCUIT.

THIS PROJECT HAS BEEN DESIGNED TO COMPLY WITH:
- CANADIAN ELECTRICAL CODE 2021
- BC BUILDING CODE 2018
- ASHRAE 90.1 – 2016
- DARK SKY COMPLIANT

DRAWING LIST

NO.	DRAWING NAME	SCALE
E0.1	TITLE SHEET, SITE PLAN, DRAWING LIST & SCHEDULES	NTS
E0.2	SITE PHOTOMETRICS	NTS

ELECTRICAL SYMBOL LEGEND

LIGHTING

- LUMINAIRE – 2X4 CEILING
- LUMINAIRE – 2X2 CEILING
- LUMINAIRE – UNDER CABINET
- STRIPLIGHT LUMINAIRE
- LUMINAIRE – EMERGENCY/NIGHT LIGHT (NL)
- LUMINAIRE – SURFACE MOUNTED
- LUMINAIRE – WALL MOUNTED
- LUMINAIRE – RECESSED WALL MOUNTED
- UL LUMINAIRE – LANDSCAPE/UPLIGHT (TO BE ON TIMER)
- POT LUMINAIRE
- TRACK LIGHTING
- SUSPENDED/PENDANT LIGHTING
- $ SINGLE POLE SWITCH
- $$ TWO GANG SWITCH
- $$$ THREE GANG SWITCH
- $$$$ FOUR GANG SWITCH
- THREE WAY SWITCH(3-3WAY,4-4WAY,D-DIMMER,T-TIMER)
- LOW VOLTAGE SWITCH
- EX CEILING EXIT LIGHT – (ARROWS AS INDICATED)
- EX WALL EXIT LIGHT – (ARROWS AS INDICATED)
- BATTERY PACK (C/W HEADS AS INDICATED)
- WALL / CEILING MOUNTED EMERGENCY REMOTE HEADS
- OS CWD OCCUPANCY SENSOR (C-CEILING, W-WALL, D DUAL (PIR/INFRARED)

POWER

- DUPLEX RECEPTACLE(GFI,WP,TL,IG)
- DUPLEX RECEPTACLE (IN-SLAB FLOOR)
- SINGLE RECEPTACLE
- FOUR-PLEX RECEPTACLE
- SPLIT-FEED RECEPTACLE
- DUPLEX RECEPTACLE – MTD ABOVE COUNTER (GFI)
- SPLIT-FEED RECEPTACLE – MTD ABOVE COUNTER
- ABOVE COUNTER QUAD OUTLET
- FLOOR/CEILING MOUNTED DUPLEX RECEPTACLE (GF)
- EQUIPMENT CONNECTION
- MOTOR
- DISCONNECT SWITCH
- PANELBOARD
- T THERMOSTAT
- JB WALL / CEILING MOUNTED JUNCTION BOX
- CEILING RECEPTACLE

COMMUNICATION

- TELEPHONE OUTLET
- ABOVE COUNTER TELEPHONE OUTLET
- DATA OUTLET
- FLOOR/CEILING DATA OUTLET
- TELEVISION OUTLET
- DUPLEX TELEPHONE/DATA
- STEREO SOUND SPEAKER

GENERAL NOTES

1. THE ELECTRICAL CONTRACTOR SHALL READ THESE DRAWINGS IN CONJUNCTION WITH THE CANADIAN ELECTRICAL CODE (CURRENT EDITION), BC BUILDING CODE (CURRENT EDITION), ALL ARCHITECTURAL, MECHANICAL CIVIL & STRUCTURAL DRAWINGS & SPECIFICATIONS FOR THE PROJECT. NOTE THAT THE SCOPE OF WORK IS NOT LIMITED TO THESE DRAWINGS AND MAY INCLUDE ADDITIONAL ITEMS LISTED IN CCN'S AND CLIENT DIRECTION.
2. THE ELECTRICAL CONTRACTOR IS TO VERIFY EXISTING SITE CONDITIONS BEFORE SUBMITTING HIS/HER BID. IMMEDIATELY NOTIFY THE ENGINEER OF ANY SITE CONDITION THAT MIGHT HINDER OR OBSTRUCT THE ELECTRICAL INSTALLATION AND DESIGN INTENT.
3. FIELD COORDINATE ALL ELECTRICAL CONDUITS, PULL BOXES, DEVICES, EQUIPMENT AND SLEEVES WITH OTHER DIVISIONS ON SITE. ADJUST ELECTRICAL EQUIPMENT PLACEMENT AS REQUIRED TO SUIT FIELD CONDITIONS. ALL NEW ELECTRICAL INSTALLATIONS SHALL BE IN CONFORMANCE WITH THE ABOVE MENTIONED CODES.
4. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE INSTALLATION OF THE ELECTRICAL EQUIPMENT WITH MANUFACTURERS AND SUPPLIERS. NOT ALL COMPONENTS ARE SHOWN. THE CONTRACTOR SHALL PROVIDE ALL COMPONENTS, DEVICES AND MATERIALS AS REQUIRED TO ENSURE A COMPLETE AND OPERATIONAL SYSTEM.
5. THE ELECTRICAL CONTRACTOR SHALL CONFIRM WIRING SIZE AND ENSURE THAT VOLTAGE DROPS IN ALL BRANCH CIRCUITS AND FEEDERS MEET THE CODE REQUIREMENT.
6. ENSURE THAT POWER, COMMUNICATION CABLES AND CONTROL WIRING ARE INSTALLED IN SEPARATELY.
7. THE ELECTRICAL CONTRACTOR SHALL BOND ALL NON-CURRENT CARRYING METAL PARTS OF THE SYSTEM AS REQUIRED BY CODE. ENSURE ALL REQUIRED PARTS OF THE SYSTEM ARE BONDED AND PROTECTED.
8. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE NEW ELECTRICAL SYSTEMS ARE TESTED, STARTED AND READY FOR USE PRIOR TO TURNOVER TO THE OWNER. CONTRACTOR SHALL RELD TEST THE ENTIRE SYSTEM AND ENSURE IT IS OPERATIONAL AND READY FOR USE. COORDINATE WITH THE MANUFACTURE OF ALL SYSTEMS AS PART OF THIS SCOPE OF WORK. ALL TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER.
9. THE CONTRACTOR SHOULD ONLY WORK FROM DRAWINGS MARKED "ISSUED FOR CONSTRUCTION" OR SHALL BEAR COSTS FOR ANY CORRECTIONS AND DAMAGES RESULTING FROM HIS/HER WORK FROM NON-IFC DRAWINGS.
10. ALL TERMINAL/LUGS OF EQUIPMENT SHALL BE RATED FOR A MINIMUM OF 75C. IF THE RATING OF THE TERMINALS/LUGS ARE LESS THAN 75C, THEN CONTACT THE ENGINEER AS THE CONDUITS & CONDUCTORS NEED TO BE RESIZED FOR AN AMPACITY RATING OF 60C.

SCOPE OF WORK

THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL BUILDING ELECTRICAL WORK INCLUDING FEEDER CABLES FROM THE ELECTRICAL ROOM, BRANCH CIRCUITS TO THE NEW ADDITION/RENOVATION AREAS, BREAKERS FOR THE ELECTRICAL DISTRIBUTION EQUIPMENT, LUMINARES, AND BASE BOARD HEATERS.

TENDER INSTRUCTIONS
ALL QUESTIONS ON THE ELECTRICAL DRAWINGS SHALL BE FORWARDED TO THE PROJECT MANAGER IN WRITING. WRITTEN ANSWERS WILL BE DISTRIBUTED TO ALL BIDDERS.

SHOP DRAWINGS
ALLOW FOR 5 BUSINESS DAYS FOR AN ENGINEERING RESPONSE.

FIELD REVIEW
ALLOW 2 BUSINESS DAYS FOR BOOKING AN INSPECTION. THE ELECTRICAL CONTRACTOR IS TO BE PRESENT.

NO.	REMARKS	DATE
03	IFDP – FIXTURE LOCATION UPDATE	24.04.05
02	ISSUED FOR DEVELOPMENT PERMIT – COMPLIANCE UPDATE	23.07.21
01	ISSUED FOR DEVELOPMENT PERMIT	23.06.13
		YY.MM.DD

consultant
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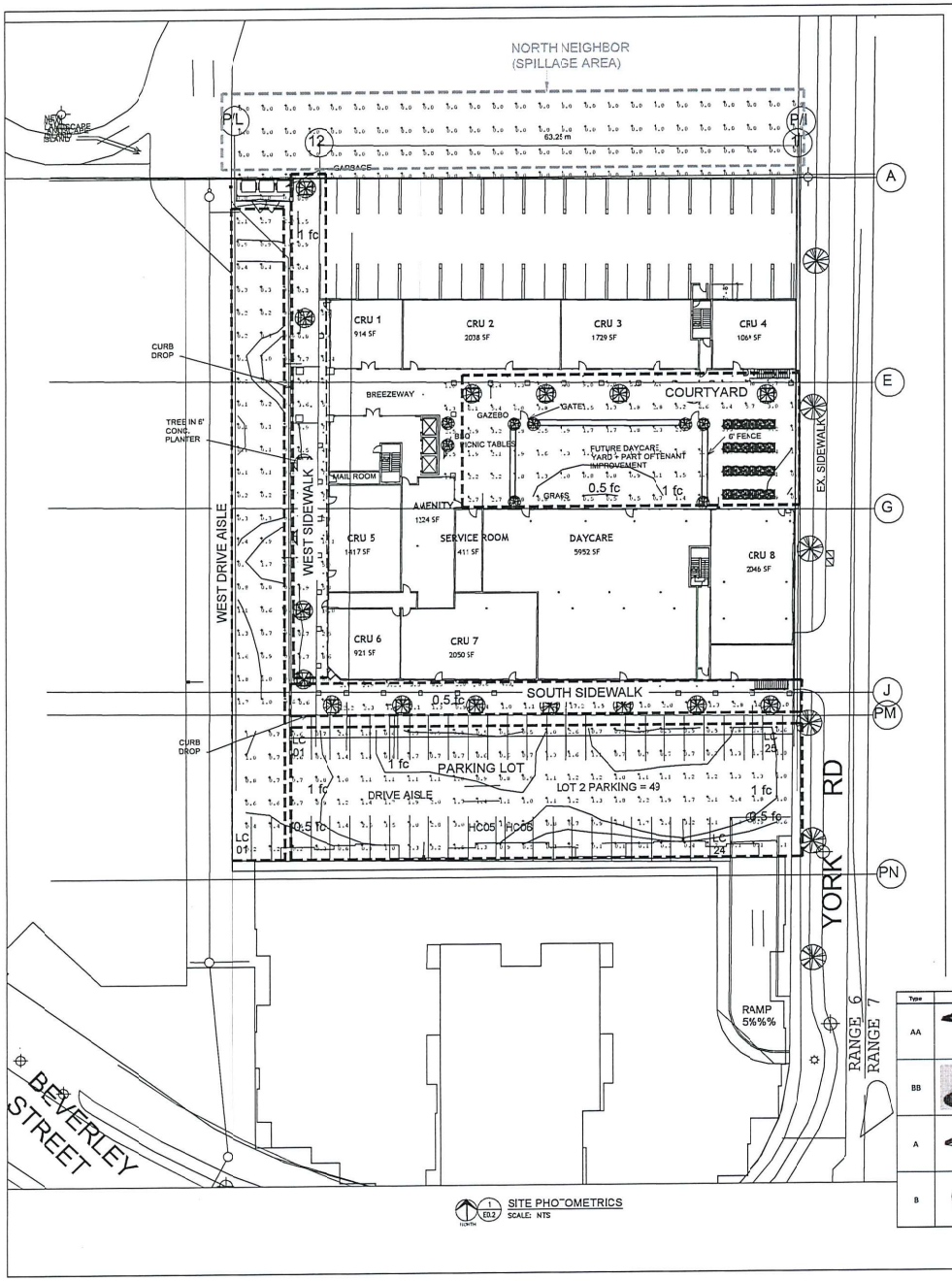
#32034 – 2151 Louie Drive
Westbank, BC V4T 3G2
778-738-2172
info@paralynxengineering.com

project title
SOMENOS VIEW RESIDENCES
2591 BEVERLEY STREET
DUNCAN, BC

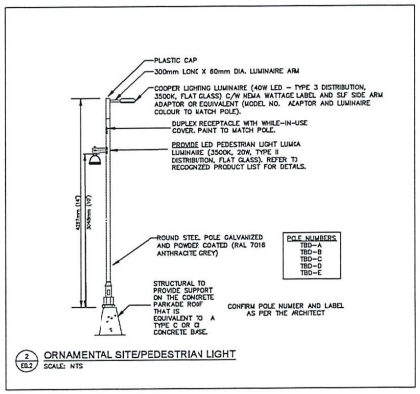
drawing title
TITLE SHEET, SITE PLAN, DRAWING LIST & SCHEDULES

drawn by	SF
date	2024-04-05
checked by	CL
date	2024-04-05
scale	AS SHOWN
project number	PL23-122
seal	
sheet	E0.1
of	2
revision no.	3

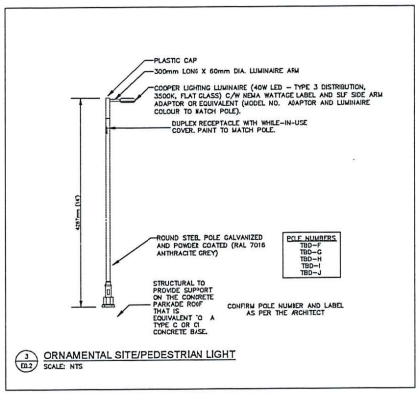
2024-04-09



SITE PHOTOMETRICS
SCALE: NTS



2 / E0.2 ORNAMENTAL SITE/PEDESTRIAN LIGHT
SCALE: NTS



3 / E0.2 ORNAMENTAL SITE/PEDESTRIAN LIGHT
SCALE: NTS

Illuminance (fc)		
Location	Average	Max
Parking Lot	1.1	-
West Sidewalk	4	-
South Sidewalk	4.1	-
West Drive Aisle	0.8	-
Courtyard	2.7	-
North Neighbour		0

REQUIRED MAINTAINED HORIZONTAL ILLUMINANCE AS PER IES RP-20-14 TABLE 1 FOR:
1. R4 (ASPHALT SURFACES) PARKING LOT = 5 lux (0.5fc)
2. R1 (CONCRETE SURFACES) PARKING LOT = 10 lux (1fc)

ACHIEVED ILLUMINANCE = 1.1fc

Luminaire Schedule

Type	Type	Description	Mounting	Comments	DARK SKY COMPLIANT	Switch/Dimmer	Part Number
AA		SITELIGHTING (P26T TOP)	POLE MOUNTED	3000K, 17,100 lm, 40W, BLACK, TYPE III, FINISH, -40CTO +65C	YES	PHOTOCELL & TIMER	MANUFACTURER - COOPER LIGHTING PART NUMBER: PRV-C40-D-UNV-T3-FMA-BK
BB		PEDESTRIAN LIGHTING (SIDE MOUNT)	POLE MOUNTED	3000K, 11,000 lm, 20W, BLACK FINISH, FROSTED LENS	YES	PHOTOCELL & TIMER	MANUFACTURER - LUMCA LIGHTING PART NUMBER - LID-M-M-A-05-01-18LED03-120-L3-30KCRI
A		DOYHLIGHT	WALL MOUNT	3000K, 15,875lm, 125W, TYPE III, BLACK FINISH	YES	PHOTOCELL & TIMER	MANUFACTURER - COOPER LIGHTING PART NUMBER-GLEON-5A2C-735-U-T3-WM
B		DOWNLIGHT	RECESSED IN SOFFIT	3000K, 1,300 lm, 15W, 60 DEGREE SPREAD, BLACK TRIM	NOT APPLICABLE	PHOTOCELL & TIMER	MANUFACTURER - UTECHNOLOGY PART NUMBER-UT-LGD-LM-15W-35K-D-10V-LT-LGD-R-BK (TRIM)

NO.	REMARKS	DATE
03	IFSP – FIXTURE LOCATION UPDATE	24.04.05
02	ISSUED FOR DEVELOPMENT PERMIT – COMPLIANCE UPDATE	23.07.21
01	ISSUED FOR DEVELOPMENT PERMIT	23.06.13
		YY.MM.DD

consultant
PARALYNX ENGINEERING
#32034 – 2151 Loula Drive
Westbank, BC V4T 3G2
778-738-2172
Info@paralynxengineering.com

project title
SOMENOS VIEW RESIDENCES
1591 BEVERLEY STREET
DUNCAN, BC

drawing title
SITE PHOTOMETRICS

drawn by	SF	date 2024-04-05
checked by	GL	date 2024-04-05
scale	AS SHOWN	
project number	PL23-122	
seal		sheet E0.2
		of 2
		revision no. 3

2024-04-09

SCHEDULE 1 Energy Attestation

MORTGAGE LOAN INSURANCE

ENERGY EFFICIENCY CRITERIA ATTESTATION

TO: Capital West <approved lender name> ("Approved Lender")

AND TO: **CANADA MORTGAGE AND HOUSING CORPORATION ("CMHC")**

RE: Multi-unit residential project located at/to be built at
2591 Beverly St, Duncan, B.C. (Somenos View Residences) <municipal address> (the "Project")

I, the undersigned, in my capacity as
Professional Engineer
<as applicable: [certified/licensed/trained] [as applicable: engineer, building consultant, energy advisor, Certified Energy Manager, etc.]>
with expertise and experience in the field of
Whole building energy modelling
<as applicable: e.g., energy consumption modelling and assessment of residential properties>,
do hereby certify to the Approved Lender and CMHC that:

1. the information provided in the *Project Summary*, outlined in the attached report, dated June 15, 2023 <date of report>, is derived directly from the energy consumption and Greenhouse Gas (GHG) assessment I conducted in respect of the Project, using best building energy simulation practices; and
2. the Project qualifies for CMHC's MLI Select energy efficiency criteria, as evidenced by the "✓" which I have included in the applicable table below:

(Dependent on the level of achievement of energy efficiency and GHG emissions reduction, place an "✓" and provide the requisite information in the applicable box (i.e., Level 1, 2 or 3) in either the table for new construction or the table for existing properties, as applicable)

For New Construction

Evaluated based on the % decrease in energy consumption and GHG emissions of the Project, as designed, relative to the energy consumption and GHG emissions of the Project designed to the requirements of the 2017 National Energy Code for Buildings (NECB) – Part 3 multi-unit buildings or the 2015 National Building Code (NBC), as applicable.

Level 1 ☐	Level 2 ☐	Level 3 ✔
20% – 24% lower than NECB or NBC	25% – 39% lower than NECB or NBC	≥40% lower than NECB or NBC
The Project will be <%> lower than <as applicable: [NECB] or [NBC]>	The Project will be <%> lower than <as applicable: [NECB] or [NBC]>	The Project will be <%> lower than <as applicable: [NECB] or [NBC]>

Step 3 of the BC Energy Step Code

20220124-004

Canada CMHC SCHL

For Existing Properties

Evaluated based on the % decrease in energy consumption and GHG emissions of the post-retrofit or post-renewal Project relative to pre-retrofit or pre-renewal energy consumption and GHG emission levels.

Level 1 ☐	Level 2 ☐	Level 3 ☐
15% – 24% decrease over pre-retrofit/pre-renewal consumption	**25% – 39% decrease over pre-retrofit/pre-renewal consumption**	**≥40% decrease over pre-retrofit/pre-renewal consumption**
The energy consumption and GHG emissions will be reduced <%> by relative to the pre-retrofit or pre-renewal consumption.	The energy consumption and GHG emissions will be reduced <%> by relative to the pre-retrofit or pre-renewal consumption.	The energy consumption and GHG emissions will be reduced <%> by relative to the pre-retrofit or pre-renewal consumption.

I acknowledge that the energy analysis upon which this attestation is based may be reviewed, audited or assessed for accuracy and best practices by CMHC or used for CMHC's impact reporting purposes. I agree to provide timely responses to questions from CMHC regarding the analysis and findings and, if necessary, provide a revised analysis and attestation.

DATED the 15 <day> of June <month>, 20 23 <year>

Name: Erik Larson

Designation: P.Eng

Contact Information: erik@delta-t.ca

DELTA-T CONSULTANTS LTD.
MECHANICAL CONSULTING ENGINEERS

EXECUTIVE SUMMARY

PROJECT:	Somenos View Residences, Duncan, B.C.	DATE:	Jun. 15, 2023
JOB NO.:	23196		

Delta-T Consultants Ltd. has been contracted by Tri City Canada Inc. to conduct energy modeling for BC Energy Step Code compliance for the Somenos View Residences (Building B) to be located on 2591 Beverly St. in Duncan, B.C.. The project is to comply with Step 3 of the BC Energy Step Code as an alternative approach for CMHC MLI Select New Construction Energy Efficiency Level 3.

The proposed building will be a steel framed mixed-use building over a concrete parkade with commercial units on the main level and approximately 210 residential units from the second to sixth floors. The project is currently at the Development Permit stage. The client is committed to design and build to achieve BC Energy Step Code Step 3.

The proposed building envelope is to have:

- 2"x6" steel frame wall with Min. R-20 batt insulation and R10 continuous exterior insulation.
- Steel frame roof with Min. R-44 insulation
- Suspended concrete slab with Min. R-20 spray insulation
- Double glazed low-E windows. Triple glazed windows may be considered, if needed.
- Building envelope with reduced infiltration rate, if needed.

The proposed building mechanical/electrical system is to consist of:

- VRF system for commercial spaces on main level
- Ducted split heat pump system to provide heating & cooling to each residential suite. Other HVAC systems with similar efficiency may also be considered.
- Energy recovery ventilator for suite ventilation
- Gas fired make-up air unit for corridor pressurization. Condensing model may be considered if needed.
- Individual electric hot water heater for domestic hot water
- Low flow plumbing fixtures, if needed
- Gas fired condensing boiler for parkade heating
- Electric baseboard heaters to provide heating to miscellaneous spaces
- LED lighting in common & CRU spaces

The building will be tested for air tightness according to the BC Energy Step Code.

Delta-T Consultants Ltd. will conduct whole building energy modelling as the project progress and work with the client and design team to ensure the building satisfies the BC Energy Step Code Step 3 targets.

PREPARED BY:

Erik Larson, P.Eng.

Delta-T Consultants Ltd.

SCHEDULE 2 Civil Plan

TRICITY CANADA INC.

SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

SITE INFRASTRUCTURE

DUNCAN, BC

FOR BUILDING PERMIT (PARKADE)

WSP Project No: CA0006559
Date: 2024-04-08

DRAWING LIST:

SHEET DESCRIPTION	SHEET TITLE
CA0006559-C-000	TITLE SHEET
CA0006559-C-000A	GENERAL NOTES
CA0006559-C-001	EXISTING CONDITIONS PLAN
CA0006559-C-002	SITE PLAN
CA0006559-C-100	ROAD A PLAN & PROFILE STA 0+000 TO 0+140
CA0006559-C-101	ROAD A PLAN & PROFILE STA 0+140 TO 0+260
CA0006559-C-102	OFFSITE SANITARY PLAN & PROFILE
CA0006559-C-200	EROSION AND SEDIMENT CONTROL PLAN
CA0006559-C-201	EXCAVATION SECTIONS
CA0006559-C-300	TURNING MOVEMENTS

We see the future more clearly and design for it today.

WSP Canada Inc. Suite 100 - 989 McGill Place, Kamloops, BC V2C 6N9 T 250-828-6116 | www.wsp.com

GENERAL NOTES

1. THE CONTRACTOR SHALL CONTACT THE OWNER TO ARRANGE A PRE-CONSTRUCTION MEETING PRIOR TO THE START OF CONSTRUCTION.
2. CONTACT "BC ONE CALL" AT 1-800-474-6886 A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION TO LOCATE ALL EXISTING UTILITIES.
3. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH:
   - APPLICABLE LOCAL MUNICIPAL BYLAWS AND GUIDELINES.
   - THE MASTER MUNICIPAL CONSTRUCTION DOCUMENT AND STANDARD DETAIL DRAWINGS (MMCD) LATEST EDITION (PLATINUM EDITION);
   - CONSTRUCTION PLANS, SEALED AND ISSUED FOR CONSTRUCTION
   - APPLICABLE CONTRACT DOCUMENTS AND ALL SPECIFICATIONS REFERENCED THEREIN.
   - FLNRO AND/OR MINISTRY OF ENVIRONMENT AND/OR FEDERAL DEPARTMENT OF FISHERIES AND OCEANS REQUIREMENTS;
   - MINISTRY OF TRANSPORTATION "B. C. TRAFFIC CONTROL MANUAL FOR WORK ON ROADWAYS", LATEST EDITION;
   - WORKSAFE BC LATEST EDITION.
   - HEALTH AUTHORITY.

   THE CONTRACTOR SHALL MAINTAIN ON SITE COPIES OF THE ABOVE DOCUMENTS AND SHALL ENSURE THAT ALL TRADES ARE THOROUGHLY FAMILIAR WITH THE APPLICABLE SECTIONS OF THE DOCUMENTS.
4. THE CONTRACTOR SHALL EXPOSE AND VERIFY THE LOCATION AND ELEVATION OF ALL EXISTING SERVICES IN THE FIELD PRIOR TO CONSTRUCTION AND NOTIFY THE ENGINEER OF RECORD OF ANY DISCREPANCIES, CONFLICTS OR OMISSIONS PRIOR TO CONSTRUCTION.
5. FIGURED DIMENSION SHALL GOVERN OVER SCALED DIMENSIONS.
6. LOT DIMENSIONS SHOWN ARE FOR REFERENCE ONLY. REFER TO BCLS REGISTERED LEGAL PLAN FOR ACTUAL LOT DIMENSIONS. THE CONTRACTOR SHALL CONFIRM LOCATIONS OF LOT LINES PRIOR TO INSTALLATION OF SERVICE CONNECTIONS.
7. THE CONTRACTOR SHALL ENSURE THAT ALL APPROVALS REQUIRED FOR THE PROPOSED WORKS HAVE BEEN OBTAINED FROM ALL AUTHORITIES AND AGENCIES PRIOR TO COMMENCING THE WORK.
8. THE CONTRACTOR SHALL ARRANGE FOR AND COORDINATE THE WORKS DONE BY
   - BC HYDRO, TELUS, CABLE AND GAS.
   - OTHER FRANCHISE UTILITIES.
9. THE CONTRACTOR SHALL CONTACT THE APPROPRIATE PERSONNEL AT LEAST 72 HOURS PRIOR TO THE WORK. SCHEDULING AND OTHER CONSTRUCTION CONSTRAINTS IMPOSED BY THESE WORKS SHALL BE TAKEN INTO ACCOUNT.
10. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY EXISTING STREETS, SERVICES, OR LANDSCAPING THAT MAY BE DAMAGED AS A RESULT OF CONSTRUCTION. REPAIRS TO EXISTING SERVICES SUCH AS WATER, SANITARY SEWER, STORM SEWER AND STREET OR TRAFFIC LIGHTING SHALL BE MADE BY THE CITY AT COST TO THE CONTRACTOR UNLESS OTHERWISE AGREED TO. REPAIRS TO EXISTING SURFACE WORKS MAY BE DONE BY THE CONTRACTOR AT THE DISCRETION OF THE CITY.
11. THE CONTRACTOR SHALL ENSURE THAT STREETS ARE KEPT CLEAN AND FREE OF EQUIPMENT AND MATERIALS AT ALL TIMES WHEN CONSTRUCTION ACTIVITY IS NOT UNDERWAY.
12. A TRAFFIC AND PEDESTRIAN SAFETY CONTROL PLAN SHALL BE SUBMITTED BY THE CONTRACTOR PRIOR TO THE PRE-CONSTRUCTION MEETING.
13. CONTRACTOR SHALL BE REGISTERED WITH WORKSAFE BC.

EARTHWORKS & GRADING

1. THE CONTRACTOR SHALL ENSURE ALL CONSTRUCTION ACTIVITIES ARE IN ACCORDANCE WITH THE GEOTECHNICAL RECOMMENDATIONS. WHERE THE GEOTECHNICAL REPORT VARIES FROM THE STANDARD MMCD 2009 (PLATINUM) EDN. SECTION 31 CLAUSES, THE REQUIREMENTS OF THE GEOTECHNICAL REPORT SHALL TAKE PRECEDENCE.
2. ALL TESTING OF MATERIALS AND COMPACTION SHALL BE PERFORMED BY A GEOTECHNICAL ENGINEER. PRIOR TO ISSUANCE OF THE SUBSTANTIAL COMPLETION CERTIFICATE, THE SUPERVISING CONSULTING ENGINEER SHALL SUBMIT TO THE CITY A FINAL GEOTECHNICAL REPORT PREPARED BY THE GEOTECHNICAL ENGINEER. COPIES OF REPORTS AND TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD AS WORK PROGRESSES OR AS REQUESTED.
3. GEOTECHNICAL ENGINEER TO REVIEW AND APPROVE EXISTING MATERIAL, TRENCH BACKFILL, AND IMPORTED MATERIAL PRIOR TO PLACEMENT.
4. REMOVE VEGETATION, STRIP ORGANIC MATERIAL, AND UNSUITABLE MATERIAL, AS REQUIRED, PRIOR TO PLACING STRUCTURAL FILL.
5. COMPACT ALL EARTH FILLS AND GRANULAR MATERIAL LAYERS TO 95% MODIFIED PROCTOR DENSITY (MPD), UNLESS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER.
6. AREAS SHALL BE GRADED TO +/- 50mm AT NOTED CONTROL POINTS. FINAL GRADING SHALL BE COMPLETED PRIOR TO THE ISSUANCE OF A SUBSTANTIAL COMPLETION CERTIFICATE.
7. EMBANKMENTS SHALL BE PLACED, SHAPED, COMPACTED, AND PROTECTED TO STANDARDS AND SPECIFICATIONS OF THE GEOTECHNICAL ENGINEER.
8. ALL SIEVE, PROCTOR AND DENSITY TEST RESULTS TO BE PROVIDED TO THE ENGINEER OF RECORD.

EROSION AND SEDIMENT CONTROL

1. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT BMPS ARE IMPLEMENTED ON SITE. ACCEPTABLE BMPS INCLUDE THOSE PROVIDED BELOW, THOSE PROVIDED BY THE EROSION AND SEDIMENT CONTROL SUPERVISORS, AND THOSE PROVIDED IN FISHERIES AND OCEANS CANADA'S LAND DEVELOPMENT GUIDELINES FOR THE PROTECTION OF AQUATIC HABITAT (1993):
   a. CLEAR ONLY THE AREAS NECESSARY (LEAVE VEGETATION IN AREAS THAT DON'T REQUIRE DISTURBANCE)
   b. ESTABLISH A STABILIZED ENTRY/EXIT POINT
   c. PROTECT THE PERIMETER OF THE SITE
   d. DIVERT UP-SLOPE WATER AROUND THE WORK SITE (KEEP CLEAN WATER CLEAN)
   e. ROUGHEN EXPOSED SOILS
   f. TEMPORARILY STABILIZE DISTURBED EARTH
   g. CREATE TEMPORARY SEDIMENT DETENTION FACILITIES ONSITE
   h. INSTALL INLET PROTECTION MEASURES AT ALL STORM SYSTEM INLETS
   i. PLACE SOIL PILES UPSLOPE OF THE PERIMETER PROTECTION AND COVER WITH PLASTIC SHEETING OR EROSION CONTROL BLANKETS
   j. DEWATER TO A CONTAINED PART OF THE SITE AND ALLOW IT TO INFILTRATE INTO THE SOIL
   k. INSTALL ROOF DOWNPIPES AS SOON AS PRACTICABLE AFTER THE ROOF IS LAID
   l. ENSURE THAT ALL CONTROL MEASURES ARE MAINTAINED IN GOOD WORKING ORDER
   m. RE-VEGETATE OR OTHERWISE PERMANENTLY STABILIZE THE SITE
2. THE CONTRACTOR SHALL INSPECT, DOCUMENT, AND MAINTAIN ESC WORKS REGULARLY, AND AFTER EACH SIGNIFICANT RAINFALL EVENT. RECOMMENDATIONS CONCERNING ADDITIONS, MAINTENANCE, AND MODIFICATIONS TO THE ACCEPTED PLAN, OR NEW BEST MANAGEMENT PRACTICES (BMPS), SHALL BE IMPLEMENTED IMMEDIATELY BY THE CONTRACTOR.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE MODIFICATION AND MAINTENANCE OF THE ESC WORKS ON AN ONGOING BASIS, AND IMMEDIATELY PERFORM REMEDIAL WORKS AS DIRECTED BY THE ESCS, THE MUNICIPALITY HAVING JURISDICTION, ENGINEER OF RECORD, OR OTHER REGULATORY AND GOVERNMENT AGENCIES.

ROADWORKS

1. CONTRACTOR TO ARRANGE FOR REQUIRED TESTING AT LEAST 48 HOURS PRIOR TO COVERING WORKS.
2. CHANGES OF GRADE AND DIRECTION SHALL BE FORMED BY SMOOTH VERTICAL AND HORIZONTAL CURVES.
3. ALL SUB-BASE ROAD AND GRANULAR BASE MATERIALS SHALL BE COMPACTED TO 95% MPD.
4. EARTHWORKS, INCLUDING STRIPPING ALL LOOSE OR OTHERWISE DELETERIOUS MATERIALS OR SOFT SPOTS, COMPACTING, AND SLOPE GRADING, SHALL BE COMPLETED TO THE APPROVAL OF A GEOTECHNICAL ENGINEER.
5. THE CONDITIONS FOR PLACING ASPHALT PAVEMENT AND CONCRETE SHALL CONFORM WITH THE SPECIFICATIONS DETAILED IN MMCD 2009 (PLATINUM) EDN.
6. TIE-INS TO EXISTING PAVEMENT SHALL BE MADE BY CUTTING BACK THE EXISTING PAVEMENT TO SOUND MATERIAL AS NECESSARY TO PRODUCE A NEAT VERTICAL FACE. PRIOR TO PLACING ASPHALTIC CONCRETE, EXPOSED PAVEMENT FACES AND OTHER ABUTTING STRUCTURES SHALL BE TACK COATED WITH ASPHALT EMULSION.
7. ALL NEW PAVEMENT SHALL BE GRADED SO THAT NO PONDING FORMS. THE MINIMUM CROSS SLOPE ON ANY NEW OR OVERLAIN ROAD SURFACE SHALL BE 2%, UNLESS OTHERWISE SPECIFIED.
8. ALL VALVES BOXES, MANHOLES, ETC., THAT ARE WITHIN THE PAVED SURFACE OF THE ROADWAY SHALL BE SET AT BASE COURSE ELEVATION FOR THE WARRANTY PERIOD, AND ADJUSTED TO FINISHED COURSE ELEVATION PRIOR TO FINISH COURSE PAVING, IF APPLICABLE.

SANITARY SEWER

1. TIE-INS AND CONNECTIONS TO EXISTING SANITARY SEWERS TO BE PERFORMED BY THE CONTRACTOR UNDER THE DIRECT SUPERVISION OF THE ENGINEER OF RECORD. A MINIMUM 72 HOURS NOTICE TO BE GIVEN FOR ANY TIE-IN.
2. NEW SEWER LINES TIED TO EXISTING LINES SHALL BE PLUGGED UNTIL THEY ARE TESTED AND FLUSHED.
3. POWER FLUSHING SHALL BE PERFORMED ON ALL MAINS PRIOR TO ACCEPTANCE. VIDEO TAPE OF ALL MAINS SHALL BE REVIEWED BY THE ENGINEER PRIOR TO PLACING IN SERVICE. TESTING AND VIDEO INSPECTION SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE SUPERVISING CONSULTING ENGINEER. VIDEO TAPES AND TEST RESULTS SHALL BE PROVIDED TO THE ENGINEER PRIOR TO THE ISSUANCE OF A SUBSTANTIAL COMPLETION CERTIFICATE.
4. DELETERIOUS MATERIALS SHALL BE PREVENTED FROM ENTERING THE SEWER SYSTEM.
5. TOP OF INSPECTION CHAMBER STANDPIPES SHALL BE SET TO 600mm ABOVE FINAL LOT GRADE.
6. MANUFACTURED WYES OR APPROVED ALTERNATIVE SHALL BE USED FOR ALL SERVICE CONNECTIONS TO SANITARY MAINS.
7. PROVIDE A MINIMUM 1.0m COVER FOR SANITARY SEWERS.
8. ALL PIPE TO BE PVC DR35 OR AS NOTED.

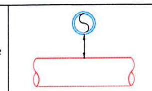
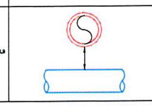
STORM

1. TIE-INS AND CONNECTIONS TO EXISTING STORM SEWERS TO BE PERFORMED BY THE CONTRACTOR UNDER THE DIRECT SUPERVISION OF THE ENGINEER OF RECORD, FOLLOWING APPROVAL TO PROCEED FROM THIS CITY. A MINIMUM 72 HOURS NOTICE TO BE GIVEN FOR ANY TIE-IN.
2. NEW SEWER LINES TIED TO EXISTING LINES MUST BE PLUGGED UNTIL THEY ARE TESTED AND FLUSHED.
3. POWER FLUSHING SHALL BE PERFORMED ON ALL MAINS PRIOR TO ACCEPTANCE. VIDEO TAPE OF ALL MAINS SHALL BE REVIEWED BY THE ENGINEER PRIOR TO PLACING IN SERVICE. TESTING AND VIDEO INSPECTION SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE SUPERVISING CONSULTING ENGINEER. VIDEO TAPES AND TEST RESULTS SHALL BE PROVIDED TO THE CITY PRIOR TO THE ISSUANCE OF A SUBSTANTIAL COMPLETION CERTIFICATE.
4. DELETERIOUS MATERIALS SHALL BE PREVENTED FROM ENTERING THE SEWER SYSTEM.
5. TOP OF INSPECTION CHAMBER STANDPIPES SHALL BE SET TO 600mm ABOVE FINAL LOT GRADE.
6. MANUFACTURED WYES OR APPROVED ALTERNATIVE SHALL BE USED FOR ALL SERVICE CONNECTIONS TO STORM MAINS.
7. PROVIDE A MINIMUM 1.0m COVER FOR STORM SEWERS.
8. ALL NEW DETENTION STRUCTURES, INFILTRATION FACILITIES AND FLOW CONTROL STRUCTURES EG. ORIFICES, GATES, WEIRS TO BE VIDEO TAPED OR PHOTOGRAPHED BY THE CONTRACTOR.
9. ALL PIPE TO BE PVC DR35 OR AS NOTED.

WATER

1. PRESSURE TESTING AND CHLORINATION OF NEW WATERWORKS TO BE PERFORMED PRIOR TO TIE-IN TO EXISTING WORKS AND WITNESSED BY ENGINEER OF RECORD. CONTRACTOR TO PROVIDE TESTING PLAN TO ENGINEER OF RECORD PRIOR TO UNDERTAKING TESTS.
2. THE CONTRACTOR SHALL ENSURE THAT ALL NEW WATERWORKS HAVE TEST POINTS AND TEMPORARY BLOW-OFFS SUITABLE TO ENSURE ADEQUATE PRESSURE TESTING, CHLORINATION AND FLUSHING. DISCHARGE OF CHLORINATED WATER INTO DITCHES, STORM SEWERS OR WATERCOURSES IS STRICTLY PROHIBITED.
3. PROVIDE A MINIMUM 1.0m COVER FOR WATERMAINS.
4. WATERMAINS SHALL BE MARKED BELOW GRADE USING A METALLIC DETECTABLE REINFORCED UNDERGROUND UTILITY MARKING TAPE. THE TAPE SHALL BE MINIMUM 150mm WIDE, METALLIC BLUE IN COLOUR AND SHALL BE MARKED "CAUTION: WATER LINE BURIED BELOW." THE TAPE IS TO BE INSTALLED ON TOP OF THE PIPE CUSHION, A MINIMUM OF 300mm ABOVE THE TOP OF THE PIPE. MARKING TAPE SHALL BE "THORTEC" OR APPROVED EQUAL.
5. A MINIMUM OF 1.5m HORIZONTAL CLEAR SEPARATION AND 150mm CLEAR VERTICAL SEPARATION SHALL BE MAINTAINED BETWEEN WATERMAINS AND ELECTRICAL CONDUITS, GAS MAINS AND TELEPHONE CONDUITS, UNLESS OTHERWISE SPECIFIED.
6. CONTRACTOR SHALL CONDUCT PRESSURE TEST IN ACCORDANCE WITH MMCD SPECIFICATIONS AND IN THE PRESENCE OF THE CIVIL ENGINEER.
7. CONTRACTOR TO MAINTAIN ACCESS AND WATER SERVICE TO LOCAL HOUSEHOLDS AND BUSINESSES AT ALL TIMES.
8. NEW WATERMAINS ARE TO BE PRESSURE TESTED, CHLORINATED AND BACTERIOLOGICALLY ACCEPTED BY INTERIOR HEALTH AUTHORITY PRIOR TO CONNECTION TO THE WATER SYSTEM. SUPERCHOLRINATED WATER SHALL BE NEUTRALIZED IN ACCORDANCE WITH MINISTRY OF ENVIRONMENT AND DEPARTMENT OF FISHERIES AND OCEANS GUIDELINES PRIOR TO DISCHARGE TO ANY DRAINAGE COURSE.
9. HEALTH AUTHORITY PERMIT TO CONSTRUCT IS REQUIRED PRIOR TO COMMENCING WORK.
10. ALL PIPE TO BE PVC DR18 OR AS NOTED.

CROSSINGS[6]:

WATERMAIN **ABOVE** SEWER		≥450mm CLEAR VERTICAL SEPARATION – NO SPECIAL PROTECTION REQUIRED
		1. 150 TO 450mm CLEAR VERTICAL SEPARATION – WATERMAIN JOINTS TO BE PROTECTED[7] – ADDITIONAL BEDDING STRUCTURAL SUPPORT REQUIRED
WATERMAIN **BELOW** SEWER[8,9]		2. >450mm CLEAR VERTICAL SEPARATION – BOTH WATERMAIN AND SEWER JOINTS TO BE PROTECTED[7]
		3. 150 TO 450mm CLEAR VERTICAL SEPARATION – BOTH WATERMAIN AND SEWER JOINTS TO BE PROTECTED[7] – ADDITIONAL BEDDING STRUCTURAL SUPPORT REQUIRED

PREFERRED ↓ NOT GENERALLY ACCEPTED

- [6]WATERMAIN TO BE LAID ABOVE THE SEWER IF POSSIBLE, WITH THE CENTRE OF THE PIPE LOCATED AT THE CROSSING TO MAXIMIZE THE SEPARATION DISTANCE BETWEEN JOINTS. VERTICAL SEPARATION LESS THAN 150mm NOT ALLOWED.
- [7]DISTANCE FOR PROTECTIVE MEASURES IS MEASURED NORMAL (PERPENDICULAR) TO THE SEWER. SEE TABLE 1 BELOW FOR PRECAUTIONS TO REDUCE THE RISK OF SANITARY AND STORM SEWAGE ENTERING WATERMAINS THAT MAY BE CONSIDERED.
- [8]PROVIDE A HYDRAULIC BARRIER IN TRENCH BETWEEN SEWER AND WATERMAIN. BARRIER MUST EXTEND AT LEAST 300mm (1 FOOT) BEYOND OUTER EDGE OF WATERMAIN ON BOTH SIDES.
- [9]NOT APPLICABLE TO SEWER FORCEMAINS.

TABLE 1. EXAMPLE PROTECTIVE MEASURES TO BE CONSIDERED (MORE THAN ONE MEASURE MAY BE REQUIRED)

– PROTECT WATERMAIN JOINTS AND SEWER JOINTS WITH SHRINK-WRAP, PETROLATUM TAPE, OR OTHER EQUIVALENT PIPELINE PROTECTION PRODUCTS. FOR EXISTING SEWERS, THE DISTANCE FOR PROTECTIVE MEASURES MAY BE REDUCED TO 1.5m (5 FEET) FROM NEW WATERMAIN TO AVOID EXCESSIVE EXCAVATION (SEE FIGURE 1 BELOW).
– CONSTRUCT SEWER OF EQUIVALENT CLASS PRESSURE PIPE OR REINFORCED CONCRETE PIPE USING FLEXIBLE GASKETS.
– ENCASE EITHER WATERMAIN OR SEWER INSIDE CASING PIPE SLEEVE. THE CASING PIPE MUST BE A MATERIAL THAT IS APPROVED FOR USE AS A WATERMAIN

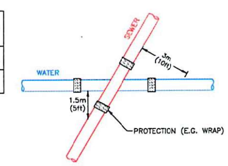


FIGURE 1. JOINT WRAPPING WHERE REQUIRED.

FRANCHISE UTILITIES

1. FRANCHISE UTILITIES INCLUDING BUT NOT LIMITED TO BC HYDRO, TELUS, SHAW, AND FORTIS ARE SHOWN FOR INFORMATION ONLY. REFER TO FRANCHISE UTILITY DRAWINGS SPECIFICATIONS FOR DESIGN AND CONSTRUCTION PURPOSES

FOR BUILDING PERMIT 2024-04-08

LEGEND:

REVISION:

REV	DATE	DESCRIPTION	BY
C	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
B	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
A	2024-03-21	FOR REVIEW	CJB

SEAL: Engineers and Geoscientists BC Permit #1000200
2024-04-08
D. RANDELL
PROFESSIONAL LICENSEE ENGINEERING

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PROJECT NUMBER: CA0006559

CLIENT: TRICITY CANADA INC.

CLIENT REF. #

PROJECT: SOMENOS VIEW RESIDENCES 2591 BEVERLY STREET

TITLE: GENERAL NOTES

DRAWING NUMBER: C-000A
REV. C

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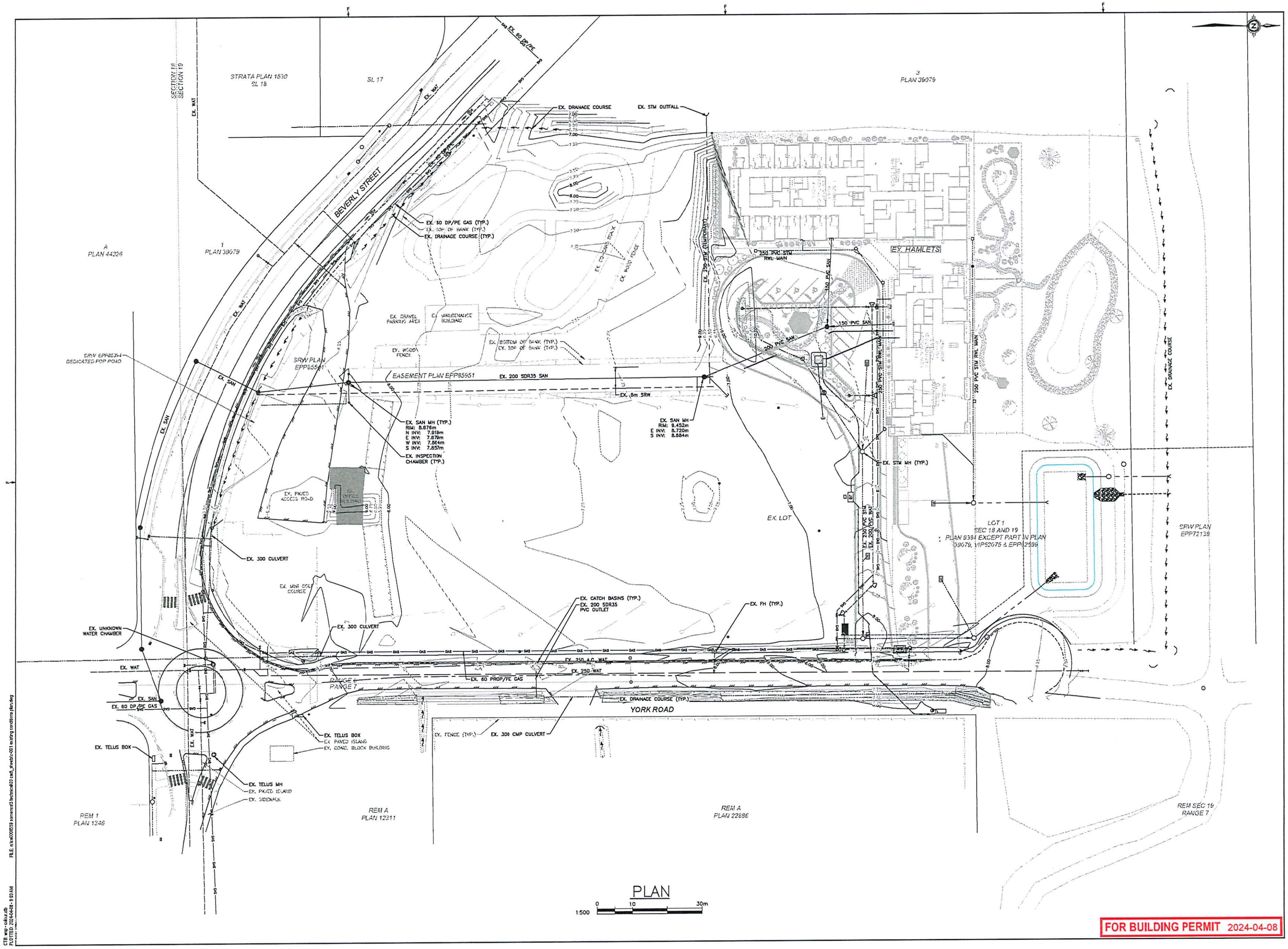
STRATA PLAN 1550
SL 18
SL 17
3
PLAN 39079
SECTION 18
SECTION 19
BEVERLY STREET
A
PLAN 44326
1
PLAN 39079
EX. DRAINAGE COURSE
EX. STM OUTFALL
EX. 50 DP/PE GAS (TYP.)
EX. TOP OF BANK (TYP.)
EX. DRAINAGE COURSE (TYP.)
EX. GRAVEL PARKING AREA
EX. MAINTENANCE BUILDING
EX. BOTTOM OF BANK (TYP.)
EX. TOP OF BANK (TYP.)
EX. HAMLETS
EASEMENT PLAN EPP85951
EX. 200 SDR35 SAN
EX. 6m SRW
EX. SAN MH (TYP.)
RIM: 8.876m
N INV: 7.919m
E INV: 7.879m
W INV: 7.864m
S INV: 7.857m
EX. INSPECTION CHAMBER (TYP.)
EX. SAN MH
RIM: 9.452m
E INV: 8.720m
S INV: 8.684m
EX. STM MH (TYP.)
EX. PAVED ACCESS ROAD
EX. LOT
LOT 1
SEC 18 AND 19
PLAN 9384 EXCEPT PART IN PLAN
39079, VIP52075 & EPP72599
SRW PLAN
EPP72138
EX. 300 CULVERT
EX. UNKNOWN WATER CHAMBER
EX. 300 CULVERT
EX. CATCH BASINS (TYP.)
EX. 200 SDR35 PVC OUTLET
EX. FH (TYP.)
EX. WAT
EX. SAN
EX. 60 DP/PE GAS
EX. 60 PROP/PE GAS
EX. 250 WAT
EX. DRAINAGE COURSE (TYP.)
YORK ROAD
RANGE 6
RANGE 7
EX. TELUS BOX
EX. PAVED ISLAND
EX. CONC. BLOCK BUILDING
EX. FENCE (TYP.)
EX. 300 CMP CULVERT
EX. TELUS BOX
EX. TELUS MH
EX. PAVED ISLAND
EX. SIDEWALK
REM 1
PLAN 1346
REM A
PLAN 12311
REM A
PLAN 22880
REM SEC 19
RANGE 7
PLAN
1:500
0
10
30m

LEGEND:

EXISTING / PROPOSED

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REV	DATE	DESCRIPTION	BY
D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
B	2024-03-21	FOR REVIEW	CJB
A	2024-02-15	FOR EARTHWORKS PERMIT	EBF

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2024-04-08
D. RANDELL

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CLIENT: TRICITY CANADA INC.

CLIENT REF. #

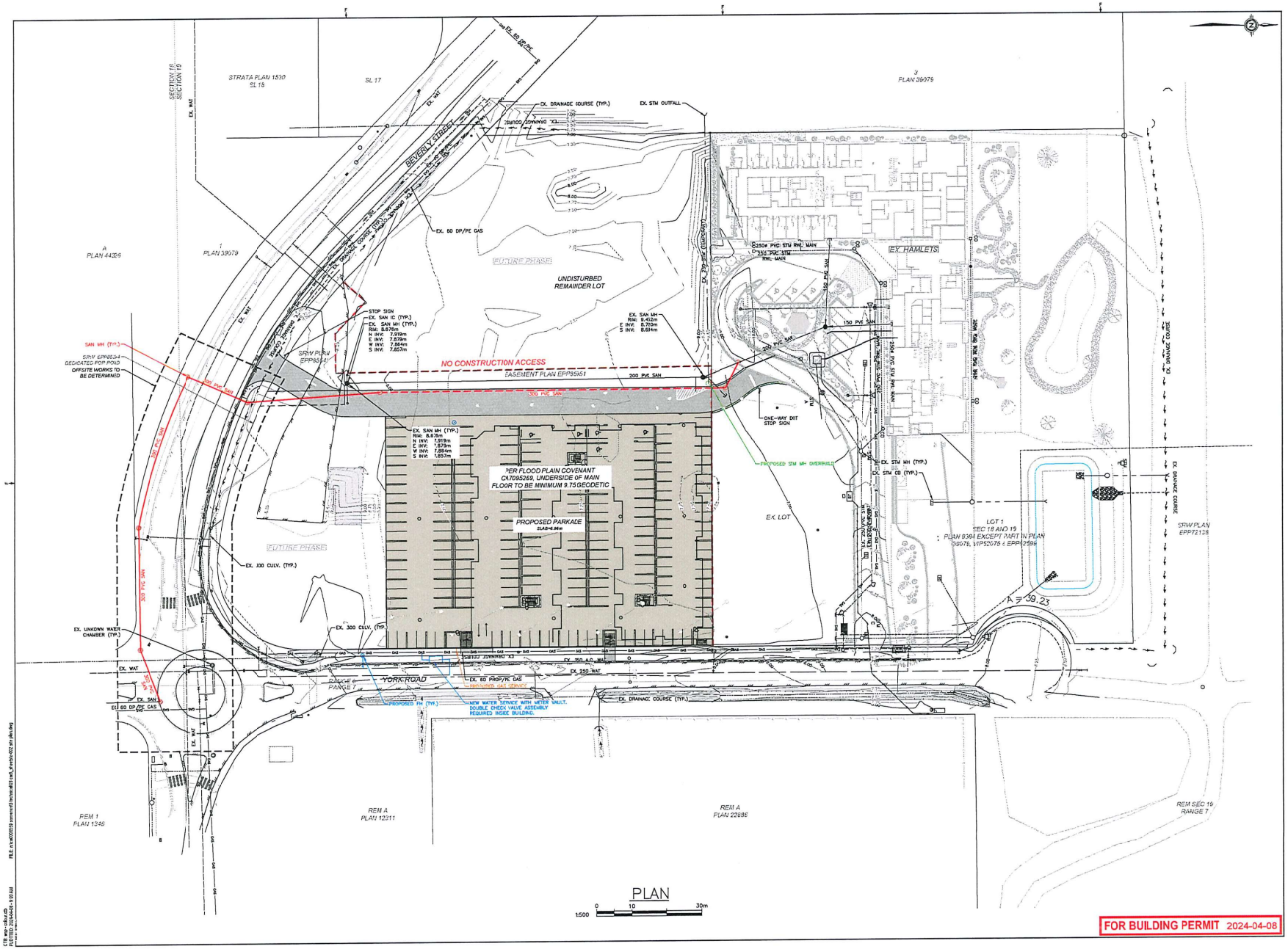
PROJECT: SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

TITLE: EXISTING CONDITIONS PLAN

DRAWING NUMBER: C-001

REV. C

FOR BUILDING PERMIT 2024-04-08



LEGEND:

REVISION:

REV	DATE	DESCRIPTION	BY
F	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
E	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
D	2024-03-21	FOR REVIEW	CJB
C	2024-02-15	FOR EARTHWORKS PERMIT	EBF
B	2023-08-11	FOR PRELIMINARY	EBF
A	2023-05-14	FOR CONCEPTUAL	EBF

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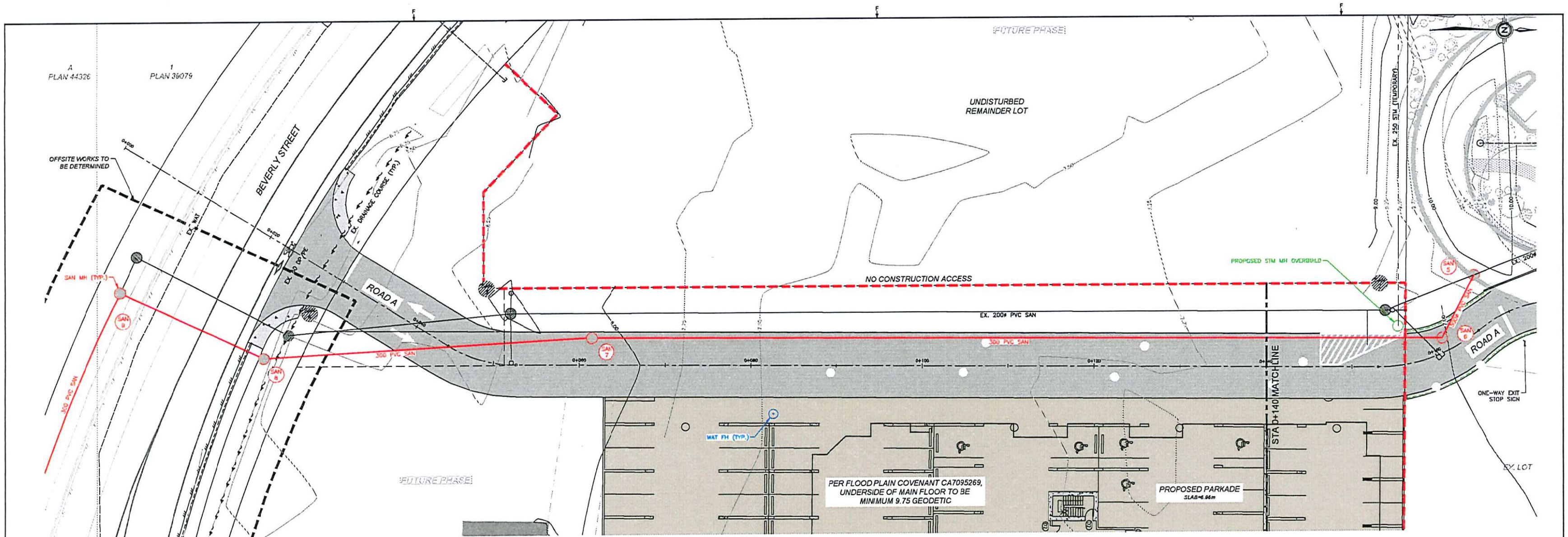
CLIENT REF. #

PROJECT: SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

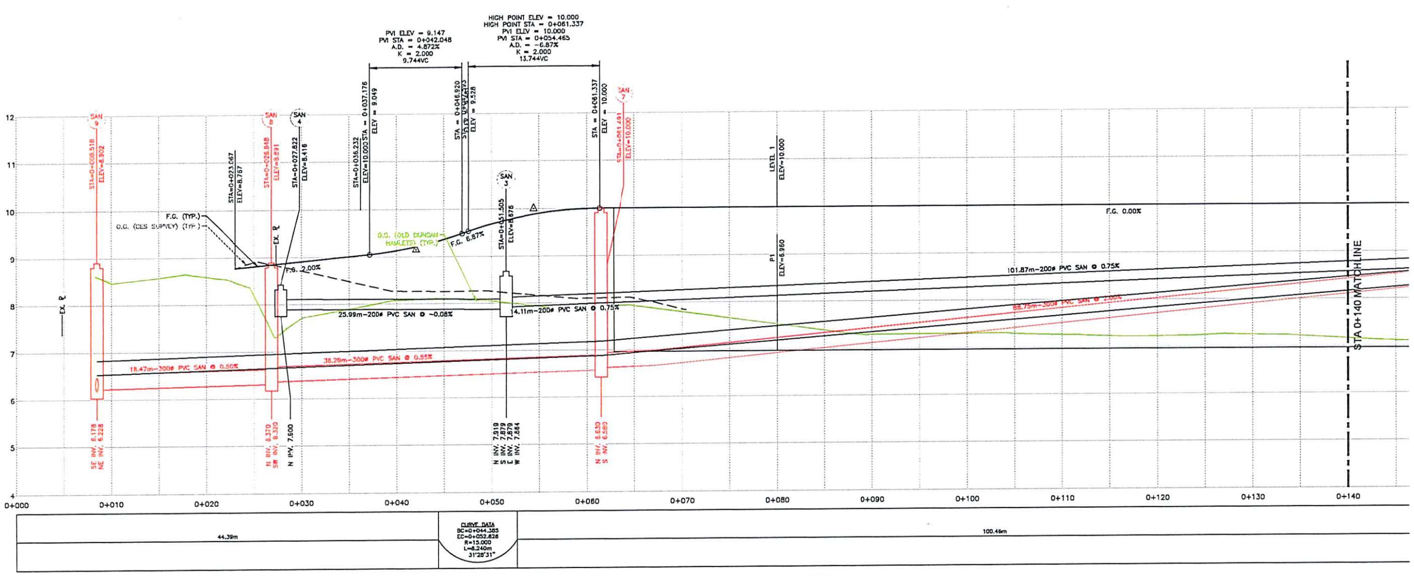
TITLE: SITE PLAN

DRAWING NUMBER: C-002
REV. F


FUTURE PHASE
PLAN 44326
PLAN 39079
OFFSITE WORKS TO BE DETERMINED
BEVERLY STREET
UNDISTURBED REMAINDER LOT
NO CONSTRUCTION ACCESS
PROPOSED STM MH OVERBUILD
ROAD A
EX. 200ø PVC SAN
300 PVC SAN
SAN MH (TYP.)
STA 0+140 MATCHLINE
ONE-WAY EXIT STOP SIGN
EX. LOT
WAT FH (TYP.)
PER FLOOD PLAIN COVENANT CA7095269, UNDERSIDE OF MAIN FLOOR TO BE MINIMUM 9.75 GEODETIC
PROPOSED PARKADE
FUTURE PHASE

PLAN

1:250 0 5 15m


PVI ELEV = 9.147
PVI STA = 0+042.048
A.D. = 4.872%
K = 2.000
9.744VC
HIGH POINT ELEV = 10.000
HIGH POINT STA = 0+061.337
PVI ELEV = 10.000
PVI STA = 0+054.465
A.D. = -6.87%
K = 2.000
13.744VC
F.G. (TYP.)
O.G. (CDS SURVEY) (TYP.)
F.G. 0.00%
101.87m-200ø PVC SAN @ 0.75%
25.99m-200ø PVC SAN @ -0.08%
4.11m-200ø PVC SAN @ 0.75%
15.47m-300ø PVC SAN @ 0.50%
38.29m-300ø PVC SAN @ 0.55%
STA 0+140 MATCHLINE
0+000
0+010
0+020
0+030
0+040
0+050
0+060
0+070
0+080
0+090
0+100
0+110
0+120
0+130
0+140
44.39m
100.46m
CURVE DATA

PROFILE

0 5 H 1:250 15m
0 1 V 1:50 3m

FOR BUILDING PERMIT 2024-04-08

LEGEND:

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D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
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B	2024-03-21	FOR REVIEW	CJB
A	2024-02-15	FOR EARTHWORKS PERMIT	EBF

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CLIENT:

TRICITY CANADA INC.

CLIENT REF. #

PROJECT:

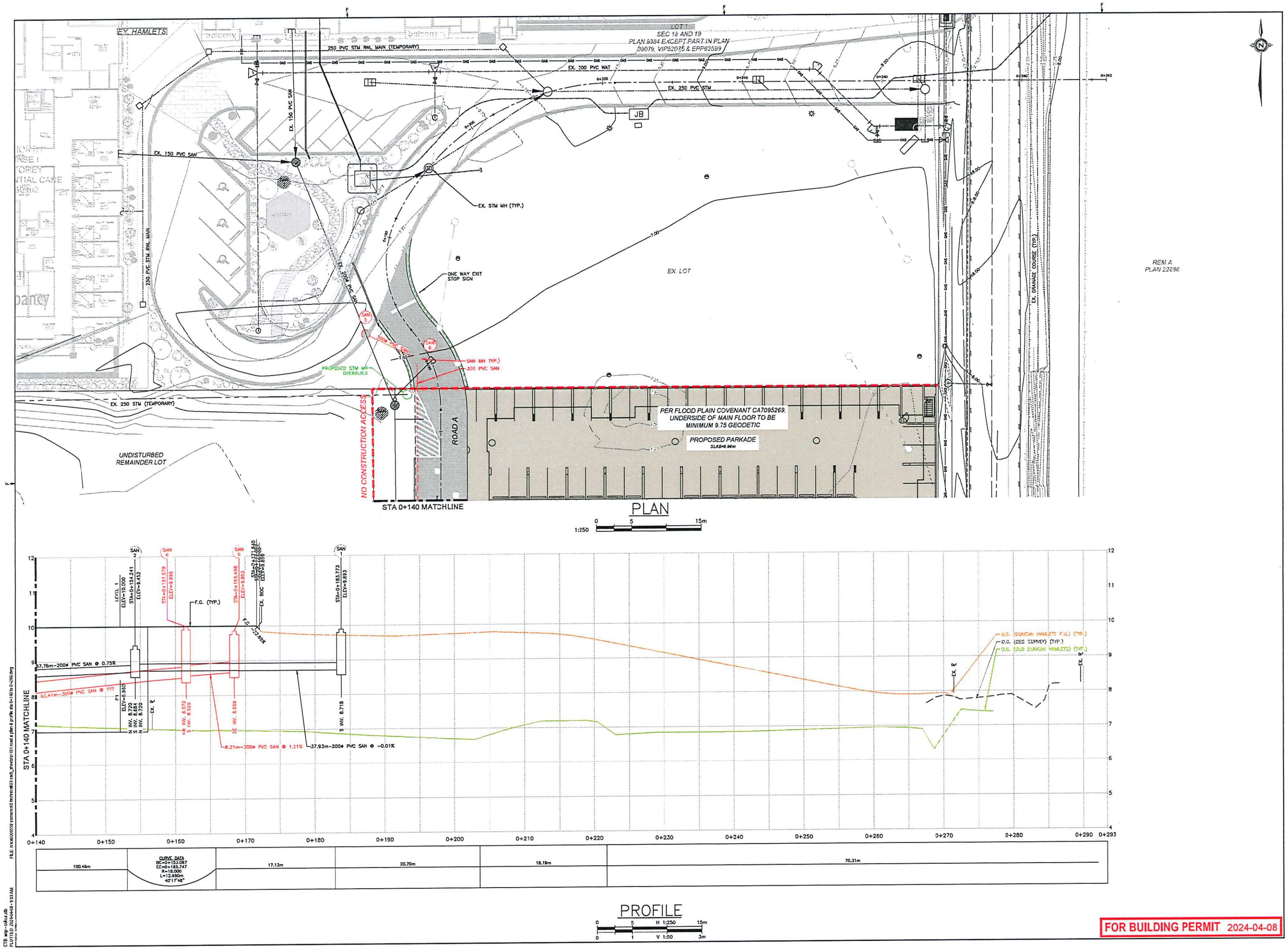
SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

TITLE:

ROAD A PLAN & PROFILE
STA 0+000 TO 0+140

DRAWING NUMBER: C-100

REV. D


LOT 1
SEC 18 AND 19
PLAN 9384 EXCEPT PART IN PLAN 39079, VIP52075 & EPP62599
250 PVC STM RWL MAIN (TEMPORARY)
EX. 200 PVC WAT
EX. 250 PVC STM
EX. 150 PVC SAN
EX. STM MH (TYP.)
ONE WAY EXIT STOP SIGN
EX. LOT
REM A PLAN 22896
EX. DRAINAGE COURSE (TYP.)
PROPOSED STM MH OVERBUILD
SAN MH (TYP.)
300 PVC SAN
EX. 250 STM (TEMPORARY)
PER FLOOD PLAIN COVENANT CA7095269, UNDERSIDE OF MAIN FLOOR TO BE MINIMUM 9.75 GEODETIC
PROPOSED PARKADE
ROAD A
NO CONSTRUCTION ACCESS
UNDISTURBED REMAINDER LOT
STA 0+140 MATCHLINE
PLAN
1:250
O.G. (DUNCAN HAMLETS F.G.) (TYP.)
O.G. (DES SURVEY) (TYP.)
O.G. (OLD DUNCAN HAMLETS) (TYP.)
37.76m-200ø PVC SAN @ 0.75%
32.41m-200ø PVC SAN @ TYP
8.21m-300ø PVC SAN @ 1.21%
37.93m-200ø PVC SAN @ -0.01%
STA 0+140 MATCHLINE
PROFILE
H 1:250
V 1:50

LEGEND:

REVISION:

REV	DATE	DESCRIPTION	BY
			CJB
D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
B	2024-03-21	FOR REVIEW	CJB
A	2024-02-15	FOR EARTH-WORKS PERMIT	EBF

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Engineers and Geoscientists BC Permit #1000200

2024-04-08

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PROJECT NUMBER: CA0006559

CLIENT: TRICITY CANADA INC.

CLIENT REF. #

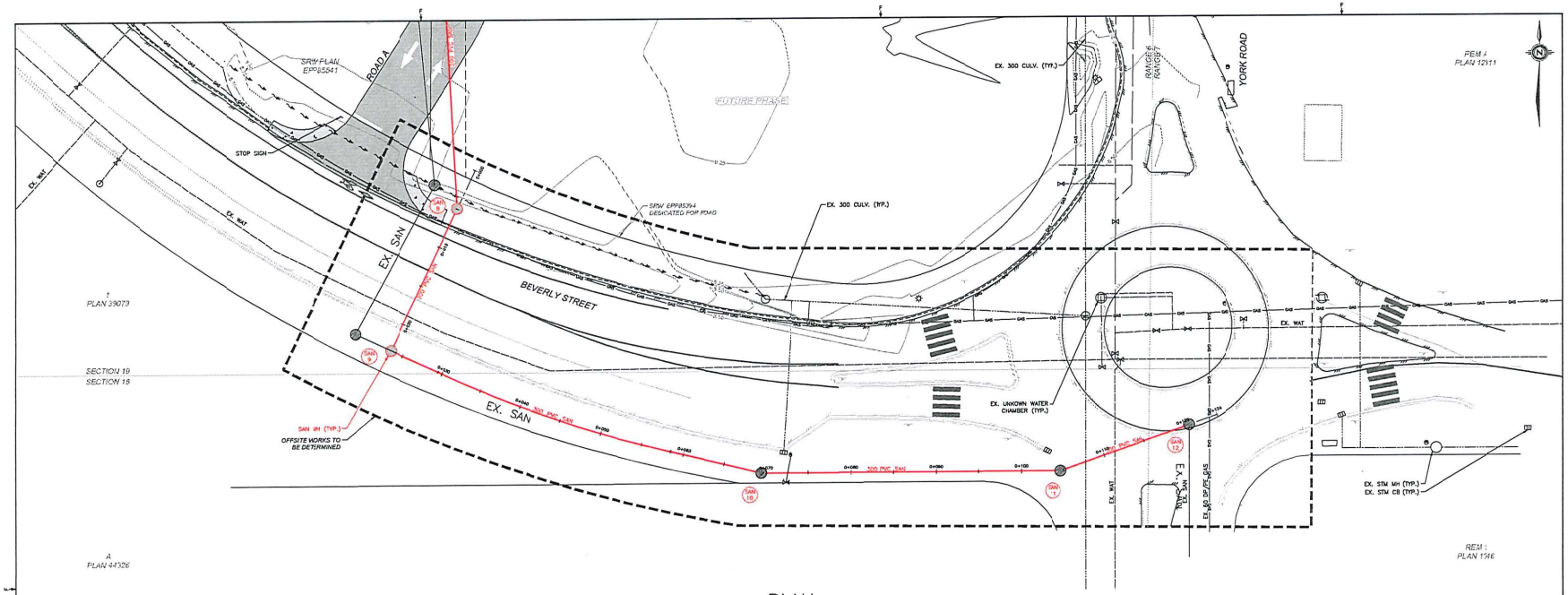
PROJECT: SOMENOS VIEW RESIDENCES 2591 BEVERLY STREET

TITLE: ROAD A PLAN & PROFILE STA 0+140 TO 0+260

DRAWING NUMBER: C-101

REV. D

FOR BUILDING PERMIT 2024-04-08



PLAN

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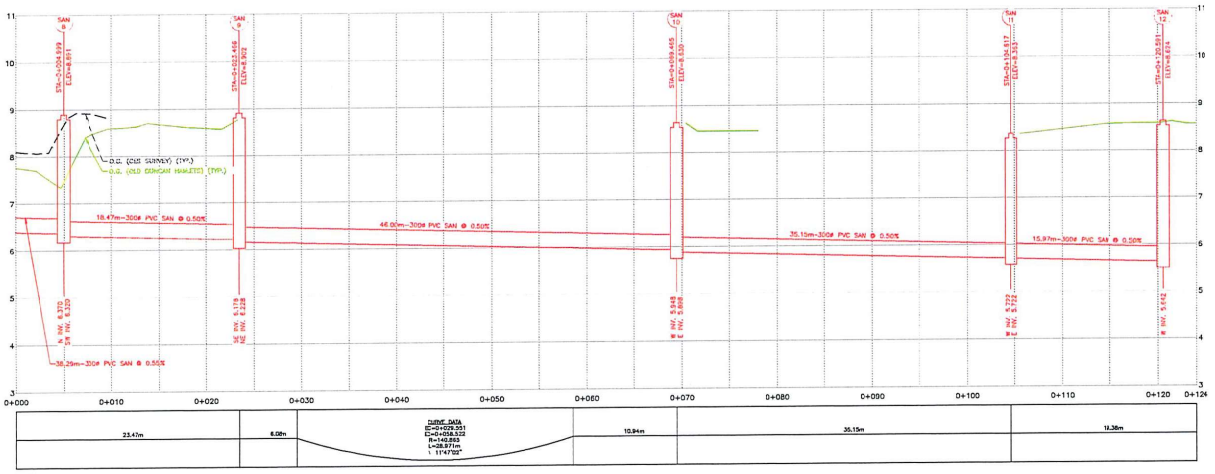

PROFILE

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V 1:50 0 1 3m

FOR BUILDING PERMIT 2024-04-08

LEGEND:

EXISTING

PROPOSED

REVISION:

REV	DATE	DESCRIPTION	BY
D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
B	2024-03-21	FOR REVIEW	CJB
A	2023-06-14	FOR CONCEPTUAL	EBF

SEAL: Engineers and Geoscientists BC Permit #1000000

2024-04-08

D. RANDELL PROFESSIONAL ENGINEER

DISCLAIMER: COPYRIGHT:

ORIGINAL SCALE: AS NOTED

DRAWN BY: EBF/CJB

DATE: 2023-06-14

APPROVED BY: DSR

DESIGNED BY: DSR

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DISCIPLINE: CIVIL

WSP Canada Inc.
#420-301 Victoria Street, Kamloops, BC V2C 2A3
T 250-3745252 | www.wsp.com

PROJECT NUMBER: CA0006559

CLIENT: TRICITY CANADA INC.

CLIENT REF. #:

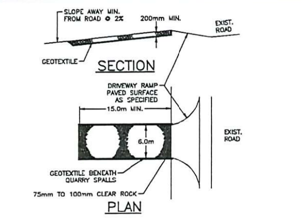
PROJECT: SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

TITLE: OFFSITE SANITARY PLAN & PROFILE

DRAWING NUMBER: C-102

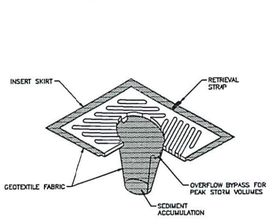
REV. D

CTB: wsp_colour.ctb
PLOTTED: 2024-04-08 1:33 PM



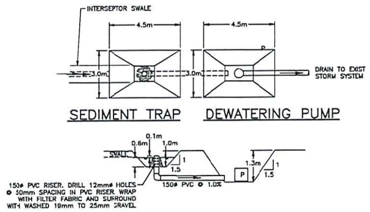
NOTES:
1. REMOVE AND REPLACE PAD WHEN SOIL IS VISIBLE ON THE SURFACE

1 CONSTRUCTION ACCESS
SCALE N.T.S.



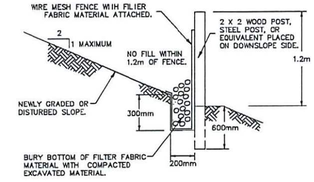
NOTES:
1. REMOVE SEDIMENT WHEN UNIT IS 1/2 FULL

2 CATCHBASIN PROTECTION
SCALE N.T.S.

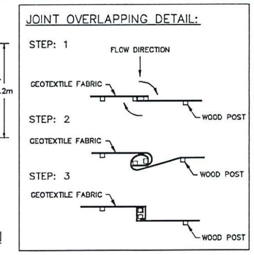


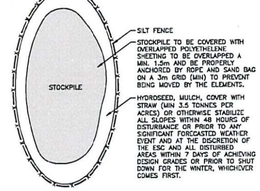
NOTES:
1. ALL SURFACES TO BE PROTECTED IMMEDIATELY UPON COMPLETION.
2. SEDIMENT TO BE REMOVED WHEN IT FILLS HALF THE POND.
3. SEDIMENT TRAP AREA TO BE MIN. 1.0% SITE AREA.

3 SEDIMENT TRAP
SCALE N.T.S.

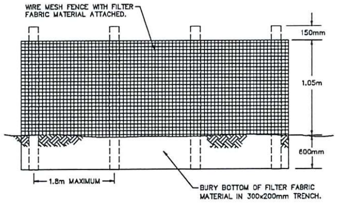

WIRE MESH FENCE WITH FILTER FABRIC MATERIAL ATTACHED.
1 MAXIMUM
NO FILL WITHIN 1.2m OF FENCE.
2 X 2 WOOD POST, STEEL POST, OR EQUIVALENT PLACED ON DOWNSLOPE SIDE.
1.2m
NEWLY GRADED OR DISTURBED SLOPE.
300mm
600mm
BURY BOTTOM OF FILTER FABRIC MATERIAL WITH COMPACTED EXCAVATED MATERIAL.
200mm

TYPICAL CROSS SECTION



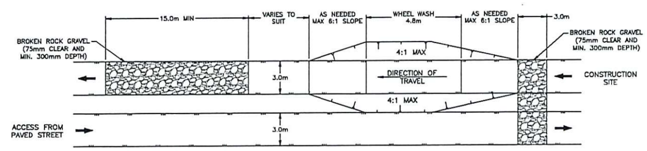

STOCKPILE
SILT FENCE
STOCKPILE TO BE COVERED WITH OVERLAPPED POLYETHELENE SHEETING TO BE OVERLAPPED A MIN. 1.5m AND BE PROPERLY ANCHORED BY ROPE AND SAND BAG ON A 3m GRID (MIN) TO PREVENT BEING MOVED BY THE ELEMENTS.
HYDROSEED, MULCH, COVER WITH STRAW (MIN 3.5 TONNES PER ACRES) OR OTHERWISE STABILIZE ALL SLOPES WITHIN 48 HOURS OF DISTURBANCE OR PRIOR TO ANY SIGNIFICANT FORCASTED WEATHER EVENT AND AT THE DISCRETION OF THE ESC AND ALL DISTURBED AREAS WITHIN 7 DAYS OF ACHIEVING DESIGN GRADES OR PRIOR TO SHUT DOWN FOR THE WINTER, WHICHEVER COMES FIRST.

4 STOCKPILE DETAIL
SCALE N.T.S.

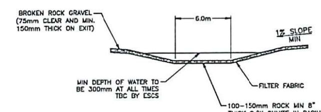


NOTES :
1. REMOVE SEDIMENT WHEN IT REACHES 1/3 HEIGHT

5 SILT FENCE
SCALE N.T.S.


15.0m MIN
VARIES TO SUIT
AS NEEDED MAX 6:1 SLOPE
WHEEL WASH 4.8m
AS NEEDED MAX 6:1 SLOPE
3.0m
BROKEN ROCK GRAVEL (75mm CLEAR AND MIN. 300mm DEPTH)
BROKEN ROCK GRAVEL (75mm CLEAR AND MIN. 300mm DEPTH)
4:1 MAX
DIRECTION OF TRAVEL
4:1 MAX
3.0m
CONSTRUCTION SITE
ACCESS FROM PAVED STREET
3.0m

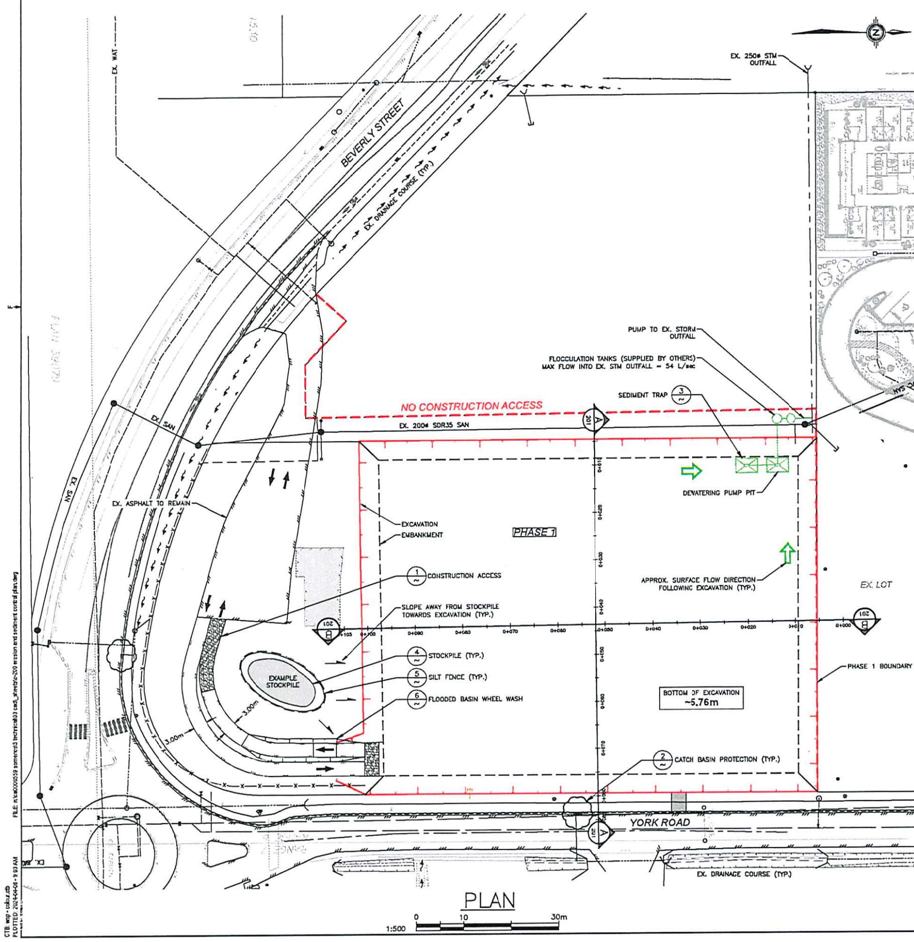
PLAN



CROSS SECTION

NOTES:
1. PURPOSE IS TO REMOVE SEDIMENT FROM VEHICLES AND EQUIPMENT PRIOR TO THEM LEAVING THE SITE.
2. CONTRACTOR TO MAINTAIN MIN. OF 0.5m WATER IN WHEEL WASH AT ALL TIMES AND REMOVE ACCUMULATED SEDIMENT AS REQUIRED TO PROVIDE PROPER CLEANING OF TRUCKS.

6 FLOODED BASIN WHEEL WASH
SCALE N.T.S.


EX. 250ø STM OUTFALL
BEVERLY STREET
EX. DRAINAGE COURSE (TYP.)
PUMP TO EX. STORM OUTFALL
FLOCCULATION TANKS (SUPPLIED BY OTHERS) MAX FLOW INTO EX. STM OUTFALL = 54 L/sec
SEDIMENT TRAP 3
NO CONSTRUCTION ACCESS
EX. 200ø SDR35 SAN
DEWATERING PUMP PIT
EX. ASPHALT TO REMAIN
EXCAVATION
EMBANKMENT
PHASE 1
1 CONSTRUCTION ACCESS
APPROX. SURFACE FLOW DIRECTION FOLLOWING EXCAVATION (TYP.)
EX. LOT
SLOPE AWAY FROM STOCKPILE TOWARDS EXCAVATION (TYP.)
4 STOCKPILE (TYP.)
5 SILT FENCE (TYP.)
6 FLOODED BASIN WHEEL WASH
EXAMPLE STOCKPILE
PHASE 1 BOUNDARY
BOTTOM OF EXCAVATION ~5.76m
2 CATCH BASIN PROTECTION (TYP.)
YORK ROAD
EX. DRAINAGE COURSE (TYP.)
PLAN
1:500
0
10
30m

EROSION AND SEDIMENT CONTROL

1. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT BMPS ARE IMPLEMENTED ON SITE. ACCEPTABLE BMPS INCLUDE THOSE PROVIDED BELOW, THOSE PROVIDED BY THE EROSION AND SEDIMENT CONTROL SUPERVISORS, AND THOSE PROVIDED IN FISHERIES AND OCEANS CANADA'S LAND DEVELOPMENT GUIDELINES FOR THE PROTECTION OF AQUATIC HABITAT (1993):
   a. CLEAR ONLY THE AREAS NECESSARY (LEAVE VEGETATION IN AREAS THAT DON'T REQUIRE DISTURBANCE)
   b. ESTABLISH A STABILIZED ENTRY/EXIT POINT
   c. PROTECT THE PERIMETER OF THE SITE
   d. DIVERT UP-SLOPE WATER AROUND THE WORK SITE (KEEP CLEAN WATER CLEAN)
   e. ROUGHEN EXPOSED SOILS
   f. TEMPORARILY STABILIZE DISTURBED EARTH
   g. CREATE TEMPORARY SEDIMENT DETENTION FACILITIES ONSITE
   h. INSTALL INLET PROTECTION MEASURES AT ALL STORM SYSTEM INLETS
   i. PLACE SOIL PILES UPSLOPE OF THE PERIMETER PROTECTION AND COVER WITH PLASTIC SHEETING OR EROSION CONTROL BLANKETS
   j. DEWATER TO A CONTAINED PART OF THE SITE AND ALLOW IT TO INFILTRATE INTO THE SOIL
   k. INSTALL ROOF DOWNPIPES AS SOON AS PRACTICABLE AFTER THE ROOF IS LAID
   l. ENSURE THAT ALL CONTROL MEASURES ARE MAINTAINED IN GOOD WORKING ORDER
   m. RE-VEGETATE OR OTHERWISE PERMANENTLY STABILIZE THE SITE
2. THE CONTRACTOR SHALL INSPECT, DOCUMENT, AND MAINTAIN ESC WORKS REGULARLY, AND AFTER EACH SIGNIFICANT RAINFALL EVENT. RECOMMENDATIONS CONCERNING ADDITIONS, MAINTENANCE, AND MODIFICATIONS TO THE ACCEPTED PLAN, OR NEW BEST MANAGEMENT PRACTICES (BMPS), SHALL BE IMPLEMENTED IMMEDIATELY BY THE CONTRACTOR.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE MODIFICATION AND MAINTENANCE OF THE ESC WORKS ON AN ONGOING BASIS, AND IMMEDIATELY PERFORM REMEDIAL WORKS AS DIRECTED BY THE ESCS, THE MUNICIPALITY HAVING JURISDICTION, ENGINEER OF RECORD, OR OTHER REGULATORY AND GOVERNMENT AGENCIES.

FOR BUILDING PERMIT 2024-04-08

LEGEND:

REVISION:

REV	DATE	DESCRIPTION	BY
E	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
D	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-21	FOR REVIEW	CJB
B	2024-02-15	FOR EARTHWORKS PERMIT	EBF
A	2023-06-14	FOR CONCEPTUAL	EBF

SEAL: Engineers and Geoscientists BC Permit #1000200 2024-04-08 D. RANDELL PROFESSIONAL ENGINEERING

DISCLAIMER: COPYRIGHT:

ORIGINAL SCALE: AS NOTED
DATE: 2023-06-14
APPROVED BY: DSR
CHECKED BY: DSR
DRAWN BY: EBF/CJB
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm

DISCIPLINE: CIVIL

wsp
WSP Canada Inc.
#420-301 Victoria Street, Kamloops, BC V2C 2A3
T 250-3745252 | www.wsp.com

PROJECT NUMBER: CA0006559

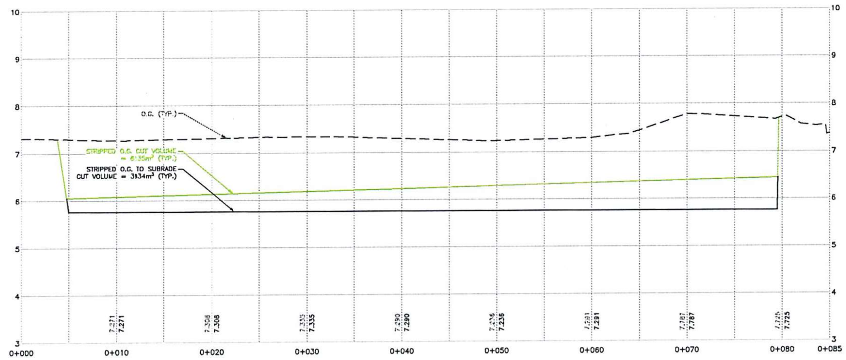
CLIENT: TRICITY CANADA INC.

CLIENT REF. #

PROJECT: SOMENOS VIEW RESIDENCES 2591 BEVERLY STREET

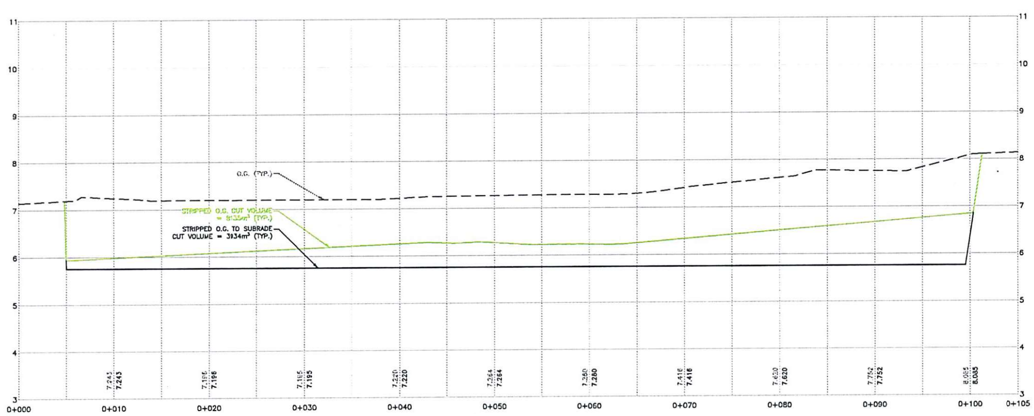
TITLE: EROSION AND SEDIMENT CONTROL PLAN

DRAWING NUMBER: C-200
REV.: E



SECTION A–A

H 1:250 · V 1:50



SECTION B–B

H 1:500 · V 1:100

SOIL REMOVAL OR DEPOSIT INFORMATION

ESTIMATED QUANTITY OF SOIL	TYPE OF MATERIAL	QUANTITY (m^3)
a. TO BE REMOVED	1000mm EXISTING	12,069m^3
b. TO BE DEPOSITED	150mm CRUSHED BASE	1,056m^3

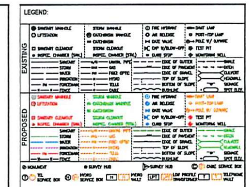
PROPOSED DATE OF COMMENCEMENT: SEPTEMBER 2024

PROPOSED DATE OF COMPLETION: SEPTEMBER 2025

ESTIMATE PREPARED BY: DOUG RANDELL, P.ENG. DATE: MARCH 22, 2024

FOR BUILDING PERMIT 2024-04-08

LEGEND:



REVISION:

REV	DATE	DESCRIPTION	BY
D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
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A	2024-02-15	FOR EARTHWORKS PERMIT	EBF

SEAL: Engineers and Geoscientists BC Permit #1000200

2024-04-08 D. RANDELL

ORIGINAL SCALE: AS NOTED
DATE: 2024-02-15
APPROVED BY: DSR
CHECKED BY: DSR
DRAWN BY (OPTIONAL): EBF/CJB

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE: CIVIL

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T 250-3745252 | www.wsp.com

PROJECT NUMBER: CA0006559

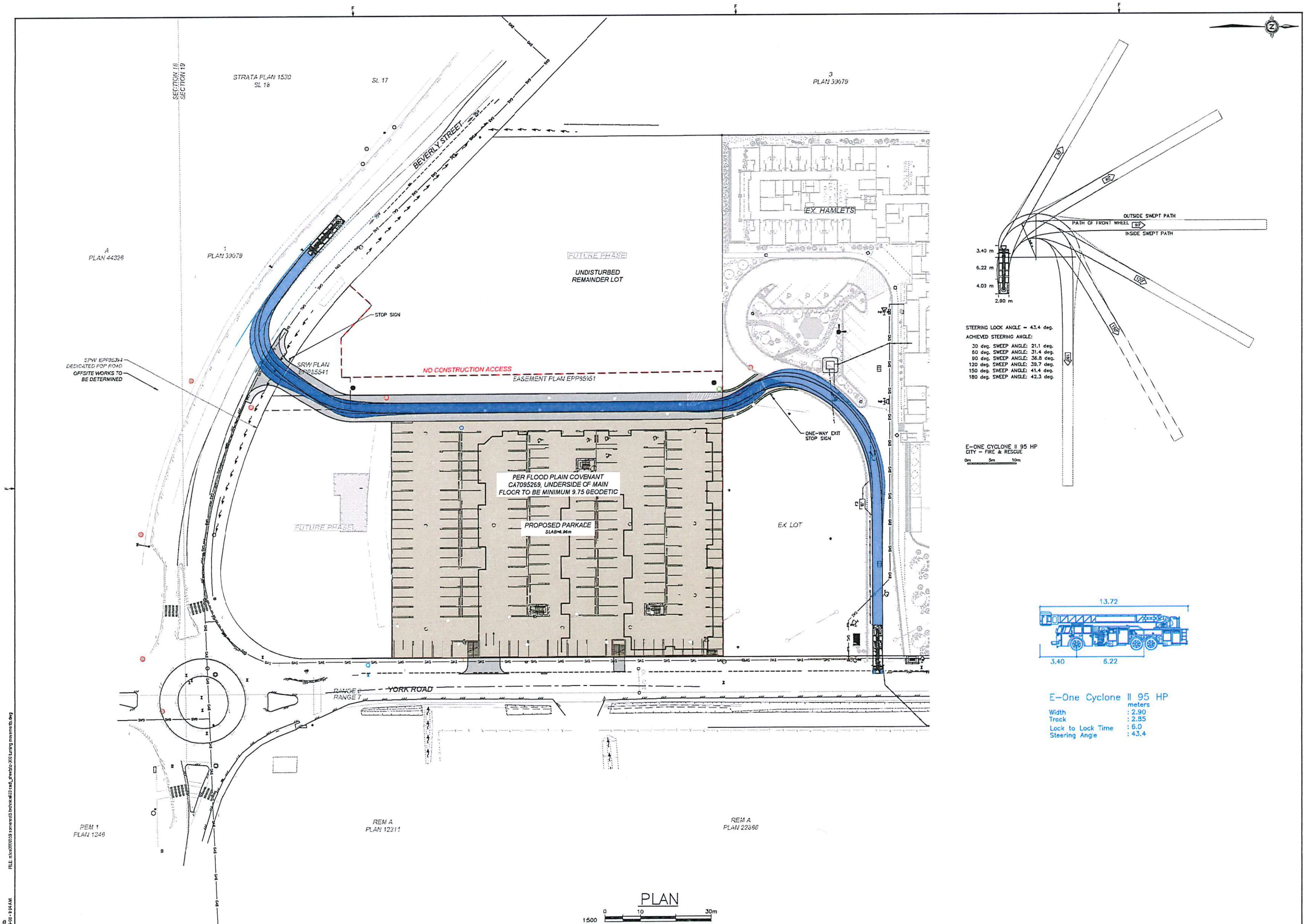
CLIENT: TRICITY CANADA INC.

CLIENT REF. #

PROJECT: SOMENOS VIEW RESIDENCES 2591 BEVERLY STREET

TITLE: EXCAVATION SECTIONS

DRAWING NUMBER: C-201
REV.: D



STRATA PLAN 1530
SL 18
SL 17
3
PLAN 33079
SECTION 18
SECTION 19
BEVERLY STREET
A
PLAN 44326
1
PLAN 33079
FUTURE PHASE
UNDISTURBED
REMAINDER LOT
EX. HAMLETS
STOP SIGN
SRW PLAN
EPP55541
NO CONSTRUCTION ACCESS
EASEMENT PLAN EPP95151
ONE-WAY EXIT
STOP SIGN
PER FLOOD PLAIN COVENANT
CA7095269, UNDERSIDE OF MAIN
FLOOR TO BE MINIMUM 9.75 GEODETIC
PROPOSED PARKADE
EX. LOT
YORK ROAD
RANGE 6
RANGE 7
REM 1
PLAN 1246
REM A
PLAN 12311
REM A
PLAN 22868
OUTSIDE SWEPT PATH
PATH OF FRONT WHEEL
INSIDE SWEPT PATH
3.40 m
6.22 m
4.03 m
2.90 m
STEERING LOCK ANGLE = 43.4 deg.
ACHIEVED STEERING ANGLE:
30 deg. SWEEP ANGLE: 21.1 deg.
60 deg. SWEEP ANGLE: 31.4 deg.
90 deg. SWEEP ANGLE: 36.8 deg.
120 deg. SWEEP ANGLE: 39.7 deg.
150 deg. SWEEP ANGLE: 41.4 deg.
180 deg. SWEEP ANGLE: 42.3 deg.
E-ONE CYCLONE II 95 HP
CITY - FIRE & RESCUE
0m 5m 10m
13.72
3.40
6.22
E-One Cyclone II 95 HP
meters
Width : 2.90
Track : 2.85
Lock to Lock Time : 6.0
Steering Angle : 43.4
PLAN
1:500
0 10 30m

FOR BUILDING PERMIT 2024-04-08

LEGEND:

REVISION:

REV	DATE	DESCRIPTION	BY
D	2024-04-08	FOR BUILDING PERMIT (PARKADE)	CJB
C	2024-03-22	FOR BUILDING PERMIT (PARKADE)	CJB
B	2024-03-21	FOR REVIEW	CJB
A	2024-02-15	FOR EARTHWORKS PERMIT	EBF

SEAL: Engineers and Geoscientists BC Permit #1000200

2024-04-08

D. RANDELL

DISCLAIMER: COPYRIGHT:

ORIGINAL SCALE: 1:500

DATE: 2024-02-15

APPROVED BY: DSR

CHECKED BY: DSR

DRAWN BY (OPTIONAL): EBF

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25mm

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PROJECT NUMBER: CA0006559

CLIENT: TRICITY CANADA INC.

CLIENT REF. #

PROJECT: SOMENOS VIEW RESIDENCES
2591 BEVERLY STREET

TITLE: TURNING MOVEMENTS

DRAWING NUMBER: C-300

REV: D

PRELIMINARY STORMWATER STORAGE REQUIREMENT MEMO – PHASE 1

BACKGROUND

TriCity Canada Inc. (the Client) has retained WSP Canada Inc. (WSP) to provide technical oversight regarding stormwater retention volumes that will be required to develop the site adjacent to 5950 York Road, Duncan BC, as per the latest phase 1 site plan. The goal of this study was to identify storage volumes required for the phase 1 site plan based on the latest best management practices regarding stormwater conveyance and local byalws.

EXISTING SITE DRAINAGE

The site is approximately 0.68 ha in size and is currently bare grassland, previously used as a recreational golfing facility, otherwise known as a driving range. With the completion of the Hamlets, recently developed to the north of the subject site, a 250mm storm main was added to service future phases. This storm main runs east to west and has an outfall to the wetlands, west of the subject property. The subject property is adjacent to this storm main on the northwest corner. It is expected that current surface runoff generally drains to the north and west towards the existing offsite wetlands. From topographic survey and google earth data the subject property appears to be sloping to the north and west.

There is a municipal storm system along Beverly Street, south of the subject property. However, existing municipal storm network specifics are not known currently. Surface runoff from Beverly Street is not anticipated to impact the subject property.

Figure 0.1:View from York Road looking west.

Adjacent properties records indicate upgrades to York Road, along the east side of the subject property, were designed by Cowichan Engineering Services Ltd. The upgrades generally consist of a paved 7.5m driving surface, with a cul-de-sac at the north end, a 2m sidewalk and barrier type curb along the west side of York Road, and a realigned ditch and new CMP culverts along the east side. All surface runoff from York Road is conveyed via an overland flow path to the new ditch at the northeast end of York Road. The surface runoff from York Road is not anticipated to impact the subject property.

PROPOSED STORMWATER MANAGEMENT SYSTEM AND DESIGN

The design for the proposed site drainage and stormwater management has been developed in accordance with the following:

- MMCD Design Guidelines 2022
- Relevant Bylaws
- Best Management Practices (BMPs).

The minor systems will be designed to the following return frequencies:

- Stormwater management – 5-year return

STORMWATER DETENTION SIZING

The onsite stormwater detention facility will be sized to accommodate a 5-year return event and is proposed to be located under the parking lot at the northwest corner of the property. Downstream of the detention pond, an overbuilt storm manhole has been proposed and storm flows will be conveyed to the 250mm storm main that has previously been installed. The detention tank has been sized to accommodate runoff from the proposed building and associated parking lot.

Runoff from impermeable surfaces will be collected using rainwater leaders and catch basins from parking lots and road surfaces and will be conveyed to the MNC rainwater detention to the west via the existing 250 storm piping on the north west of the property. Site grading will convey storm water to the northwest corner of the property. A proposed alignment of storm sewers will require

design and therefore this plan is to be considered preliminary and represents the most conservative volume required. We understand that there may even be an agreement in place to eliminate stormwater storage requirements altogether. This will need to be confirmed during detailed design.

The 5 year return storm was examined on a 1, 2, 6, 12, and 24 hour duration. The 24 hour duration produced the most conservative estimate for storage and the results for the 5 year 24 hour duration storm are shown.

The parameters used to calculate storage requirements are shown in Table 2.1.

Table 0.1: Pre Development 5 year PCSWMM Model parameters

PARAMETER	VALUE	NOTES
Total Area (ha) (A)	0.68	
Predevelopment Runoff Coefficient (C)	0.20	Coefficient for grasslands
Time of Concentration (min)	15	
5-year 24 hr -Rainfall Intensity (I)	3.1	
Q Predevelopment PEAK(10 min, 5 year return)	0.01 m3/s	

Table 0.2: Post-Development 5-year PC SWMM Model parameters

PARAMETER	VALUE	NOTES
Total Area (ha) (A)	0.68	
Postdevelopment Runoff Coefficient (C)	0.90	
Time of Concentration (min)	5	
5-year- 24 hr Post Dev Climate Change Rainfall Intensity (I)	3.5	
Q Postdevelopment PEAK (24hr, 5 year return)	0.03 m3/s	

These parameters led to a storage requirement of 119.45 m^3. PCSWMM results have been attached.

EROSION AND SEDIMENT CONTROL

Please refer to the attached Erosion and Sediment Control (ESC) plan for details. These measures will need to be in place prior and during construction activities..

Thanks,

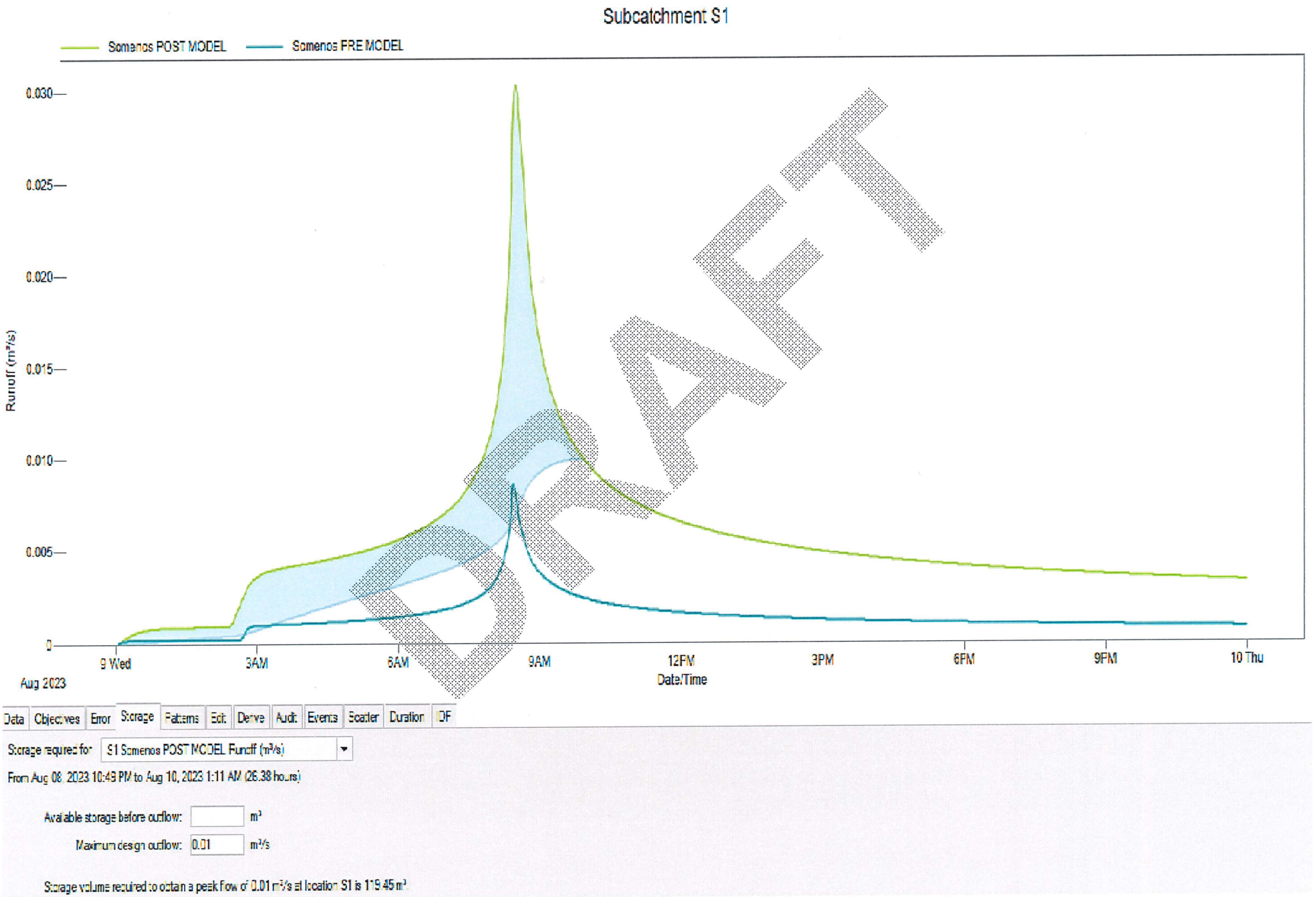
Prepared By

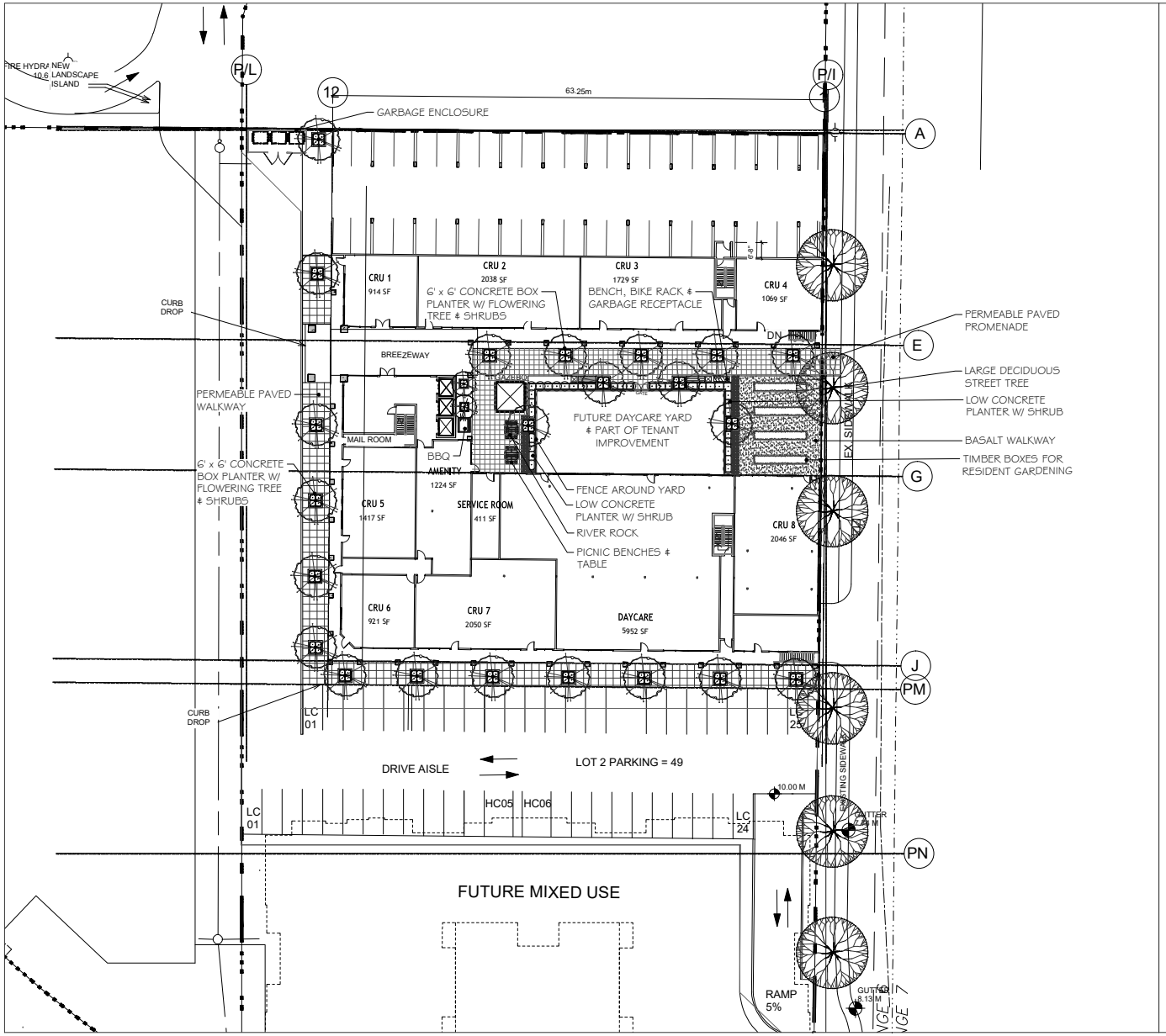
Shawn Morrow, EIT

Reviewed By

Doug Randell, P.L.Eng, PMP

PCSWMM RESULTS: SOMENOS





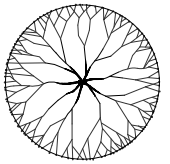
SCHEDULE 3
Landscape Plan

SUGGESTED PLANT LIST

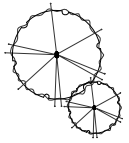
	Key	Common Name	Latin Name	Size
Trees	VMAP	Vine Maple	Acer circinatum	6cm Cal.
	JMAP	Japanese Maple	Acer palmatum var.'Bloodgood'	6cm Cal.
	GINK	Maidenhair Tree	Ginkgo biloba var. 'Princeton Sentry'	7cm Cal
	FAGU	Columnar Purple Beech	Fagus sylvatica var. 'Dawick's Purple'	6cm Cal.
Medium Shrubs	BOX	Boxwood	Buxus sempervirens var. 'Wintergreen'	#5 Pot
Small Shrubs	AZAW	Evergreen Azalea	Azalea var.'Gumpo White'	#2 Pot
	EUOF	Creeping Euonymus	Euonymus forturei var.'Emerald Gaiety'	#1 Pot
	DWPJ	Dwarf Lily of the Valley Shrub	Pieris japonica var.'Debutante'	#1 Pot
Ground Covers	BEAR	Bearberry	Arctostaphylos uva-ursi var.'Vancouver Jade'	SP4
	BERG	Heartleaf Bergenia	Bergenia cordifolia var.'Bressingham Ruby'	SP5
	CCTO	Creeping Cotoneaster	Cotoneaster dameri	SP4
Vines	ARM	Evergreen Clematis	Clematis armandii	#5 Pot
Perennials & Grasses	SCIZ	Kaffir Lily	Schizostylis coccinea var.'Oregon Sunset'	SP5
	HEUC	Coral Bells	Heuchera var. 'Palace Purple'	SP5
	TEST	Plane Sedge	Carex testacea	SP5
	CARX	Variegated Sedge	Carex morrowii aureo-vanegata	SP5

Notes: - All landscape work to conform with B.C.S.L.A. / B.C.N.T.A. standard specification.
- All areas to be irrigated with an automatic underground system.

LEGEND

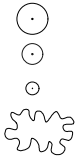


LARGE DECIDUOUS SHADE TREE



SMALL ORNAMENTAL DECIDUOUS TREES

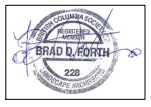
LARGE AND SMALL CONIFEROUS TREES



LARGE SHRUB
MEDIUM SHRUB
SMALL SHRUB
GROUND COVER & PERENNIALS

4☆SITE
LANDSCAPE ARCHITECTURE AND SITE PLANNING 250.508.7885

ARCH. STAMP



SOMENOS VIEW RESIDENCES
DUNCAN, BC

CLIENT
Dan Hicks

REV. DATE	NUMBER	DESCRIPTION
06-12-23	1	PRELIM. LANDSCAPE CONCEPT PLAN

DATE JUNE 12, 2023
SCALE 1:500
DRAWN BY BF/RF

LANDSCAPE CONCEPT PLAN

L1

Landscape Cost Estimate

SOMENOS PROJECT

4☆SITE LANDSCAPE ARCHITECTURE AND SITE PLANNING 250.500.7968

PREPARED BY FORSITE LANDSCAPE ARCHITECTURE

SOFT LANDSCAPING	Quantity	Unit Cost	Total Cost
TREES:			
Large, Deciduous	6	$1,000.00	$6,000.00
Medium, Flowering	22	$750.00	$16,500.00
Small, Flowering	2	$300.00	$600.00
PLANTS:			
Medium Shrubs	35	$20.00	$700.00
Small Shrubs	90	$15.00	$1,350.00
Ground Covers	500	$3.50	$1,750.00
Perennials & Grasses	250	$3.50	$875.00
	Quantity (m)	**Unit Cost (/m^2)**	**Total Cost**
Other:			
Soil (m^3)	64	$60.00	$3,840.00
Sod (m^2)	300	$15.00	$4,500.00
TOTAL SOFT LANDSCAPING			**$36,115.00**

HARD LANDSCAPING	Quantity (m^2)	Unit Cost (/m^2)	Total Cost
Permeable Paving	542	$85.00	$46,070.00
River Rock	16	$50.00	$800.00
Basalt Walkways	101	$30.00	$3,030.00
Conc. Walkways (NIC)			
SITE FURNISHINGS/SPECIAL FEATURES:			
Gazebo	1	$8,000.00	$8,000.00
6'x6' Conc. Planter Box	22	$1,200.00	$26,400.00
4'x4' Conc. Planter Box	2	$1,000.00	$2,000.00
Perimeter Low Conc. Planters (m)	85	$50.00	$4,250.00
Bike Rack	1	$1,500.00	$1,500.00
Benches	2	$500.00	$1,000.00
Trace Receptacle	1	$300.00	$300.00
Picnic Tables	2	$1,000.00	$2,000.00
Barbecue	1	$3,000.00	$3,000.00
Timber Garden Boxes	4	$1,000.00	$4,000.00
TOTAL HARD LANDSCAPING			**$102,350.00**

IRRIGATION	Quantity	Unit Cost	Total Cost
Irrigation	LS	$5,000.00	$5,000.00
TOTAL IRRIGATION			**$5,000.00**

TOTAL HARD, SOFT LANDSCAPING & IRRIGATION	**$143,465.00**

SCHEDULE 3 Environmental Assessment Plan

current ENVIRONMENTAL
558 England Ave
Courtenay, BC V9N 2N3
p: 250.871.1944
w: currentenvironmental.ca

To:	Dan Hicks, Project Manager, TriCity Canada	Date:	April 3, 2024
		Pages:	13
From:	Dusty Silvester, R.P.Bio Molly Duncan, Technician		
		Project:	2351

RE: ENVIRONMENTAL ASSESSMENT – Municipality of North Cowichan Development Permit Area 3
Lot 3, 2591 Beverly Street, Duncan, BC

The proponent, TriCity Canada, retained Current Environmental Ltd. (CEL) to complete a site survey of environmentally sensitive areas on or near the subject property at 2591 Beverly Street, Duncan, BC. The purpose of this survey was to investigate the presence of invasive species and assess the applicability of Municipality of North Cowichan (MNC) aquatic & terrestrial habitat Development Permit Areas (DPA) prior to development on the subject property. This letter report describes environmental features according to DPA guidelines outlined in the MNC Official Community Plan[1].

1 BACKGROUND

The subject property is located at 2591 Beverly Street, in the MNC (Figure 1). The property is 1.01 ha in size bearing legal description LOT 3, PLAN EPP85394, SECTION 19, RANGE 6, QUAMICHAN LAND DISTRICT (PID: 030-594-715). The subject property is zoned University Village Mixed Commercial/ Residential Comprehensive Development Zone (CD19) and is bounded by other CD19 lots to the north and west, Beverly St. to the south, and York Rd. to the east.

The subject property is partially developed, having been historically cleared of native vegetation and recent use as a golf driving range, and resides on relatively flat terrain that slopes up to an approximately 2 m high berm along the western property boundary. In the southern portion of the lot, there is an existing mixed commercial-residential building and associated parking. The northern portion of the lot is cleared and is dominated by grasses and invasive species.

Phase 1 of proposed development on the subject property consists of two multi-family residence buildings, approximately 550 m^2 and 1600 m^2, that will house 200-350 people, and associated parking (Figure 2). The subject property is within the MNC development permit areas of Multi-Unit and Intensive Residential Development Permit Areas (DPA-1) and Natural Environment (DPA-3).

[1] MNC (2022). Municipality of North Cowichan Official Community Plan Chapter 10: Development Permit Areas. Accessed from https://www.northcowichan.ca/sites/default/files/2023-12/Development%20Permit%20Areas.pdf

Figure 1. Subject property location (outlined in red) at Lot 3, 2591 Beverly St., Duncan, BC.

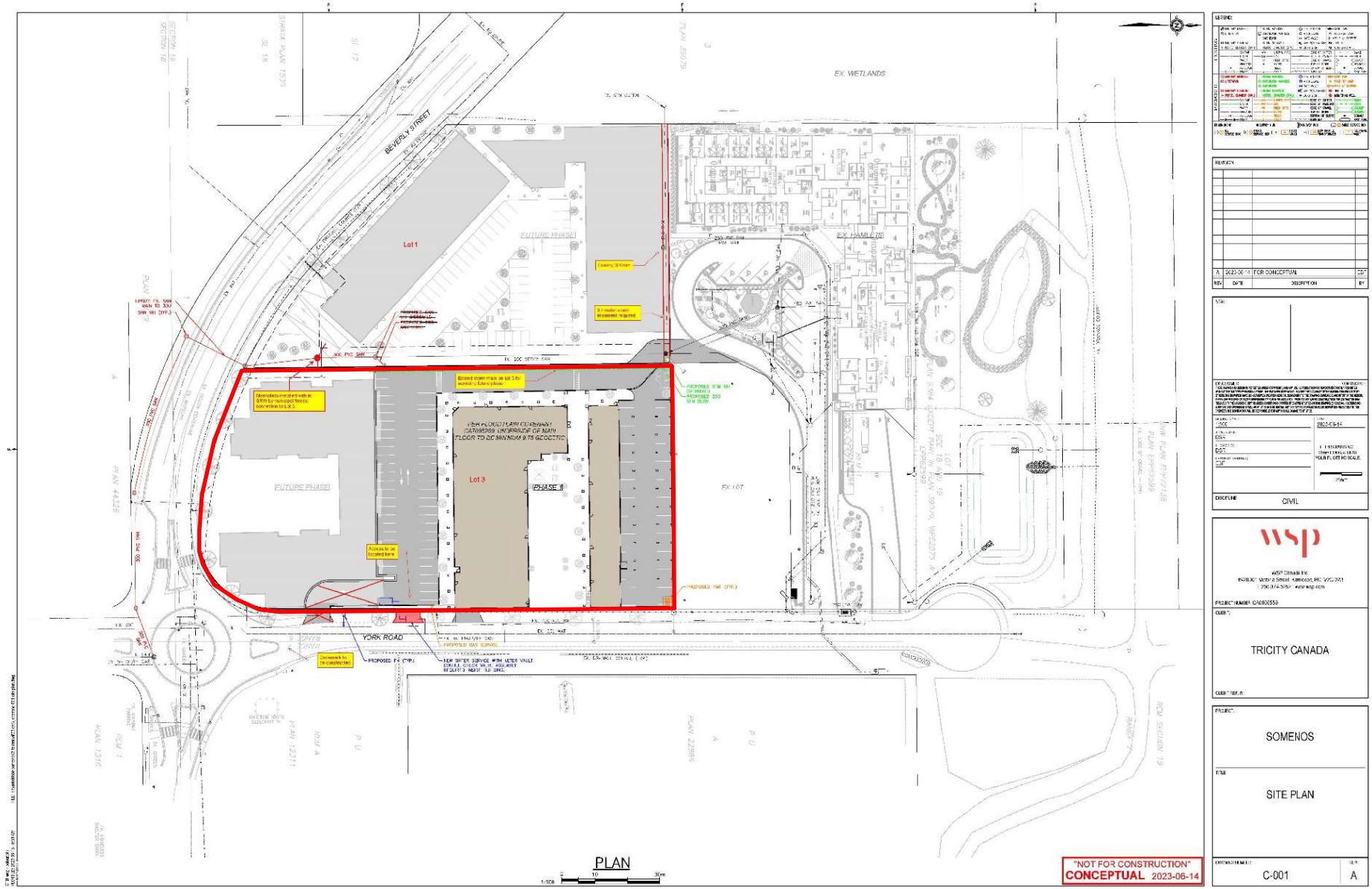


Figure 2. Proposed development on Lot 3, 2591 Beverly St., Duncan, BC outlined in red.

2 METHODS

2.1 BACKGROUND REVIEW

Background information on known environmentally sensitive features within or in proximity to the subject property was obtained from the following sources:

1) Municipality of North Cowichan mapping[2]
2) Conservation Data Center (CDC) At-Risk "Known Occurrences" Atlas-BC Ecosystems Explorer[3]
3) Sensitive Ecosystems Inventory (SEI)[4]
4) Wildlife Tree Stewardship Atlas (WiTS)[5]
5) Great Blue Heron (GBHE) Management Team Atlas[6]
6) Habitat Wizard[7]
7) Aerial imagery

2.2 FIELD ASSESSMENT

Field assessment of the property was completed on March 22, 2024, to delineate and verify the known environmentally sensitive features on the property, and to identify any other environmentally sensitive features on the site.

2.2.1 Aquatic Habitats and Species

Criteria for delineating watercourses to identified aquatic features were based primarily on *Riparian Areas Protection Regulation* (RAPR) methodology[8]*.* The wetland and ditch were delineated using a handheld GPS unit; therefore, the accuracy of these features depicted in site plans will vary depending on forest cover and satellite availability at the time of assessment. No fish sampling was conducted as a part of this assessment.

2.2.2 Terrestrial Habitats and Species

Survey methods for terrestrial elements and ESAs were directed in part by those outlined in *Environmental Best Management Practices for Urban and Rural Land Development in British Columbia*[9]*,* and the *Field Manual for Describing Terrestrial Ecosystems*[10]*.* Vegetation on the subject property was identified with the assistance of *Plants of Coastal British Columbia*[11].

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[2] Municipality of North Cowichan (2024). Interactive Web Map. Accessed from https://www.northcowichan.ca/municipal-services/maps
[3] B.C. Conservation Data Centre: CDC iMap (2024). Ministry of Environment, Victoria, B.C. Accessed from http://maps.gov.bc.ca/ess/hm/cdc/
[4] Sensitive Ecosystems Inventory (2024). Georgia Basin Habitat Atlas. Accessed from < https://cmnmaps.ca/GBHA/>
[5] Wildlife Tree Stewardship (WiTS) Program (2024). Nest Tree Report. The Community Mapping Network. Accessed from <http://www.cmnmaps.ca/wits/>
[6] Great Blue Heron (GBHE) Management Team (2024). The Community Mapping Network. Accessed from <http://cmnmaps.ca/GBHE/>
[7] Ministry of Environment and Climate Change (2024). Habitat Wizard. Accessed from <https://maps.gov.bc.ca/ess/hm/habwiz/>
[8] Ministry of Forests, Lands, Natural Resource Operations & Rural Development. (2019). Riparian Areas Protection Regulation Technical Assessment Manual. Accessed from: < https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/rapr_assessment_methods_manual_for_web_11.pdf>
[9] BC Ministry of Water, Land, and Air Protection. (2004). Environmental Best Management Practices for Urban and Rural Land Development in British Columba. Accessed from: http://www.env.gov.bc.ca/wld/documents/bmp/urban_ebmp/EBMP%20PDF%201.pdf
[10] BC Ministry of Environment. (2010). *Field Manual for Describing Terrestrial Ecosystems, 2nd Edition.* <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/conservation-data-centre/field_manual_describing_terrestrial_ecosystems_2nd.pdf>
[11] Pojar, J. and A. MacKinnon. (1994). *Plants of Coastal British Columbia (Revised, 2004).* Lone Pine Publishing.

2.2.3 Species at Risk

An office-based assessment of Species at Risk occurrences on the subject property was completed using the *CDC BC Species and Ecosystems Explorer*[3], the *Wildlife Tree Stewardship Atlas*[5], and the *Great Blue Heron Atlas*[6]. The on-site assessment of Species at Risk was completed concurrent with the other inventory efforts mentioned above and was based primarily on the methods outlined in *Environmental Best Management Practices for Urban and Rural Land Development*[9].

3 RESULTS

ESAs inventoried in proximity to the subject property in relation to the associated DPAs include a wetland and a ditch. These ESAs are described in further detail in the following sections.

3.1 AQUATIC HABITAT

3.1.1 Wetland 1

Along the northern property boundary, a wetland (Wetland 1) was observed on 5950 York Road with a small intersection into the northwest corner of Lot 3, 2591 Beverly St. It is believed that Wetland 1 receives inputs from runoff of the neighbouring property to the north and the shallow water table onsite. Wetland 1 is approximately the length of the northern property boundary and drains into a 300 mm PVC pipe located in the northwest corner of the property (Photo 1). Flow remains piped underneath the adjacent property to the west and outlets into the Municipality of North Cowichan constructed wetlands approximately 75 m from the subject property (Photo 2).

According to the Proponent, the pipe was installed by a previous owner to limit flooding of the existing building on the subject property. Since the driving range has been in disuse and the vegetation unmaintained, vegetation in Wetland 1 near the inlet of the pipe and along the berm is the most well-established within the wetland and consists of red alder, Pacific willow, Hooker's willow, black hawthorn, red-osier dogwood, hardhack, cattail, common rush, and sedges (Photo 3). Vegetation in the eastern portion of the wetland mostly consists of sedges and grasses including common rush, horsetail, and hardhack (Photo 4). Invasive species including reed canary grass and Himalayan blackberry were also observed in the eastern portion of Wetland 1. At time of assessment, Wetland 1 contained standing water throughout but did not contain adequate depth for flows to enter the pipe.

The work plan for stormwater on the subject Lot 3 will include decommissioning the temporary pipe draining Wetland 1 and integrating runoff into a comprehensive engineered stormwater management facility plan. As indicated by the MNC[12] during previous work on the property to the north at 5950 York Road (PID 030594707), the *Riparian Areas Protection Regulation* (RAPR) applies to the constructed wetlands that have been established on the MNC property to the west (PID: 029913527) during several phases since 2017, but no environmental setbacks apply to the subject Lot 3 or neighbouring Lot 1 where it has been stated by the MNC that "It has always been understood that there would not be environmental setbacks from our parcel and the constructed wetlands to the west". **Based on the existing directive from MNC on this matter no specific environmental setbacks will be prescribed.**

[12] Email Correspondence. Kyle Young, Director of Development Services/Approving Officer. July 11, 2018.

3.1.2 Ditch 1

Aquatic habitat in proximity to the subject property also consists of a roadside ditch (Ditch 1) along the eastern side of York Road, approximately 20 m from the eastern property boundary. Ditch 1 appears to begin at the northeast corner of the intersection of York Rd. and Beverly St. to collect road runoff from the roundabout and immediate properties. Ditch 1 flows in a northerly direction in a roadside swale and through a series of driveway culverts along York Rd for approximately 130 m before flowing into a 70 m long pipe section directly east of the northeast corner of the subject property. Ditch 1 daylights into an open channel for approximately 25 m before flowing into the York Rd Flood Pump Station, which is connected to Somenos Creek. At time of site visit, this ditch contained standing water in the northern portion of the ditch but there was no substantial flow. Vegetation in Ditch 1 is dominated by grasses and invasive species including Himalayan blackberry and reed canary grass (Photo 5).

Since Ditch 1 is located on the opposite side of York Road and lacks any surface water connection to the subject property, there will be no interaction between development on the subject property and the ditch. **Ditch 1 is recommended to be excluded from the RAPR assessment process for proposed development on Lot 3.**

3.2 TERRESTRIAL HABITAT AND INVASIVE SPECIES

The majority of the subject property has been cleared of native vegetation and mostly consists of common rush, grass species, trailing blackberry, and invasive species (Photos 6 & 7). Tree cover on the subject property is limited to two lodgepole pine trees along the southern property boundary, and red alder saplings along the constructed berm (Photo 8). Throughout the property, Himalayan blackberry, reed canary grass, Scotch broom, wild carrot, and thistle species were observed. As outlined in DPA-1 guidelines Section 1.5.2 h) and DPA-2 guidelines Section 2.3.4 e), invasive plants and noxious weeds must be removed and replaced with native plant species as part of the landscape plan. During the development phase of the subject property, it is recommended that all invasive species be removed and properly disposed of.

Approximately 7 m to the west of the northwest corner of the subject property, Himalayan blackberry and poison hemlock have colonized two historic soil and material stockpiles on the adjacent property Lot 1 (Photo 9). Neither species is listed as a 'Noxious Weed' under the *Weed Control Regulation* of the BC *Weed Control Act*, and management is voluntary and are not currently present on the subject Lot 3 so are not of immediate concern to this project. **It is recommended that no movement of soils between the adjacent property (Lot 1) and the subject property (Lot 3) occur, and all soil stockpiles generated on Lot 3 be located at least 30 m from the western property boundary to limit any potential cross-contamination. If at any time poison hemlock is identified on the subject property, a management plan is to be created.**

3.3 AQUIFER PROTECTION AREA

During the site visit, it was determined that the subject property has a very shallow water table as pockets of standing water and saturated soils were observed throughout the site (Photo 6). Pursuant to DPA-3 guidelines Section 2.4.5 Aquifer Protection Areas, an assessment of the characteristics of the aquifer and its ability to accommodate the additional groundwater demand proposed by development must be included where the possibility of a development impacting an aquifer exists. An assessment of the aquifer and recommendations to ensure the aquifer is protected are not included in this memorandum but will be addressed by a suitable qualified professional in a separate report.

3.4 SPECIES AT RISK

According to BC Conservation Data Centre, there are two species at risk occurrences in proximity to the subject property. The blue-listed Western bumble bee has historically occurred throughout Cowichan Bay area and the unranked Oregon ash was last observed 600 m southeast of Somenos Creek in 2005. At the time of assessment the Community Mapping Network Great Blue Heron Atlas and Wildlife Tree Stewardship (WiTS) Atlas were not functioning to show the proximity of the nearest recorded great blue heron or bald eagle nest sites. However, the lack of mature canopy coverage on the lot and on nearby lots would indicate that there are no nest sites in conflict with the development and will not be a constraint.

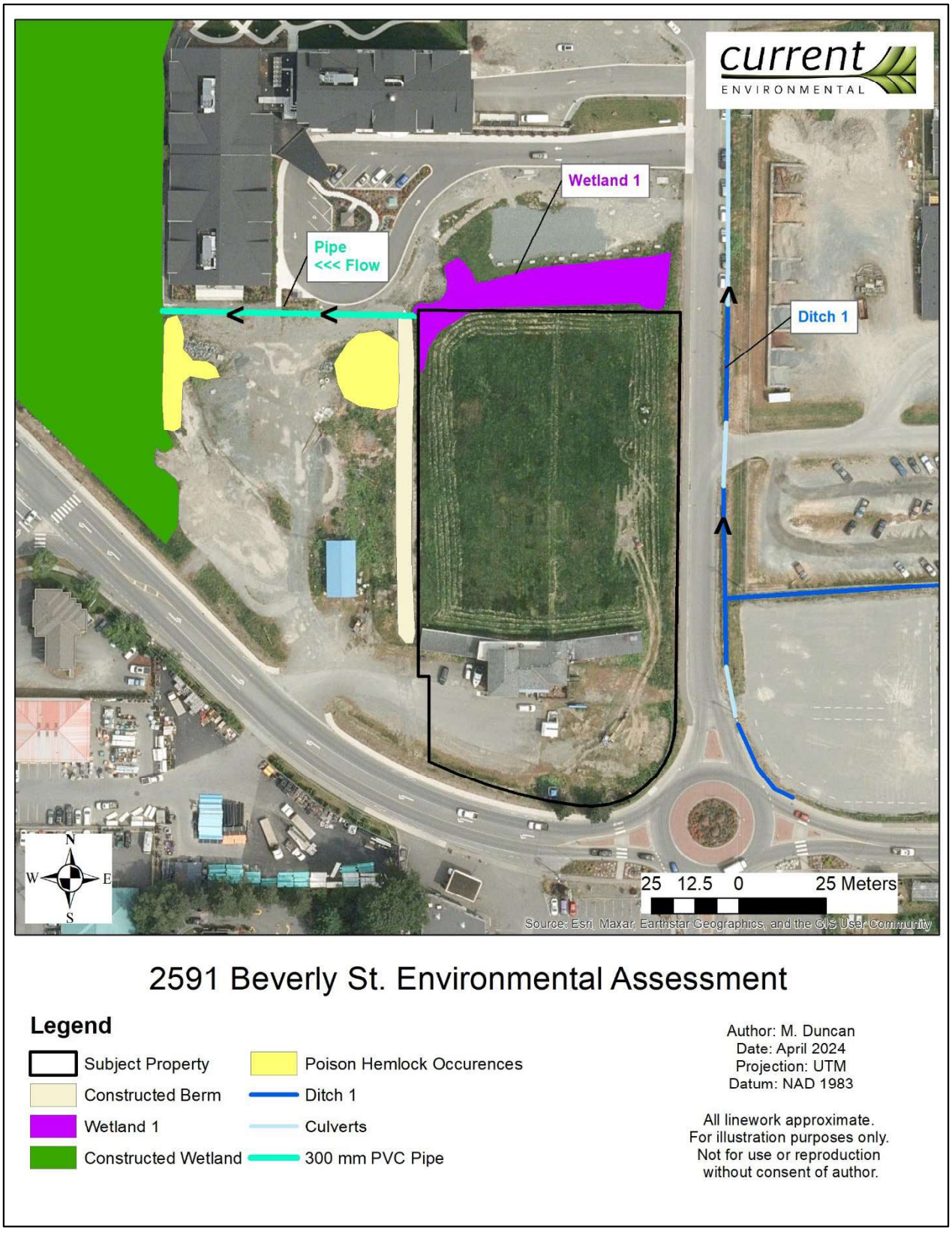


Figure 3. Identified ESAs on and near the subject property at Lot 3, 2591 Beverly St. (black outline).

4 CLOSURE

We trust that this letter report has satisfied your requirements for a preliminary environmental assessment on the subject property at 2591 Beverly St., Duncan, BC.

Please contact the undersigned with any questions or concerns.

Sincerely,

M Duncan

Dusty Silvester, R.P. Bio. & Molly Duncan, Tech.

5 PHOTOS

Photo 1. View looking east from the adjacent berm of Wetland 1 and the 300 mm PVC pipe on the subject property that connects to the constructed wetlands to the west.

Photo 2. View of the outlet of the pipe into the constructed wetlands approximately 75 m west of the subject property.

Photo 3. View of wetland vegetation in Wetland 1 near the inlet of the pipe.

Photo 4. View of Wetland 1 on the neighbouring property to the north at 5950 York Road.

Photo 5. View of riparian vegetation in Ditch 1 and the York Rd. flood station in the background.

Photo 6. View of the northern portion of the subject property showing vegetation and the shallow water table.

Photo 7. View of the eastern property boundary where invasive species including Himalayan blackberry, reed canary grass, wild carrot, and Scotch broom are present.

Photo 8. View of one lodgepole pine tree located along the southern property boundary.

Photo 9. View of poison hemlock and Himalayan blackberry that has colonized a historic soil stockpile approximately 7 m west of the subject property. Enhanced mitigation measures are recommended during construction to limit accidental seed dispersal onto the subject property.

LHC Lowen Hydrogeology Consulting Ltd.

#307 – 847 Dunsmuir Road, Victoria, B.C. V9A 0A5
Phone: 250-595-0624 Website: www.lowenhc.ca

TECHNICAL MEMORANDUM

TO:	Dan Hicks, Project Manager	E-MAIL:	dan@tricitycanada.ca
FROM:	Dennis Lowen, P. Eng. LHC Project No: 2402	E-MAIL:	dl@lowenhc.com
RE:	Proposed Development, Aquifer Protection Assessment for 2591 Beverly Street, District of North Cowichan, B.C.	DATE:	April 2, 2024
		# OF PAGES:	12

1.0 BACKGROUND

The District of North Cowichan, BC, has requested that the development applicant (Tricity Canada Inc.) provide an Aquifer Protection Assessment to support the development submission. Lowen Hydrogeology Consulting Ltd. (LHC) has addressed the Aquifer Protection Assessment. As requested, we have endeavoured to address the DPA 3 guidelines.

The author, Dennis A. Lowen, P. Eng, P. Geo, is a Qualified Professional with 50 years of experience in hydrogeology. Mr. Lowen is intimately acquainted with the District of North Cowichan geology and hydrogeology as he has carried out well drilling exploration, aquifer impacts from quarrying, contaminated soil landfill impacts, land drainage and wastewater ground dispersal projects in the region.

The subject property's legal description is Plan EPP85394, PID 030-594-715. See Figure 1 for a location plan.

2.0 PHYSICAL SETTINGS

2.1 Climate

The subject area lies at an elevation ranging from 7.0 to 9.0 m.asl[1]. The property is located 350 m South of Somenos Creek. This area is situated in the Coastal Douglas-fir biogeoclimatic zone (CDF) and, more specifically, within the Moist Maritime subzone of the CDF (CDFmm). These areas are characterized by warm, dry summers and mild wet winters (F.C. Nuszdorfer, 1991)[2].

The nearest climate station recording climate normal and within the same biogeoclimatic zone and similar elevations is the Victoria International Airport (station ID.1018620), located 14 km to the southeast.

The annual average daily temperature is 10°C, with a minimum of 5.6°C and a maximum of 14.4°C (Canadian Climate Normals, 1981-2010 Station Data, 2021)[3].

Annual precipitation is 882.9 mm, of which 845.3 falls as rain and 39.7 cm as snow. The rainy season is between October and March, with monthly precipitation over 75 mm. The driest months are June to September, with monthly precipitation under 35 mm.

2.2 Topography and Surface Water Drainage

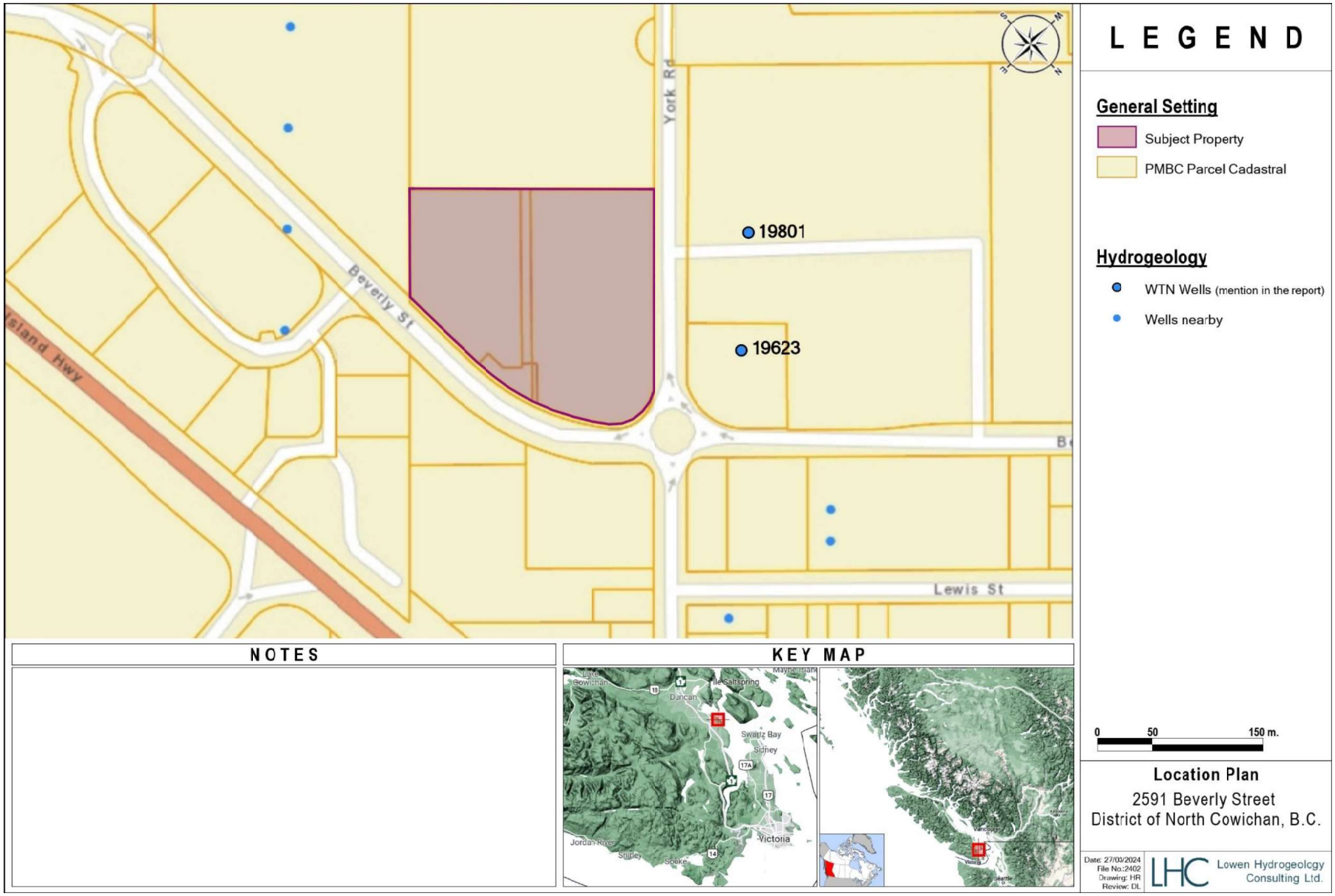
The property lies on gently sloping terrains with <10% slopes. Natural drainage is toward the east or Somenos Creek. This creek discharges into the Cowichan River.

[1] asl: Above Sea Level

[2] F.C. Nuszdorfer, K. K. (1991). *Ecosystems of British Columbia, Chapter 5: Coastal Douglas-fir Zone.* BC Ministry of Forests.

[3] Canadian Climate Normals, 1981-2010 Station Data. (2021). Retrieved from Historical Climate Data: https://climate.weather.gc.ca/

Figure 1: Location Plan



2.3 Soils

The Soil Survey, Spatial View map, published by DataBC Public Web Map Service, identifies the zone encompassing the subject property within the creek's catchment. This area does not have typical soil as usually defined but is described as anthropogenic. This designation indicates that the natural soils in the region have been altered by human activities (Government of Canada, 2019)[4]. They are believed to be stable.

The pre-existing natural soil unit here, in our opinion, was the Crofton soil Unit, consisting of poorly drained silt loam. This soil unit is mapped nearby (to the north). Additionally, based on nearby well records and previous work by Lowen Hydrogeology Consulting Ltd. (LHC, 2011)[5], a clay layer is underlying the observed silt loam. This layer is likely marine clay. The clay is very impermeable.

The soil at the subject property is poorly drained, and the depth to the aquifer and underlying sand and gravel aquifer is expected to be greater than 4.0 m (see section 2.5 Hydrogeology). This setting suggests the property is not developed on water-laden lands or unstable soil.

2.4 Geology

No water well providing a well log, and information on the geology is mapped in the close vicinity of the subject property. However, two wells are located within a hundred meters and provide geological information that may be relevant to the subject site.

The nearby well records and test pitting (LHC 2011) indicate an organic soil layer and a clay layer overlies the sand-gravel aquifer deposits. The black organic soils are likely swamp deposits as several swamps are observed in the region. The clay layer is likely of marine origin. It is well known that ocean levels were higher in the area in the past. The organic and clay soils have low to very low permeability.

The subject area is underlain at depth by sedimentary rocks of the Nanaimo Group. These formations were mostly deposited under marine conditions during the Upper Cretaceous period and consist of a wide range of grained rocks: boulder, cobble, and pebble conglomerate, coarse to fine sandstone, siltstone, shale and coal.

2.5 Hydrogeology

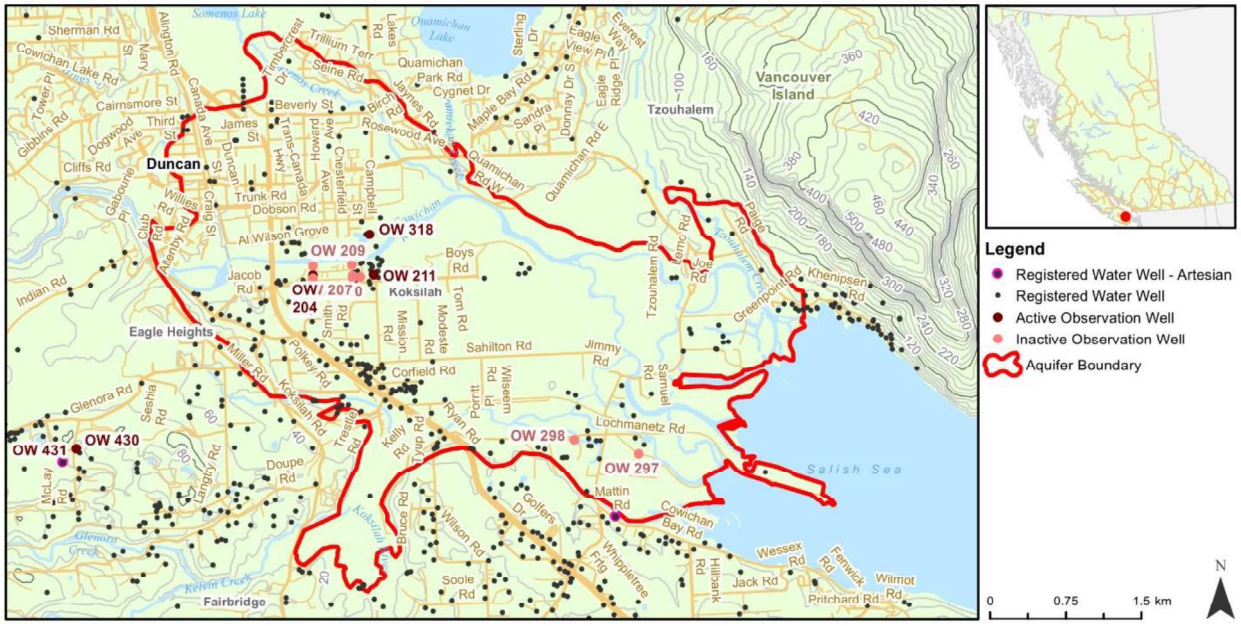
Two overlapping aquifers are mapped under the subject property. The shallower one is the unconsolidated Aquifer 186 developed within the saturated sand and gravel deposits. The deeper one is the sedimentary bedrock Aquifer 198 (Cowichan Bay) within the Nanaimo Group rock unit. The proposed surface activities will not affect the deep bedrock aquifer (198). An Aquifer Summary Sheet for Aquifer 186 is provided in Figure 2.

[4] Government of Canada. (2019). *Soils of British Columbia*. Retrieved from https://sis.agr.gc.ca/cansis/soils/bc/$ER/N/description.html

[5] LHC Ltd. (March 2011). *Quamichan and Alexander Schools, Drainage Trench flows*, for School District #79, Cowichan Valley, BC.

Figure 2: Aquifer No. 186 Summary Sheet

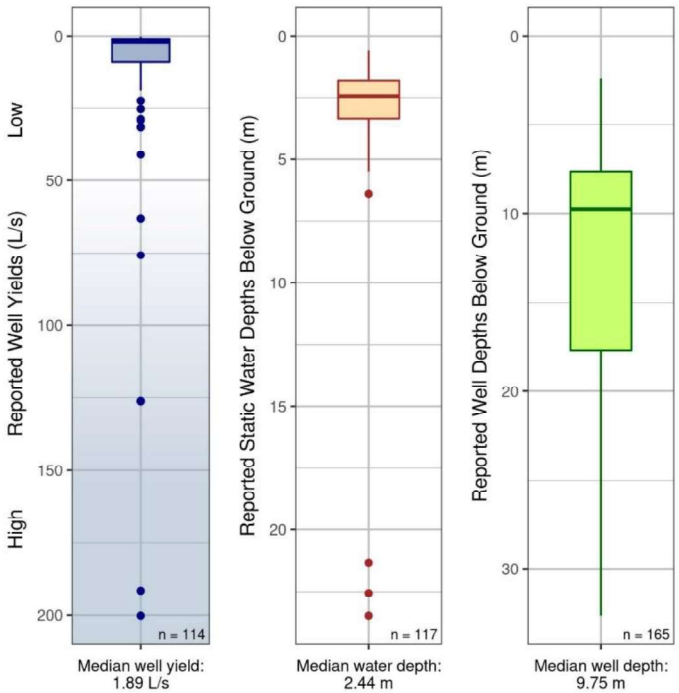
Aquifer #186
Lower Cowichan River A



Aquifer Description (Mapping Report - 2020): Predominantly unconfined fluvial or glacio-fluvial sand and gravel Aquifers found along rivers of moderate stream order with the potential to be hydraulically influenced by the river (subtype = 1b).

Aquifer Details	
Region	West Coast
Water District	Victoria
Aquifer Area	17.4 km^2
No. Wells Correlated	168
Vulnerability to Contamination	High
Productivity	High
Aquifer Classification	IA
Hydraulic Conductivity *	3.2x10^{-3} - 2.2x10^{-1} m/s (n=4)
Transmissivity *	3.9x10^{-3} - 1.2e+00 m^2/s (n=4)
Storativity *	3x10^{-4} - 3.8e+00 (n=2)
No. Water Licences Issued to Wells	3
Observation Wells (**Active**, Inactive)	**204**, **211**, **318**, 205, 208, 298

* min - max
For Hydraulic Connection see guidance document



Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).
Factsheet generated: 2022-07-27. Aquifers online: https://apps.nrs.gov.bc.ca/gwells/aquifers.

Sand and Gravel Aquifer No. 186

Aquifer 186 covers an area of 17.4 Km^2 extending BV from the subject property to the mouth of the Cowichan River. Overall, the aquifer is classified as having high productivity and vulnerability to contamination. However, as is normal for large aquifers, conditions may vary from one location to another.

Aquifer 186 was formed via deposition of flowing water during the last glacial period. The deposit is mainly coarse sand and gravel, indicating a relatively fast-moving stream deposition.

There are three active and three inactive observation wells within the aquifer. Therefore, aquifer water levels are being observed full-time. The observation wells indicate stable water levels.

Precipitation, streams, and rivers recharge the aquifer. The aquifer is hydraulically connected to local surface waters in places, and depending on relative hydraulic levels, the aquifer may feed or be fed by the surface waters.

The direction of groundwater flow likely follows the topography, which slopes down towards the Cowichan Estuary. Locally, this flow is expected to be eastward. The discharge area of the aquifer is ultimately Cowichan Bay.

3.0 AQUIFER PROTECTION ASSESSMENT

3.1 Aquifer Vulnerability Assessment

Sand and Gravel Aquifer No.186 AT THE Subject Site

Aquifer #186 is classified as Highly Vulnerable as it is exposed at the surface or has a thin soil cover over much of its area. However, a site-specific assessment using local well data (Attachment #1 - Well Records) indicates that the aquifer has a low vulnerability here. The simplified stratigraphy at the site, from well records WTN 19623 and 19801, is as follows.

Depth (m.)	Geologic Unit
0 - 0.61	Organic soil
0.61 - 3.35	Silty clay
3.35+	Aquifer 186, sand/gravel

The site-specific "Aquifer Vulnerability Index (AVI)" has been calculated using the observed geology. See Table 1 for the AVI calculation. In the subject area, Aquifer #186 is confined by a low permeability soil layer, which protects against contamination from surface infiltration. The AVI calculation indicates a low vulnerability for the aquifer beneath the subject property.

Table 1

AQUIFER VULNERABILITY INDEX CALCULATION

PROJECT:	Aquifer Protection Assessment
PROJECT No.:	2402
DATE:	27/03/2024
WELL ID. PLATE No.:	Unknown
WELL TAG Nos.:	19623, 19801
LOCATION:	2591 Beverly Street, North Cowichan, Bc

Layer	Thickness (m)	K value (m/d)	c** (years)
Organic soil	0.61	0.00001	1.67E+02
Silty clay	2.74	0.000001	7.51E+03

TOTAL **7,674** years

Low Vulnerability

* Van Stempvoort, D.,Ph.D., Ewart,L., and L.Wassener, 1992. AVI: A Method for Groundwater Protection Mapping in the Prairie Provinces of Canada, Prairie Provinces Water Board, Regina, Sask.

** Hydraulic Resistence "c"

Hydraulic Resistance, c = Σdi / Ki , for layers 1 to i

The lower the hydraulic resistance (c) the higher the vulnerability:

c = Less than 10 years - extremely high vulnerability

c = 10 - 100 years - high vulnerability

c = 100 - 1000 years - moderate vulnerability

c = 1000 - 10,000 - low vulnerability

c = greater than 10,000 - extremely low vulnerability

3.2 Rainwater Management Plan

The development will encompass the following features:

- Buildings and driveways.
- A Parking Lot.

WSP Canada Inc. has designed the site drainage, which includes silt and hydrocarbon removal, plus a stormwater treatment system that includes two stage filtering before discharge. The discharge outlets to the natural drainage system.

3.3 Groundwater and Surface Water Quality Impacts

Groundwater quality can be altered by a development in two manners:

- An increase in runoff water leads to soil erosion and increasing turbidity in the receiving surface water bodies, which may recharge underlying aquifers.
- Direct pollution from human activities onsite.

The rainwater management plan is designed to capture runoff from the driveways and the roofs, preventing this excess runoff from spreading over the parcel and flowing into the creek downstream. Adequate measures are included in the site development plan to preclude any negative groundwater or surface water quality impacts.

4.0 POTENTIAL FOR AQUIFER DISCHARGE AND DEPLETION

Nearby well records indicate a confining layer over the aquifer 3-4 m thick. The site excavation plan (by WSP) means the maximum excavation will be 1.5 m below the ground surface. This should lead to a 1.5 to 2.5 m confining layer under the building foundation and over the aquifer.

The local well records also indicate a hydraulic level in the aquifer approximately 1.0 meters below the ground surface. If the confining layer (clay and organic soils) is thinner or absent beneath this site, groundwater could discharge in the excavation. A drainage blanket beneath the building site could mitigate this impact.

5.0 CONCLUSIONS

- The rainwater management plan will handle site runoff and prevent any negative impacts to existing surface water or groundwater.
- The permitted uses and development plan will preclude environmental degradation. No activities are allowed on site, representing a danger to groundwater quality and quantity.
- There are no large-scale production wells near this site (minimum offset >250 m); therefore, no impacts on existing wells are anticipated. In the unlikely event of groundwater discharge, due to the excavation, the drawdown impact would be minor (less than 1.0 m.) and would not pose a threat to any nearby wells.
- The development will not negatively impact the sand and gravel Aquifer 186 or bedrock Aquifer 198 underlying the site.
- If groundwater discharge occurs in the excavated areas, the flow can be managed with appropriate civil works.
- The underlying Aquifer 186 is most likely protected by a layer of very low permeability soils.

6.0 RECOMMENDATIONS

— Four auger test holes should be drilled to confirm on site soil conditions.

— The site drainage plan should be implemented as designed.

7.0 CLOSURE / DISCLAIMER

This report has been prepared following generally accepted groundwater engineering practices. The opinions expressed herein are considered valid at the time of writing. Changes in site conditions can occur, however, whether due to natural events (e.g. climate change, earthquakes) or to human activities (e.g. recharge area modification or blasting on this or adjacent properties). In addition, changes in regulations and standards may occur, whether from legislation or the broadening of knowledge. This report is, therefore, subject to review and revision as changed conditions are identified.

In formulating our analysis, we relied on information provided by others: well drillers, surveyors, and hydrogeology reports/aquifer mapping. The information provided by others is believed to be accurate but cannot be guaranteed by Lowen Hydrogeology Consulting Ltd.

Furthermore, if the recommendations in this report are not implemented, the undersigned assumes no responsibility for any adverse consequences that may occur.

Please contact the undersigned if you have any questions or require further information.

Best regards,

LOWEN HYDROGEOLOGY CONSULTING LTD.
Permit Number: 1005090

PROFESSIONAL PROVINCE OF D. A. LOWEN BRITISH COLUMBIA GEOSCIENTIST

PROFESSIONAL PROVINCE OF D. A. LOWEN BRITISH COLUMBIA ENGINEER

April 2, 2024

Dennis Lowen, P. Eng., P. Geo.
Licence to Practice #11552

DL//hr

REFERENCES

BC Ministry of Environment. (2018). *AQ.186 Aquifer Mapping Report.*

BC Ministry of Environment. (2018). *AQ.198 Aquifer Mapping Report.*

Canadian Climate Normals, 1981-2010 Station Data. (2021). Retrieved from Historical Climate Data: https://climate.weather.gc.ca/

F.C. Nuszdorfer, K. K. (1991). *Ecosystems of British Columbia, Chapter 5: Coastal Douglas-fir Zone.* BC Ministry of Forests.

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Van Stempvoort, D., & Wassenaar, L. (1992). *AVI: A Method for Groundwater Protection Mapping on the Prairie Provinces of Canada.*

Well Record - WTN 19801

BRITISH COLUMBIA Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 19801
Well Identification Plate Number:
Owner Name: DISTRICT OF NORTH COWICHAN
Intended Water Use: Unknown Well Use
Artesian Condition: No

Well Status: New
Well Class: Unknown
Well Subclass:
Aquifer Number: 186
Technical Report: N/A

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No
Drinking Water Area Indicator: No

Sections

Licensing Information

Licensed Status: Unlicensed
Licence Number:

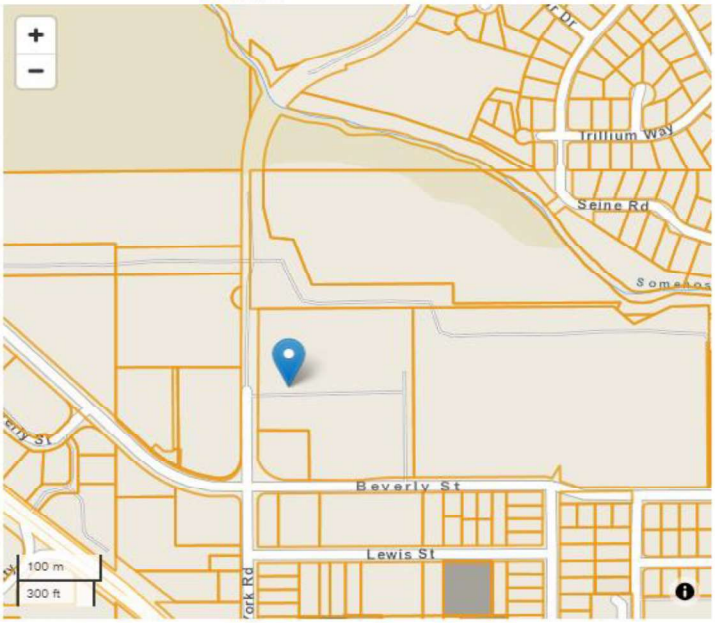
Location Information

Street Address:
Town/City: DUNCAN

Legal Description:

Lot	
Plan	
District Lot	
Block	
Section	19
Township	
Range	7
Land District	45
Property Identification Description (PID)	

Description of Well Location:



Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 48.786028
Longitude: -123.698168
UTM Easting: 448716
UTM Northing: 5403905
Zone: 10
Coordinate Acquisition Code: (100 m accuracy) Digitized from old Dept. of Lands, Forests and Water Resources maps

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1966-01-01	1966-01-01	Drillwell Enterprises	August 13th 2003 at 8:40 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1966-01-01	1966-01-01				

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 40 ft bgl
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Estimated Well Yield: 180 USgpm
Well Cap:
Well Disinfected Status: Not Disinfected
Drilling Method: Other
Method of determining elevation: Unknown

Static Water Level (BTOC): 2 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	0	some wood.						
0	12	Grey brown silty clay						
12	13	Black organic material						
13	23	Oxidized sand and gravel						
23	24	Blue silty gravel						
24	27	Med. to fine blue sand and gravel						
27	40	Layers of blue clay and brown silt -						

Casing Details

From	To	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:
Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:
Liner Thickness:
Liner to:

Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

Estimation Method:
Static Water Level Before Test:
Hydrofracturing Performed: No
Estimation Rate:
Drawdown:
Increase in Yield Due to Hydrofracturing:
Estimation Duration:

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:
Method of Decommission:
Backfill Material:

Pumping Test Information and Aquifer Parameters

Start Date	Description	Test Duration (min)	Boundary Effect	Storativity	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Specific Yield	Specific Capacity (L/s/m)	Analysis Method	Comments
There are no records to show										

Comments

180 GPM FOR 19" OF DRAWDOWN. METHOD OF DRILLING = DRILLED

Documents

Well Number	Document Type	Date Of Upload	Document Status	Uploaded Document
19801	Unknown	Date Unknown	Public Document	WTN 19801_Well Record.pdf

Well Record - WTN 19623

BRITISH COLUMBIA Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 19623
Well Identification Plate Number:
Owner Name: DISTRICT OF NORTH COWICHAN
Intended Water Use: Not Applicable
Artesian Condition: No

Well Status: New
Well Class: Unknown
Well Subclass:
Aquifer Number: 186
Technical Report: N/A

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No
Drinking Water Area Indicator: No

Licensing Information

Licensed Status: Unlicensed
Licence Number:

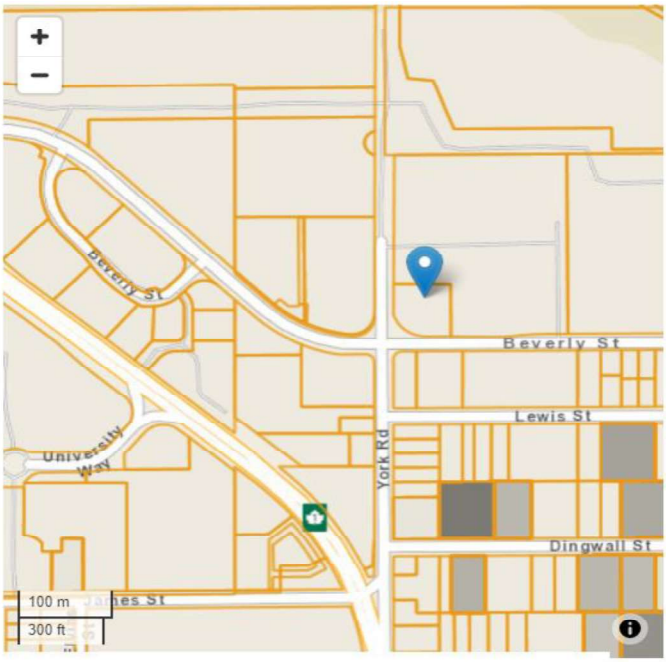
Location Information

Street Address: BEVERLY STREET
Town/City: DUNCAN

Legal Description:

Lot	
Plan	
District Lot	
Block	
Section	19
Township	
Range	7
Land District	45
Property Identification Description (PID)	

Description of Well Location:



Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 48.78539 **Longitude:** -123.69823
UTM Easting: 448711 **UTM Northing:** 5403834
Zone: 10 **Coordinate Acquisition Code:** (100 m accuracy) Digitized from old Dept. of Lands, Forests and Water Resources maps

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1966-01-01	1966-01-01	Drillwell Enterprises	August 13th 2003 at 8:16 AM

Total Depth Drilled:
Finished Well Depth: 40 ft bgl
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Estimated Well Yield: 180 USgpm
Well Cap:
Well Disinfected Status: Not Disinfected
Drilling Method: Other
Method of determining elevation: Unknown

Static Water Level (BTOC): 2 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1966-01-01	1966-01-01				

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 25 ft bgl
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Estimated Well Yield: 60 USgpm
Well Cap:
Well Disinfected Status: Not Disinfected
Drilling Method: Other
Method of determining elevation: Unknown

Static Water Level (BTOC): 2 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	0	lenses						
0	0	Into blue clay at 20' 6"						
0	2	Black topsoil						
2	6	Layers of brown clay and oxidized silt						
6	10	Med. to coarse sand and gravel with silt						
10	20.6	Fine to med. brown sand and gravel.						
20.6	25	Blue clay						

Casing Details

From	To	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:
Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner Thickness:
Liner from:
Liner to:

Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

Estimation Method:
Estimation Rate:
Estimation Duration:
Static Water Level Before Test:
Drawdown:
Hydrofracturing Performed: No
Increase in Yield Due to Hydrofracturing:

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:
Method of Decommission:
Backfill Material:

Pumping Test Information and Aquifer Parameters

Start Date	Description	Test Duration (min)	Boundary Effect	Storativity	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Specific Yield	Specific Capacity (L/s/m)	Analysis Method	Comments
There are no records to show										

Documents

Well Number	Document Type	Date Of Upload	Document Status	Uploaded Document
19623	Unknown	Date Unknown	Public Document	WTN 19623_Well Record.pdf

GEOPACIFIC CONSULTANTS
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2nd Floor, 3351 Douglas Street
Victoria, B.C. V8Z 3L4

Total Concept Developments Ltd.
158 Victoria Street
Kamloops, BC
V2C 1Z7

March 27, 2024
File: 22431
R2

Attention: Casey VanDongen

Re: Geotechnical Investigation Report – Proposed Mixed-Use Development
Lot 3 - 2591 Beverly Street, North Cowichan, BC

1.0 INTRODUCTION

We understand that a new mixed-use development is proposed for the above referenced site in Duncan. Based on preliminary information provided, the development may consist of three six storey buildings over a single level of below grade parking. We expect a mix of prefabricated steel stud above grade, with reinforced concrete construction below grade. We anticipate loading to be moderate with column loads in the range of 3600 kN and wall loads of up to 100 kN/m.

This report presents our recommendations for the design and construction of the proposed development and temporary excavations, based on our field investigation and experience in the immediate area. This report has been prepared exclusively for our client, for their use, and the use of others on the design team as well as for the Municipality of North Cowichan in the development and permitting process.

2.0 SITE DESCRIPTION

The proposed development is located to the northwest of the intersection of Beverly Street and York Road, in Duncan. The site consists of two lots that combined are triangular with an approximate area of 4.3 acres. The site is bounded by Beverly Street to the south and south-west, York Road to the east, residential development to the north and an estuary to the west. The eastern lot is currently improved with a golf driving range, a mixed-use development at the south-eastern extent with asphalt parking. The western lot is mostly unimproved with only a single small storage structure at the south-eastern extent and asphalt drive aisles at the southern extent. The site is generally flat with an approximately geodetic elevation between 8 to 10 metres (Google Earth Pro).

The site location relative to the surrounding area is shown on our Drawing No. 22431-01, following the text of this report.

3.0 FIELD INVESTIGATION

GeoPacific completed an investigation of the soil and groundwater conditions at the site from February 14th to 16th, 2023, using a track-mounted auger drill supplied and operated by Blue Max Drilling of Courtney, BC. The site investigation consisted of two Cone Penetration Test (CPT) soundings, supplement with sixteen augured tests holes. Twelve Dynamic Cone Penetration Test (DCPT) was conducted to assist in determining the in-situ relative density of the surficial soils.

The auger test holes were drilled to depths of between 6.1 m and 10.7 m below current site grades. The CPT soundings were advanced to depths of between 2.8 m and 7.6 m below the current site grades.

Prior to our investigation, a BC One Call was placed, and Municon West Coast cleared the utilities at the test hole locations. All test holes were backfilled and sealed in accordance with provincial abandonment requirements following classification, sampling, and logging.

GeoPacific and Municon West Coast returned to site on November 28th, 2023, to complete a Multi-channel Analysis of Surface Waves (MASW) survey. A total of two MASW acquisition lines were completed to provide seismic site classifications the proposed building sites in accordance with the 2023 BCBC as well for cyclic stress (CSR) and Cyclic Resistance (CRR) ratio calculations for cyclic loading.

The test hole logs are presented in Appendix A. The CPT sounding data is presented in Appendix B. Interpreted soil parameters are presented in Appendix C. Interpreted settlement calculations based on CPT the CPT results are presented in Appendix D. The results from the MASW survey are presented and discussed in Appendix E. The approximate locations of the test holes, CPT soundings and MASW acquisition lines completed by GeoPacific Consultants Ltd. are shown on our Drawing 22431-01.

4.0 FIELD INVESTIGATION

4.1 Soil Conditions

According to "Northern Vancouver Island – Geology" – (Map 2013-NVI-1-1) published by Geoscience BC, the site is understood to be underlain by Quaternary Cover described as "Alluvium, glaciofluvial gravels and sand, till". Observed soil conditions were highly variable in composition yet correlate with the description of Alluvium and glaciofluvial deposits as described below. For a more detailed description of the subsurface conditions encountered refer to the test hole logs in Appendix A

TOPSOIL / FILL

Approximately 0.3 m to 1.5 m of topsoil/variable granular fill was encountered at all test hole locations. The fills were generally localized at the western lot and southern extent of both lots. It consisted of dense to very dense silty sand and gravel while the topsoils were generally localized to the eastern lot and consisted of soft silts with trace to some sand and with intermixed wood fragment, peat. The stratum was noted to be black and brown in colour and generally moist.

INTERBEDDED SANDS, SILTS, PEAT AND CLAYEY SILTS

The majority of the observed test holes show that the topsoil is underlain by interbedded soft to firm sand and silts. Layers of organic silts and peat were noted at within this layer at test holes TH23-01, 05, 06, 07, 09, 13 & 16. Localized areas of soft to firm clayey soils were noted primarily at the western extent of the western lot. The stratum when encountered was noted to contain some intermixed wood debris. The depth of the stratum varied considerably from 1.2 metres to 6.6 metres below exiting grades. This stratum is noted it be highly compressible. In general, the thickness of organic silt and peat is expected to be lower in the Lot 3 area relative to the remainder of the site.

GRAVEL

The stratum of finer grained soils described above was underlain by dense to very dense gravel at all test hole locations. The gravel was intermixed with varied sands and silts. It was noted to be cobbly. It was consistently noted to be very wet and grey to grey-black in colour. The depth the gravel layer varied considerably from 4.6 m to 10.7 m below exiting grades on site and resulted in auger refusal at several test holes, TH23-03, 05, 07 & 09 at depths ranging from 3.4 m to 5.2 m below grade.

INTERBEDDED SILTY SAND, ORGANIC SILTS AND PEAT

The gravel layer was locally underlain by interbedded loose to compact silty sand, soft to firm organic silts and peat. The stratum was noted to contain interbedded organics, was grey to grey-brown in colour and wet.

4.2 Groundwater Conditions

The static groundwater was encountered during the investigation at approximate depth of 1.8 meters below grade. The groundwater level is expected to vary seasonally with higher levels following periods of extended rainfall. Prior to detailed design, GeoPacific should monitor the groundwater levels during the wetter winter months of the year to observe seasonal fluctuations. We expect groundwater seepage to be persistent, with flows controlled using conventional sumps and sump pumps.

Water levels were measured using a handheld water level meter on March 10, 2023. The following table provides the monitoring well details.

Table 1: Manual Groundwater Measurements

			March 10, 2023	
Well #	**Well Depth (m)**	**Screen Depth (m)**	**Depth to Water Below Ground Surface (m)**	**Approximate Groundwater Elevation (m geo)**
MW23-01	**3.7**	**2.1 – 3.7**	**1.7**	**5.5**
MW23-02	**3.0**	**1.5 – 3.0**	**1.6**	**7.0**
MW23-03	**4.0**	**2.4 – 4.0**	**0.8**	**7.5**

5.0 DISCUSSION

5.1 General Comments

We understand that a new mixed use development is proposed for the above referenced site in Duncan, BC. Based on preliminary information provided, the development will consist of three, six storey buildings over a single shared level of below grade parking.

We expect prefabricated steel stud construction above grade and reinforced concrete for the below grade parking and foundations. We anticipate structural loading to be moderate, with column loads in the range of up to 3600 kN and wall loads of up to 100 kN/m. Floor loading is expected to be relatively light. Furthermore, we expect the site will require new drive aisles and asphalt parking.

The site is located within the Lower Cowichan / Koksilah River flood plain and therefore it will be necessary to raise the site to meet the required flood construction level (FCL) for development. According to the "City of Duncan Floodplain Designation Bylaw No. 1997, updated January 2023", it will be necessary to fill the area to construct the proposed development such that the habitable levels are at or above the acceptable flood construction level (FCL) of approximately 10 m geodetic.

We expect initial stripping depth to be in the range of 0.3 to 1.0 m to expose a subgrade of sand and silt, though deeper sub-excavation, up to 3 m, will be required locally where thicker surficial peat deposits were identified. We anticipate the subgrade would be backfilled/protected with fractured rock material, compacted as described

herein for “Engineered Fill”. A number of foundation options are possible however given the high groundwater table, the potential for liquefiable soils to be present beneath the building and variable subgrade conditions, we expect that the most practical option is to support the structure on a raft foundation.

We confirm, from a geotechnical point of view, that the proposed development is feasible provided that the recommendations outlined in the following sections are incorporated into the overall design and construction.

5.2 Seismic Analysis

It is generally accepted that loose to compact and saturated non-plastic silts and sands are prone to liquefaction or strain softening during cyclic loading caused by large earthquakes. The strength reduction caused by soil liquefaction can cause foundations to punch. Furthermore, once liquefaction has been triggered, experience has shown that significant, permanent vertical and horizontal movements may be experienced.

We have completed a liquefaction assessment based on 1 / 2,475 design earthquake recommended by the 2018 British Columbia Building Code (BCBC) for seismic restraint designs. In the Duncan area, the design earthquake is expected to measure 7.0 on the Richter Scale and generate a maximum horizontal ground acceleration of 0.509 g for this site (Natural Resources Canada, Site Coordinates: 48.785°N, 123.700°W).

Plots of the liquefaction potential and predicted post-liquefaction ground movements are presented as Figures D.01 to D.02 in Appendix D of this report. The analysis shows minor ground liquefaction within the loose to compact silty sands to sands resulting in surface settlements of up to 60 mm and horizontal movements of up to 210 mm. These are estimated free field movements based on empirical relationships developed from experience on other earthquake sites and are assumed to be beyond the influence of structures.

Based on the proposed building slab elevation, we expect that the building will be underlain by between 0.5 and 2.5 m of liquefiable silty sand. The raft slab foundation will mitigate the impacts of ground softening caused by liquefaction provided the raft stress do not exceed those recommended herein.

5.3 Ground Settlements Due to General Grade Filling

As indicated above, we anticipate that some filling may occur throughout site to achieve desirable street and building grades for the development. We anticipate that the permanent fills would cause some consolidation of the silty sand, peat, and organic silt and clays, likely in the range of 25 mm to 100 mm. The fills should be placed well in advance of construction of any roads, structures, or utilities to allow any settlements to occur well in advance of construction.

We do not anticipate any change in the water table elevation outside of the areas to be filled. Within the filled areas, some seasonal increase in water table (mounding) will occur as a result of the fill placement.

6.0 RECOMMENDATIONS

6.1 Site Preparation

6.1.1 Stripping

Prior to the construction of any parking areas, building subgrades or slab on grade, all existing fill, topsoil, organic soils, debris, refuge, asphalt, vegetation and any other loose or disturbed soils should be removed from construction area to expose a subgrade of firm to stiff grey clay/silt/sand. Due to the presence of existing fills throughout the site, large variations in stripping depths are expected. It should be recognized that the thickness of unacceptable soil can vary throughout the site and between test hole locations. As noted above, generally stripping is anticipated to be on the order of 1 to 1.2 m thick, though locally up to 3 m of peat would need to be removed. Provided the near surface peat and organic silt is removed from the building area, preload treatment is not required to prepare the building site.

Stripping should be extended beyond the building and parking lot areas at a distance equal to the total thickness of engineered fill to be placed.

Grade reinstatement beneath the building area and surrounding parking areas should be done with compacted "engineered fill". In the context of this report we anticipate engineered fill will consist of 75 to 150 mm minus fractured rock, compacted to a minimum of 95% Modified Proctor dry density (MPDD, ASTM D1557), at a moisture content that is within 2% of optimum for compaction.

The initial lift of fill placed on a fine grained subgrade should be 500 mm in thickness and compacted using a large roller with the vibratory function deactivated. Each subsequent lift should not exceed 300 mm in loose thickness and should be compacted with a large vibratory roller. GeoPacific should review the compaction of engineered fill.

6.2 Foundations

6.2.1 Raft Foundations

Bearing pressures for spread foundations are governed by the thickness of compressible silt beneath the foundations and the extent of pre-loading undertaken. Following the above recommended site preparation, we recommend that a raft foundation be designed using a Serviceability Limit States (SLS) bearing pressure of 75 kPa and a factored Ultimate Limit States (ULS) bearing pressure of 150 kPa. The raft can be designed on the basis of a modulus of subgrade reaction of 10 MPa/m. Foundations should be buried a minimum of 450 mm for frost protection.

Foundation subgrades must be inspected by the geotechnical engineer prior to footing construction. Bearing pressures may need to be reduced for higher columns loads than those described above.

6.2.2 Settlement of Foundations

Following the above recommended sub excavation, immediate elastic settlement of foundations is expected to be up to 25 mm total, with long term deep seated settlement of up to 50 mm in addition to the immediate settlement. Long term settlements are expected as a result of consolidation of the interbedded clays and silts at depth. Differential settlements of up to 1:300 should be expected beneath the raft.

6.3 Slabs-On-Grade

In order to provide suitable support for any slabs on grade we recommend that any fill placed under the slabs should be "engineered fill" as described in section 6.1 above.

Floor slabs should be directly underlain by a minimum of 150 mm of 19 mm clear crushed gravel fill to inhibit upward migration of moisture beneath the slab. The crushed gravel fill should be compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) Maximum Dry Density at a moisture content that is within 2% of optimum for compaction. A moisture barrier should underlie the slab directly above the free draining granular material to help reduce moisture levels within the slab.

Slab-on-grade subgrade and compaction of the under-slab fill must be reviewed by GeoPacific.

6.4 Seismic Design of Foundations

Based on the completed Multi-Channel Analysis of Surface Waves (MASW) survey and the requirement for sub excavation of any significantly thick (>3m) peat deposits, we recommend that the building be designed in accordance with the Class D spectral parameters as defined in Table 4.1.8.4.A of the 2018 BC Building Code (BCBC). The peak ground acceleration on firm ground for the approximate site location is 0.509 g (Natural Resources Canada, Site Coordinates: 48.785°N, 123.700°W).

The results of our seismic survey can be viewed in Appendix E following the text of this report.

We do not expect any of the soils used to support building foundations to be prone to ground liquefaction or strain softening during cyclic loading caused by the design earthquake defined in the 2018 BCBC.

6.5 Foundation Drainage Systems and Flooding

As noted above, the groundwater table is near the present ground surface and can be expected to rise to the ground surface in periods of sustained precipitation. Managing groundwater flows using a conventional perimeter drainage system may not be practical and therefore designing the raft for full water pressure, to the ground surface is recommend. In this case perimeter drainage can be omitted.

Since the parkade entrance is below the FCL, the parkade will flood during a large storm event, where flood water levels exceed the level of the parkade entrance. This risk is considered acceptable provided the owners/occupants are made aware of this risk. The raft should therefore be design for buoyant pressures equivalent to the elevation of the parkade ramp.

6.6 Temporary Excavations and Shoring

We expect that any temporary excavations would be sloped where possible since it is more economical to do so. We recommend that all excavations be sloped at a maximum grade of 1:1 (H:V) in the surficial fills with any surficial loose soils benched back at a distance equal to the thickness of the layer of said material. Some localized dewatering may be required during excavation to permit construction of mechanical sumps and elevator pits. We expect that most excavation related dewatering can be handled with conventional sumps and pumps, though the deeper elements described may require well point dewatering.

All excavations and trenches must conform to the latest Occupational Health and Safety Regulation supplied by Work Safe BC. Any excavation in excess of 1.2 m in depth requiring worker entry must be reviewed by a

professional geotechnical engineer. Temporary excavations in the fill soils and native soils can be cut at a slope angle of 1:1 (H:V). All slopes should be covered with poly-sheeting.

Temporary cut slopes in excess of 1.2 m in height must be covered in polyethylene sheeting and require review by a professional engineer in accordance with WorkSafe BC guidelines, prior to worker entry.

6.7 Methane Control

The proposed developments could be underlain by thin layers of peat and organic silts, which generate methane as they degrade. The parkade exhaust system will be sufficient to exhaust any methane that penetrates the raft slab foundation.

6.8 Utility Installation

Site utilities will be required beneath the slab-on-grade. The design of these systems must consider the locations and elevations of the foundations. The service trenches and excavations required for the installation of the underground facilities must be located outside of a 1.5:1 (H:V) slope measured downward from the edge of adjacent foundations.

We recommend that all utility trenches be sloped or shored as per the latest Workers Compensation Board (WCB) regulations. We recommend that all service trenches be backfilled with clean granular material, which conforms to municipal standards, compacted to 95% Modified Proctor (ASTM D1557) Maximum Dry Density, with a moisture content within 2% of optimum for compaction. If for any reason the backfill becomes saturated prior to compaction, it must be removed and replaced with dry fill.

6.9 On-Site Pavement Structures

Following the recommended site preparation in Section 6.1, it is our opinion that the minimum asphalt pavement structure specified in Table 1 is adequate to support the anticipated conventional automobile and light truck traffic loads.

Table 1: Recommended Minimum Pavement Structure for On-Site Works

Material	Thickness (mm)	CBR
Asphalt	75	N/A
Well-Graded Road Base (19 mm minus)	150	80
Well-Graded Sub-Base (75 mm minus)	300	20

Parking areas should be proof rolled prior to the placement of sub-base material. Any soft or loose areas encountered during the proof roll, which cannot be recompacted in-situ, must be excavated and be replaced with 75 mm minus sub-base. All base and sub-base fills should be compacted to a minimum of 95% Modified Proctor (ASTM D1557) Maximum Dry Density with a moisture content within 2% of optimum for compaction. The base and sub-base materials should meet municipal requirements for gradation and density. Density testing should be conducted by GeoPacific on the base and sub-base materials to confirm that they have been compacted to the required standard.

6.10 Flood Hazard

The site is subject to a known flood hazard. The parking level is to be constructed below the flood control level (FCL) of 10 metres geodetic. All habitable structures as well as mechanical and electrical systems considered essential to the functionality of the building should be constructed above the FCL.

7.0 DESIGN AND CONSTRUCTION REVIEWS

As required for Municipal "Letters of Assurance", GeoPacific Consultants Ltd. will carry out sufficient field reviews during construction to ensure that the geotechnical design recommendations contained within this report have been adequately communicated to the design team and to the contractors implementing the design. These field reviews are not carried out for the benefit of the contractors and therefore do not in any way effect the contractors' obligations to perform under the terms of his/her contract.

It is the contractors' responsibility to advise GeoPacific Consultants Ltd. (a minimum of 48 hours in advance) that a field review is required. Field reviews are normally required at the time of the following activities:

1. Stripping - Review of stripping depth.
2. Filling - Review of grade reinstatement and compaction.
3. Sub-Excavation - Review of sub-excavation of peat soils and replacement with engineered fill.
4. Excavation - Review of temporary slopes and soil conditions.
5. Engineered Fill - Review of material and compaction degree.
6. Foundation - Review of foundation subgrade prior to blinding and footing construction.
7. Slab-on-grade - Review of subgrade, under-slab fill materials, and compaction.
8. Backfill - Review of placement of backfill along foundation walls.
9. Utilities - Review of trenched excavation subgrade prior to utility placement.

It is critical that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also critical that contractors working on the site view this document in advance of any work being carried out so that they become familiar with the sensitive aspects of the works proposed. It is the responsibility of the developer to notify GeoPacific Consultants Ltd. when conditions or situations not outlined within this document are encountered.

8.0 CLOSURE

This report has been prepared exclusively for our client for the purpose of providing geotechnical recommendations for the design and construction of the proposed development. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of this report is prohibited.

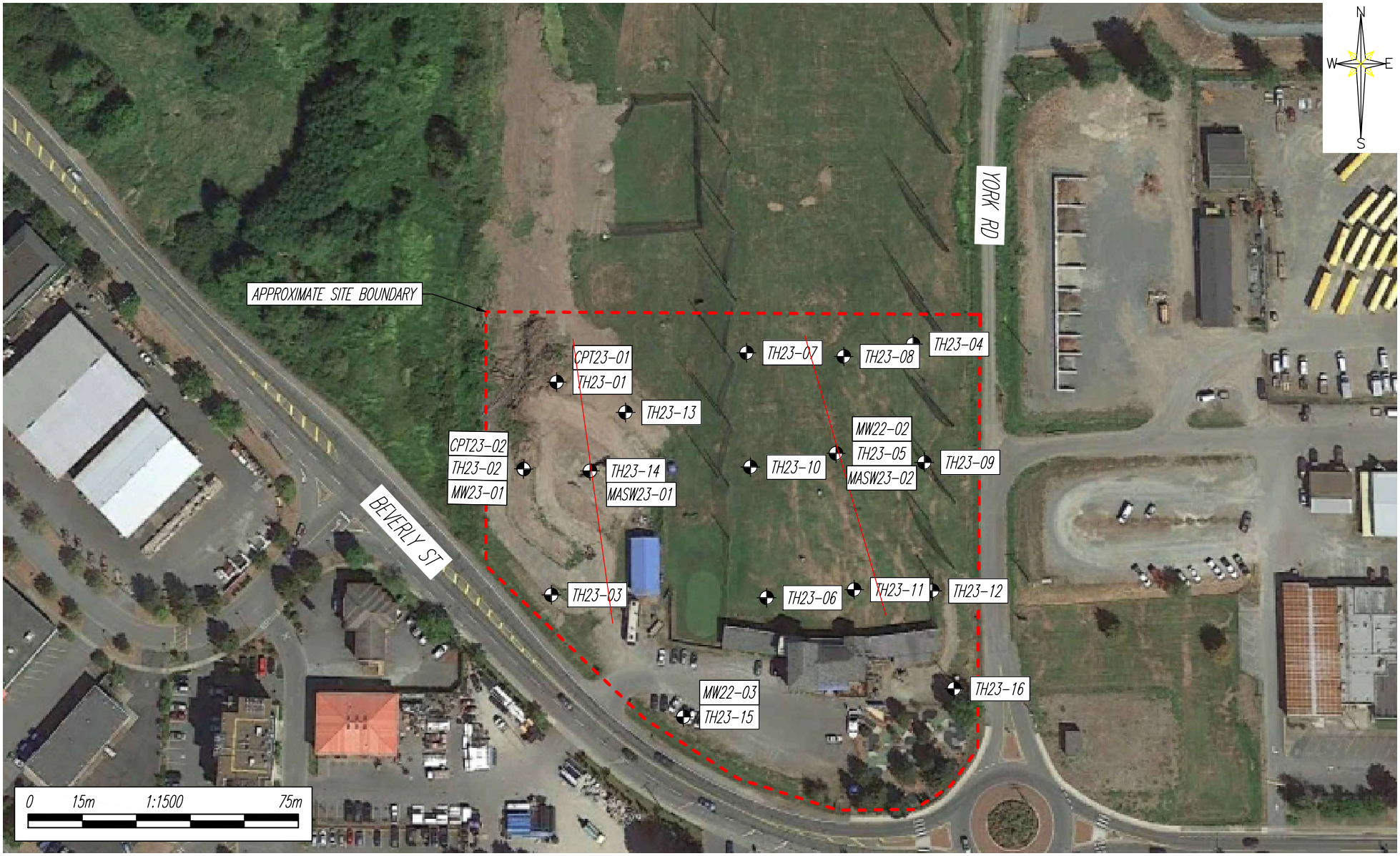
We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

For:
GeoPacific Consultants Ltd.

Reviewed by:

Daniel Kokan, M.Eng., P.Eng.
Geotechnical Engineer

Matt Kokan, M.A.Sc., P.Eng.
Principal



LEGEND:

- TH23-XX – TEST HOLE (TH) LOCATION
- MW23-XX – MONITORING WELL (MW) LOCATION
- CPT23-XX – CONE PENETRATION TEST (CPT) LOCATION

SITE PLAN

1:1500

*TEST LOCATIONS ARE APPROXIMATE

REFERENCE:

GEOPACIFIC CONSULTANTS

DATE:	MARCH 03, 2023	
DRAWN BY: P.A.F.	APPROVED BY: R.D.	REVIEWED BY: R.D.
SCALE:	AS SHOWN	

MIXED USED DEVELOPMENT

2591 BEVERLY STREET, DUNCAN, BC

TEST HOLE SITE PLAN

FILE NO.: 22431

DWG. NO.: 22431-01

REVISIONS:

A.

B.

C.

ORIGINAL PAPER SIZE 8.5"x11"

APPENDIX A - TEST HOLE LOGS

Test Hole Log: TH23-01/CPT23-01

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		FILL Compact to very dense silty SAND and GRAVEL. Trace roots. Moist. Black	0.0
1 / 1		***SILTY CLAY*** Soft to firm silty CLAY with interbeded seams of coarse sand. Intermixed fibrous wood. Some moisture. Grey-Black.	0.6
2 / 2		***SILTY SAND*** Loose SAND with some silt to silty. Some wood debris. Grey. Wet.	2.1
3 / 4		***ORGANIC SILT*** Soft to firm organic clayey SILT with trace sand. Intermixed and interbedded PEAT of fibrous wood. Some moisture. Grey.	4.6
5 / 6		***SILTY GRAVEL*** Compact to very dense silty GRAVEL. Intermixed wood debris. Wet. Black-Grey. Bubbled for last 5', possible methane release.	6.6
7 / 8 / 9 / 10		End of Borehole	10.7

Moisture Content (%): 57.6%, 40.3%, 37.8%, 50.7%, 37.4%, 37.4%

DCPT (blows per foot): >50, 17, 9, 6, 5, 4, 5, 5, 4, 3, 2, 1, 1, 2, 5, 4, 5, 4, 5, 6, 20, 30, 50

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 14, 2023

Datum: Surface
Figure Number: A1

Test Hole Log: TH23-02/MW23-01

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		FILL Compact to very dense silty SAND and GRAVEL. Trace roots. Moist. Black.	0.0 – 0.5
1 / 1		***CLAYEY SILT*** Soft to firm organic clayey silty. Intermixed fibrous wood. Some moisture. Brown.	0.5 – 1.5
2 / 2		***SANDY SILT*** Soft to very stiff sandy SILT. Some wood debris. Grey. Moist.	1.5 – 2.7
3 / 3		***SILTY GRAVEL*** Compact to very dense silty GRAVEL. Some intermixed wood debris. Wet. Grey.	2.7 – 4.9
4 / 4			
5 / 5		***ORGANIC SILT*** Stiff to very stiff interbedded organic SILT with trace sand and sandy silts. Intermixed and interbedded PEAT of fibrous wood. Wet. Grey.	4.9 – 8.2
6 / 6			
7 / 7			
8 / 8			
9 / 9		***SILTY SAND AND GRAVEL*** Dense to very dense silty sandy GRAVEL. Coarse grained. Angular. Wet. Grey.	8.2 – 9.1
10 / 10		End of Borehole	

Moisture Content (%): 338.7%

DCPT (blows per foot) 10 20 30 40

Disturbed soils, 25, 29, 27, 27, 27, 26, 13, 23, 15, 6, 8, 15, 13, 9, 12, 10, 18, 41, 50

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 14, 2023

Datum: Surface
Figure Number: A2

Test Hole Log: TH23-03

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concepts Development Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 – 2 / 0 – 0.6		***FILL*** Compact to very dense silty SAND and GRAVEL. Trace roots. Moist. Black.	0.0
2 – 6 / 0.6 – 2		***CLAYEY SAND AND SILT*** Soft clayey sandy SILT. Trace wood debris. Moist. Grey.	0.6
6 – 12.5 / 2 – 3.8		***SILTY GRAVEL*** Dense to very dense silty GRAVEL. Lenses of very stiff SILT. Trace wood debris. Wet. Grey. Becomes cobbly.	2.0
12.5 / 3.8		End of Borehole	3.8

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Depth (m)	DCPT (blows per foot)
0.0	>50
0.6	20
1.0	3
1.5	3
2.0	3
2.3	1
2.5	3
3.0	23
3.5	38
3.8	>50
3.8	>50

Groundwater / Well

Remarks

Refusal on Auger

Logged: RD
Method: Solid Stem Auger
Date: Feb 14, 2023

Datum: Surface
Figure Number: A1

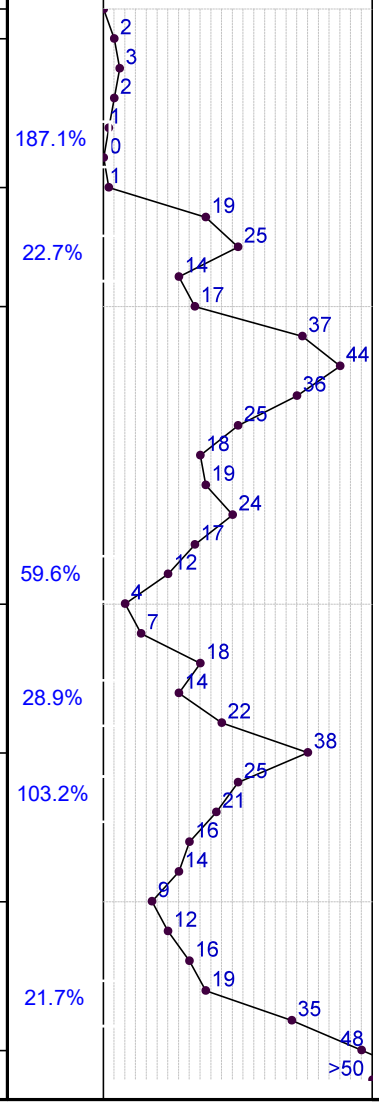
Test Hole Log: TH23-04

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 / 0		***TOPSOIL*** Soft SILT, trace sand and gravel. Black. Moist.	0.0
1 / 0 – 2 / 1		***SILT*** Soft organic SILTs with intermixed Fibrows wood. Intermixed soft silty PEAT wood trunks and fibrous. Grey. Moist.	1.8
2 / 1 – 3 / 3		***GRAVEL*** Compact to dense GRAVEL, trace to some silt. Grey. Wet.	3.0
3 / 1 – 6 / 6		***SILT*** Soft to firm SILT with trace sand, wood chips and debris. Wet. Grey.	
6 / 6 – 7 / 7		***SILTY SAND*** Loose to very dense silty SAND and with some gravel. Intermixed micro organics. Wet. Grey.	6.1
7 / 7 – 9 / 9		***ORGANIC SILT*** Firm to very stiff organic SILT with some gravel and trace sand. Some wood debris and fibrous peat. Moist. Grey to black.	7.6
9 / 9 – 10 / 10		***GRAVELLY SILTY SAND*** Dense to very dense silty gravelly SAND. Moist. Grey.	9.1
10 / 10		End of Borehole	10.7



Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A4
Page: 1 of 1

Test Hole Log: TH23-05/MW23-02

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

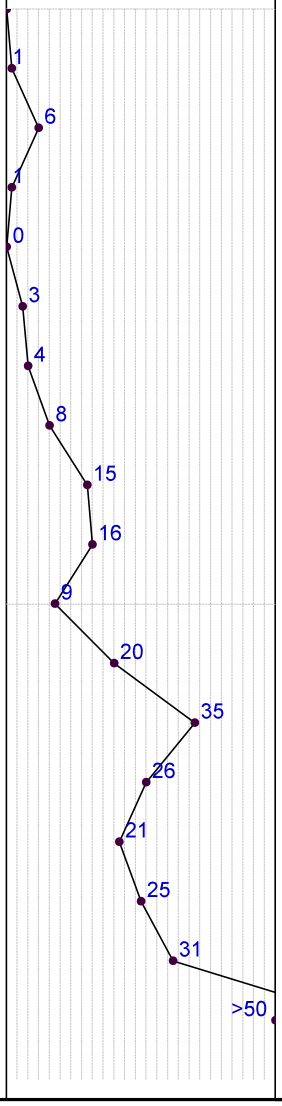
GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		TOPSOIL Soft SILT, some gravel. Trace organics. Black. Moist.	0.0
		ORGANIC SILT Soft organic SILT, some clay. Gray with Brown streaks. Moist.	0.5
4 / 1		***SANDY SILT*** Interbedded soft to firm SILT, some sand with loose to compact coarse grain SAND with some gravel. Some wood debris. Grey. Wet.	1.2
10 / 3		***GRAVELLY SAND*** Dense coarse gained gravelly SAND with a lens of very stiff SILT. Grey-Brown. Wet.	3.0
15 / 4		***SANDY GRAVEL*** Dense to very dense silty sandy GRAVEL, cobbly (subrounded). Grey. Wet.	4.6
17 / 5		End of Borehole	5.2

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40



Groundwater / Well

Remarks

Refusal on Auger

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A5
Page: 1 of 1

Test Hole Log: TH23-06

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 / 0		***TOPSOIL*** Soft organic SILTs with intermixed Fibrows wood. Intermixed soft silty PEAT wood trunks and fibrous. Grey-Brown. Moist.	0.0
5 / 1.5		***SAND*** Compact SAND with some silt and some gravel. Grey. Wet.	1.5
8 / 2.4		***SILT*** Very stiff SILT with some sand trace gravel. Grey. Wet.	2.4
10 / 3		***SAND and GRAVEL*** Compact to very dense coarse SAND and sub-rounded GRAVEL. Grey. Wet.	3.0
15 / 4.6		***CLAYEY SILT*** Firm clayey SILT, trace gravel. Intermixed with fibrous wood. Grey. Wet.	4.6
19 / 5.8		***PEAT*** Firm silty PEAT. Fibrous. Wet.	5.8
20 / 6.1		***SILTY GRAVEL*** Compact to very dense silty GRAVEL. Some cobbles. Some intermixed wood debris. Wet. Grey.	6.1
25 / 7.6		End of Borehole	7.6

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Depth (ft)	DCPT (blows per foot)
0	2
1	6
2	1
3	0
4	1
5	10
6	29
7	16
8	17
9	25
10	25
11	26
12	>50
13	>50
14	20
15	5
16	8
17	6
18	7
19	5
20	12
21	25
22	46
23	49
24	47
25	>50

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A6

Test Hole Log: TH23-07

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		TOPSOIL Soft SILTS. Intermixed with wood and PEAT. Grey with Brown streaks.	0.0
4 / 1		***SILTY SAND AND GRAVEL*** Dense to very dense silty SAND and GRAVEL, Cobbly. Grey. Wet. Lense of silty PEAT at 8' with Fibrous wood. Brown. Wet.	1.2
11 / 3		End of Borehole	3.4

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Depth (m)	DCPT (blows per foot)
0	1
1	3
2	1
3	3
4	20
5	35
6	27
7	30
8	45
9	>50

Groundwater / Well

Remarks

Refusal on Auger

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A7

Test Hole Log: TH23-08

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0 / 0		Ground Surface					
0 – 1		***TOPSOIL*** SOFT silts, trace gravel. Wood debris. Black-Brown streaks. Moist.	0.0				
1 – 4		***SILTY GRAVEL*** Compact to very dense silty GRAVEL, trace to some sand. Trace wood fragments. Grey. Wet.	1.4				
5 – 6		***SANDY SILT*** Firm to stiff clayey SILT. Lenses of coarse sand.	5.5				
6 – 7		***NO RECOVERY*** No sample recovered. Material described as boney and cobbly. Wet.	6.1				
24 / 7		End of Borehole	7.3				Refusal on Auger

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A8

Test Hole Log: TH23-09

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 / 0		***TOPSOIL*** Soft SILT with trace sand and gravel. Many roots. Brown. Moist.	0.0
2 / 1		***SAND*** Loose to compact coarse grained SAND, trace gravel, trace silt. Moist. Grey.	0.5
4 / 1		***CLAYEY SILT*** Soft clayey SILT, some sand, trace gravel. Grey. Wet.	1.2
5 / 1.5		***ORGANIC SILT*** Soft organic clayey SILT with interbedding layers of coarse sand and fibrous silty PEAT. Silts are grey with brown streaks. Silty Peat is dark brown. Wet.	1.5
10 / 3		***SANDY GRAVEL*** Dense to very dense sandy GRAVEL, some silt. Cobbly. Grey. Wet.	3.0
13 / 4		End of Borehole	4.1

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Groundwater / Well

Remarks

Refusal on Auger

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A9

Test Hole Log: TH23-10

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 / 0		***TOPSOIL*** Soft Sandy SILT. Trace roots. Black. Moist.	0.0
3 / 1		***CLAYEY SILT*** Soft SILT, some clay, trace gravel. Intermixed with wood debris. Grey-Brown.	1.1
7 / 2		***SILTY GRAVEL*** Compact to dense silty GRAVEL, some sand, increased cobbles with depth. Trace wood fragments. Grey. Wet.	3.0
10 / 3		***SANDY GRAVEL*** Dense sandy GRAVEL, some silts, some cobbles. Grey. Wet.	
27 / 8		***CLAYEY SILT*** Soft to firm clayey SILT. Trace wood fragments. Grey. Wet.	8.2
30 / 9		End of Borehole	9.1

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A10

Test Hole Log: TH23-11

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		SILT Soft SILT, some sand. Trace grass and roots. Intermixed with wood. Grey-Brown. Moist.	0.0
3 / 1		***SANDY SILT*** Soft to firm clayey SILT with trace to some sand. Some wood debris. Moist. Grey. Became wet at 7'.	0.9
10 / 3		***SILTY SAND AND GRAVEL*** Compact to dense silty sandy GRAVEL. Cobbly. Grey. Wet.	3.0
16 / 5		***SANDY SILT*** Soft to firm sandy SILT, some gravel, some cobbles. Intermixed with wood debris.	4.9
20 / 6		***SANDY GRAVEL*** Dense sandy cobbly GRAVEL. Grey. Wet.	6.1
23 / 7		***SILTY SAND*** Compact to dense silty SAND. Some fibrous wood. Brown. Wet.	7.0
26 / 8		***CLAYEY SILT*** Soft clayey SILT. Intermixed with brown shreds of organic silt. Grey. Wet.	7.9
30 / 9		***SILT*** Firm to stiff SILT, some clay, trace sand. Grey with streaks of brown. Wet.	9.1
35 / 11		End of Borehole	10.7

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A11

Test Hole Log: TH23-12

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
0 – 6 / 0 – 2		***TOPSOIL*** Soft to firm SILT. Some wood debris. Grey-Brown streaks. Moist.	0.0
6 – 24 / 2 – 7		***SAND and GRAVEL*** Compact to very dense Sand and GRAVEL with trace to some silt, some cobbles. Interbedded lenses of stiff SILT. Wet. Grey.	1.8
24 – 26 / 7 – 8		***SILTY SAND*** Dense silty Sand. Grey. Wet.	7.3
26 – 29 / 8 – 9		***ORGANIC SILT*** Stiff sandy SILT. Grey, Moist with Interbedded with silty PEAT. Brown. Moist.	8.1
29 / 9		End of Borehole	9.1

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

2, 6, 6, 1, 2, 1, 5, 22, 20, 22, 20, 31, 42, 32, 14, 23, 15, 12, 9, 15, 50/6"

Groundwater / Well

Remarks

Silt becomes soft at 29 ft.

Logged: RD
Method: Solid Stem Auger
Date: Feb 15, 2023

Datum: Surface
Figure Number: A12
Page: 1 of 1

Test Hole Log: TH23-13

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft)	Depth (m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0	0		Ground Surface	
			SAND (FILL) Compact fill SAND, trace silt, trace gravel. Light-Brown. Moist.	0.0
			ORGANIC SILT Firm organic SILTs. Interbedded grey-brown layering. Some wood debris. Moist.	1.5
			SILTY SAND Loose silty SAND. Thin PEAT lenses. Grey-Brown streaks. Moist.	3.0
			SAND and GRAVEL Dense to very dense SAND and GRAVEL, cobbly. Trace to some wood debris.	
			ORGANIC SILT Stiff intermixed SILT, trace sand, trace to some gravel and cobbles. Grey with brown streaks of silt.	5.2
			SAND and GRAVEL Dense to very dense silty SAND and GRAVEL, cobbly. Grey. Wet.	6.4
			GRAVELLY SILT Stiff to very stiff gravelly SILTs, trace sand. Lense of fibrous peaty material. Becomes more cobbly with depth.	7.6
33	10		End of Borehole	10.1

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

28, 17, 8, 5, 2, 4, 4, 3, 11, 25, 31, >50, >50, >50, 39, >50

Groundwater / Well

Remarks

Refusal on auger at 33 ft.

Logged: RD
Method: Solid Stem Auger
Date: Feb 16, 2023

Datum: Surface
Figure Number: A13

Test Hole Log: TH23-14

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		SANDY SILT (FILL) Loose to compact silty SAND. Black. Moist.	0.0
		SANDY SILT Firm sandy SILT. Intermixed with wood debris. Grey with brown streaks. Moist.	0.5
9 / 2.6		***SILTY SAND*** Compact silty SAND. Grey. Wet.	2.6
10 / 3		***GRAVELLY SAND*** Dense gravelly SAND, trace to some silt. Grey. Wet.	3.0
15 / 4.6		***SAND and GRAVEL*** Dense to very dense SAND and GRAVEL, cobbly. Grey. Wet.	4.6
19 / 5.8		***PEAT*** Stiff silty PEAT. Fibrous wood. Brown. Moist.	5.8
20 / 6.1			6.1

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

Groundwater / Well

Remarks

Logged: RD
Method: Solid Stem Auger
Date: Feb 16, 2023

Datum: Surface
Figure Number: A14

Test Hole Log: TH23-15/MW23-03

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

GEOPACIFIC CONSULTANTS
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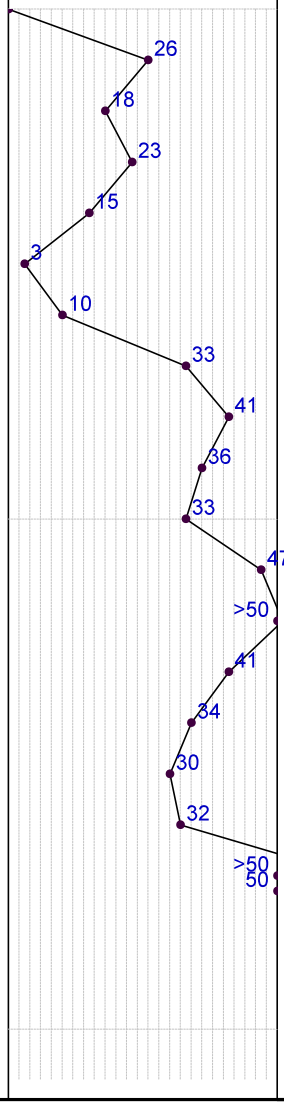
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft)	Depth (m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
			Ground Surface	
0	0		***SAND AND SILT (FILL)*** Compact SAND and SILT, some gravel. Black. Moist.	0.0
1				0.3
2			***SANDY SILT*** Stiff to very stiff sandy SILT. Grey. Moist.	
3	1			
4			***SILT*** Soft to firm SILT, some sand. Trace to some wood debris. Brown streaks. Grey. Wet.	1.2
5				
6	2			1.8
7			***SAND and GRAVEL*** Dense SAND and GRAVEL. Intermixed with sticks and woodchips. Brown. Wet.	
8				
9				
10	3			3.0
11			***SANDY GRAVEL*** Dense to very dense sandy GRAVEL with some interbedded silt. Grey-brown. Wet. Water is turbid and brown.	
12				
13	4			
14				
15				
16	5			
17				
18				
19				
20	6		End of Borehole	6.1
21				

Moisture Content (%)

DCPT (blows per foot)
10 20 30 40



Groundwater / Well

Remarks

Groundwater Table at 6 ft.

Logged: RD
Method: Solid Stem Auger
Date: Feb 16, 2023

Datum: Surface
Figure Number: A15

Test Hole Log: TH23-16

File: 22431
Project: Proposed Mixed-Use Development
Client: Total Concept Developments Ltd.
Site Location: 2591 Beverly Street, Duncan, BC

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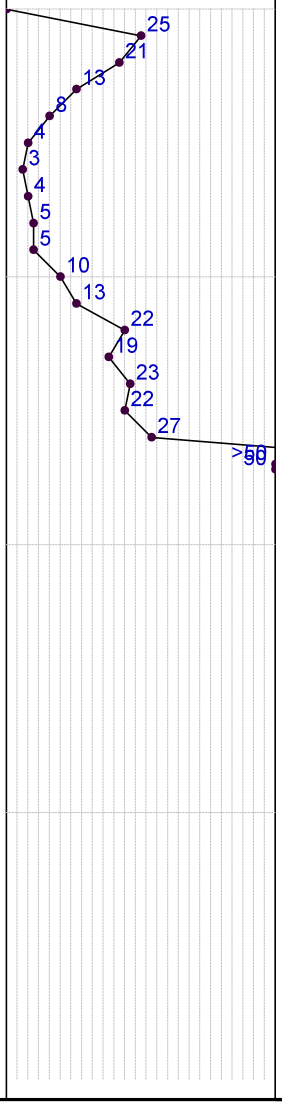
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)
0 / 0		Ground Surface	
		SANDY SILT Stiff to very stiff sandy SILT. Some wood debris, roots. Black to Grey. Moist to wet at depth.	0.0
		PEAT Loose PEAT. Fibrous wood. Brown. Moist.	1.5
		ORGANIC SILT Soft to firm gravelly organic SILT. Intermixed with wood debris. Grey with streaks of brown. Some moisture.	3.8
		GRAVEL Compact to very dense GRAVEL with interbedded silty and sandy material. Trace wood fragments. Gray. Wet. Becomes cobbly below 15'.	
		GRAVELLY SILT Firm to stiff gravelly SILT, some sand. Trace to some wood fragments. Cobbly. Grey with lense of brown organic silts. Wet.	9.8
		End of Borehole	10.7

Moisture Content (%)



Groundwater / Well

Remarks

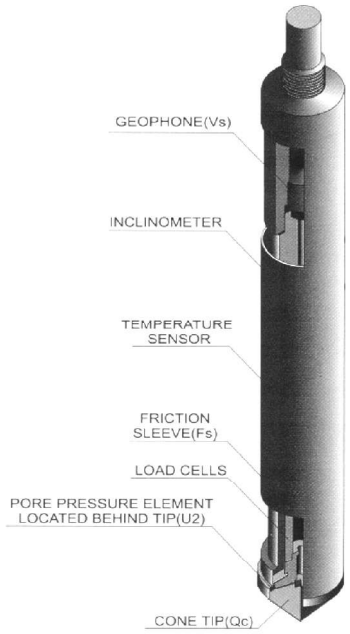
Logged: RD
Method: Solid Stem Auger
Date: Feb 16, 2023

Datum: Surface
Figure Number: A16

APPENDIX B - ELECTRONIC CONE PENETRATION RESULTS

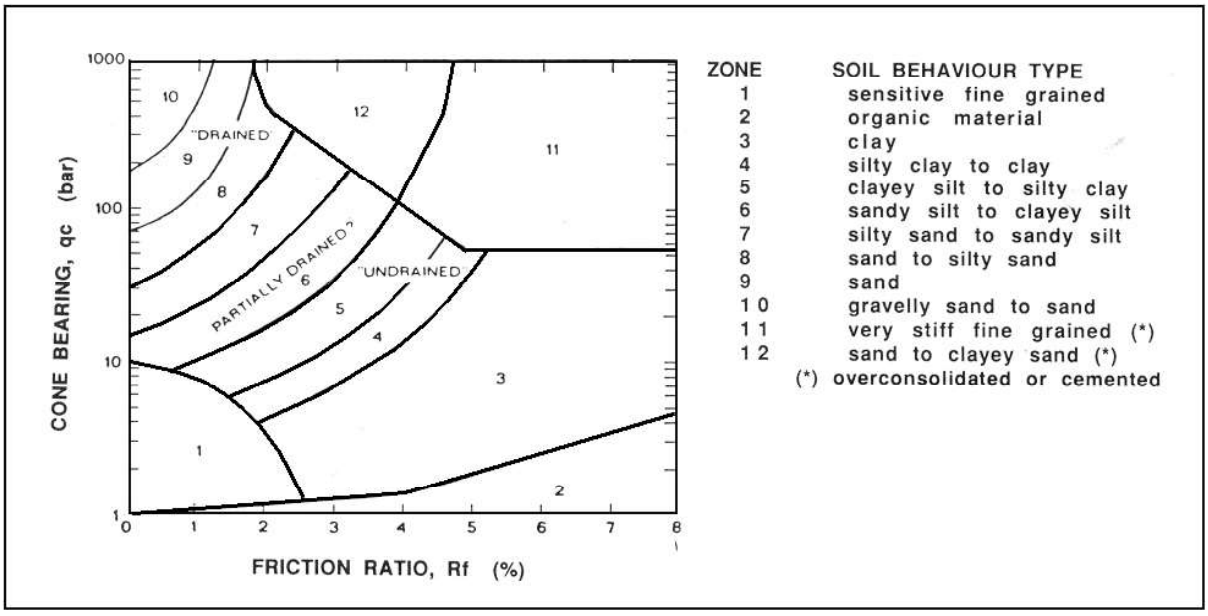
The system used is owned and operated by GeoPacific and employs a 35.7 mm diameter cone that records tip resistance, sleeve friction, dynamic pore pressure, inclination and temperature at 5 cm intervals on a digital computer system. The system is a Hogentogler electronic cone system and the cone used was a 10 ton cone with pore pressure element located behind the tip and in front of the sleeve as shown on the adjacent figure.

Electronic Cone Penetrometer



In addition to the capabilities described above, the cone can be stopped at specified depths and dissipation tests carried out. These dissipation tests can be used to determine the groundwater pressures at the specified depth. This is very useful for identifying artesian pressures within specific layers below the ground surface.

Interpretation of the cone penetration test results are carried out by computer using the interpretation chart presented below by Robertson[1]. Raw data collected by the field computer includes tip resistance, sleeve friction and pore pressure. The tip resistance is corrected for water pressure and the friction ratio is calculated as the ratio of the sleeve friction on the side of the cone to the corrected tip resistance expressed as a percent. These two parameters are used to determine the soil behaviour type as shown in the chart below. The interpreted soil type may be different from other classification systems such as the Unified Soil Classification that is based upon grain size and plasticity.

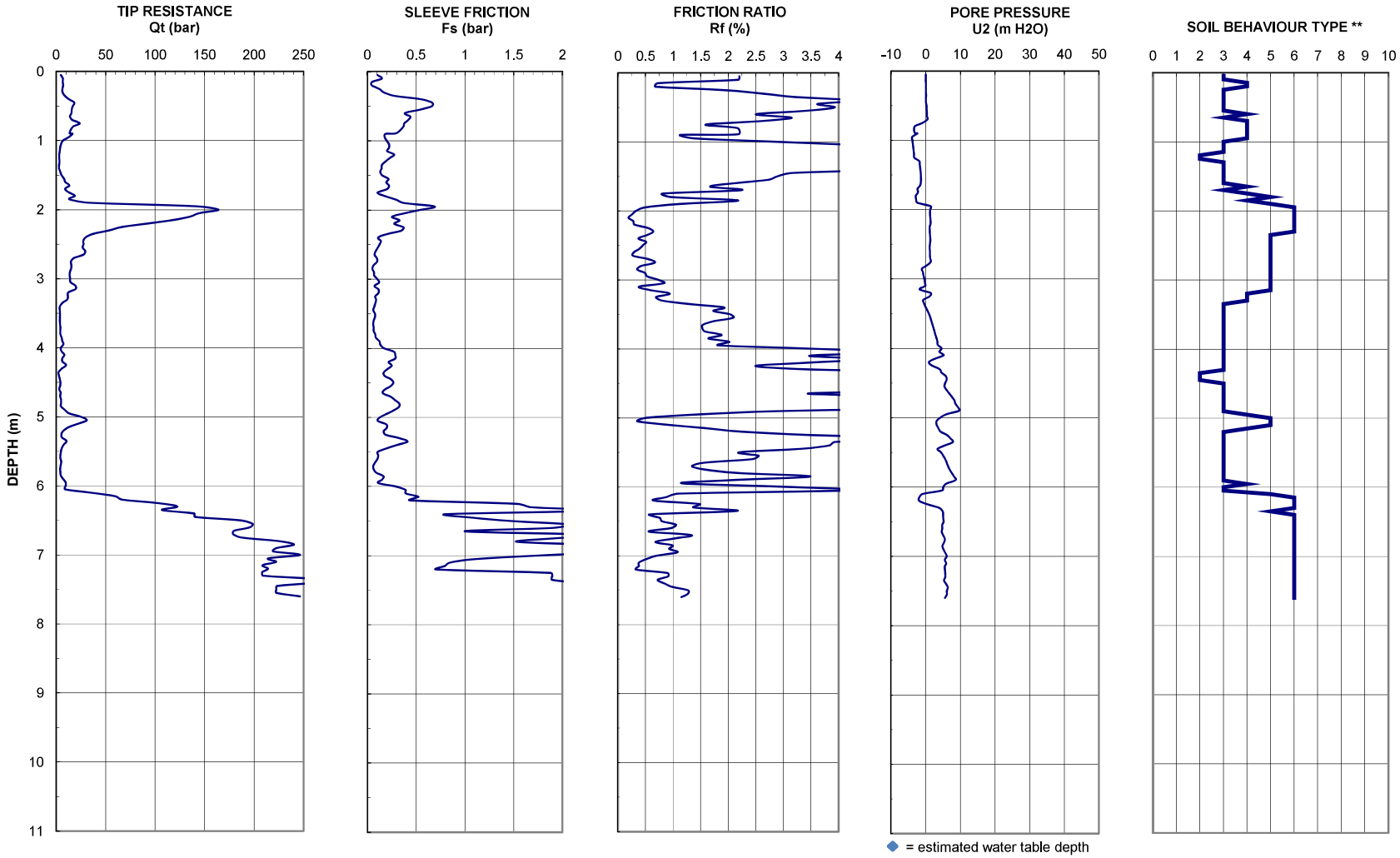


ZONE	SOIL BEHAVIOUR TYPE
1	sensitive fine grained
2	organic material
3	clay
4	silty clay to clay
5	clayey silt to silty clay
6	sandy silt to clayey silt
7	silty sand to sandy silt
8	sand to silty sand
9	sand
10	gravelly sand to sand
11	very stiff fine grained (*)
12	sand to clayey sand (*)

(*) overconsolidated or cemented

[1] Robertson, P.K., 1990, "Soil Classification using the cone penetration test", 1990 Canadian Geotechnical Colloquium, Canadian Geotechnical Journal, Vol. 27, No. 1, 1990

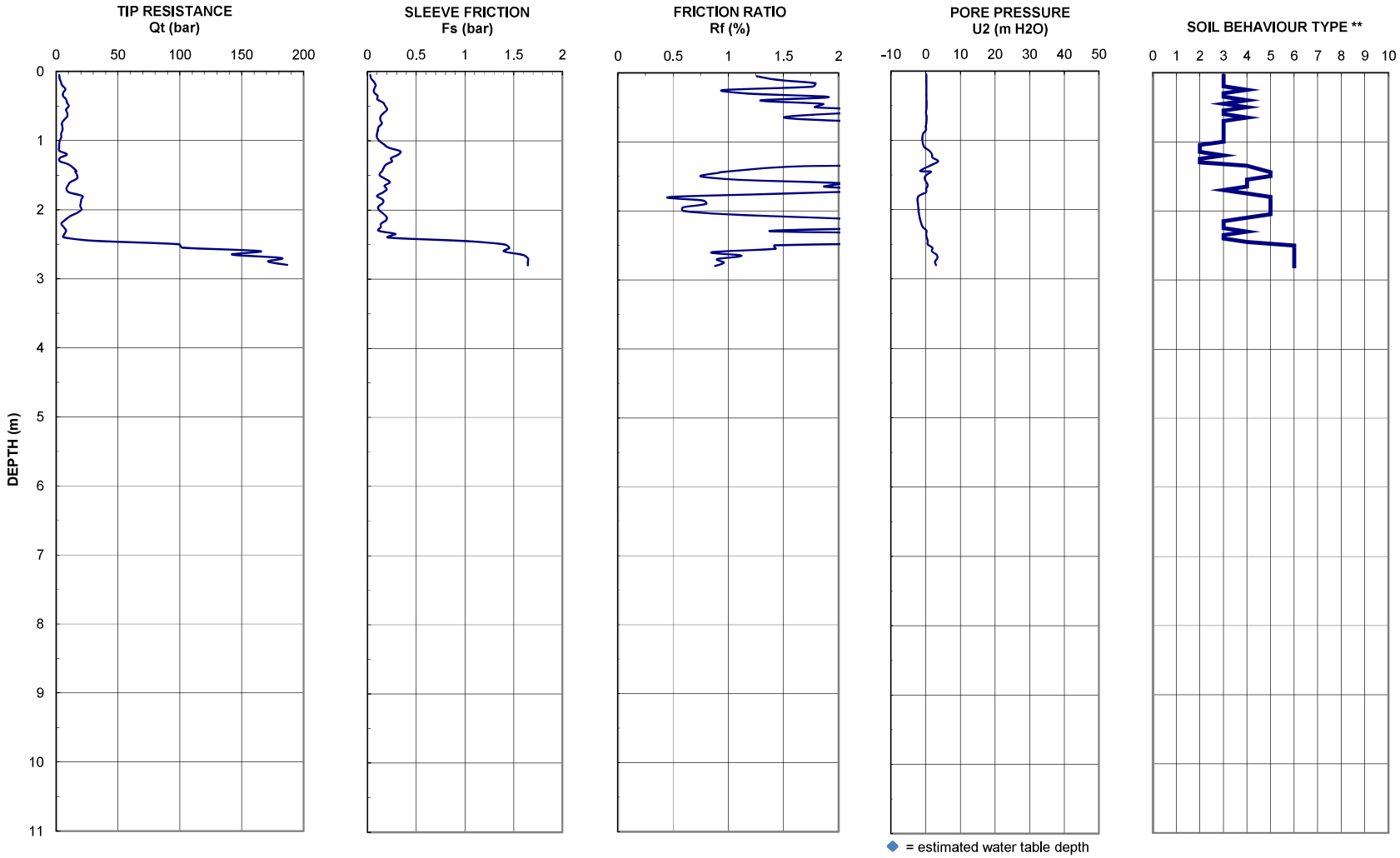
GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	2023-Feb-16	TOTAL CONCEPT DEVELOPMENTS LTD	GeoPacific Project #: 22431
	Sounding: CPT23-01	2591 BEVERLY STREET, DUNCAN	Figure: B.01



** Based on Robertson et. al 1990

1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay
4 Clayey Silt to Silty Clay
5 Silty Sand to Sandy Silt
6 Clean Sand to Silty Sand
7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	2023-Feb-14	TOTAL CONCEPT DEVELOPMENTS LTD	GeoPacific Project #: 22431
	Sounding: CPT23-02	2591 BEVERLY STREET, DUNCAN	Figure: B.02



** Based on Robertson et. al 1990

1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay
4 Clayey Silt to Silty Clay
5 Silty Sand to Sandy Silt
6 Clean Sand to Silty Sand
7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained

APPENDIX C - OVER CONSOLIDATION RATIO ANALYSIS

The over consolidation ratio (OCR) is defined as the ratio between the maximum past vertical pressure on the soil versus the current in-situ vertical pressure. The maximum past vertical pressure is typically caused by the presence of excess overburden which is removed by either natural or man-made reasons. Soil ageing and other chemical precipitation affects can also cause a soil to behave as if it has a higher maximum past pressure, which is sometimes described as pseudo-overconsolidation.

Research by Schmertmann (1974) showed the following equation reasonably approximates the OCR of medium plastic to clayey soils:

$$OCR = \left(\frac{\left(\frac{Su / p'oc}{Su / p'nc} \right)^{5/3} + 0.82}{1.82} \right)$$

Su/p'oc = The undrained shear strength to effective stress ratio of the over consolidated soil

Su/p'nc = The undrained shear strength to effective stress ratio of a normally consolidated soil (OCR = 1). Typically = ~0.2

Soils which are subject to loads less than the maximum past pressure of the soil are typically subject to relatively small elastic settlements. Loads which exceed the maximum past pressure on the soil typically cause consolidation which is the gradual settlement of the ground as a result of expulsion of water from the pores of the soil. The rate of settlement and the time to complete consolidation is a function of the permeability of the soil.

The Schmertman equation has been employed to estimate the OCR of the soils with depth employing the CPT data provided in Appendix B and C.

APPENDIX C - INTERPRETED PARAMETERS

The following charts plot the Standard Penetration Test (SPT) values and the undrained strength of fine grained soils based upon generally accepted correlations. The methods of correlation are presented below.

STANDARD PENETRATION TEST CORRELATION

The Standard Penetration Test $N_{1(60)}$ value is related to the cone tip resistance through a Qc/N ratio that depends upon the mean grain size of the soil particles. The soil type is determined from the interpretation described in Appendix B and the data of Table C.1 below is used to calculate the value of $N_{(60)}$.

Table C.1. Tablulated $Qc/N_{1(60)}$ Ratios for Interpreted Soil Types

Soil Type	Qc/N Ratio
Organic soil - Peat	1.0
Sensitive Fine Grained	2.0
Clay	1.0
Silty Clay to Clay	1.5
Clayey Silt to Silty Clay	2.0
Silt	2.5
Silty Sand to Sandy Silt	3.0
Clean Sand to Silty Sand	4.0
Clean Sand	5.0
Gravelly Sand to Sand	6.0
Very Stiff Fine Grained	1.0
Sand to Clayey Sand	2.0

The $Qc/N_{1(60)}$ ratio is based upon the published work of Robertson (1985)[2]. The values of N are corrected for overburden pressure in accordance with the correction suggested by Liao and Whitman using a factor of 0.5. Where the correction is of the form:

$$N_1 = \sigma^{0.5} * N$$

All calculations are carried out by computer using the software program CPTint.exe developed by UBC Civil Engineering Department. The results of the interpretation are presented on the following Figures.

UNDRAINED SHEAR STRENGTH CORRELATION

It is generally accepted that there is a correlation between undrained shear strength of clay and the tip resistance as determined from the cone penetration testing. Generally the correlation is of the form:

$$S_u = \frac{(q_c - \sigma_v)}{N_k}$$

where q_c = cone tip resistance, σ = in situ total stress, N_k = cone constant

The undrained shear strength of the clay has been calculated using the cone tip resistance and an N_k factor of 12.5. All calculations have been carried out automatically using the program CPTint.exe. The results are presented on the Figures following.

---

2 Robertson, P.K., 1985, "In-Situ Testing and Its Application to Foundation Engineering", 1985 Canadian Geotechnical Colloquium, Canadian Geotechnical Journal, Vol. 23, No. 23, 1986

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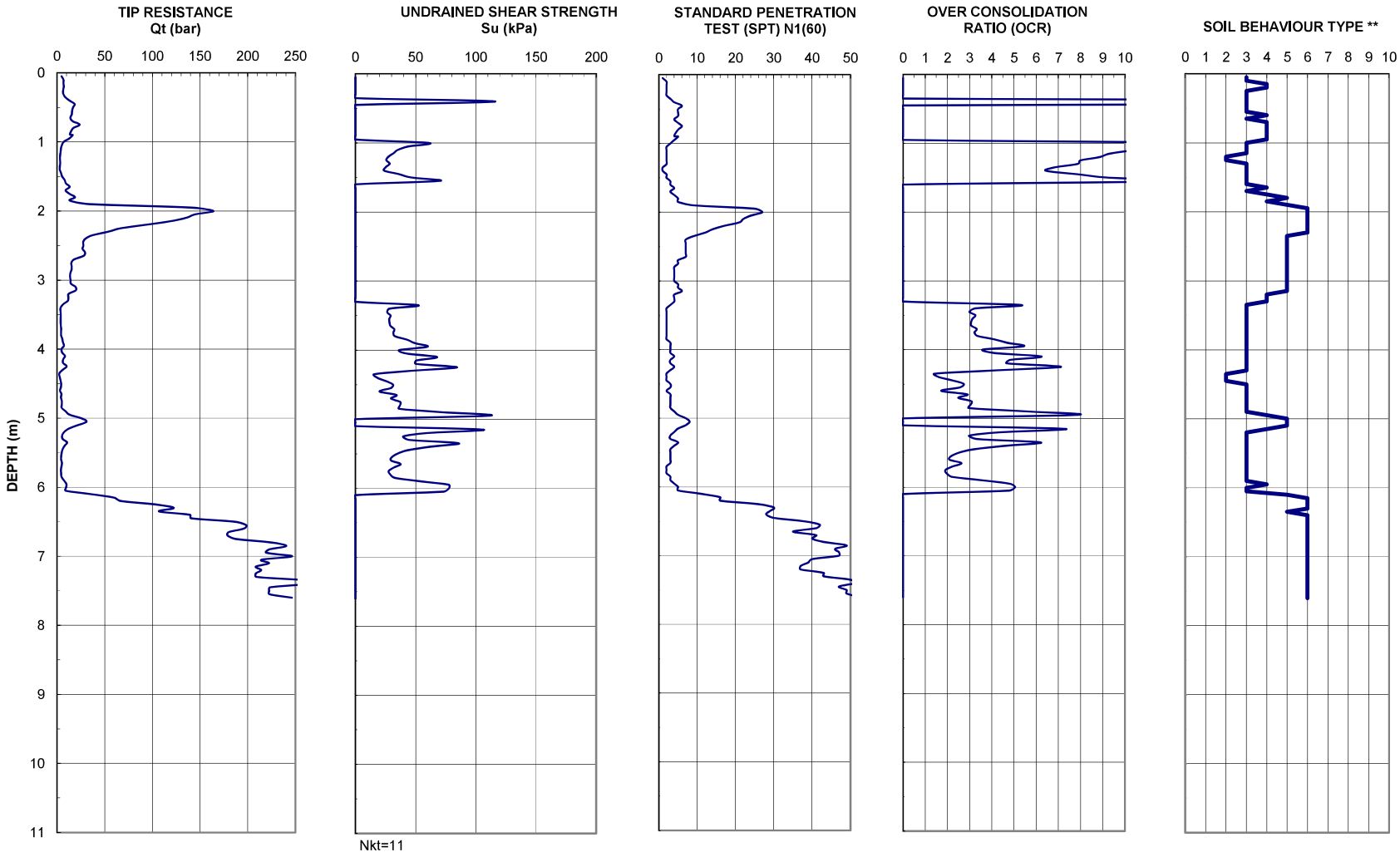
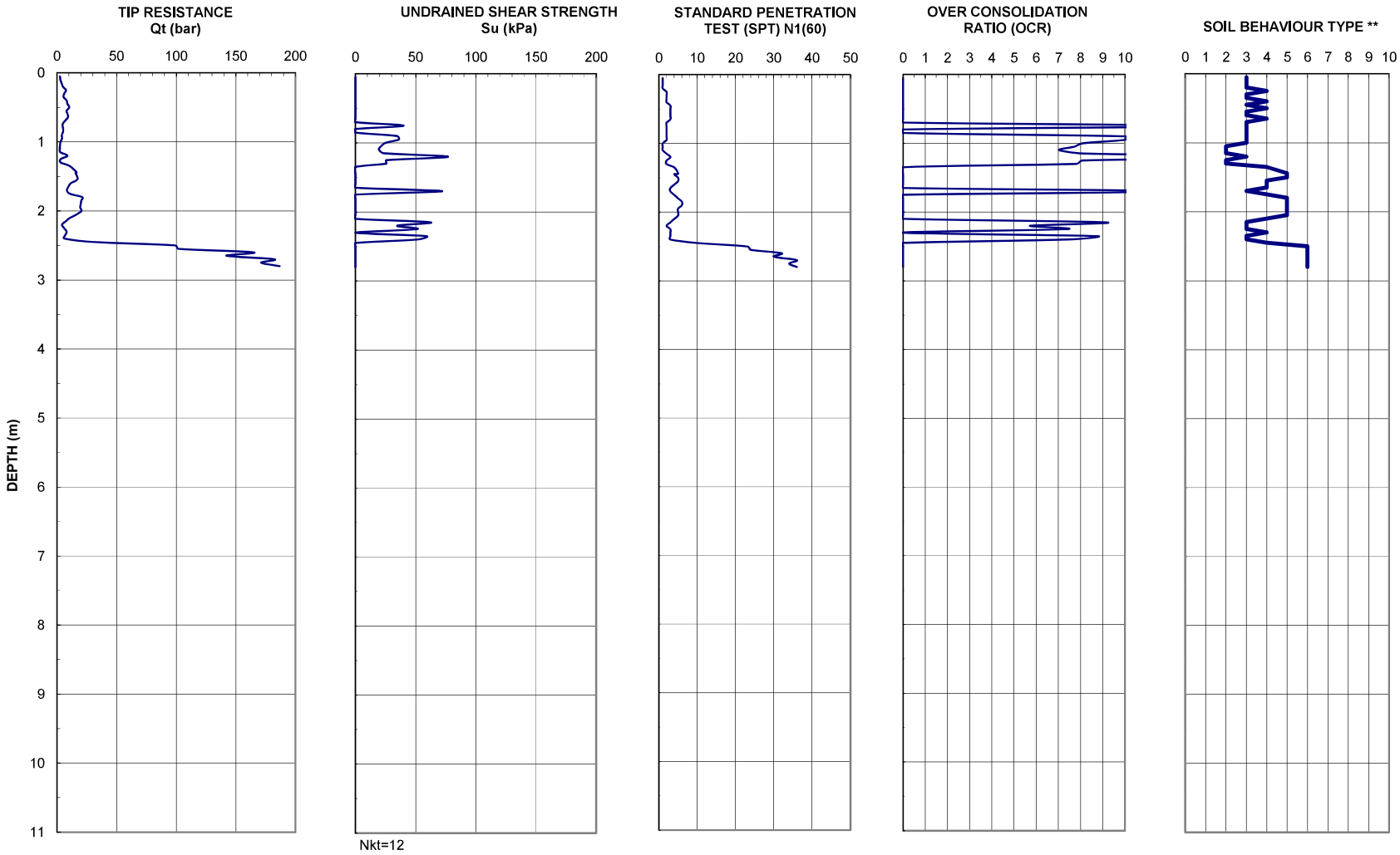
	Sounding: CPT23-01	2591 BEVERLY STREET, DUNCAN	Figure: C.01



** Based on Robertson et. al 1990

1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay
4 Clayey Silt to Silty Clay
5 Silty Sand to Sandy Silt
6 Clean Sand to Silty Sand
7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	2023-Feb-14	TOTAL CONCEPT DEVELOPMENTS LTD	GeoPacific Project #: 22431
	Sounding: CPT23-02	2591 BEVERLY STREET, DUNCAN	Figure: C.02



** Based on Robertson et. al 1990

1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay
4 Clayey Silt to Silty Clay
5 Silty Sand to Sandy Silt
6 Clean Sand to Silty Sand
7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained

APPENDIX D - LIQUEFACTION ANALYSIS

Assessment of the liquefaction potential of the ground has been determined by the Cone Penetration Test (CPT). The method of analysis is presented in the following sections.

FACTOR OF SAFETY AGAINST LIQUEFACTION

The factor of safety against liquefaction calculated here is the ratio of the cyclic resistance of the soil (CRR) to the cyclic stresses induced by the design earthquake (CSR). Where the ratio of CRR/CSR is greater than unity the soils ability to resist cyclic stresses is greater than the cyclic stresses induced by the earthquake and liquefaction will be unlikely. Where the CRR/CSR is less than unity then liquefaction could occur. This ratio is presented as the FOS against Liquefaction on the following charts. Calculation of the factor of safety is based on NCEER (1998)[1] which evaluates the CRR directly from cone penetration test sounding data. The value of the cyclic stress ratio has been calculated based on peak horizontal ground acceleration of the 2018 British Colombia Building Code interpolated seismic hazard value.

SEISMIC INDUCED SETTLEMENT

In the event of a significant earthquake, settlement of the ground surface could occur as a result of densification of the looser soil layers as a result of liquefaction or due to the expulsion of sand in the form of sand dykes or sills from beneath the site. Tokimatsu and Seed (1987)[2] suggest a method of analysis for estimating vertical settlements as a result of earthquake induced accelerations. In this method the normalized standard penetration blow counts ($N_{1(60)}$) is compared with the cyclic stress ratio for the induced earthquake to determine the volumetric strain resulting from the earthquake shaking. The volumetric strain is assumed to result in only vertical settlement. The vertical settlement is summed for each depth at which settlement is predicted to occur and accumulated from the bottom of the test hole. The results are presented on the following charts labelled as Settlement.

HORIZONTAL DISPLACEMENT

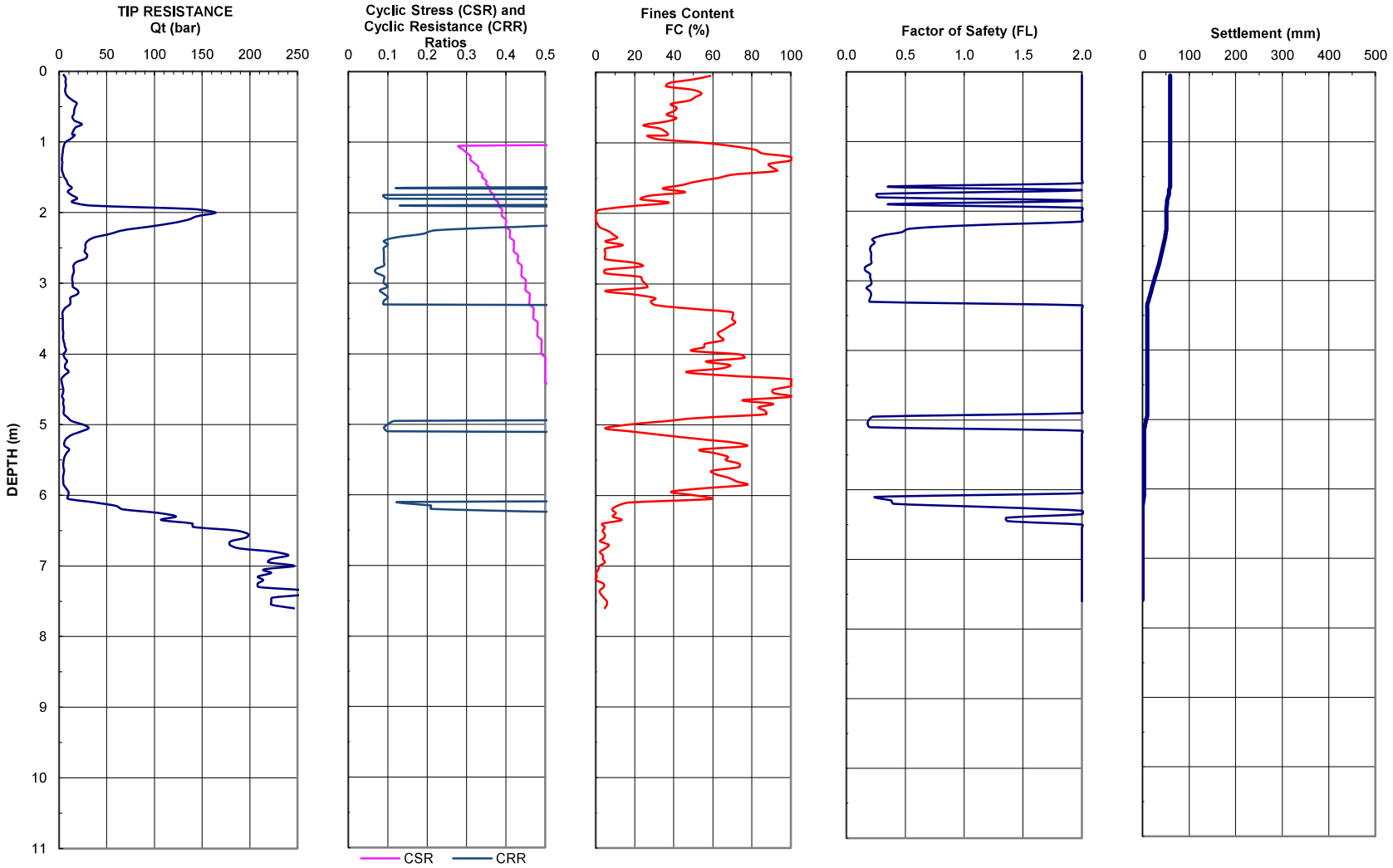
Horizontal ground displacements known as "free field" displacements occur as a result of liquefaction of the ground and are assumed to occur without the influence of any structures. The horizontal displacements presented in our report are generally based upon the lateral spread method by of Youd, Bartlett, & Hansen (2002). Displacements are calculated based on an empirical relationship developed from observations from other earthquake sites on sloping ground or near a free face, such as an abrupt slope. The presence of the proposed embankment on-site is expected to induce a static bias within the soils at the margin of the embankment making the soils and embankment in this area subject to lateral spread induced movements. In the event of a real earthquake of significant magnitude to cause limited liquefaction, actual movements will be influenced by a wide variety of factors including the characteristics of the earthquake including duration, number of significant cycles, variations in peak particle velocity, wavelength, amplitude and frequencies as well as soil damping and variations in density and continuity of the soil layers.

1 Youd, T. L., Idriss, I. M. (2001). “Liquefaction Resistance of Soils: Summary Report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils”, Journal of Geotechnical and Geoenvironmental Engineering, Vol 127, 10, pp. 817-833

2 Tokimatsu, K.A.M. and Seed, H.B., 1987. "Evaluation of Settlement in Sands Due to Earthquake Shaking", Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8, pp. 861-878.

3 Youd, T.L., Bartlett, S.F., Hansen, C.M. (2002), "Revised MultiLinear Regression Equations for Prediction of Lateral Spread Displacements", Journal of Geotechnical and GeoEnvironmental Engineering, Vol. 128, No. 12, pp. 1007-1017

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	2023-Feb-16	TOTAL CONCEPT DEVELOPMENTS LTD	GeoPacific Project #: 22431
	Sounding: CPT23-01	2591 BEVERLY STREET, DUNCAN	Figure: D.01

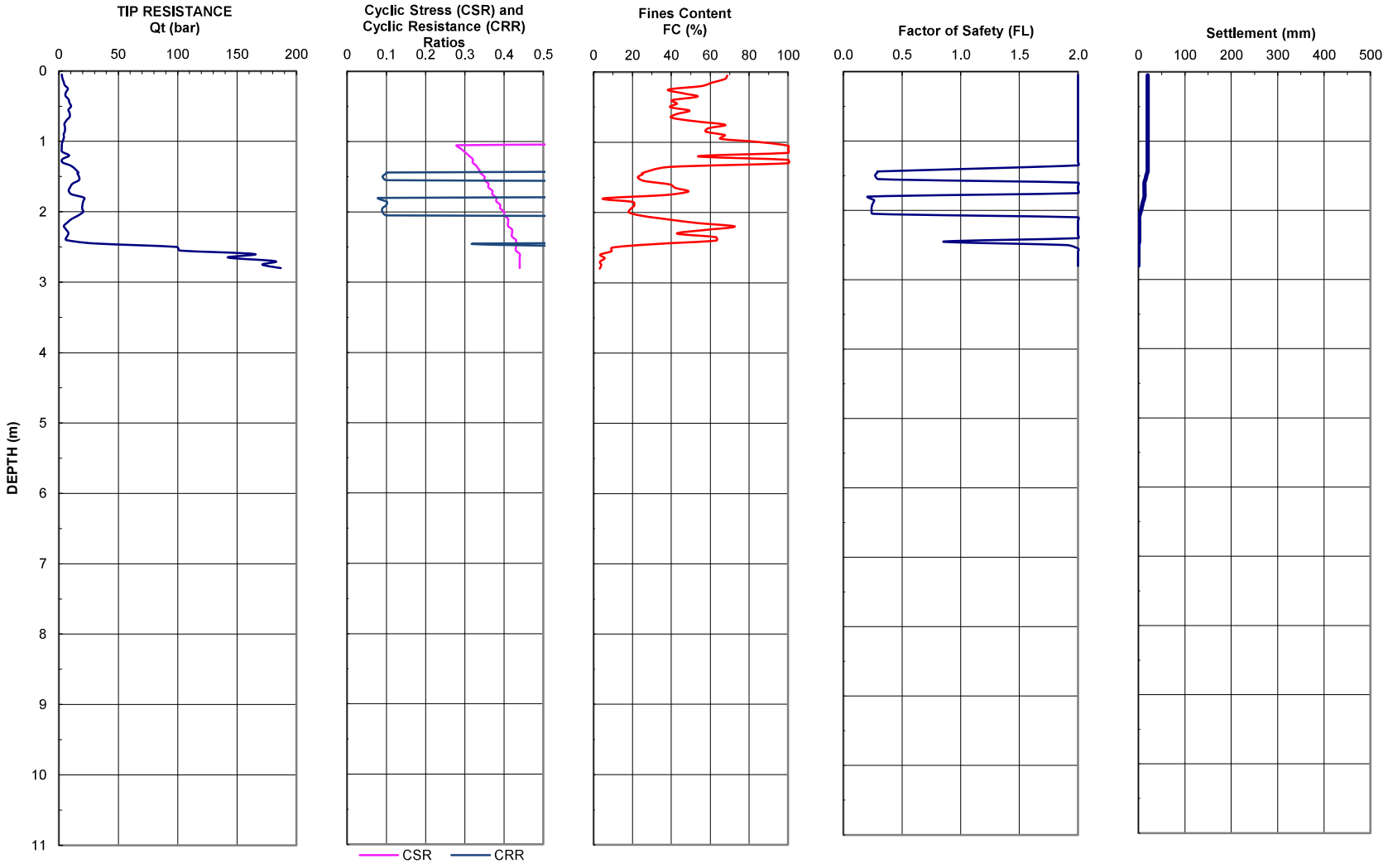


Liquefaction interpretation: PGA = 0.51

magnitude = 7.0

settlement accumulation max depth = 15m

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	2023-Feb-14	TOTAL CONCEPT DEVELOPMENTS LTD	GeoPacific Project #: 22431
	Sounding: CPT23-02	2591 BEVERLY STREET, DUNCAN	Figure: D.02



Liquefaction interpretation: PGA = 0.51

magnitude = 7.0

settlement accumulation max depth = 15m

Appendix E – MASW 1D & 2D Results

File: 22431
Project: 2591 Beverly Street
Client: Total Concept Developments Ltd.
Location: 2591 Beverly St., North Cowichan, BC.
Date: November 28th, 2023

SURVEY PARAMETERS

Multichannel Analysis of Surface Waves (MASW)

Table 1: Software and Equipment

Seismic Acquisition System	Acquisition Software	Processing Software	Seismic Source	Shotplate material	Geophones
DMT Summit X One	Summit X Acquisition tool	Parkseis 3.0	10 lb sledge hammer	Polyethylene	4.5 Hz

Table 2: MASW Survey Parameters

Profile ID	Geophone Spacing	# of Geophones	Survey Line Length	Azimuth	Stack	Record length
MASW23-01	2m	24	70m	170°	5-10	1s
MASW23-02	2m	24	70m	160°	5-10	1s

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1-D Multichannel Analysis of Surface Waves (MASW)

PURPOSE AND GENERAL PROCEDURE

Mutlichannel Analysis of Surface Waves (MASW) measures seismic surface waves to determine shear wave velocity variations (v_s) of the subsurface. The shear wave velocity profiles (in one, two or three dimensions) can be used for different purposes, e.g., to determine seismic site classes for seismic site response, elastic moduli of soil and rock, liquefaction potential, compaction, and grouting evaluation.

Surface waves are generated from a variety of sources, the most common of which is a sledge hammer. The surface waves propagate through the subsurface and their velocities are analysed. Sub-surface shear-wave velocities that correlates with the analysed propagation velocity pattern of the observed surface waves are then deduced through a process called inversion.

The typical 1D field procedure comprises placing an array of equally spaced geophones in a line and generating a surface wave source at varying distances from each end of the line, as shown in Figure 1. The spacing of geophones has a strong influence on resolution, the total length of the geophone array and the distance of the source have a strong influence on the depth of investigation.

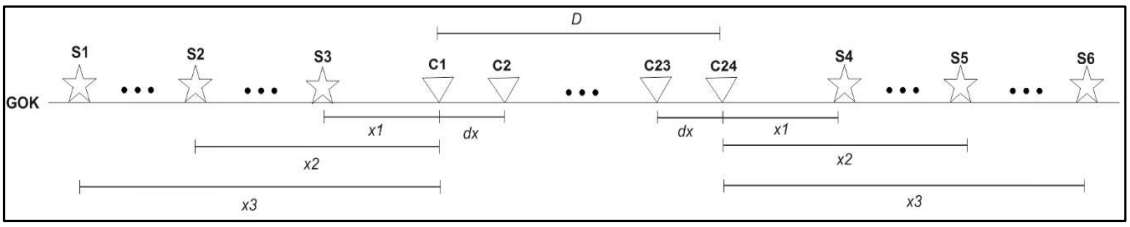

Figure 1: Typical MASW configuration.

Once a source (shot) has been generated, the geophones are triggered to record. Once the geophones have stopped recording a shot gather is produced which displays the amplitude and time of the recorded subsurface response relating to that source. A typical MASW record is shown in Figure 2. Multiple shots at the same position are usually stacked to increase signal to noise ratio and remove random noise.

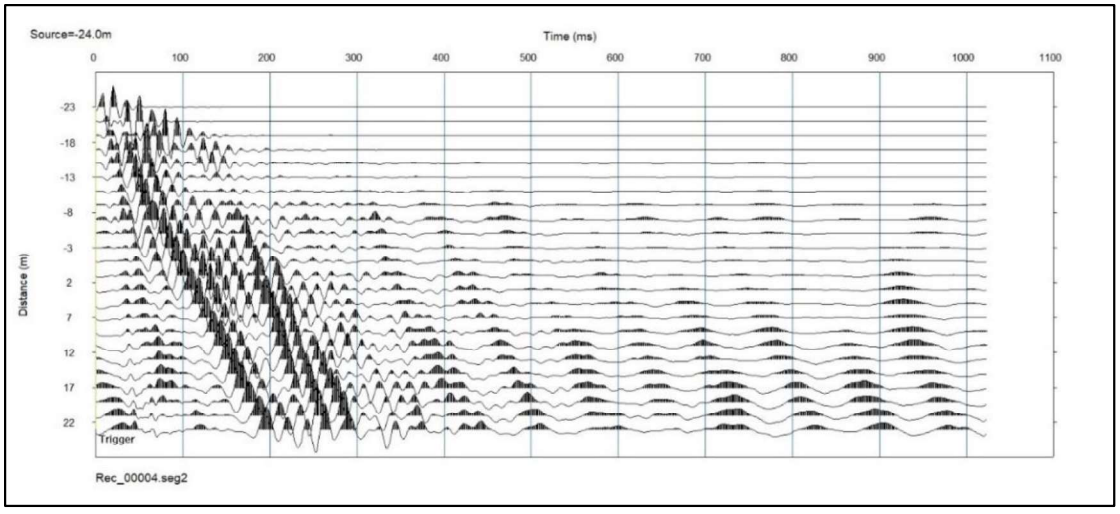

Figure 2: Typical MASW shot record.

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Once the raw time domain records are collected the traces are transformed to the frequency domain to create a dispersion image. A typical dispersion image is shown in Figure 3. A dispersion curve is fitted to the data and used in a process called inversion, which back-calculates shear-wave velocity variation with depth. This gives the theoretical dispersion curve closest to the measured curve that corresponds with the shear-wave velocity variation in the subsurface. The final result is a 1D layered earth model of shear-wave velocities.

To increase the depths of investigation, passive records (no active source) can be collected. Passive sources (traffic, etc.) usually have a wide frequency range which can lead to recording low frequency signals. The recording times of passive seismic waves typically range between 1-2 seconds. The processing workflow to the dispersion image is analogous to the active MASW. Dispersion images for passive and active MASW can be stacked to enhance data quality and widen the frequency range.

SEISMIC SITE CLASSIFICATION FOR SEISMIC SITE RESPONSE

The average shear wave velocity $\overline{v}_{s30}$ is utilized for seismic site classification and calculated with the following equation:

$$\overline{v}_{s30} = \sum d_i / \sum t_i = 30 / \sum d_i / v_{si}$$

where d_i = thickness of the i-th layer, t_i = one way travel time in i-th layer and v_{si} = shear wave velocity of i-th layer.

The criteria for the classes are defined in Table 4.1.8.4.A of the 2018 British Columbia Building Code (BCBC). The table below gives a short summary.

Site Class	Ground Profile Name	Average Shear Wave Velocity, $\overline{v}_{s30}$ (m/s)
A	Hard rock	$\overline{v}_{s30} > 1500$
B	Rock	$760 < \overline{v}_{s30} < 1500$
C	Very dense soil and soft rock	$360 < \overline{v}_{s30} < 760$
D	Stiff soil	$180 < \overline{v}_{s30} < 360$
E	Soft soil	$\overline{v}_{s30} < 180$
F	Other soils	-

In accordance with the 2018 BCBC a site-specific dynamic analysis is required for sites classified as Site Class “F” in order to provide the structural engineer with the estimated seismic design spectra of the site based on the design earthquake for structures with a natural period above 0.5 seconds. For structures with a natural period of less than 0.5 seconds 2012 BCBC has a provision that structures may be designed in accordance with Site Class E. A fundamental input parameter for a site-specific dynamic analysis is the shear wave velocity.

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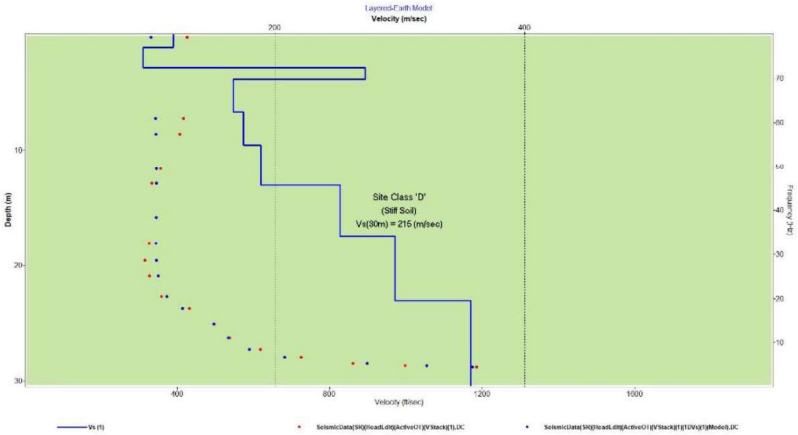
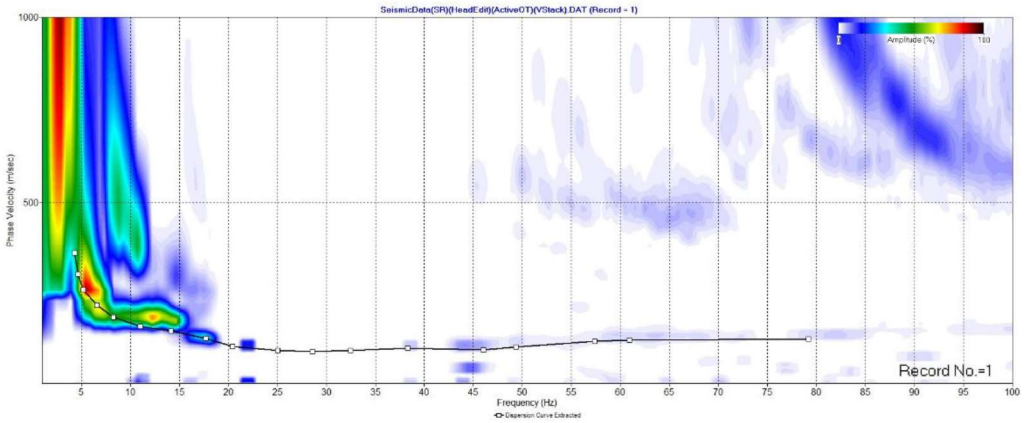
File: 22431
Project: 2591 Beverly Street
Client: Total Concept Developments Ltd.
Location: 2591 Beverly Street, North Cowichan, BC.
Date: November 28th, 2023



Layer	Depth of Bottom of Layer (m)	Vs (m/s)
1	1.163	118.75
2	2.873	94.56
3	3.896	272.32
4	6.704	166.76
5	9.542	174.83
6	13.09	188.76
7	17.526	252.16
8	23.07	296.07
9	30.5	356.77

MASW23-01 Site Class:
Site Class 'D' (Stiff Soil)
Vs (30m) = 215 m/s



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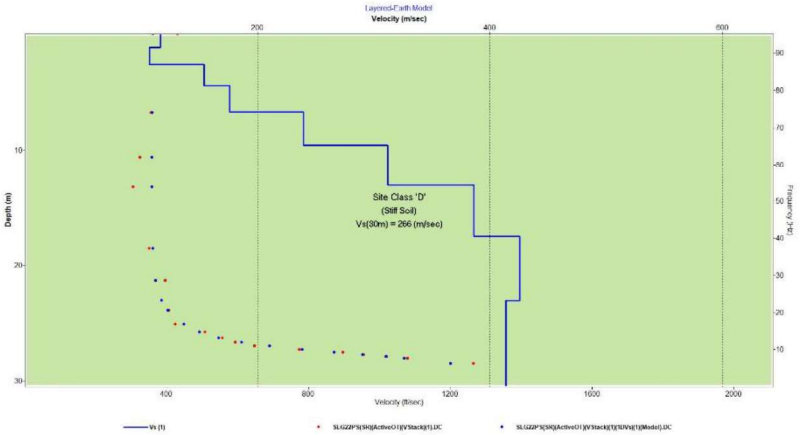
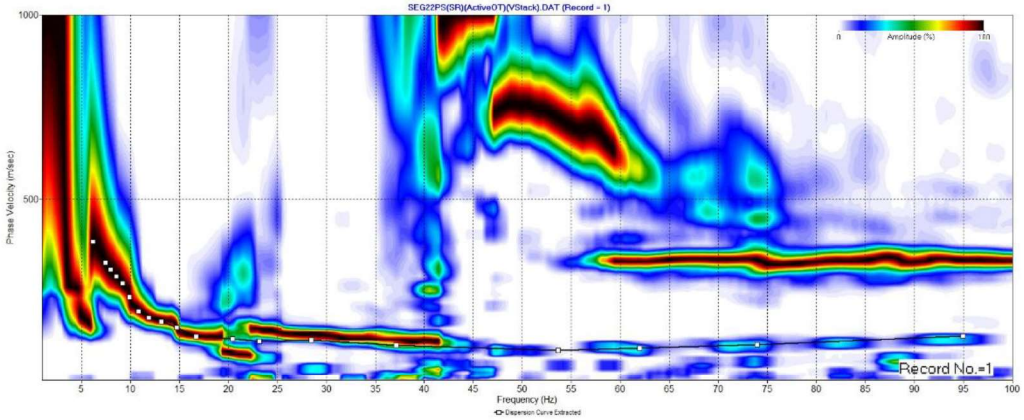
File: 22431
Project: 2591 Beverly Street
Client: Total Concept Developments Ltd.
Location: 2591 Beverly Street, North Cowichan, BC.
Date: November 28th, 2023



Layer	Depth of Bottom of Layer (m)	Vs (m/s)
1	1.163	116.45
2	2.616	107.28
3	4.433	154.19
4	6.704	176.14
5	9.542	239.6
6	13.09	311.95
7	17.526	386.11
8	23.07	425.67
9	30.5	413.68

MASW23-02 Site Class:
Site Class 'D' (Stiff Soil)
Vs (30m) = 266 m/s



MEMO

DATE: March 25, 2024
PROJECT NO: 08-24-0022
PROJECT: Somenos View Residences
SUBJECT: Parking Design Review - Column-Adjacent Stall Width Variance

TO: Dan Hicks – Project Manager
TriCity Canada

PREPARED BY: Kieran Quan, EIT
REVIEWED BY: Jason Potter, PTP, M.Sc.
APPROVED BY: Yulia Liem, P.Eng., PTOE

Permit No. 1000468
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
Y. P. LIEM
35685
2024-03-25

1. INTRODUCTION

TriCity Canada (TriCity / the proponent) proposes to develop a residential condo building with 220 units at 2591 Beverly Street (Somenos View Residences) in Duncan, BC. The proponent is seeking a design variance from the Municipality of North Cowichan (the Municipality) Zoning Bylaw 1997, No. 2950 (the bylaw) width requirement for column-adjacent vehicle parking stalls. The bylaw requires that vehicle parking stalls adjacent to structures, such as columns, have a width of 3.0m. The proponent is seeking to provide a stall width of 2.6m for both column-adjacent and non-column-adjacent stalls in the proposed parkade.

Bunt & Associates Engineering Ltd. (Bunt) has prepared this technical memo to review if 2.6m column-adjacent parking stalls are accessible for design vehicles.

2. DESIGN REVIEW

Bunt reviewed inbound and outbound parking maneuvers in/out of standard and small car column-adjacent parking stalls using AutoTURN software. As is consistent with Bunt internal guidelines, the vehicle design speed was set to 5 km/h and the design vehicles could only turn their wheels from a stopped position if they were about to change direction between forward and reverse drive. The analysis is attached as **Exhibits 1-3**. The following summarizes the analysis:

- **Exhibit 1** illustrates a standard 5.6m P-TAC (Passenger – Transportation Association of Canada) design vehicle accessing a 90-degree column-adjacent parking stall without any conflicts with the column or adjacent stalls.

- **Exhibit 2** illustrates a standard 5.6m P-TAC design vehicle accessing a 45-degree column-adjacent parking stall from a one-way drive aisle without any conflicts with the column or the adjacent parked vehicle (shown in grey).
- **Exhibit 3** illustrates 4.6m small car (Honda Civic 2017) design vehicle accessing a 90-degree small car space without any conflicts with the column or the adjacent stalls.

As shown in the Exhibits, drive aisle widths are consistent with the requirements set out in the bylaw.

3. CONCLUSIONS

The swept path analysis indicates that 2.6m-wide column-adjacent stalls for all three types of parking proposed (90-degree standard stalls, 45-degree standard stalls from a one-way aisle, and 90-degree small car parking) are accessible without conflicts for their respective design vehicles. Despite the stalls being narrower than bylaw they are found to be functional due to adequate aisle width.

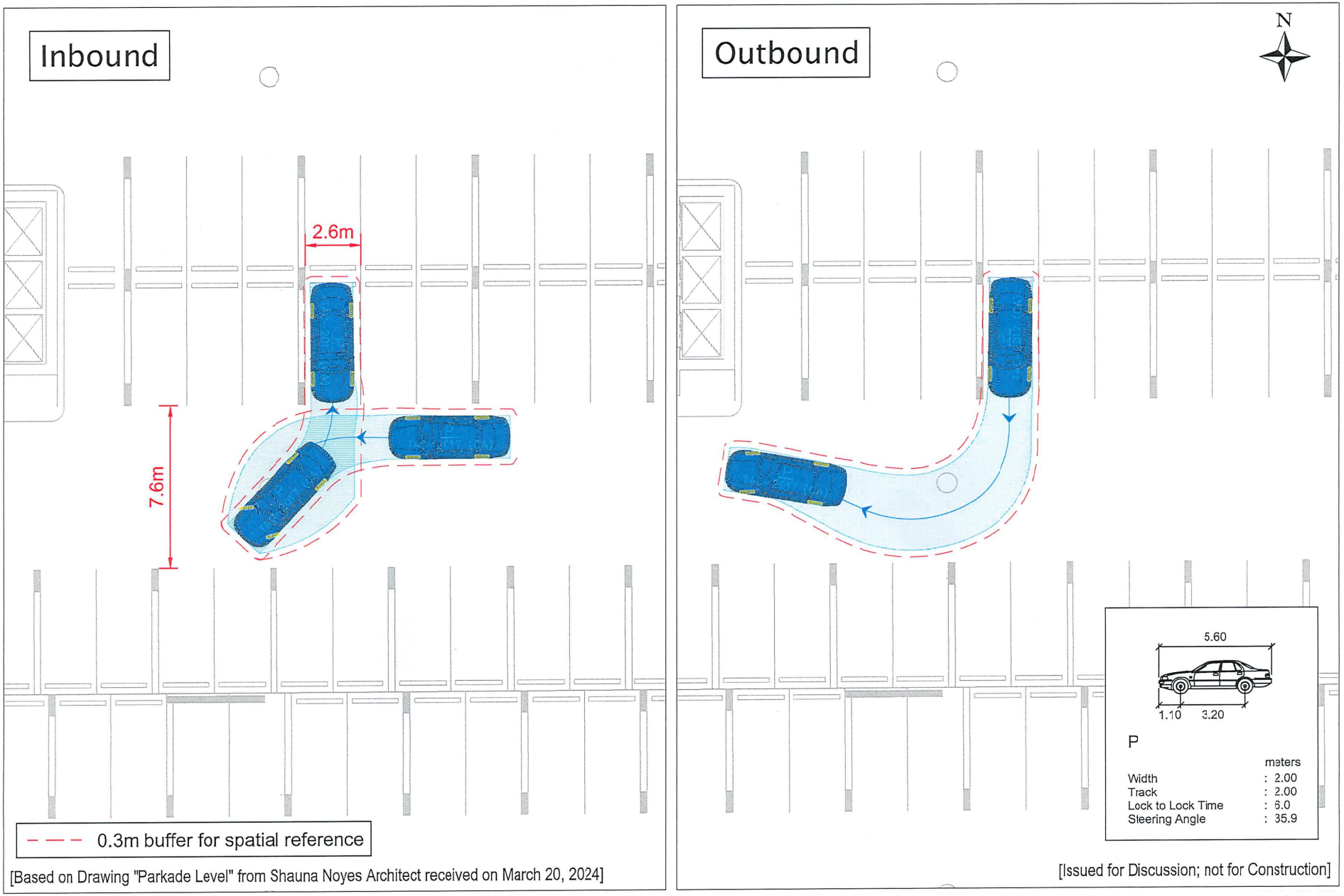


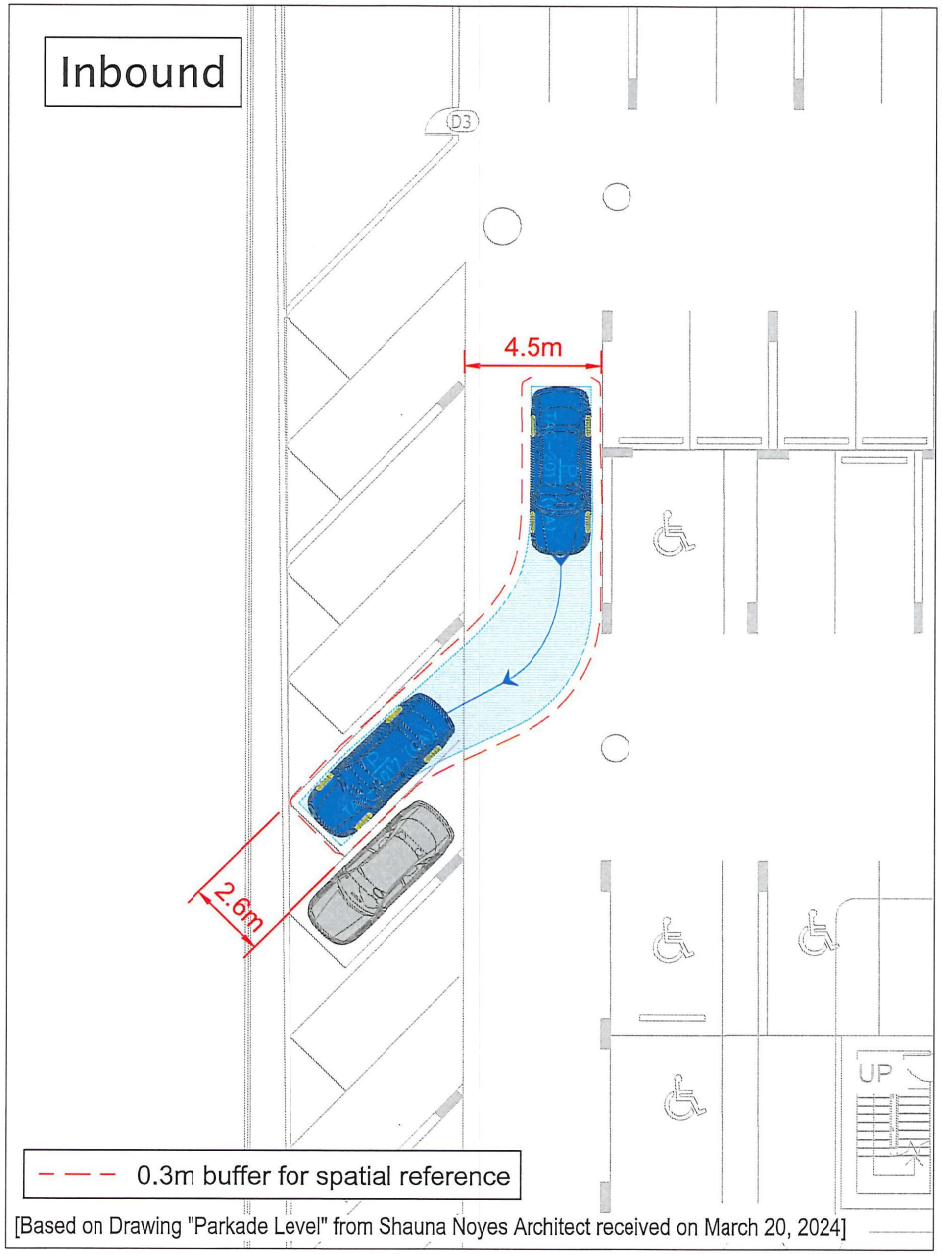
Exhibit 1

Passenger Vehicle Parking - 90-degree Column-Adjacent Stalls

Somenos View Residences
08-24-0022 March 2024 Scale 1:250 on Letter Prepared by KQ

bunt & associates

C:\Dept BL\Projects\2024\08-24-0022 Somenos View Residences\4.0 Analysis & Design\ACAD\08-24-0022_Somenos View Residences_AT_V01-01.dwg
Plotted by Kieran Quan



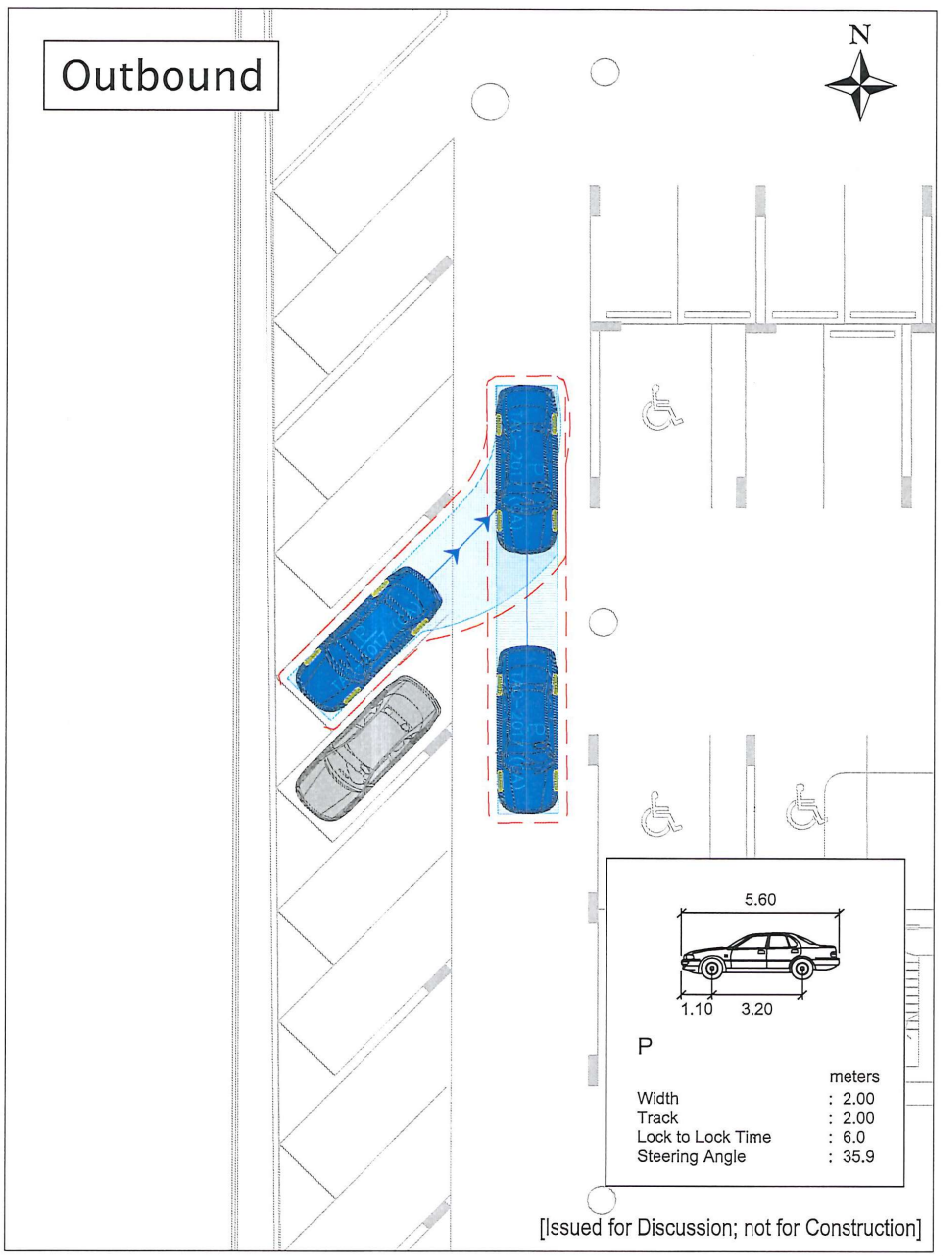


Exhibit 2

Passenger Vehicle Parking - 45-degree One-Way Column-Adjacent Stalls

Somenos View Residences
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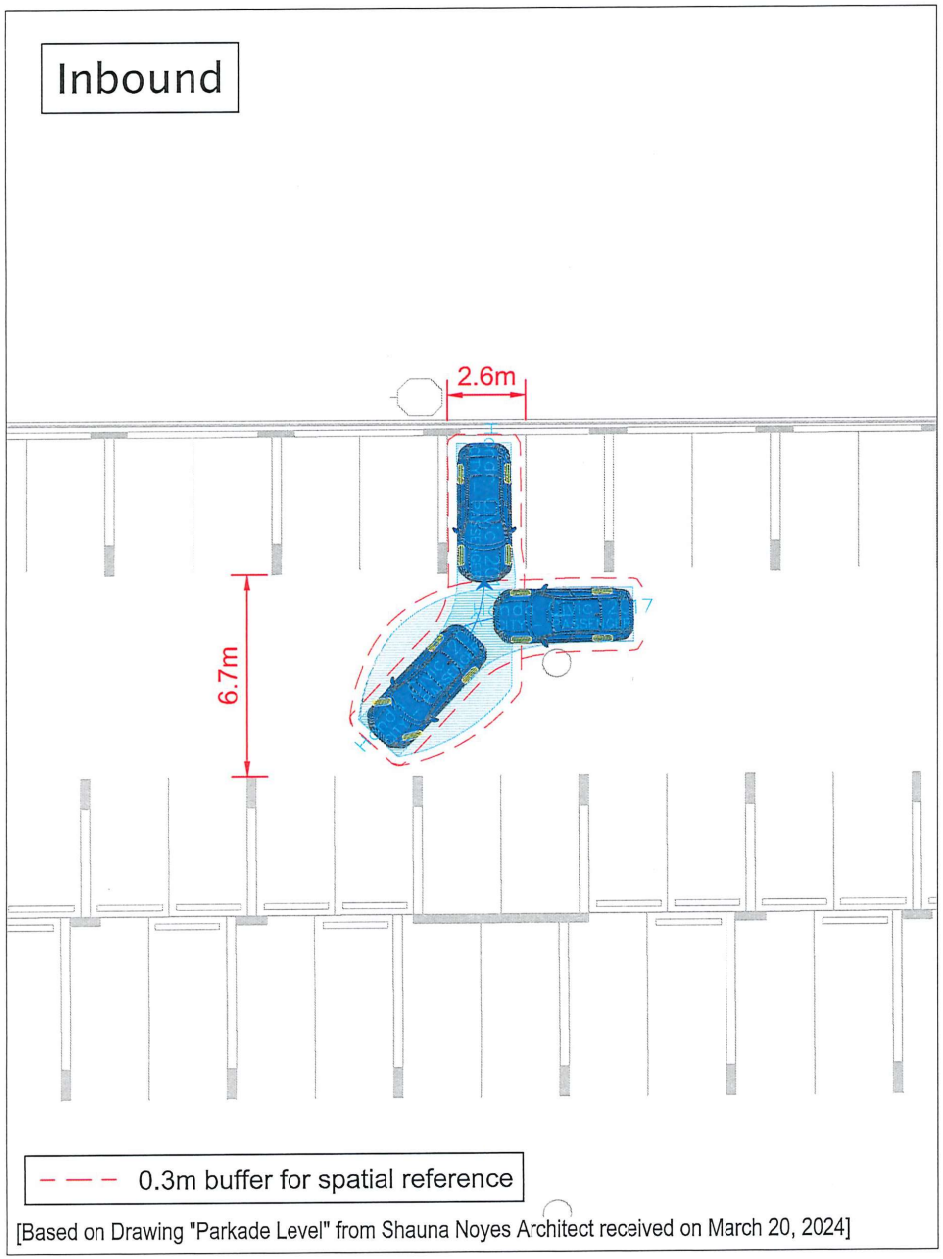

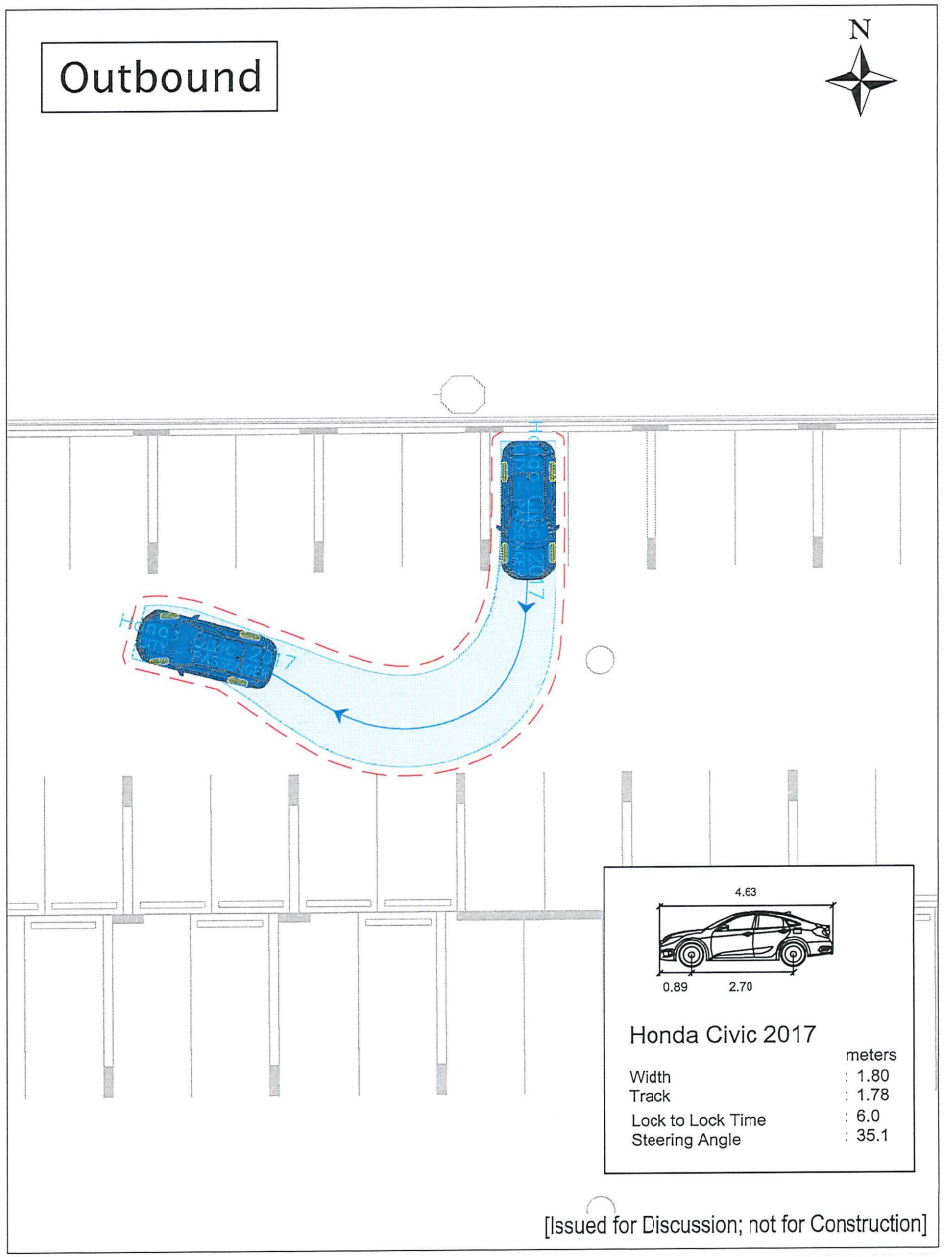

Exhibit 3

Small Car Parking - 90-degree Column-Adjacent Stalls

Somenos View Residences
08-24-0022 March 2024 Scale 1:250 on Letter Prepared by KQ

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