

DEVELOPMENT PERMIT

District of Lake Country
 10150 Bottom Wood Lake Road
 Lake Country, BC V4V 2M1
 t: 250-766-6674 f: 250-766-0200
 lakecountry.bc.ca

APPROVED ISSUANCE OF DEVELOPMENT PERMIT *(pursuant to Sec. 488 of the Local Government Act)*

PERMIT #: DP001085
 FOLIO #: 2400000
 ZONING DESIGNATION: CD17 – Comprehensive Development Zone 17 (Westrich)
 ISSUED TO: Riche Lam
 SITE ADDRESS: 11375 Woodsdale Court
 LEGAL DESCRIPTION: THAT PART OF LOT 72 LYING EAST OF THE HIGHWAY AS SHOWN ON PLAN M69 SECTION 15 TOWNSHIP 20 OSOYOOS DIVISION YALE DISTRICT PLAN 444, EXCEPT PLANS H936, H15689 AND 40347
 PARCEL IDENTIFIER: 007-844-948

SCOPE OF APPROVAL

This Permit applies to and only to those lands within the Municipality as described above, and any and all buildings, structures and other development thereon.

This Permit is issued subject to compliance with all of the Bylaws of the Municipality applicable thereto, except as specifically varied or supplemented by this Permit, noted in the Terms and Conditions below.

Applicants for Development Permits should be aware that the issuance of a Permit limits the applicant to be in strict compliance with all District bylaws unless specific Variances have been authorized by the Permit. No implied Variances from bylaw provisions shall be granted by virtue of drawing notations which are inconsistent with bylaw provisions and which have not been identified as required Variances by the applicant or Municipal staff.

If any term or condition of this permit is for any reason held to be invalid by a decision of a Court of competent jurisdiction, such decision will not affect the validity of the remaining portions of this permit.

1. TERMS AND CONDITIONS

Development Permit DP001085 for 11375 Woodsdale Crt, legally described as THAT PART OF LOT 72 LYING EAST OF THE HIGHWAY AS SHOWN ON PLAN M69 SECTION 15 TOWNSHIP 20 OSOYOOS DIVISION YALE DISTRICT PLAN 444, EXCEPT PLANS H936, H15689 AND 40347 for the development of six-storey residential building containing 283 units and below grade parking portion of the building shall be conducted in accordance with the recommendations contained in the following documents attached to and forming part of this permit:

- a) The development of the subject shall be conducted in accordance with the following documents to the satisfaction of the Director of Planning and Development:
 - (i) **Schedule A:** Site Plan and Architectural Drawings with revision 1 date 2026-01-13, prepared by J+S Architect;
 - (ii) **Schedule B:** Preliminary Geotechnical Investigation Report, , with date 2021-11-01, prepared by GeoPacific Consultants Ltd. And signed by Roberto Avendano;

- (iii) **Schedule C:** Environmental Assessment Report with date 2023-04-11, prepared by Okanagan EHS Services Ltd., submitted by Shannen Ivanitz.
- (iv) **Schedule D:** Riparian Areas Protection Regulation: Assessment Report with date 2023-0-28, prepared by Okanagan EHS Services Ltd., submitted by Shannen Ivanitz.
- (v) **Schedule E:** Landscape Plan with date 2025-12-23, prepared by WSP Canada Inc.

2. PERFORMANCE SECURITY

As a condition of the issuance of this Development Permit, a security deposit is required for \$ 642,437.50 for landscape security deposit (125% of the Landscape Estimate and Environmental Monitoring Estimate). This will be collected prior to the issuance of the applicable Building Permit.

Upon acceptance of the works by municipal staff, 85% of the security shall be returned. The Municipality shall retain the remaining 15% for a period of 24 months from the date of acceptance of the works, during which time the Municipality may use the remaining security to replace the required works, if necessary. Upon the expiration of the 24 months warranty period, the Permit Holder must provide a statement certified by a qualified professional indicating that the works have met the requirements of the survival monitoring and reporting as identified in the Environmental Assessment Report along with the conditions specified in the Development Permit. The remaining security funds shall be refunded at the expiration of the 24 months warranty period, subject to a final inspection by Municipal staff to confirm the survival of the required works.

3. DEVELOPMENT

The development described herein shall be undertaken strictly in accordance with the terms, conditions and provisions of this Permit and any plans and specifications attached to shall form a part hereof.

The development shall commence within **TWO** YEARS of the date that this permit is issued.

If the Permit Holder does not substantially commence the development permitted by this Permit within **TWO** years of the date of issuance of this permit, this permit shall lapse.

The terms of the permit or any amendment to it are binding on all persons who acquire an interest in the land affected by the permit.

**THIS IS NOT A BUILDING PERMIT
OR A CERTIFICATE TO COMMENCE
CONSTRUCTION**

4. APPROVALS

Authorization passed by Council on the ___ day of _____, 2026.

Issued by the Corporate Officer of the District of Lake Country this ___ day of _____, 2026.

Corporate Officer, Reyna Seabrook



MULTI-FAMILY RESIDENTIAL DEVELOPMENT

**ISSUED FOR DEVELOPMENT PERMIT
January 13, 2026**

CIVIC ADDRESS:

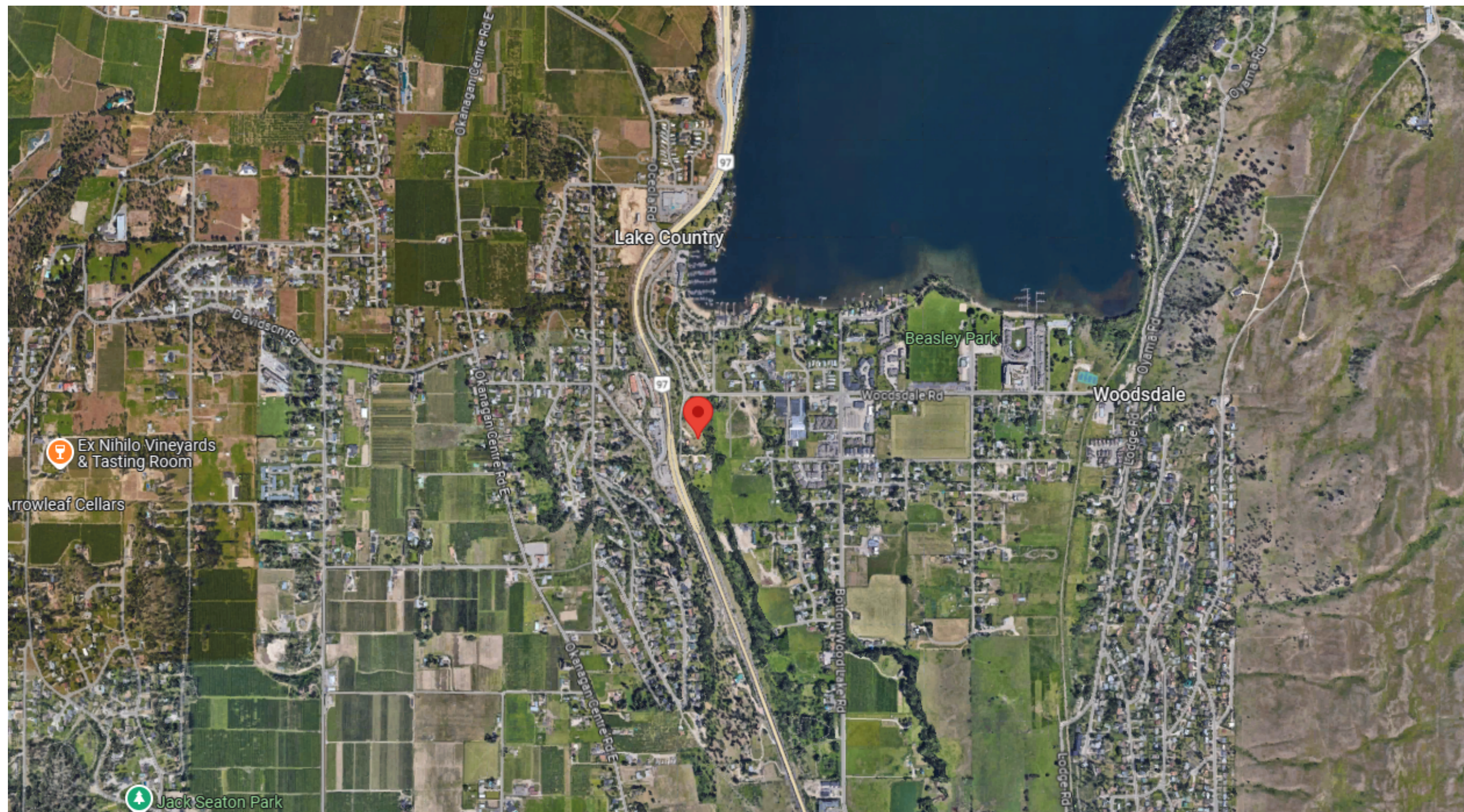
11375 Woodsdale Ct, Lake Country, BC

LEGAL DESCRIPTION:

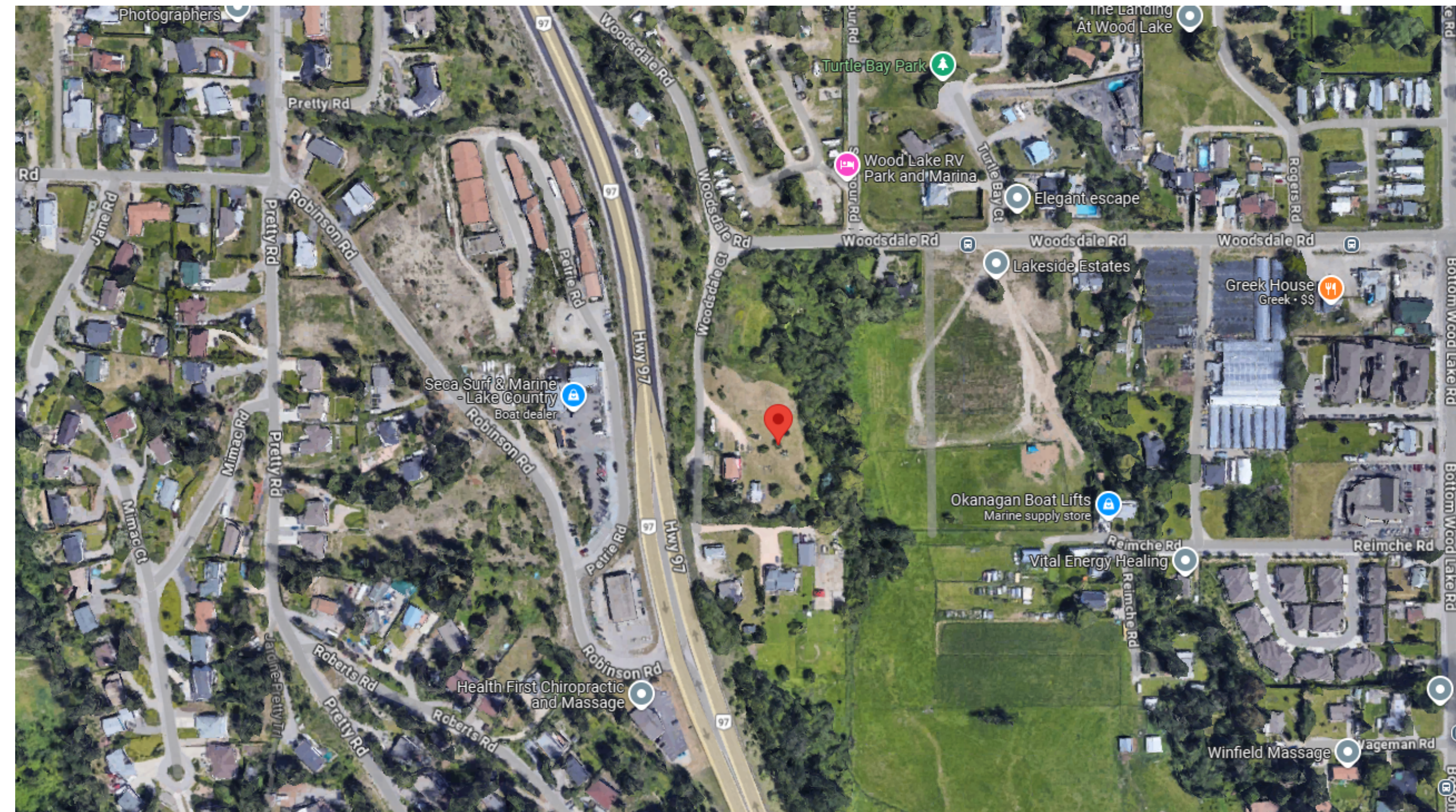
THAT PART OF LOT 72 LYING EAST OF THE HIGHWAY AS SHOWN ON PLAN M69 SECTION 15 TOWNSHIP 20 OSOYOOS DIVISION YALE DISTRICT

SHEET LIST	
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A7.05	ELEVATION VIEW @ REAR
A7.06	ELEVATION VIEW @ LANE

SCHEDULE _____
This forms part of development
Permit #
Date
Signature



KEY PLAN



CONTEXT PLAN



VIEW FROM NORTHEAST



VIEW FROM LANE



VIEW FROM SOUTHEAST

NO.	REVISION	DATE

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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE: N T S	
JOB NO.: 2414	

SHEET TITLE:

PROJECT CONTEXT



Project Development Data - Residential Development

Multi Family Residential Development- 11375 WOODSDALE CRT

A. **Project:**
Multi-Family Residential Development

B. **Legal Description:**
LOT 72 SECTION 15 OSOYOOS DIV OF YALE LAND DISTRICT PLAN KAP444 TOWNSHIP 20

C. **Zoning:**
Existing Zoning: RU6
Proposed Zoning: CD

D. **Proposed Setbacks:**

	Proposed	Req'd
Front	4.11m	3.0m
Side(South)	7.30m	4.0m
Side(North)	15.0m	4.0m
Rear	14.0m	5.0m

E. **Building Height:**
Max. Allowable Building Height(From Front Street) 6 storeys 26m
Max. Proposed Building Height(From Front Street) 6 Storeys 22.0m

F. **Site Coverage Calculations:**

Site Area Parcel	108,278 sq ft	10059.30 sq m
Net Site Area	105,330 sq ft	9785.47 sq m
Site Coverage (Allowed)	60.00%	
Site Coverage (Proposed)	58%	

G. **Floor Space Ratio (F.S.R.) Calculation:**

Site Use	Gross Site Area	Proposed Total FSR Area	Proposed FSR	Proposed FSR(Net Site)
Residential	108,278 sq ft	220,278 sq ft	2.03	2.09

H. **Residential Statistics - Floor Areas**

Level	Number of Floors	Unit Area per Floor	Total Unit Area	Common Area per Floor	Total Common Area	Gross Floor Area (Per Floors)	Gross Floor Area (All Floors)	Net Floor Area
P1	1	11,624 sq ft	11,624 sq ft		0 sq ft	11,624 sq ft	11,624 sq ft	11,624 sq ft
P2	1	9,791 sq ft	9,791 sq ft	2,883 sq ft	2,883 sq ft	12,673 sq ft	12,673 sq ft	9,791 sq ft
GROUND FLOOR LEVEL	1	31,386 sq ft	31,386 sq ft	6,393 sq ft	6,393 sq ft	37,779 sq ft	37,779 sq ft	31,386 sq ft
LEVEL 2 - LEVEL 5	4	34,707 sq ft	138,828 sq ft	3,965 sq ft	15,860 sq ft	38,672 sq ft	154,688 sq ft	138,828 sq ft
LEVEL 6	1	28,650 sq ft	28,650 sq ft	4,962 sq ft	4,962 sq ft	33,612 sq ft	33,612 sq ft	28,650 sq ft
TOTAL	6		220,278 sq ft		27,215 sq ft	110,063 sq ft	250,375 sq ft	220,278 sq ft

I. **Residential Statistics - Unit Counts**

Size	1 Bed	2 Bed	2 Bed + Den	3Bed	3Bed+Den	No. of Floors	Total
P1	0	0	0	3	10	1	13
J2 GROUND FLOOR LEVEL	16	24	1	2	0	1	43
J3 LEVEL 2 - LEVEL 5	16	27	2	2	0	4	188
J4 LEVEL 6	14	22	1	2	0	1	39
J7 Total	94	154	10	15	10	6	283

J. **Amenity Space**

Level	Outdoor Common Amenity	Indoor Common Amenity	Private Amenity Balconies/Roof Deck/Patio	Subtotal (sq.ft.)	Subtotal (sq.m.)
P1	0 sq ft	0 sq ft	1,543 sq ft	1,543 sq ft	143 sq m
P2	0 sq ft	0 sq ft	1,994 sq ft	1,994 sq ft	185 sq m
GROUND FLOOR LEVEL	61,833 sq ft	813 sq ft	10,140 sq ft	72,786 sq ft	6762 sq m
LEVEL 2 - LEVEL 5	0 sq ft	0 sq ft	3,534 sq ft	14,137 sq ft	1313 sq m
LEVEL 6	4,237 sq ft	1,464 sq ft	2,983 sq ft	8,684 sq ft	807 sq m
Total	66,070 sq ft	2,277 sq ft	20,195 sq ft	99,145 sq ft	9211 sq m

Required Amenity Space

Unit	Number of Unit	Required Area Per Unit (sq.m.)	Total Required Area (sq.m.)
Studio	0	7.5	0 sq m
1 Bed	94	15	1410 sq m
2 and more bed	189	25	4725 sq m
Total			6135 sq m

L. **Parking Statistics** NOTE: Service / Circulation Areas are not included in parking space calculations

Residential Vehicular Parking:
1_ Visitor parking: Min 1/7 space per dwelling unit

Vehicle Parking

Required Parking						
	RESIDENTIAL			RES. VISITOR		Total Required
	H/C	1 Bed/1Bachelor	2Bed	3Bed +	Gross	
Total	7	94	197	38	40	369

Proposed Parking

Residential				Total provided
Gross	Small Car	H/C	Visitor	
323	131	8	40	363

Note: request cash-in-lieu for 6 regular size stalls deficiency

Bicycle Parking

Required Bicycle Parking			
	Gross	Class 1	Class 2
Total	170	142	28

Provided Bicycle Parking

Class 1	Class 2	Total
184	28	212

Req'd size (horizontal)			Req'd access	Provided size (horizontal)			Prov'd access
width (m)	depth(m)	height(m)	width(m)	width (m)	depth(m)	height(m)	width(m)
0.60	1.80	1.90	1.20	0.60	1.80	2.40	1.20

NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
ISSUED FOR:	DATE
REZONING	OCTOBER, 2025
DEVELOPMENT PERMIT	13/01/2026

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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Woodsdale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 11/19/20	
SCALE:	
JOB NO.: 2414	

SHEET TITLE:

PROJECT DATA

DRAWING NO.: **A0.03** REVISION NO:



NO.	REVISION	DATE
	REVISIONS:	MM/DD/YYYY
	ISSUED FOR:	DATE
	REZONING:	OCTOBER, 2025
	DEVELOPMENT PERMIT	13/01/2026

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PROJECT:
MULTI-FAMILY DEVELOPMENT

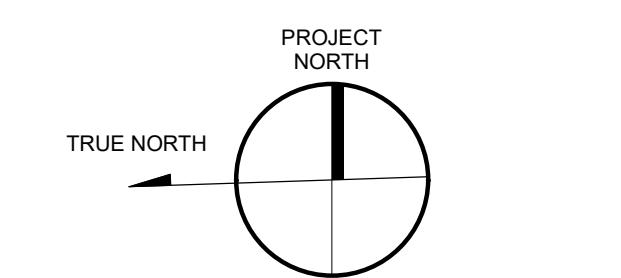
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CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 01/20/2022	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	
SHEET TITLE:	

FIRE ACCESS PLAN

1 FIRE ACCESS PLAN
1/16" = 1'-0"



NO.	REVISION	DATE
1	ISSUED FOR:	DATE
2	REZONING	OCTOBER, 2025
3	DEVELOPMENT PERMIT	13/01/2026

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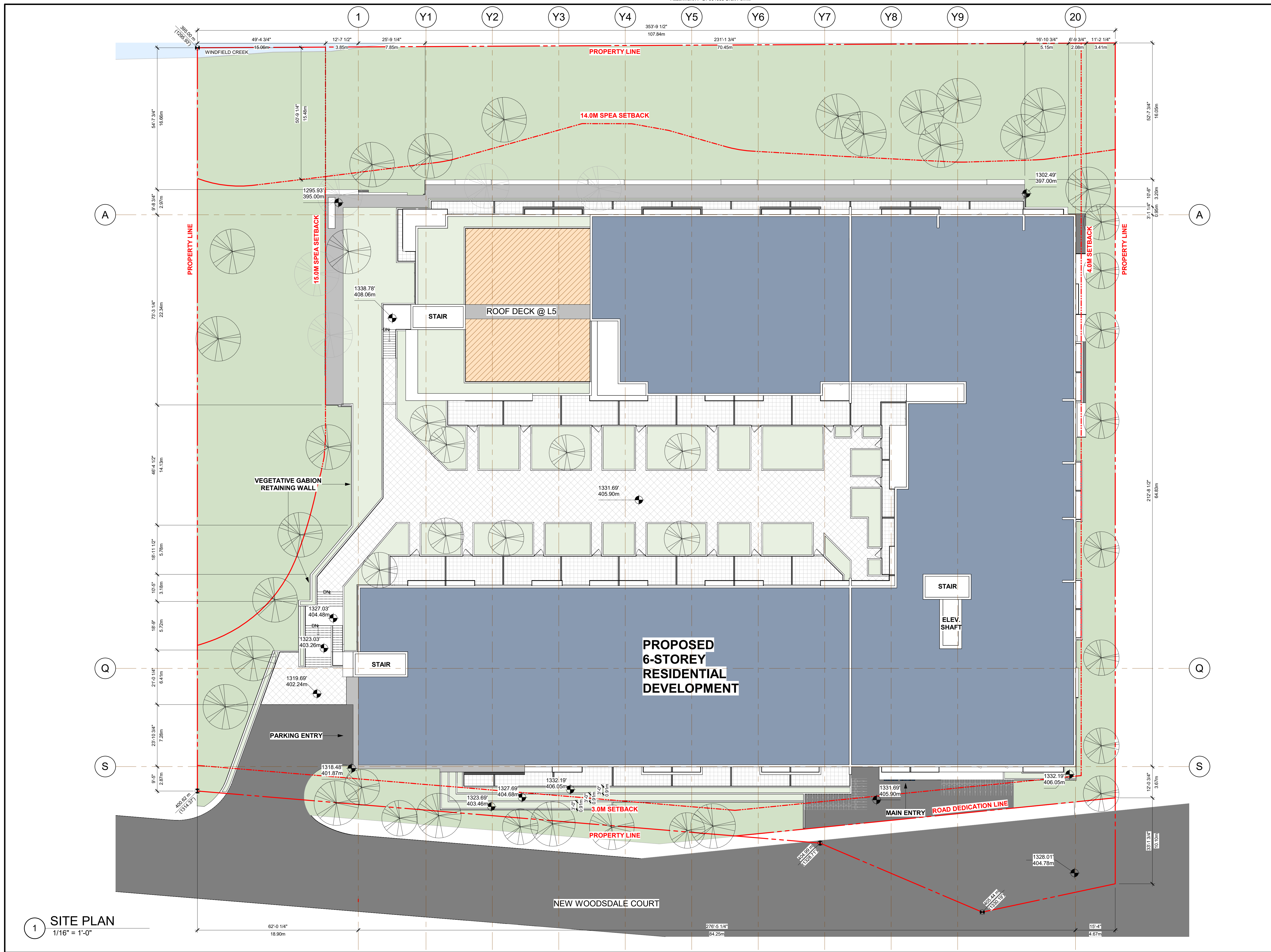
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MULTI-FAMILY DEVELOPMENT
11375 Woodsdale Ct, Lake Country, BC
CLIENT:

CONSULTANT:

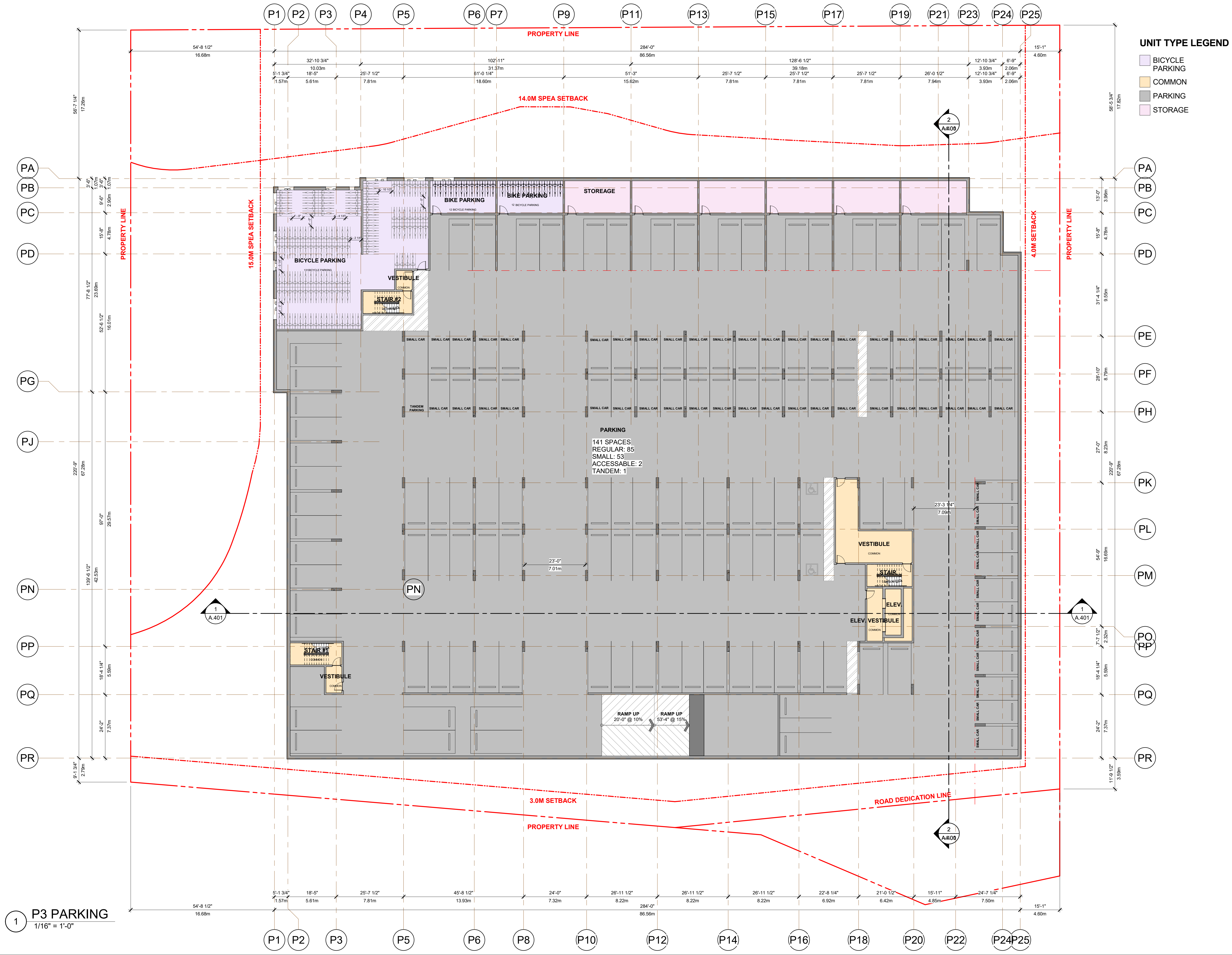
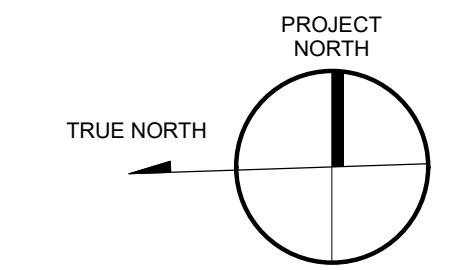
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DATE: 8/26/2021	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	

SHEET TITLE:
SITE PLAN

DRAWING NO.: A1.00	REVISION NO.:
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1 SITE PLAN
1/16" = 1'-0"



UNIT TYPE LEGEND

- BICYCLE PARKING
- COMMON
- PARKING
- STORAGE

NO.	REVISION	DATE

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PROJECT:
MULTI-FAMILY DEVELOPMENT

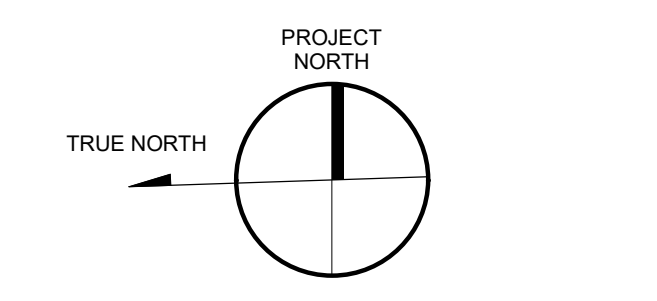
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CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 07/13/21	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	

SHEET TITLE:
P3 FLOOR PLAN

1 P3 PARKING
1/16" = 1'-0"



NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
ISSUED FOR:	DATE
REZONING:	OCTOBER, 2025
DEVELOPMENT PERMIT	13/01/2026

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PROJECT:
MULTI-FAMILY DEVELOPMENT

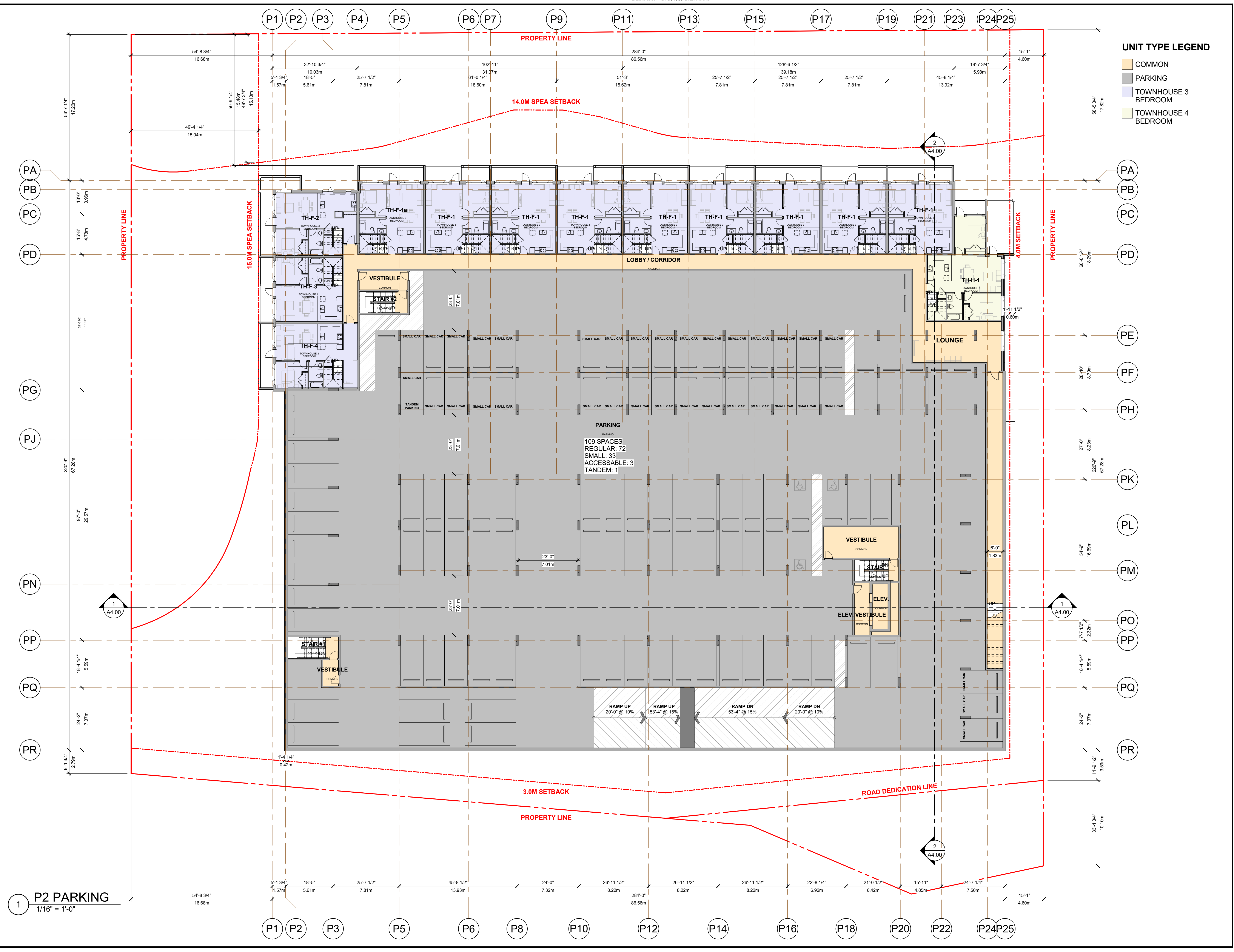
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 CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 07/13/21	
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JOB NO.: 2414	

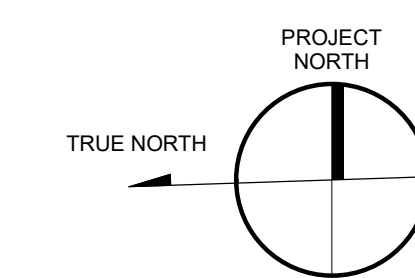
SHEET TITLE:
P2 FLOOR PLAN

DRAWING NO.: A2.01	REVISION NO.:
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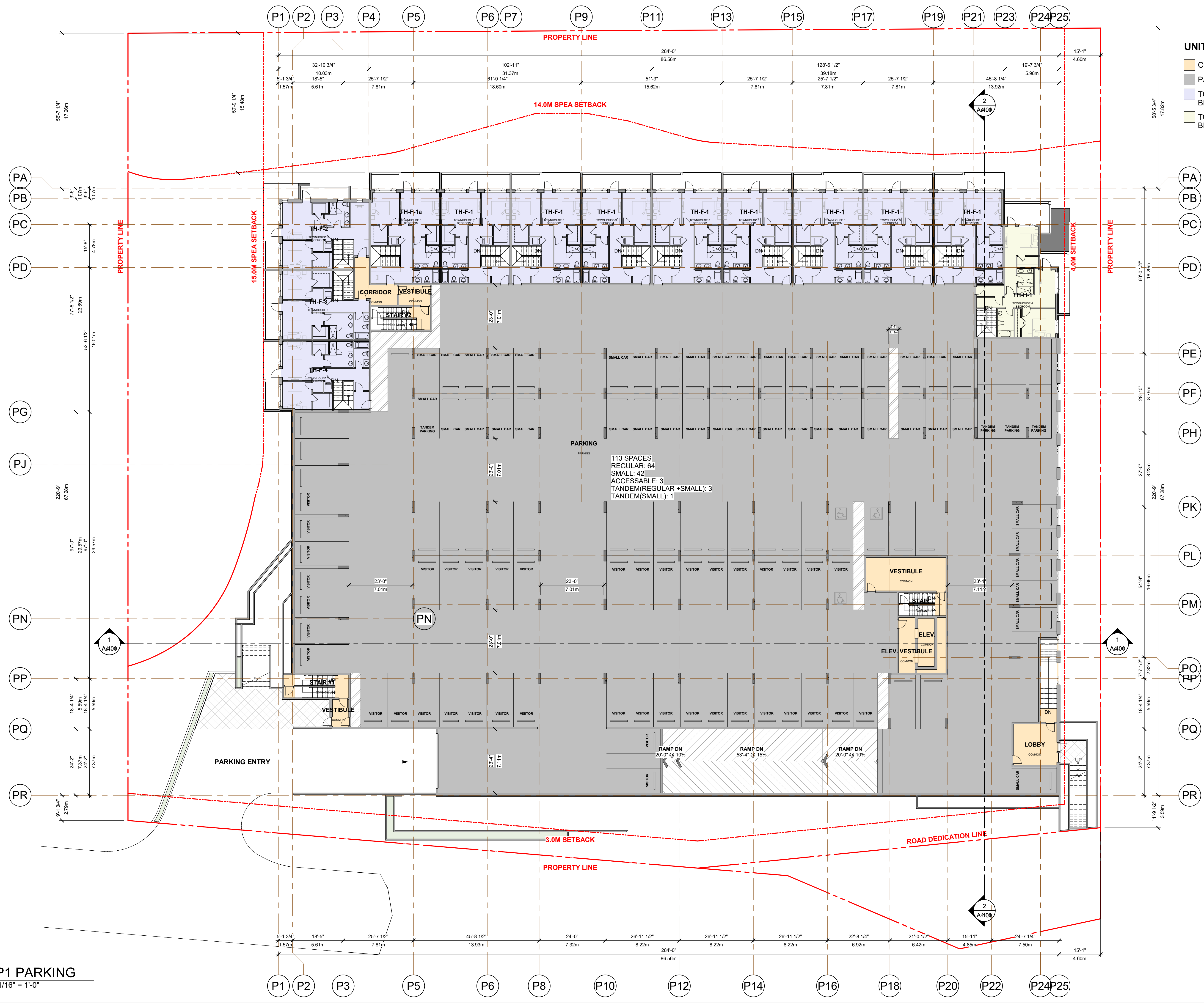




T: 604.210.9698 206-4603 KINGSWAY, BURNABY BC V5H 4M4
WWW.JSARCHITECT.CA EMAIL: INFO@JSARCHITECT.CA



- UNIT TYPE LEGEND**
- COMMON
 - PARKING
 - TOWNHOUSE 3 BEDROOM
 - TOWNHOUSE 4 BEDROOM



113 SPACES
REGULAR: 64
SMALL: 42
ACCESSIBLE: 3
TANDEM (REGULAR + SMALL): 3
TANDEM (SMALL): 1

1 P1 PARKING
1/16" = 1'-0"

NO.	REVISION	DATE

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MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

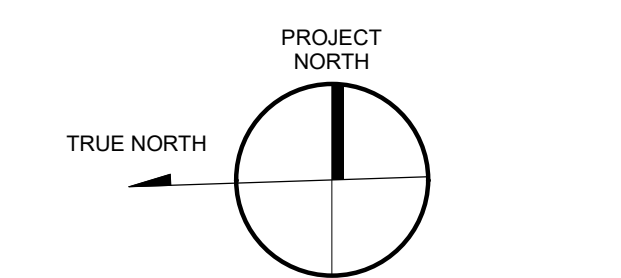
CLIENT:

CONSULTANT:

DRAWN BY: Designer
DATE: 10/23/20
SCALE: 1/16" = 1'-0"
JOB NO.: 2414

SHEET TITLE:
P1 FLOOR PLAN

DRAWING NO.:
A2.02



- UNIT TYPE LEGEND**
- 1 BEDROOM
 - 2 BEDROOM
 - 3 BEDROOM
 - COMMON
 - INDOOR AMENITY
 - SERVICE

NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
ISSUED FOR:	DATE
REZONING:	OCTOBER, 2025
DEVELOPMENT PERMIT:	13/01/2026

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MULTI-FAMILY DEVELOPMENT

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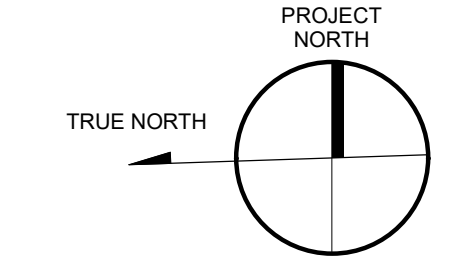
CONSULTANT:

DRAWN BY: JS/ STC	SEAL:
DATE: 10/09/2025	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	
SHEET TITLE:	

GROUND FLOOR PLAN



1 LEVEL 1 FLOOR PLAN
1/16" = 1'-0"



UNIT TYPE LEGEND

- 1 BEDROOM
- 2 BEDROOM
- 3 BEDROOM
- COMMON
- SERVICE

NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
ISSUED FOR:	DATE
REZONING:	OCTOBER, 2025
DEVELOPMENT PERMIT:	13/01/2026

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PROJECT:
MULTI-FAMILY DEVELOPMENT

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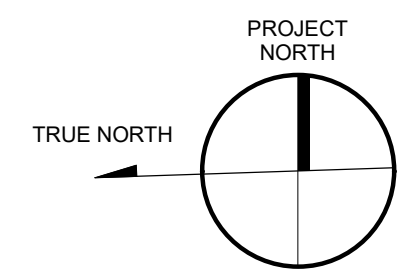
CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 12/07/21	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	
SHEET TITLE:	

L2-5 FLOOR PLAN



1 LEVEL 2-5 FLOOR PLAN
1/16" = 1'-0"



UNIT TYPE LEGEND

- 1 BEDROOM
- 2 BEDROOM
- 3 BEDROOM
- COMMON
- INDOOR AMENITY
- SERVICE

NO.	REVISION	DATE

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PROJECT:
MULTI-FAMILY DEVELOPMENT

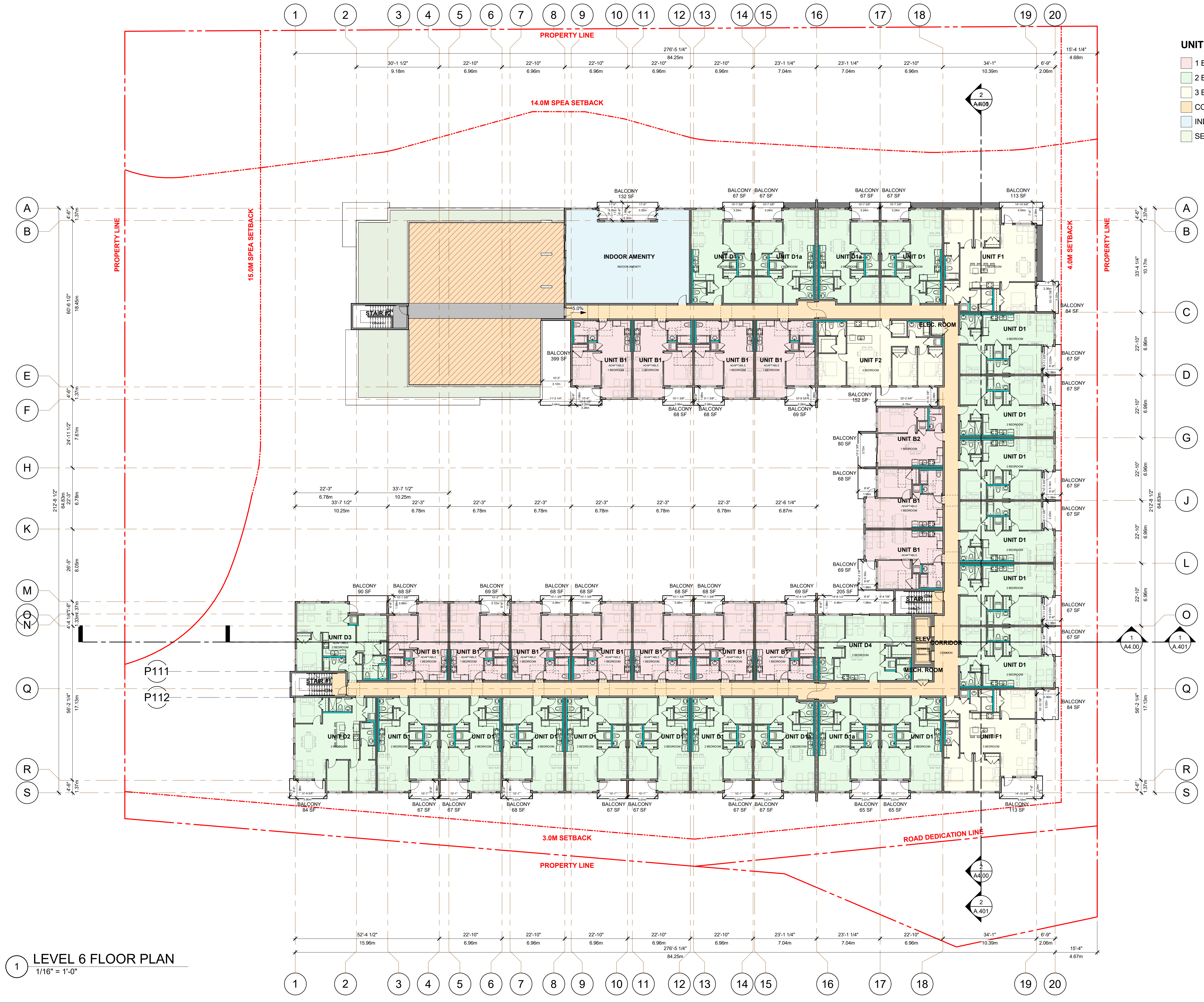
11375 Wooddale Ct, Lake Country, BC
CLIENT:

CONSULTANT:

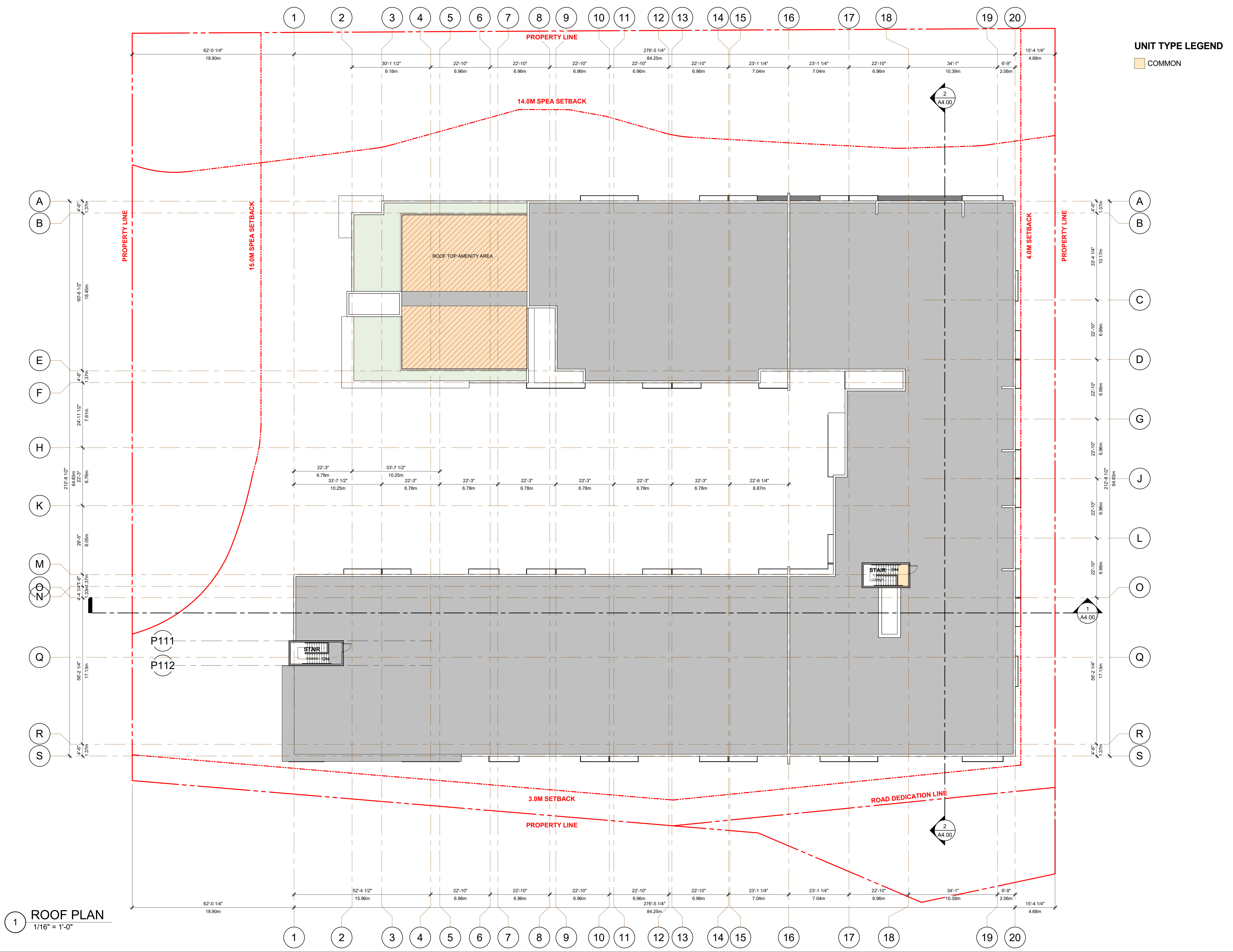
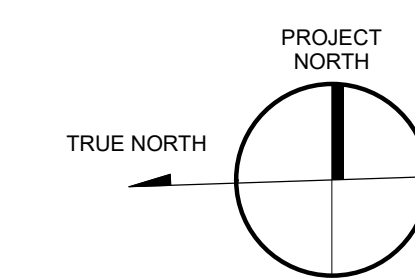
DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE: 1/16" = 1'-0"	
JOB NO.:	
2414	
SHEET TITLE:	

L6 FLOOR PLAN

DRAWING NO.:	REVISION NO.:
A2.05	



1 LEVEL 6 FLOOR PLAN
1/16" = 1'-0"



UNIT TYPE LEGEND
COMMON

1 ROOF PLAN
1/16" = 1'-0"

NO.	REVISION	DATE

ISSUED FOR: REZONING
DEVELOPMENT PERMIT

DATE: OCTOBER, 2025
13/01/2026

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PROJECT:
MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC
CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 11/01/22	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	

SHEET TITLE:
ROOF PLAN

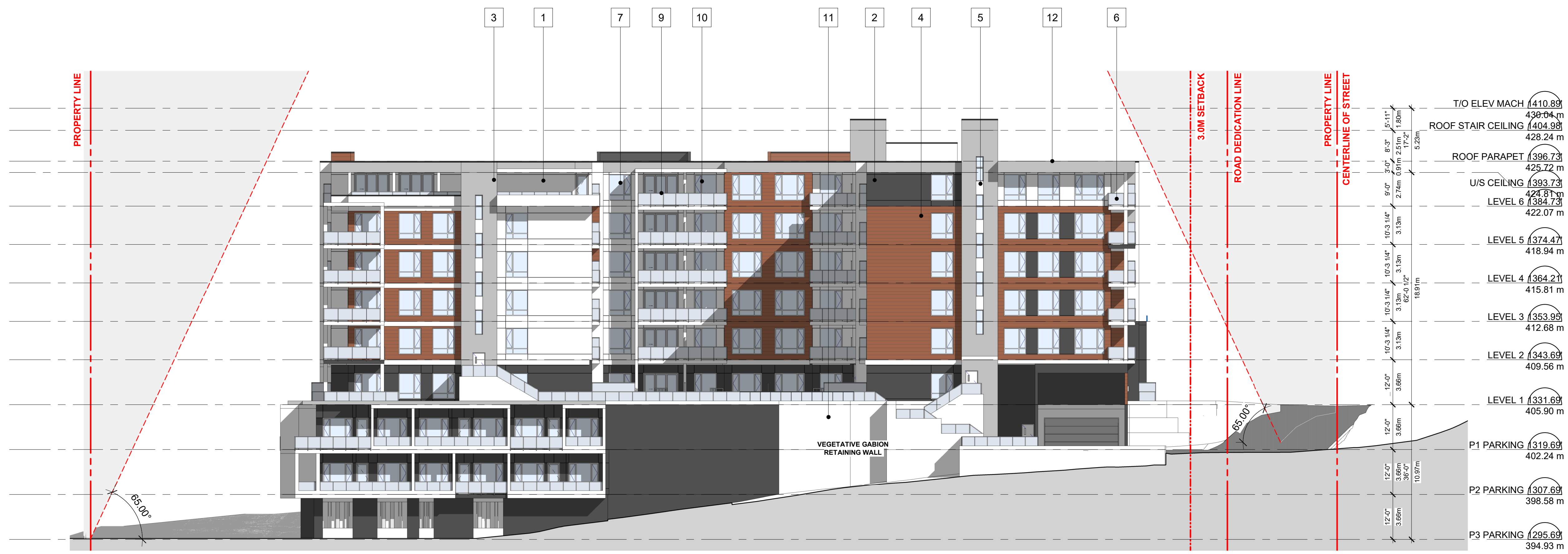
DRAWING NO.: **A2.06** REVISION No:



1 SOUTH ELEVATION
1/16" = 1'-0"

MATERIAL LEGEND	
1	FIBRE CEMENT PANEL - WHITE
2	FIBRE CEMENT PANEL - DARK GREY
3	FIBRE CEMENT PANEL - LIGHT GREY
4	FIBRE CEMENT PANEL - WOOD GRAIN
5	SPANDREL GLASS - WHITE
6	CLEAR TEMPERED GLASS GUARD RAILING

MATERIAL LEGEND	
7	THERMALLY BROKEN, DOUBLE GLAZED WINDOW - CLEAR
8	PRIVACY SCREEN - FROSTED GLASS PARTITION WALL
9	ALUMINUM GUARDRAIL - WHITE
10	VINYL WINDOW / DOOR FRAME - WHITE
11	CONCRETE
12	PRE-FINISHED METAL FLASHING - DARK GREY



2 NORTH ELEVATION
1/16" = 1'-0"

NO.	REVISION	DATE

ISSUED FOR: REZONING
OCTOBER, 2025

DEVELOPMENT PERMIT
13/01/2026

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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Woodsdale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/23/21	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	

SHEET TITLE:

NORTH & SOUTH ELEVATION

DRAWING NO.: A3.01

REVISION NO.:



1 EAST ELEVATION
1/16" = 1'-0"

MATERIAL LEGEND		MATERIAL LEGEND	
1	FIBRE CEMENT PANEL - WHITE	7	THERMALLY BROKEN, DOUBLE GLAZED WINDOW - CLEAR
2	FIBRE CEMENT PANEL - DARK GREY	8	PRIVACY SCREEN - FROSTED GLASS PARTITION WALL
3	FIBRE CEMENT PANEL - LIGHT GREY	9	ALUMINUM GUARDRAIL - WHITE
4	FIBRE CEMENT PANEL - WOOD GRAIN	10	VINYL WINDOW / DOOR FRAME - WHITE
5	SPANDREL GLASS - WHITE	11	CONCRETE
6	CLEAR TEMPERED GLASS GUARD RAILING	12	PRE-FINISHED METAL FLASHING - DARK GREY



2 WEST ELEVATION
1/16" = 1'-0"

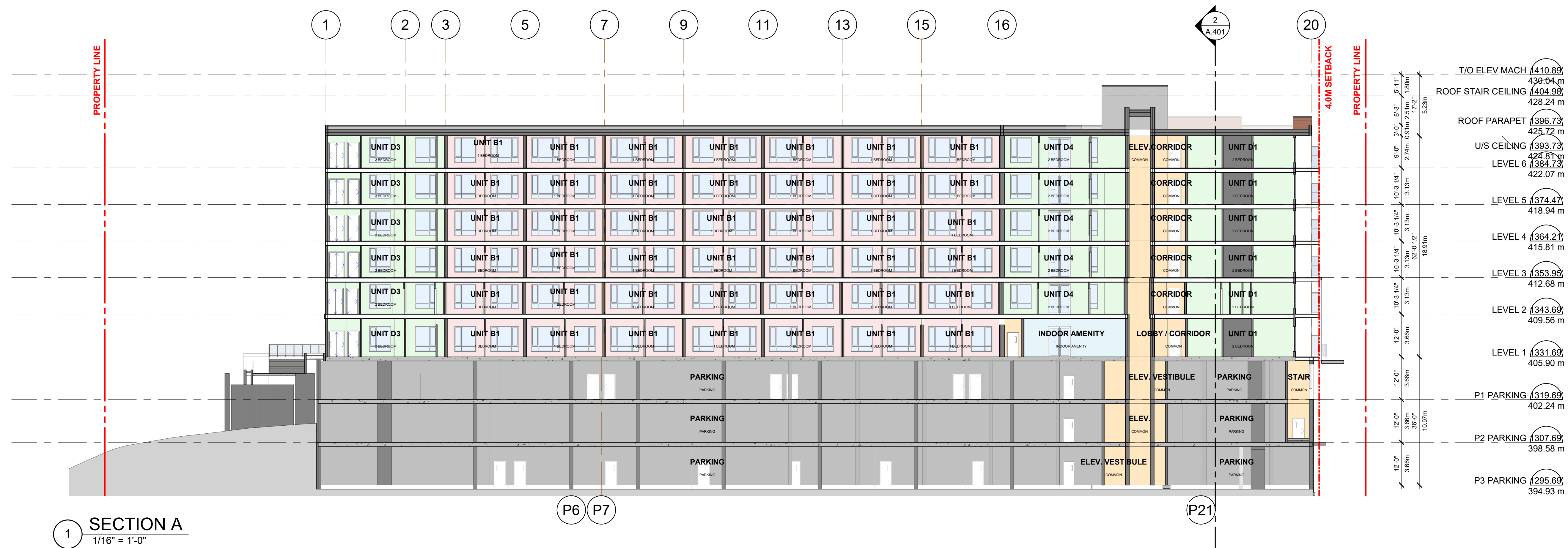
NO.	REVISION	DATE
	ISSUED FOR:	DATE
	REZONING	OCTOBER, 2025
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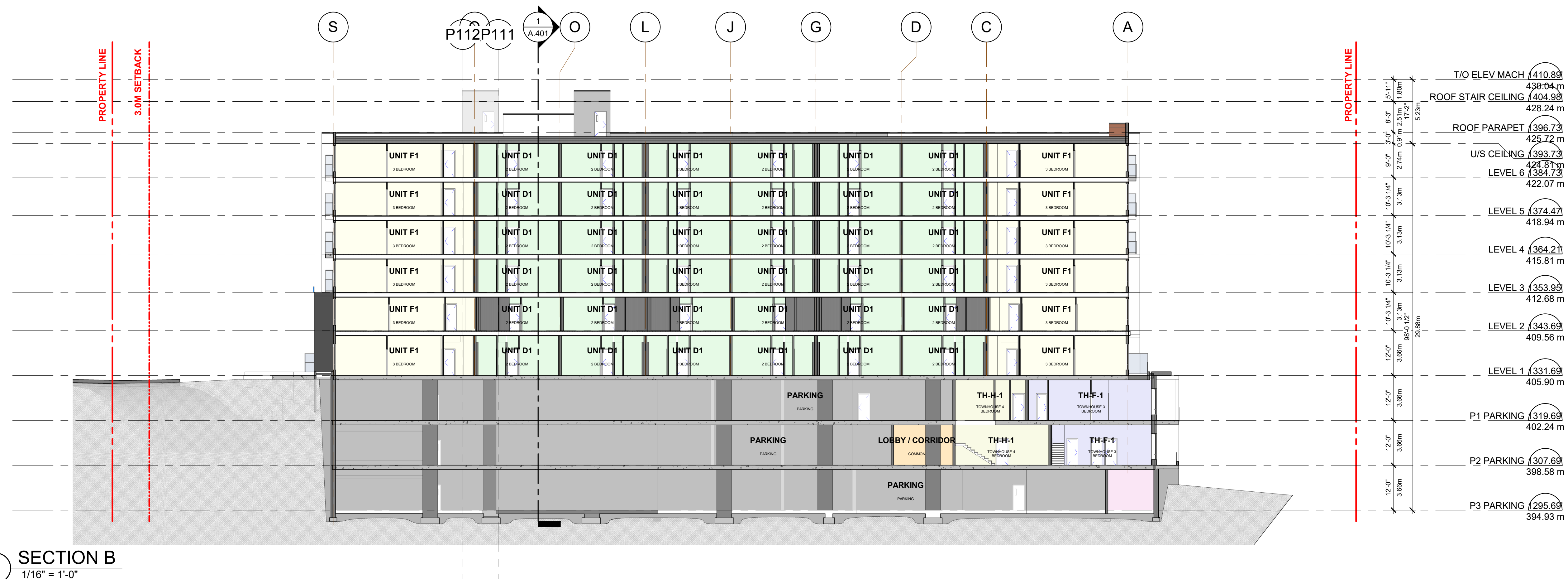
PROJECT:
MULTI-FAMILY DEVELOPMENT
11375 Woodsdale Ct, Lake Country, BC
CLIENT:
CONSULTANT:

DRAWN BY: Designer
DATE: 10/09/20
SCALE: 1/16" = 1'-0"
JOB NO.: 2414

SHEET TITLE:
EAST & WEST ELEVATION
DRAWING NO.: A3.00
REVISION NO.:



1 SECTION A
1/16" = 1'-0"



2 SECTION B
1/16" = 1'-0"

NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

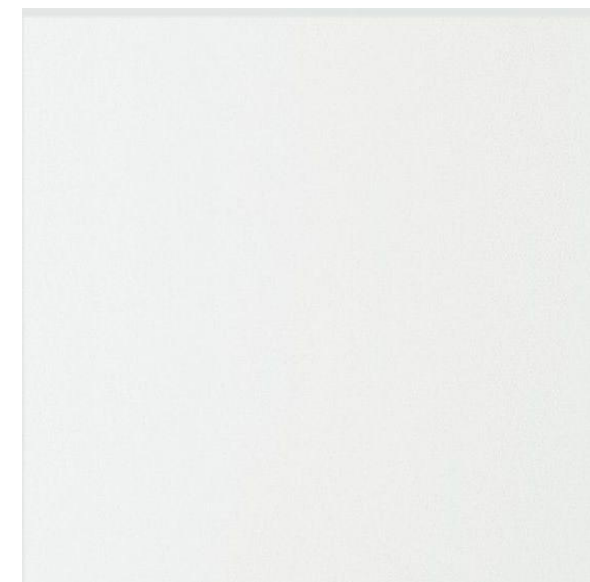
CLIENT:

CONSULTANT:

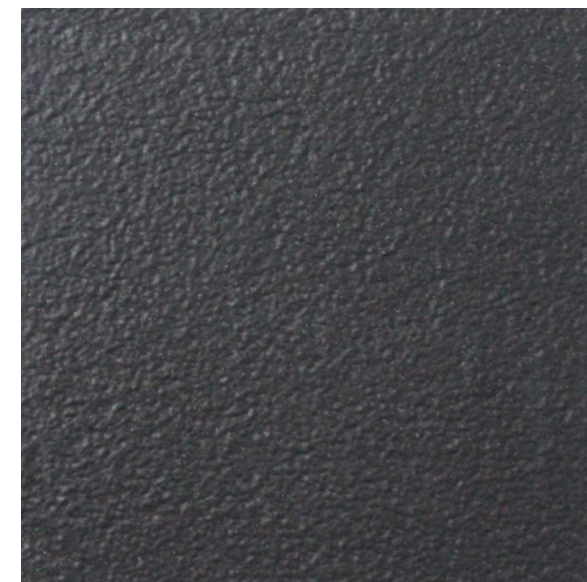
DRAWN BY: Designer	SEAL:
DATE: 01/20/2022	
SCALE: 1/16" = 1'-0"	
JOB NO.: 2414	

SECTIONS

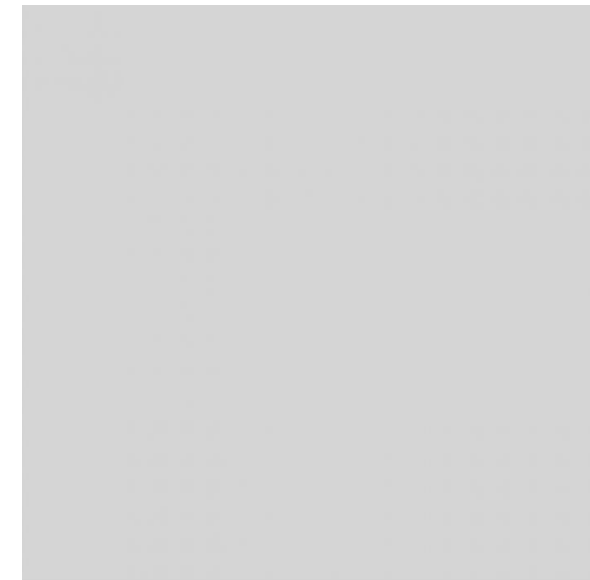
DRAWING NO.: A4.00	REVISION NO.:
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FIBRE CEMENT PANEL
White



FIBRE CEMENT PANEL
Dark Grey



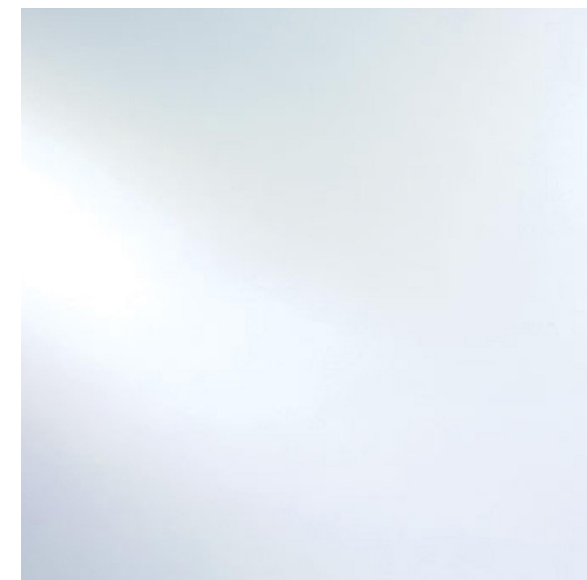
FIBRE CEMENT PANEL
Light Grey



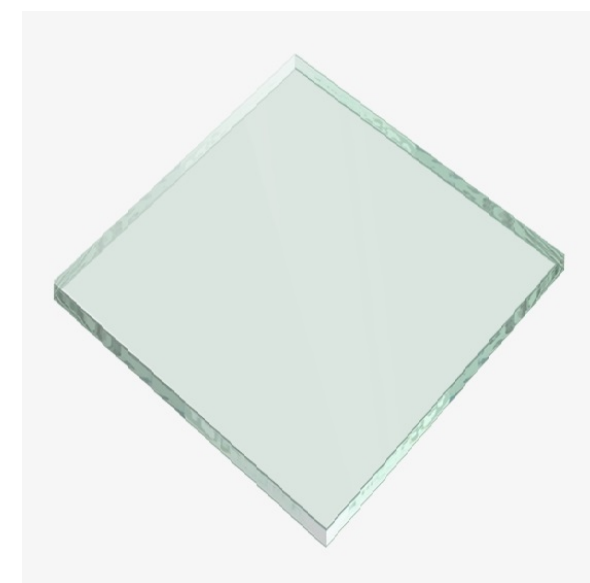
FIBRE CEMENT PANEL
Wood Grain



SPANDREL GLASS
White



BALCONY GUARDRAIL
White



DOUBLE GLAZED WINDOW
Clear



CONCRETE



PRE-FINISHED METAL FLASHING
Dark Grey



MATERIAL LEGEND	
1	FIBRE CEMENT PANEL - WHITE
2	FIBRE CEMENT PANEL - DARK GREY
3	FIBRE CEMENT PANEL - LIGHT GREY
4	FIBRE CEMENT PANEL - WOOD GRAIN
5	SPANDREL GLASS - WHITE
6	CLEAR TEMPERED GLASS GUARD RAILING

MATERIAL LEGEND	
7	THERMALLY BROKEN, DOUBLE GLAZED WINDOW - CLEAR
8	PRIVACY SCREEN - FROSTED GLASS PARTITION WALL
9	ALUMINUM GUARDRAIL - WHITE
10	VINYL WINDOW / DOOR FRAME - WHITE
11	CONCRETE
12	PRE-FINISHED METAL FLASHING - DARK GREY

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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Woodsdale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/23/21	
SCALE:	
JOB NO.:	
2414	
SHEET TITLE:	

MATERIAL BOARD

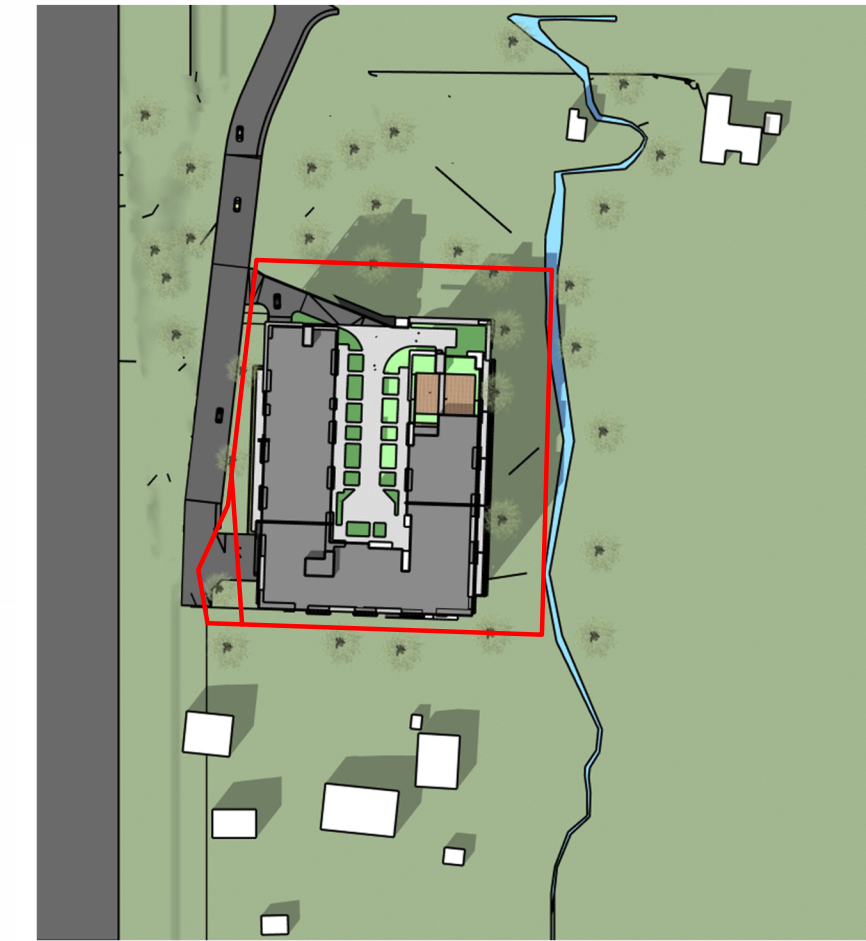
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A5.01	



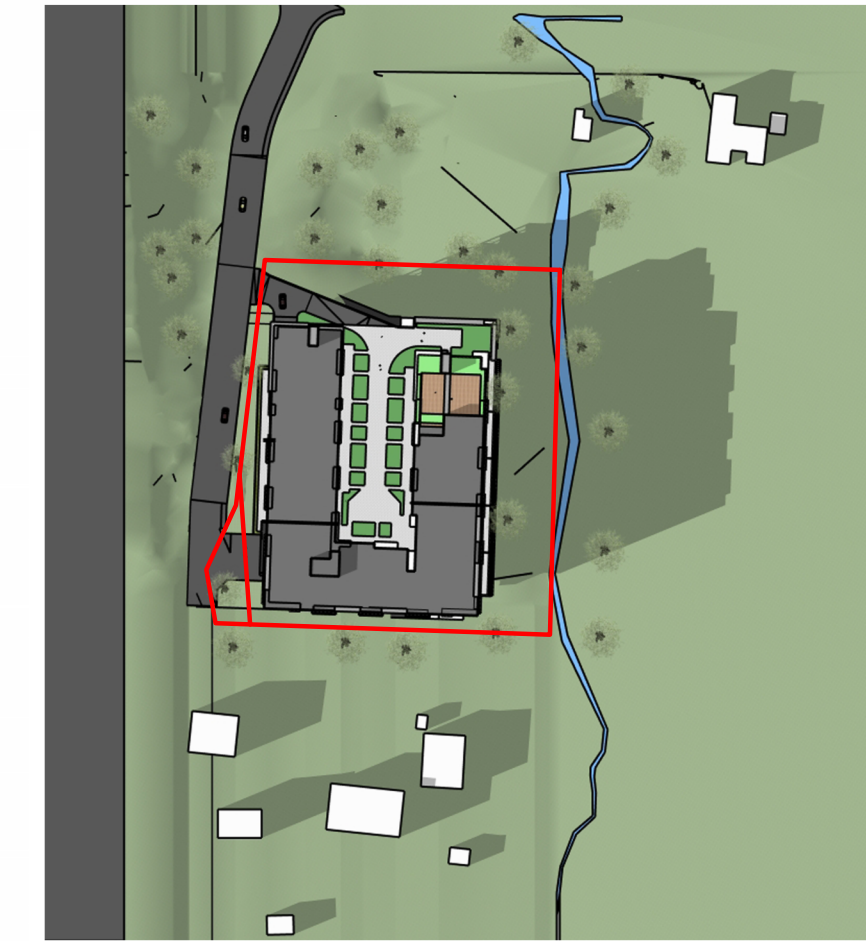
MARCH/SEPT 21 - 10:00AM



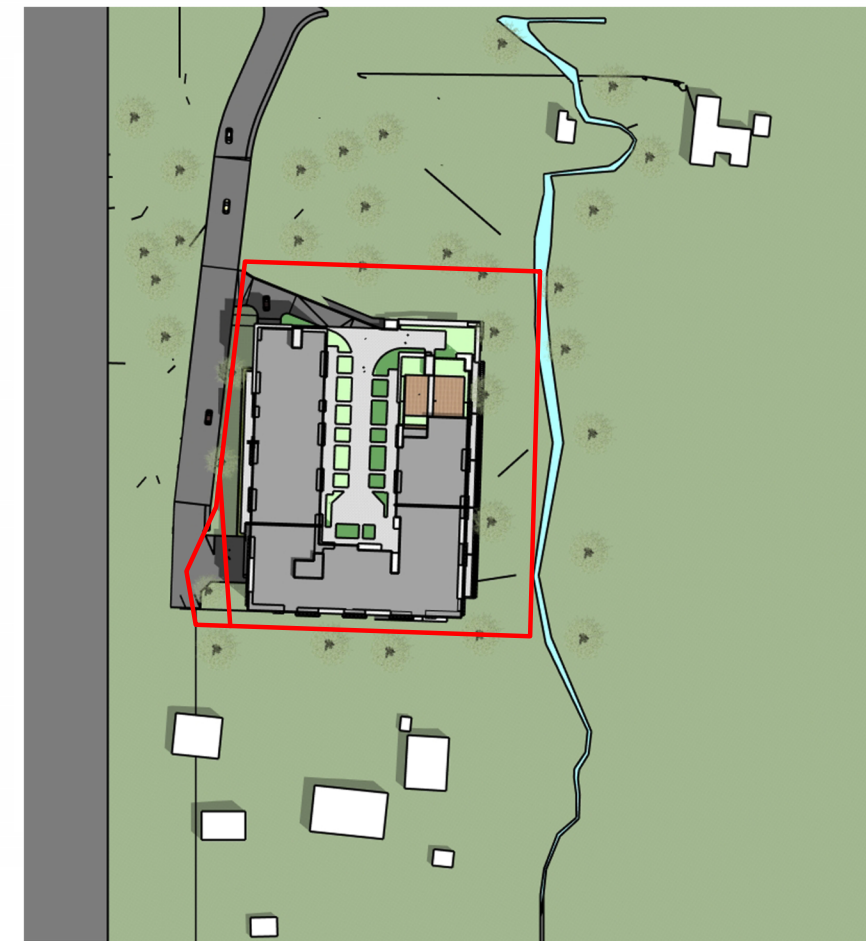
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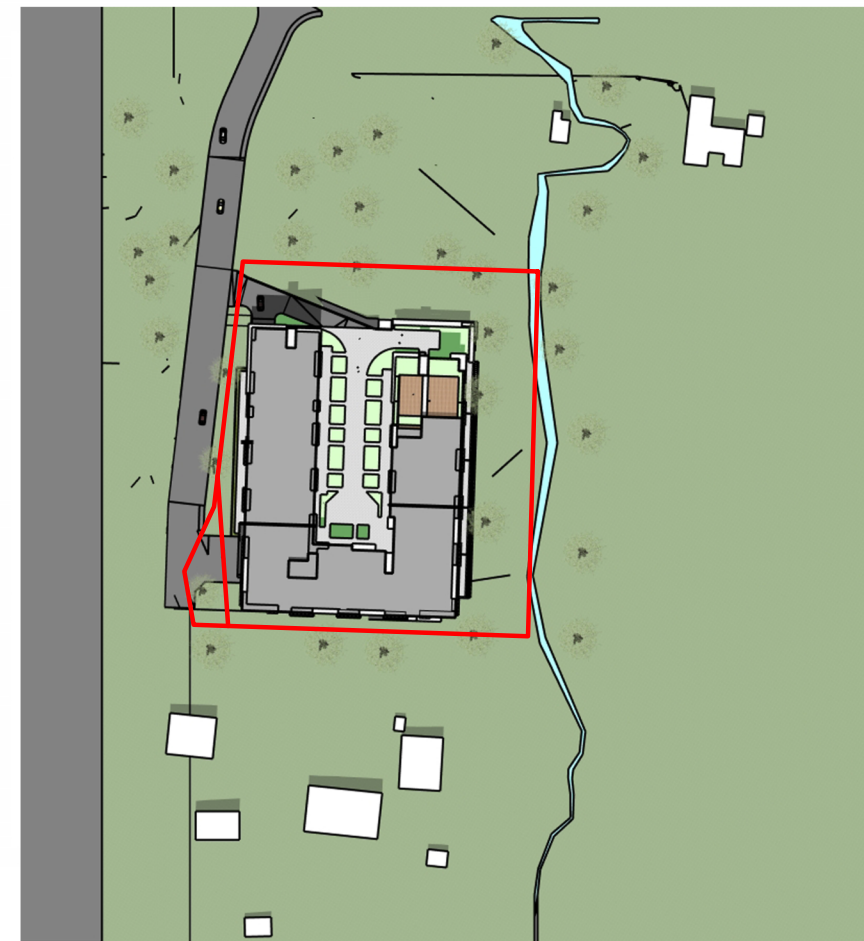
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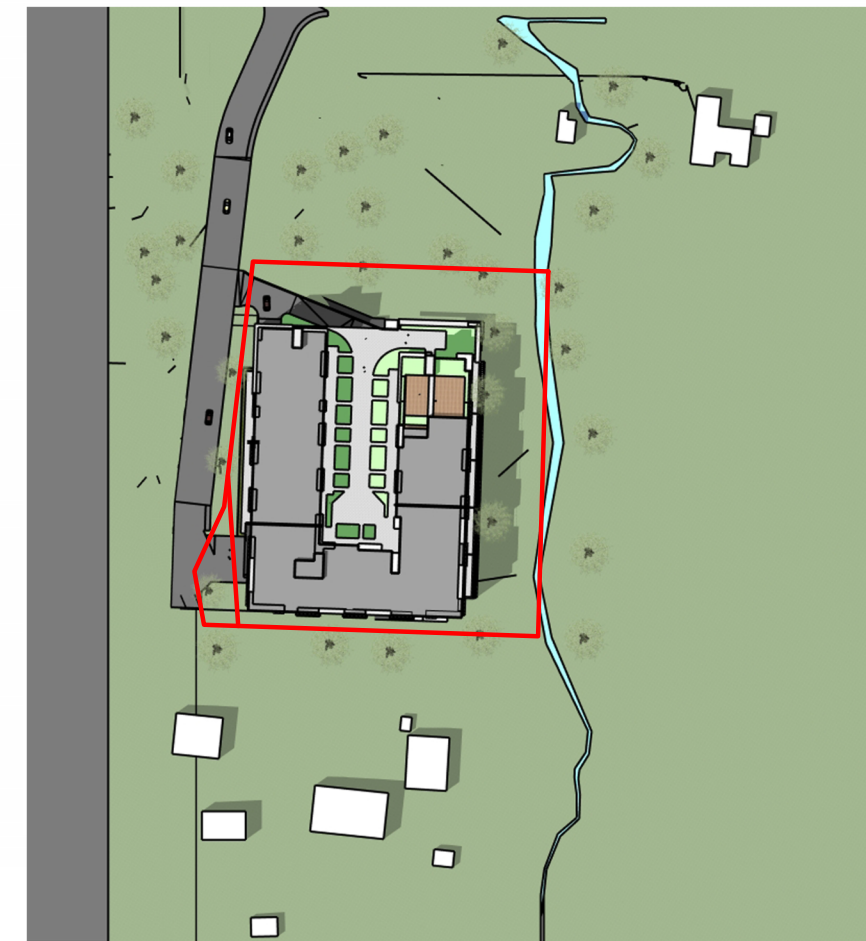
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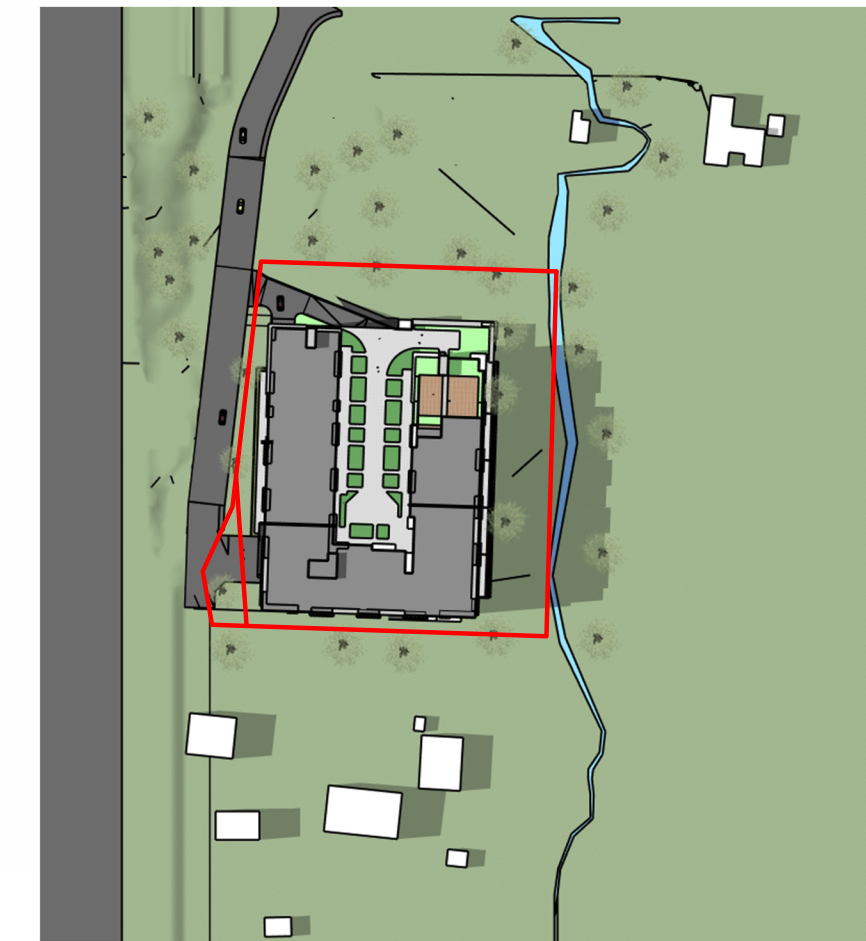
JUNE 21 - 10:00AM



JUNE 21 - 12:00PM



JUNE 21 - 2:00PM



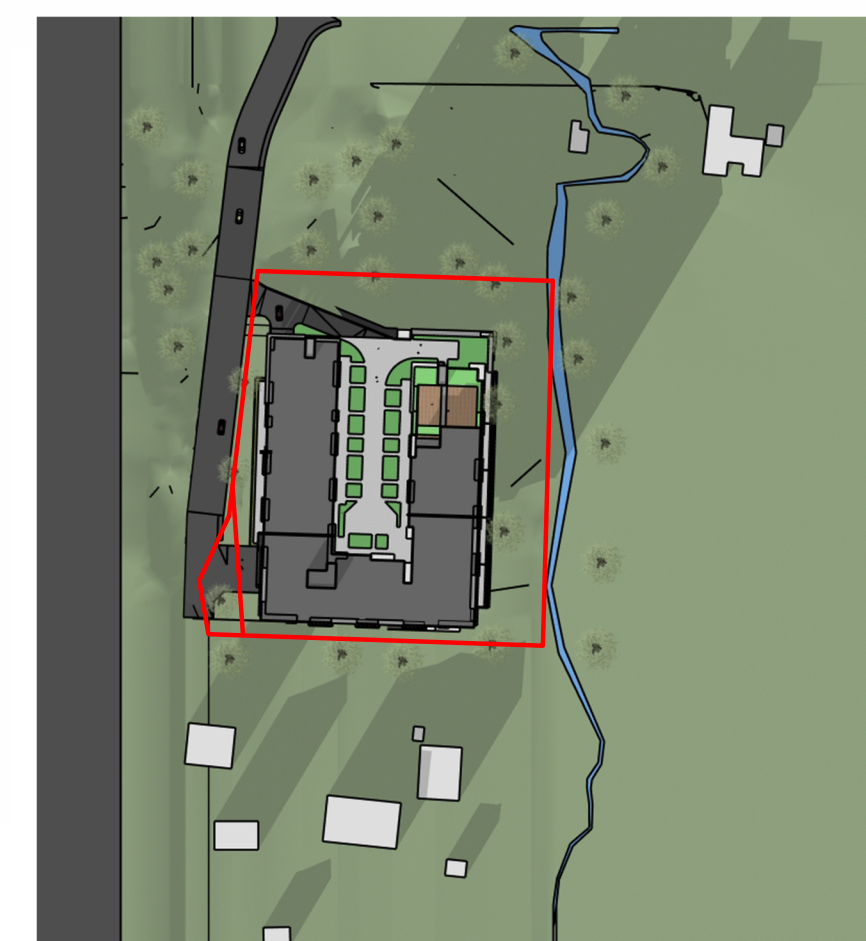
JUNE 21 - 4:00PM



DECEMBER 21 - 10:00AM



DECEMBER 21 - 12:00PM



DECEMBER 21 - 2:00PM



DECEMBER 21 - 4:00PM

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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE:	
JOB NO:	
2414	

SHEET TITLE:

SHADOW STUDY

DRAWING NO. REVISION NO.

A6.01



NO. REVISION	DATE
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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Woodsdale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE:	
JOB NO:	
2414	

SHEET TITLE:
3D VIEW - LOOKING SOUTHWEST

DRAWING NO.:	REVISION NO.:
A7.01	



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PROJECT:
MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC
CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE:	
JOB NO.: 2414	

SHEET TITLE:
3D VIEW - LOOKING NORTHEAST

DRAWING NO.:	REVISION No.:
A7.02	



T: 604.210.9698 206-4603 KINGSWAY, BURNABY BC V5H 4M4
WWW.JSARCHITECT.CA EMAIL: INFO@JSARCHITECT.CA



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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

CLIENT:

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DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE:	
JOB NO:	
2414	

SHEET TITLE:

**AERIAL VIEW -
LOOKING
SOUTHEAST**

DRAWING NO.:	REVISION No.:
A7.03	



NO. REVISION:	DATE MM/DD/YYYY
ISSUED FOR:	DATE
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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC

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DRAWN BY: Designer	SEAL:
DATE: 10/09/20	
SCALE:	
JOB NO:	
2414	

SHEET TITLE:

**AERIAL VIEW -
LOOKING
NORTHWEST**

DRAWING NO.:	REVISION No.:
A7.04	



NO. REVISION	DATE
REVISIONS:	MM/DD/YYYY
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PROJECT:
MULTI-FAMILY DEVELOPMENT

11375 Wooddale Ct, Lake Country, BC
CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 07/13/21	
SCALE:	
JOB NO.: 2414	
SHEET TITLE:	

ELEVATION VIEW @ REAR



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PROJECT:

MULTI-FAMILY DEVELOPMENT

11375 Woodsdale Ct, Lake Country, BC

CLIENT:

CONSULTANT:

DRAWN BY: Designer	SEAL:
DATE: 07/13/21	
SCALE:	
JOB NO:	
2414	

SHEET TITLE:

ELEVATION VIEW @ LANE

DRAWING NO.:	REVISION No.:
A7.06	



Westrich Management Ltd
10309 102 Ave NW
Edmonton, AB
T5J 0L1

SCHEDULE _____	
This forms part of development	
Permit #	
Date	
Signature	

604-439-0922
201-1889 Spall Road
Kelowna, BC V1Y 4R2

November 4, 2021
File #: 19852

Attention: Richie Lam

**Re: Preliminary Geotechnical Investigation Report - Proposed Residential Development
11375 Woodsdale Court & 2975 Woodsdale Road, Lake Country, BC**

1.0 INTRODUCTION

We understand that Westrich Management Ltd intends to redevelop the referenced site. Based on the provided drawings, prepared by Raimond Fung Architects Ltd., dated July 07, 2021, the proposed development is to consist of 5 townhouse buildings allowing for a total of 48 units and two 6-storey condo structures with one level of below-grade parking. We anticipate that the townhouse buildings would consist of up to 3 storeys of above grade wood framed construction, founded at approximately the existing site grades or slightly above existing site grades, and the condo buildings would be reinforced concrete construction for the first 2 levels and wood frame construction for the 4 levels above. Although structural loading has not been provided at the time of this report, based on our experience with similar sized developments we anticipate column loads to range between 200 and 600 kN for the townhouses and 800 to 3,000 kN for the condo buildings. We expect that the sustained average ground stress below the townhouses to be about 10 kPa and the condo development will be in the range of 40 kPa.

This report has been prepared for Westrich Management Ltd. and for their design construction team, for the project described. This report represents the results of our geotechnical field investigation including the soil and groundwater conditions and provides preliminary recommendations for the design and construction of the noted development. We assume that the District of Lake Country would rely on information contained in our report during their review process. Any unauthorized use of this report is prohibited.

2.0 SITE DESCRIPTION

The site is located south-east of the intersection of Woodsdale Court and Woodsdale Road in Lake Country, BC. The site is an assembly of 2 lots that are presently improved with a 2 storey single-family home at the south-west corner of the south lot. The site is bound by Woodsdale Court to the west, Woodsdale Road to the North, rural farmland to the east and single family residential property to the south. The site slopes gently downwards to the east at a gradient of about 5 horizontal to 1 vertical (5H:1V) with an elevation at the west end of the property of 404 m geodetic to 396 m geodetic at the east end of the property. The property flattens out at an elevation 396 m along the east side of the property where it is heavily vegetated and fairly marshy, which could not be accessed during the investigation. Some fill has been dispersed through the middle and north end of the lot. The remaining of the lot is surfaced with grass and some shrubs and trees throughout.

The site location relative to the surrounding area and improvements is shown on our Drawing No. 19852-01, following the text of this report.

3.0 SUBSURFACE INVESTIGATION

The subsurface ground conditions of the above referenced site were investigated on August 28th, 2021 using the subcontracted services of OnTrack Drilling of Langley, BC. The site investigation consisted of 6 solid stem auger test holes supplemented with 5 cone penetration test (CPT) soundings, with one of them being a seismic CPT.

The solid stem auger test holes were advanced to depths of 15.2 m below the current site grades and the soils were logged by a representative of GeoPacific and samples were collected for laboratory analysis. The test hole logs are presented in Appendix A.

The CPT soundings were advanced to approximate depths of 8.5 to 13.8 m below the current site grades. As the cone penetrometer is advanced into the ground it records the tip resistance, sleeve friction, pore water pressure, and inclination every 50 mm. Analysis of the CPT sounding data provides an estimate of the geotechnical design parameters and to infer the subsurface stratigraphy from soil-type behaviour characteristics. The stratigraphic interpretation was verified with the solid stem auger test holes. The CPT sounding results are presented in Appendix B. Interpreted soil parameters are presented in Appendix C. The liquefaction and settlement analysis are presented in Appendix D. The shear wave velocity data is presented in Appendix E.

Prior to our investigation, a BC One Call was placed and a subcontracted utility locate technician from 4Life Utility Locates cleared the test hole locations of any underground services. Following the drill investigation, all holes were backfilled and sealed in accordance with provincial abandonment requirements following classification and sampling.

The approximate locations of the test holes and CPT soundings are shown on our attached Drawing No. 19852-01 following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Conditions

The soil profile through the property varies as it follows the topography of the site. In the west and south end of the property at the upper topographic elevations, the soil profile generally consists of varying amounts of compact sand and gravel fills overlying natural deposits consisting of sands and gravels with some interbedded layers of silt. The soil profile in the east and north side of the property at the lower topographic elevations consists of varying amounts of compact sand and gravel fills overlying peat of varying thickness, which is underlain by sand and silt deposits. The entire property is all underlain by dense silty sand to sand and gravel till-like deposits.

For a detailed account of the soil conditions encountered, refer to Appendix A, following the text of this report.

4.1.1 West and South Area of Site

Topsoil/Fill

A thin veneer of surficial topsoil covered the majority of the site and was encountered in most test holes, generally ranging between approximately 0.1 and 0.5 m thickness from the ground surface. Compact to loose silty sand fills overly the native sand and gravel deposits in this area of the site. Moisture contents of the fill soils ranged from 4 to 47%. The fill was present to depths of 1.0 and 4.0 m at test hole locations TH21-01 and TH21-03, respectively. Some waste material was noted in the loose fill at TH21-03, which had DCPT blow counts ranging between 2 to 16 blows per 0.3 m.

Sand / Sand and Gravel

The fill is underlain by a sequence of native post-glacial alluvial sand to sand and gravel deposits. The sand to sand and gravel is generally compact and fine-medium grained with trace amounts of silt. The sand sequence is thicker in the south end of the property at TH21-01, which extends from 1.0 m to 14.0 m below site grades. Towards the middle of the property at TH21-03, the sand becomes thin and is about 1.0 m thick below the overlying fill.

Sand/Sand and Gravel [Till-Like]

Underlying the sand to sand and gravel throughout the entire site is very dense silty sand to sand and gravel. The silty sand to sand and gravel is glacial till-like and caused refusal for all CPT soundings. The till-like silty sand to sand and gravel is encountered at various depths depending on elevation, though it was encountered at depths between 5.5 m and 14.0 m below site grades in the south and west area of the site. This till-like sequence extends beyond the depths encountered in our investigation of 15.2 m below grade.

4.1.2 East and North Area of Site

Topsoil/Fill

A thin veneer of surficial topsoil covered the majority of the site and was encountered in most test holes, generally ranging between approximately 0.1 and 0.5 m thickness from the ground surface. Varying thicknesses of compact to loose silty sand to sand and gravel fills overly the native deposits in this area of the site. The middle area of the site consist of thicker amounts of silty sand to sand and gravel fill, which range between 2.2 m to 5.8 m. The sand and gravel fill is predominant at the north end of the property at TH21-05, which has been placed and benched on the existing surrounding natural soil. The east side of the property contains thinner layers of fill up to 0.8 m thick. Moisture contents of the fill soils ranged from 13 to 28%.

Peat

The majority of the fill is underlain by peat. The peat is shallow at lower elevations of 396 m geodetic along the east end of the property at TH21-02 and TH21-06 at depths of 1.0 to 3.0 m below existing grades. Firm sandy silt overlies the peat at these locations which is 0.4 m to 2.0 m thick. At higher elevations towards the north and middle of the site, the depth to the peat was found to be between 4.6 to 5.8 m below site grades. The moisture content of the peat ranges between 138 and 338 percent. The peat sequence ranges in thickness between 1.0 m and 4.4 m, which thicker deposits

were encountered in the north end of the property. Based on the moisture content and the CPT data strength correlation, the peat sequence is expected to exhibit a high compressibility under an y change in surface stress and the proposed loading. The long term settlement of the peat will be somewhat independent of the final stresses on-site. The organic material within this stratum will gradually decay over time resulting in unavoidable long term ground settlements. We anticipate more peat to be encountered through the heavily vegetated area of the site along the east property line, which is situated at 396 m geodetic.

The extent of the expected peat zone can be seen in the shaded region on our attached drawing No. 19852-01 following the text of this report.

Sand and Silt

The peat is generally underlain by a sequence of interbedded sand and sandy silt of varying thickness between 2.0 to 11.0 m thick. The sand is generally compact and fine-medium grained, and the silt is firm to soft with trace organics. Natural moisture contents of the silt range between 28 to 58 percent, which is indicative of relatively moderate compressibility. Based on the CPT strength correlations, the undrained shear strength varies from approximately 20 to 50 kPa with an average of approximately 30 kPa.

Sand/Sand and Gravel [Till-Like]

Underlying the sand and silt throughout the entire site is very dense silty sand to sand and gravel. The silty sand to sand and gravel is till-like and caused refusal for all CPT's. The till-like silty sand to sand and gravel is encountered at various depths depending on elevation, though it was encountered at depths between 8.0 m and 13.8 m. The till-like sequence extends beyond the depths encountered in our investigation of 15.2 m below grade.

Due to heavy growth on the east side of the property we recommend that supplementary test holes are completed once cleared, to further assess the soil conditions.

4.2 Groundwater Conditions

The static groundwater table was noted at various depths depending on the elevation throughout the sight. At the lowest elevations 396 m geodetic, the groundwater was encountered at a depth of 0.5 to 1.5 m below existing site grades. As the elevation of the site increases to the west, the groundwater depth is encountered at 2.5 to 5.0 m below existing site grades. The water table elevation should be expected to fluctuate seasonally and with the water levels of nearby Wood Lake. Groundwater levels in the late spring to early summer can be expected to increase by up to 1 m, as the lake levels rise at the lower geodetic elevations of the site.

5.0 DISCUSSION

5.1 General comments

We understand that it is intended to redevelop the site with a townhouse and condo development. As noted in Section 1.0, the latest architectural drawings indicate the development will consist of five 3-storey at grade wood frame residential townhouse structures and two 6-storey condo structures with one level of underground parking. Based on our experience with similar projects we anticipate column loads to range between 200 and 600 kN for the townhouses and 800 to 3,000 kN for the condo buildings. We expect that the sustained average ground stress below the townhouses to be in the range of 10 kPa and the condo development will be in the range of 40 kPa.

In general, the site is covered with fills of varying thickness throughout the property, followed by sands and gravels in the west and south portion of the property and up to 1 m to 4.4 m of peat in the east and north portion of the property. The peat is underlain by sands and silts to depths of up to 13.8 m below existing site grades. Till-like silty sand to sand and gravel is encountered at depths between 5.5 m to 13.8 m and extends beyond the depths encountered in our investigation of 15.2 m below grade. The near surface peat deposits are considered to be of high compressibility under the anticipated ground stress increase expected and the silt deposits are considered moderately compressible while the sand is considered to be of low compressibility under the proposed loading.

The condition of the existing fills encountered in the middle and northwest portions of the property is variable in content and relative density ranging from loose to dense silty sand to sand and gravel, though it is predominantly loose to compact. We anticipate that the north condo building will be situated at these fills which will require up to 3.0 m of excavating for the underground parkade. The fills extend to depths between 4.0 to 6.0 m, thus we recommend the rest of the fill be over-excavated and replaced with "Engineered Fill" as defined in Section 5.3. This will avoid any ground improvement measures for the loose fill. Alternatively, some form of ground improvement can be considered. For preliminary purposes, improvement of the soils 3 to 5 m from the bottom of building foundations, roads, and utilities should be considered. Rapid Impact Compaction (RIC) can be considered for this purpose.

To the south, where the ground conditions are comprised of sand to sand and gravel, we anticipate that conventional site preparation measures would be completed. The south condo building will be governed by these measures.

Preloading of the east and north end of the site will likely be required to precompress the existing peat and silt deposits in advance of construction. Removal of some/all of the peat may be required in some areas if grades are reduced which result in the exposure of the peat at foundation, road, and utility elevations. The extent of preloading will ultimately be a function of the proposed development grading. It should be appreciated that if relatively extensive preloading is required, off-site settlements will be generated that will likely extend into the properties to the east and Woodsdale Road to the north. For extensive fills, the duration of preloading at the north eastern extent of the site may be upwards of 10 to 16 months. Phased filling of the southeast end of the property may also be required depending on final grading. Phasing is typically required as peat does not necessarily behave in a predictable manner as it possesses characteristics of both a solid and fluid. Over stressing of the peat can result in rapid formation of an instability. Phasing of the fill placement allows the materials below the fill to consolidate and gain strength, and reduce the risk of an instability. The developer should be prepared to remedy any impacts on private or public property due to the site preparation work.

We recommend that a test preload should be completed due to the depth of the peat to further refine the compressible peat layers in order to further refine our preload estimates.

We expect that one of the proposed condo buildings towards the north end of the site would span between the compressible soils and silty sand to sand and gravel till-like soils. Thus, a combination of spread footings in the granular soils and piles in the compressible soils should be considered to reduce differential settlements across the building to within structural limits. Additionally, where the peat exceeds 4.0 m in thickness, we recommend that a piled solution is the most practical foundation option to tolerate long term settlements and reduce construction duration. The townhomes proposed in the northeast corner of the property should be pile supported. Pile supported buildings will experience very limited post construction settlements while the surrounding grades, underlain by organics, will continue to settle over time. The condition typically results in maintenance requirements consisting of repairs/releveling of loading ramps, access stairways, and occasional damage to utilities. There are no methods or procedures that allow for the accurate quantification of long-term settlements of peat, due to its naturally high variability. Alternatively, the peat could be overexcavated and replaced with engineered fill and the condo building could be constructed entirely on spread footings. Further investigation, specifically in the condo building footprint and the northeast corner at the townhome locations would be required to confirm the feasibility of the peat replacement option.

We confirm, from a geotechnical standpoint, that the proposed development as described above is feasible, provided that the recommendations outlined in Section 6.0 of this report are incorporated into the overall design.

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.

GeoPacific has undertaken an assessment of CPT data collected. We have employed a design peak ground acceleration of 0.06g, as provided by Natural Resources Canada which is on the high/conservative side for the Kelowna area, under the 2018 BC Building Code (2018 BCBC) earthquake. The results of our analysis indicate a factor of safety against liquefaction in excess of 1.5 for all sand layers, and thus no soil liquefaction is anticipated at the site based on the 2018 BCBC design earthquake. Furthermore, any ground improvements will likely further increase the factor of safety against liquefaction at the site. The plot of our analysis are attached in Appendix D.

5.3 Grade Reinstatement

We anticipate that extensive grading may be required to develop this property as intended. Due to the size of the site, the use of “engineered fills” consisting sands to sand and gravel to raise grades is not considered economically feasible. Therefore, the use of natural glacially derived till-like fills (such as till located at the northern end of the site) may be considered for use to reinstate grades. However, as a result of higher fines content of these soils they are moisture sensitive. The placement and compaction of these materials is expected to be limited to the warmer and dryer months of the year. If works are to be undertaken during wetter months of the year there should be an expectation that import granular materials will likely be required.

All engineered fills placed should be compacted to at least 95% Modified Proctor Dry Density (ASTM D1557). The amount of compactive effort necessary to achieve the required levels of compaction is likely to be a function of the type of condition of the soil being employed and to some extent by the contractors equipment. These conditions will have to be reviewed at the time of construction by the geotechnical engineer to ascertain the level of effort required. Conventional density testing is not likely to be feasible to evaluate all compaction works based on the likely variable fill conditions, however, the requirement for some density testing should be expected to confirm the performance and level of effort is satisfactory. Furthermore, proof rolling of all building sites and road subgrades is recommended to identify any soft or loose areas. Irrespective of the type of fill material employed fill lifts should be limited to a maximum thickness of 300 mm.

Filling, compaction and proofrolling should be reviewed by the geotechnical engineer during construction.

5.4 Slope Stability

We have reviewed the slope stability of the proposed development site in accordance with the 2018 BC Building Code. The slopes have been assessed in general accordance with the guidelines recommended by the association of Professional Engineers & GeoScientists of BC in their report "Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC", dated May 2010.

The Regional District of Central Okanagan indicates that the steepest sloped section on-site is measured at about 5H:1V in the middle of the property, which slopes downwards from west to east. Based on the described conditions, we are of the opinion that the site meets the accepted requirements for development under both static and seismic conditions subject to the incorporation of the recommendations herein. GeoPacific should be provided with a grading plan to re-assess the stability of the proposed development once the design is further refined.

6.0 RECOMMENDATIONS

6.1 Site Preparation for Buildings

6.1.1 Site Preparation for Conventional Foundations

Within the west and south area underlain by sands and gravels, prior to construction of foundations and floor slabs, all unsuitable materials including vegetation, topsoil, fill, organic material, debris, and loose or otherwise disturbed soils must be removed to expose a subgrade of compact natural sand to sand and gravel.

Stripping should extend out beyond the new building envelopes, roads, and/or footing locations at a distance equal to the thickness of proposed engineered fill beneath the footings. For examples, if 1 metre of engineered fill will underlie a footing then stripping should extend a minimum distance of 1 metre beyond the out edge of that footing.

Stripping is not required in landscaped areas unless the criteria stated in the previous paragraph requires the removal of that material.

Proof rolling of all building sites and road subgrades is recommended to identify any soft or loose areas.

Upon completion of stripping and review, all subgrade areas should be blinded with a 100 mm thick layer of 19 mm clear crush gravel immediately after excavation. Stripped lots should be graded to inhibit ponding of water.

Should grade reinstatement be required, we recommend the use of engineered fill as described in Section 5.3.

As noted in Section 5.1, the condition of the existing fills encountered in the middle and northwest portions of the property is variable in content and relative density, and are not presently suitable to support heavier development. We recommend the two following options to remediate the fills in this area:

1) Conventional Excavate, Replace & Recompact

We anticipate that the north condo building will require up to 3.0 m of excavating for the underground parkade. The loose fills extend to depths between 4.0 to 6.0 m, thus we recommend that the remaining existing fill soils may be excavated, allowed to dry where at an elevated moisture content, and be replaced in 300 mm maximum loose lifts with each lift within 3 m of final grades compacted to 95% Modified Proctor (ASTM D1557) dry density. Provided structural loads are light to moderate fills below 3 m may be compacted to 92% Modified Proctor dry density (MPDD). If structural loading is heavy, then 95% MPDD should be achieved. Density testing should be conducted by GeoPacific.

Due to the moisture sensitivity of the till fill and other fill soils with high fines (silt/clay) content, this operation is likely only feasible during periods of warmer and dryer weather. In addition, the static water table is likely to be elevated during the wetter winter months and may extend into the fill zone of the property. These works would ideally be undertaken during the warmer summer months.

2) Rapid Impact Compaction

For shallower or at-grade improvements where over-excavating of the loose fills is not feasible, then ground improvements by means of a Rapid Impact Compactor (RIC) should be considered. An RIC generally consists of a 400 size excavator with a 1.2 m diameter hydraulic hammer. The RIC strikes the ground repeatedly in a pre-determined pattern to compact the soils at depth. Subject to the amount of ground settlement that occurs during the RIC work, which may vary from 0.3 to 0.6 m, multiple passes may be required to sufficiently compact the soils. The influence depth of RIC densification is typically around 4 to 5 m, although this is dependent on several factors such as soil type, degree of saturation, and soil stiffness amongst others. Quality assurance testing using an auger drill rig with DCPT's would be required to confirm the effectiveness of the RIC work. RIC work should be completed at the proposed grades or lower, to allow for the compaction of the bearing zone.

6.1.2 Site Preparation for Piled Foundations

No special site preparation is required where pile supports are used.

Stripped subgrades and engineered fill materials and compaction must be reviewed by the geotechnical engineer.

6.2 Preloading

Prior to implementation of a full preload, a smaller test preload can be constructed to gain a better understanding of the compressibility of soils on site along the north and east side. The test preload would be constructed within the northeast corner over the compressible peat. Dimensions for a test preload will range between 30 m to 50 m square on plan.

The preload height is governed by the total building weight, the depth to the nearest compressible layer, the net area load and the presumed bearing stresses beneath the foundations.

For the proposed townhomes in the north and east area underlain by peat where preloading is required, we recommend installing settlement gauges and monitoring for 6 to 12 months. GeoPacific is to be provided with settlement data to review and provide further recommendations. The extent of preloading will ultimately be a function of the proposed development grading. It should be appreciated that if relatively extensive preloading is required that off-site settlements will be generated that will likely extend into the properties to the east, and Woodsdale Road to the north. The site layout should consider and be prepared to remedy any impacts on private or public property due to the site preparation work.

Monitoring points should be established on the road, utilities and fixtures determined to be sensitive to ground settlements adjacent to the site to monitor the effects of the preload on neighboring lands. Due to the compressible nature of the soils in the area and the requirement for elevating the site to achieve flood proofing and preloading to reduce long term settlements to levels that are tolerable for buildings roads and utilities, some off site impacts are unavoidable. We strongly recommend that the developer undertakes a visual and photographic survey of the roads and neighbouring properties to thoroughly document any existing deterioration prior to undertaking further excavations or fill placement at the site. Any damage to neighboring properties must be remediated at the owner/developers expense. Thinner stages may be required adjacent to existing structures to mitigate the risk of damaging offsite settlements. Thorough survey of the preload and adjacent improvements will be required during site preparation and preloading.

GeoPacific will prepare preload drawings under a separate cover.

6.3 Building Foundations

6.3.1 Shallow Foundations

Provided the above site preparation outlined in section 6.1.1 is completed for the buildings not overlying peat, the proposed townhouse buildings and the southern condo building and southern half of the northern condo building may be supported on conventional foundations after the recommended site preparation. The buildings can be supported using pad and strip foundations bearing on the well compacted fills or compact natural sand and may be designed using a Serviceability Limit States (SLS) bearing pressure of 120 kPa and a factored Ultimate Limit States (ULS) bearing pressure of 180 kPa. For buildings founded on densified ground, a SLS bearing pressure of 200 kPa and a factored ULS bearing pressure of 300 kPa may be used.

All footings should be located a minimum of 600 mm below final grades for frost protection. Footings should not be less than 450 mm in width for strip footings and not less than 600 mm for square and rectangular footings.

Foundation subgrades must be reviewed by the geotechnical engineer prior to footing construction

6.3.2 Deep Foundations

Where the proposed north condo building spans between the compressible soils and the silty sand to sand and gravel till-like soils, we recommend that a combination of spread footings in the granular soils and piles be used in the compressible soils should be considered to reduce differential settlements across the building to within structural limits. Additionally, where the peat exceeds 3.0 m in thickness, we recommend that a piled solution is the most practical foundation option to tolerate long term settlements and reduce construction duration. The townhomes proposed in the northeast corner of the property may need to be pile supported, depending on peat thickness from supplemental testing in the northeast corner.

There are a number of piling options likely to be feasible for the condo building foundations, for example, steel pipe piles, ICP spun concrete piles, and steel screw piles.

Steel pipe piles driven to effective refusal within the very dense till-like deposits can be designed considering the structural capacity of the piles. Penetration of 2 to 3 m into the till-like material may be required before refusal is achieved. The pile types and capacities must be confirmed during detailed design with the structural engineer. For example, a 250 and 300 mm nominal steel pipe pile with a wall thickness of 7.9 mm and 250 MPa strength steel may be designed on the basis of a factored ULS axial capacities of 800 and 940 kN, respectively.

Geopacific can provide a detailed pile analysis for a varying type of piles once structural loads are known.

We recommend a test pile program be implemented to evaluate the capacity of the piles and ascertain pile dimensions for the site. Pile Dynamic Analysis (PDA) tests will be required to confirm in-situ pile capacities.

Pile foundation require full time supervision during construction, as per British Columbia Building Code, BCBC 2018.

6.4 Foundation Settlements

Post construction for preloaded grade supported townhouse building settlements at the east end of the property will be controlled by long term secondary compression of the peat and silt. Based on the thickness of compressible soils, we anticipate that long term (20 year) settlements will be in the range of 100 to 300 mm. Differential settlements are expected to be generally less than 1:300, though there is some potential to approach 1:200. These estimates can be better quantified once monitoring of the preload is well under way.

Post construction settlements of the southern end of the site directly underlain by sand and gravel deposits and the condo building supported by a combination of shallow and piled foundations are expected to be less than 25 mm total and 1:500 differential.

6.5 Slab-On-Grade Floors

It is recommended that all floor slabs be directly underlain by a polyethylene moisture barrier and 150 mm of 19 mm clear crushed gravel to inhibit upward migration of moisture beneath the slab. It is recommended that any grading fills placed under the slab should be compacted in 300 mm loose lifts to a minimum of 98% of ASTM D698 SPMDD.

GeoPacific shall review underslab fill placement and compaction prior to slab-on-grade construction.

6.6 Radon

We recommend that site preparation for the floor slabs include a rough-in for a subfloor depressurization system to protect from soil gas ingress (radon) unless the associated testing is provided and indicates a radon abatement system is not required. Should radon testing not be completed or an abatement system is required, the abatement system is described in detail in Section 9.13.4. of the 2018 BCBC. Accordingly, the 100 mm thick layer of underslab fill required per Section 6.5 of this report can be utilized as part of the abatement system and access through the slab should be provided to allow for depressurization for all contiguous areas. A vapour barrier should be placed between the granular fill and the concrete slab to inhibit the migration of moisture and gas through the slab.

6.7 Foundation Drainage

A perimeter drainage system is not required from a geotechnical perspective for building slabs that are to be constructed at least 150mm above exterior grades and the surrounding grades slope away from the buildings. Otherwise, a perimeter drainage system is required for any below grade construction such as parkades, basements or crawl spaces.

6.8 Seismic Design of Foundations

The site is classified as Site Class “F” according to the British Columbia Building Code (BCBC) 2018, Table 4.1.8.4.A. In accordance with the BCBC, a site specific dynamic analysis is required in order to provide the structural engineer with the estimated seismic design spectra of the site based on the design earthquake. For structures with periods of 0.5 seconds or less, the structural designer can assume a Site Class “E” design spectrum. The site classification must be confirmed once the grading plan and preferred foundation strategy for the apartment building are known.

For the south and east portion of the development where buildings will be founded upon sands and gravels, we are of the opinion that seismic design spectra can be selected in accordance with Site Class “D”.

GeoPacific can complete a Site Specific Dynamic Analysis under a separate cover.

6.9 Temporary Excavation and Shoring

We expect that temporary excavations would be sloped where possible since it is more economical to do so. We would expect that slopes cut to a 1H:1V can be constructed in the fill soils and existing native sand and gravel soils. Flatter cut slopes of 2H:1V will be necessary in the peat and any saturated soils.

It should be appreciated that temporary cut slopes are only suitable when located a safe distance away from existing structures, roads, and utilities. Where the proposed development encroaches on existing structures, property lines and utilities, shoring may be required to support the excavation.

All cut slopes must be reviewed by a professional geotechnical engineer, prior to worker-entry.

6.10 Permanent Slopes

Permanent slopes should be graded to 2H:1V or flatter. Slopes of 4H:1V or flatter may be desirable for landscape maintenance purposes. All permanent slopes should be vegetated to prevent erosion.

6.11 Utility Design and Installation

Utilities are expected to be underlain by dense till like soils to compact, improved fill. Some perched groundwater may need to be controlled using sumps and pumps.

We recommend that any trenches be sloped or shored as per the latest Work Safe BC regulations. We recommend that all service trenches be backfilled with clean granular material, which conforms to municipal standards, compacted to 95% "Modified Proctor" dry density (ASTM D1557), 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.

6.12 Methane Gas Generation

The decomposition of peat and organic silt at depth is expected to generate methane gas. For the building structures underlain by peat, a methane collection and dispersal system may be required beneath the building floor slabs, subject to finalized grades, to ensure that the gas cannot be trapped beneath the floor slab. Any crawl, or confined spaces within the buildings should be ventilated.

6.13 New On-Site Pavement

6.13.1 Site Preparation

We expect that new pavement areas will be required as part of the proposed development. Prior to the construction of any new roads and parking areas, all surficial debris, organic soils and loose or otherwise unsuitable/disturbed soils must be removed from the proposed pavement structure areas to expose a subgrade of compact fill or natural sand soils. The stripped subgrade should be proof rolled under the review of the geotechnical engineer to locate any soft or loose zones. Any soft or loose zones should be over excavated and replaced with engineered fill as defined in Section 6.1 of this report, prior to sub-base placement.

6.13.2 Pavement Structure

Following the recommended site preparations described above, it is our opinion that the minimum asphalt pavement structure provided in Table 1 below, will satisfactorily support light residential vehicles.

Material	Thickness (mm)	Minimum Soaked CBR
Asphaltic Concrete	75	N/A
19 mm minus crushed gravel base course	100	80
100 mm minus, well graded, clean, sand and gravel subbase course	200	20

The asphalt thickness may be reduced to 65 mm in areas occupied by cars and light trucks only.

All base and subbase fills should be compacted to a minimum of 95% Modified Proctor dry density with a moisture content that is within 2% of optimum for compaction. Density testing should be conducted on the base and subbase materials to confirm that they have been compacted to the required standard. The density testing results should be forwarded to the geotechnical engineer for review.

Thickening of the subbase course may be required for pavement structures at the south side depending on the grading of the site. GeoPacific must be provided with the grading plan well in advance of construction to confirm.

7.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding sections make recommendations for the design and construction of the proposed subdivision and related earthworks. Field reviews are required for the following aspects of work:

1. Review of stripping in building areas
2. Review of stripping in road and parking lot areas
3. Review of engineered fill materials, compaction
4. Review of existing fill compaction
5. Review of densification work
6. Review of preload fill placement
7. Review of preload settlement gauge readings
8. Review of foundation subgrade prior to footing construction
9. Review of slab-on-grade fill compaction prior to slab construction
10. Review of pavement subgrade, sub-base and base materials and compaction.
11. Review of utility subgrade, bedding and backfill materials and compaction.

GeoPacific will provide on-site field review reports and overall summary reports for all aspects of work outlined in this report once completed.

8.0 CLOSURE

This report has been prepared exclusively for Westrich Management Ltd for the purpose of providing preliminary 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.

Connor Griffin, B.Sc., G.I.T.
Project Geologist

Reviewed by:

Roberto Avendano, B.Eng., P.Eng.
Principal



Zakhar Okunev, B.Eng., E.I.T.
Geotechnical Engineer-in-Training



LEGEND:

- CPT#-# - CONE PENETRATION TEST (CPT) LOCATION
- SPT#-# - SEISMIC CONE PENETRATION TEST (SPT) LOCATION
- △ TH#-# - TEST HOLE (TH) LOCATION

SITE PLAN

*TEST LOCATIONS ARE APPROXIMATE



- PEAT ZONE

REFERENCE:

3770 West 75th Ave
Vancouver, B.C. V6P 4P2
P 604-438-0922
F 604-438-0189

DATE: 26-Aug-2021
 DRAWN BY: CG
 APPROVED BY: RA
 REVIEWED BY: CG
 SCALE: NTS

Proposed Site Redevelopment
 11375, 11349, 11339 Wooddale Court, Lake Country, BC
 TEST HOLE SITE PLAN

FILE NO: 19852
 DWG. NO.: 19852-01
 REVISIONS:
 A.
 B.
 C.

APPENDIX A – TEST HOLE LOGS

Test Hole Log: TH21-01 (SCPT21-01)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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

INFERRED PROFILE							
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT	Groundwater / Well	Remarks
					(blows per foot)		
					10 20 30 40		
0		Ground Surface	0.0				
0.1		Topsoil					
0.2		Sand [FILL]					
0.9		compact SAND fill, gravelly, fine-medium grained, brown, slightly moist	0.9	3.8			
2.0		Sand					
3.0		compact SAND, gravelly, fine-medium grained, brown, slightly moist					
4.0				13.9			
5.0							
6.0				17.8			
8.0		medium-coarse grained @ 4.0 m					
5.0		wet @ 5.0 m					5.0 m estimated water table depth
8.0				13.8			
8.8		Silt	8.8	84.3			
9.4		stiff organics sandy SILT, brown-black, wet	9.4	43.1			
8.8		ash layer @ 8.8 m to 9.0 m					
10.4				16.1			
10.4		Sand	10.4				
11.4		compact gravelly SAND, some silt, some cobbles, brown-grey, wet	11.4				
11.4		Sand and Gravel	11.4				
12.2		compact SAND and GRAVEL, subrounded, grey, wet	12.2	19.2			

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.01
Page: 1 of 2

Test Hole Log: TH21-01 (SCPT21-01)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot)	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
43	13	Sand compact silty SAND, some interbedded silt, tan, wet					
44							
45							
46	14	Sand and Gravel compact-dense SAND and GRAVEL, medium grained, brown-grey, wet	14.0	18.6			
47							
48							
49	15						
50							
51							
52	16	Sand [TILL-LIKE] very dense silty SAND, till-like, fine-medium grained, moist-wet		21.5			
53							
54							
55							
56	17						
57							
58							
59	18						
60							
61		End of Borehole	18.3				
62	19						
63							
64							
65	20						
66							
67							
68							
69	21						
70							
71							
72	22						
73							
74							
75	23						
76							
77							
78							
79	24						
80							
81							
82	25						
83							
84							

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.01
Page: 2 of 2

Test Hole Log: TH21-02 (CPT21-02)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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INFERRED PROFILE							
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT	Groundwater / Well	Remarks
					(blows per foot)		
					10 20 30 40		
0		Ground Surface	0.0				
1		Sand [FILL]					
2		compact silty SAND fill, gravelly,		14.4			
3		tan-grey, slightly moist					
4		sandy SILT @ 0.9 m	0.8				
5				154.5			
6		Silt					
7		soft-firm sandy SILT, brown, moist	2.0				
8				29.8			
9		Peat					
10		soft PEAT, some wood fibres,					
11		semifibrous, brown, wet		39.2			
12			3.4				
13		Sand					
14		loose silty SAND, fine-medium					
15		grained, some silt, brown-grey, wet		19.0			
16							
17		Sand					
18		compact SAND, some gravel,					
19		some organics, medium grained,					
20		brown-tan, wet					
21							
22		gravelly @ 6.1 m					
23		grey @ 6.4 m					
24				17.5			
25			7.5				
26		Silt					
27		soft sandy SILT, some organics,		37.1			
28		grey, wet		138.0			
29			8.5				
30		Peat					
31		soft PEAT, semifibrous, brown,		31.6			
32		wet					
33			9.4				
34		Silt					
35		firm SILT, some organics, grey,		33.4			
36		wet		31.0			
37			10.7				
38		Silt					
39		soft-firm sandy SILT, grey, wet					
40		some organics @ 10.4 m					
41			11.6				
42		Sand					
		compact silty SAND, fine-medium					
		grained, grey, wet					

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.02
Page: 1 of 2

Test Hole Log: TH21-02 (CPT21-02)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) • 10 20 30 40 •	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
43	13	Silt		37.6			
44		soft sandy SILT, grey, wet					
45			13.7				
46	14	Sand and Gravel [TILL-LIKE]		12.2			
47		very dense silty SAND and GRAVEL, till-like, light grey, moist					
48							
49	15		15.2				
50		End of Borehole					
51							
52	16						
53							
54							
55	17						
56							
57							
58	18						
59							
60							
61	19						
62							
63							
64	20						
65							
66							
67	21						
68							
69							
70	22						
71							
72							
73	23						
74							
75							
76	24						
77							
78							
79	25						
80							
81							
82							
83							
84							

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.02
Page: 2 of 2

Test Hole Log: TH21-03

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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INFERRED PROFILE							
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot)	Groundwater / Well	Remarks
0		Ground Surface	0.0				
0.0 - 0.9		Topsoil Sand [FILL] compact SAND fill, gravelly, brown, slightly moist	0.9	13.2	30		
0.9 - 4.0		Sand [FILL] compact silty SAND fill, gravelly, brown-grey, slightly moist becomes loose and wet @ 3.0 m	4.0	12.8	18		
4.0 - 4.5		black-grey waste (smelly) @ 3.0 m to 4.0 m	4.5	47.5	8		
4.5 - 5.5		Sand loose silty SAND, fine grained, some gravel, light grey, wet black-grey @ 4.5 m	5.5	14.6	11		3.0 m estimated water table depth
5.5 - 8.2		Sand and Gravel compact-dense silty SAND and GRAVEL, subrounded, tan, moist Sand and Gravel [TILL-LIKE] very dense silty SAND and GRAVEL, till-like, tan, slightly moist	8.2	10.7	16		
8.2 - 10.7		Sand [TILL-LIKE] very dense silty SAND, till-like, trace gravel, fine-medium grained, light grey, slightly moist	10.7	9.7	8		DCPT refusal @ 5.5 m
10.7		End of Borehole	10.7	10.5	10		
10.7 - 12.0				15.9	27		
					24		
					>50		

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.03
Page: 1 of 1

Test Hole Log: TH21-04 (CPT21-03)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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INFERRED PROFILE							
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT	Groundwater / Well	Remarks
					(blows per foot)		
					10 20 30 40		
0		Ground Surface	0.0				
1		Sand [FILL] compact SAND fill, some gravel, brown, slightly moist					
2		Sand [FILL] compact silty SAND fill, gravelly, dark grey, moist-wet	1.2	28.6			
3		Sand loose silty SAND, fine-medium grained, grey, wet	2.3	22.3			
4		Sand and Gravel loose-compact silty SAND and GRAVEL, grey, wet	3.7				
5		Peat soft PEAT, semifibrous, brown, wet	4.6	16.0			
6				338.8			
7		Silt soft-firm sandy SILT, some organics, grey, wet	6.7	198.3			
8		Sand and Gravel [TILL-LIKE] very dense silty SAND and GRAVEL, light grey, moist	7.6	58.6			
9				17.8			
10							
11				16.0			
12							
12.2		End of Borehole	12.2				

3.0 m estimated water table depth

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.04
Page: 1 of 1

Test Hole Log: TH21-05 (CPT21-04)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



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

INFERRED PROFILE							
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot)	Groundwater / Well	Remarks
0		Ground Surface	0.0				
1		Sand and Gravel [FILL] compact-loose SAND and GRAVEL fill, frequent cobbles, brown, slightly moist			11, 14		
2				13.5			
3					50		
4					37		
5					21		
6					17		
7					18		
8					32		
9					10		
10					13		
11					4		
12					3		
13					3		
14				19.2			
15							
16							
17		Sand [FILL] compact SAND fill, gravelly, brown, wet	4.9				
18							
19							
20		Peat soft PEAT, semifibrous, brown, wet	5.8	214.2			
21							
22							
23				282.3			
24							
25		Sand compact silty SAND, some organics, gravelly, brown-grey, wet	7.2				
26					36.3		
27							
28							
29					19.4		
30							
31							
32		Sand very dense silty SAND, till-like, some gravel, tan-grey, moist	9.4				
33							
34							
35					19.9		
36		End of Borehole	10.7				
37							
38							
39							
40							
41							
42							

2.5 m estimated water table depth
DCPT ended @ 4.0 m

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.05
Page: 1 of 1

Test Hole Log: TH21-06 (CPT21-05)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC



GEOPACIFIC
CONSULTANTS

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

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot)	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
0		Ground Surface	0.0				
0-1		Sand [FILL] compact SAND fill, gravelly, brown, wet		28.7			
1-2		Sand and Gravel compact silty SAND and GRAVEL, tan-grey, wet		28.7			
2-3		Silt firm sandy SILT, gravelly, grey, moist	3.2				
3-4		Peat soft PEAT, semifibrous, brown, wet		201.0			
4-6				330.6			
6-7		ash layer @ 6.7 m to 7.0 m		338.1			
7-8		Silt soft-firm sandy SILT, interbedded sand and silt, trace organics, grey, wet	7.6				
8-9				44.5			
9-10		Sand compact-loose silty SAND, interbedded sand and silt, grey, wet	8.8				
10-11				36.5			
11-12		Silt soft-firm sandy SILT, some gravel, light grey, wet	11.3				
12-12.8			12.8	14.3			

1.5 m estimated water table depth

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.06
Page: 1 of 2

Test Hole Log: TH21-06 (CPT21-05)

File: 19852

Project: Proposed Site Redevelopment

Client: Westrich Management Ltd

Site Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, 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	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)				
43	13	Sand and Gravel dense SAND and GRAVEL, grey, wet		14.6			
44							
45							
46	14			16.8			
47							
48							
49	15						
50							
51		End of Borehole	15.2				
52							
53	16						
54							
55							
56	17						
57							
58							
59	18						
60							
61							
62	19						
63							
64							
65	20						
66							
67							
68	21						
69							
70							
71	22						
72							
73							
74	23						
75							
76							
77	24						
78							
79							
80	25						
81							
82							
83							
84							

Logged: CG
Method: Solid Stem Auger
Date: 08-26-2021

Datum: Ground Elevation
Figure Number: A.06
Page: 2 of 2

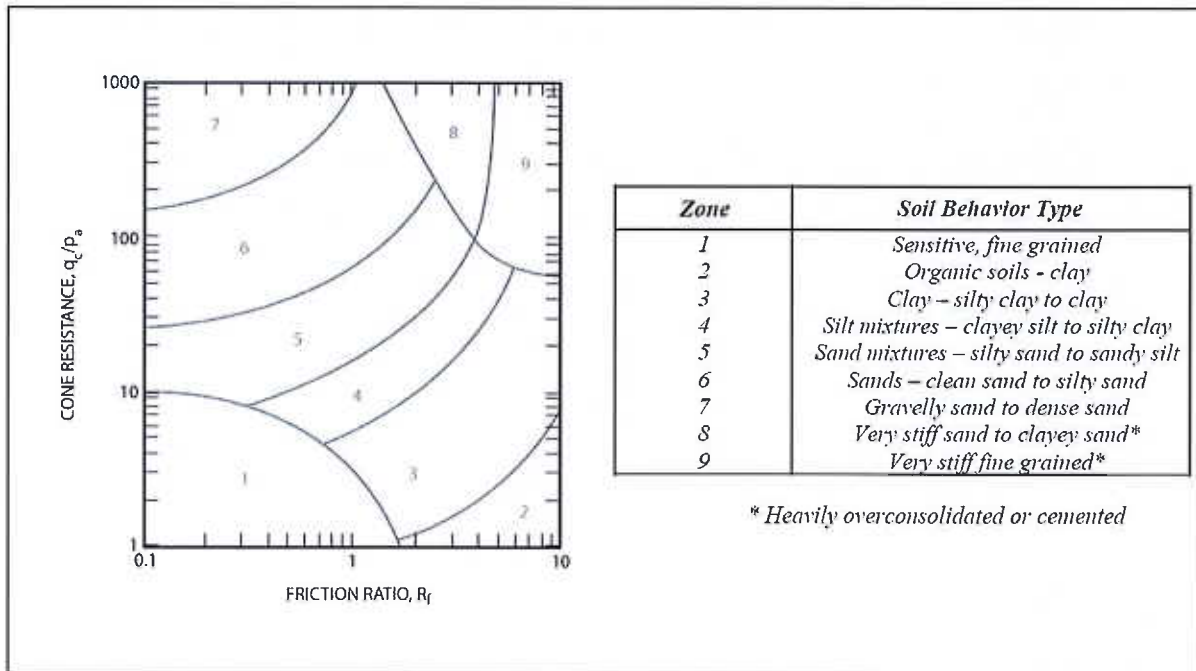
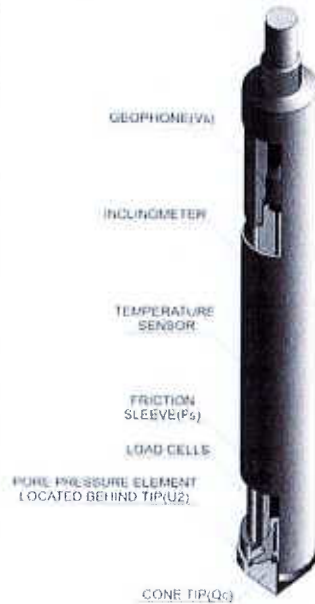
APPENDIX B - ELECTRONIC CONE PENETRATION RESULTS

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.

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 Robertson¹. 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.

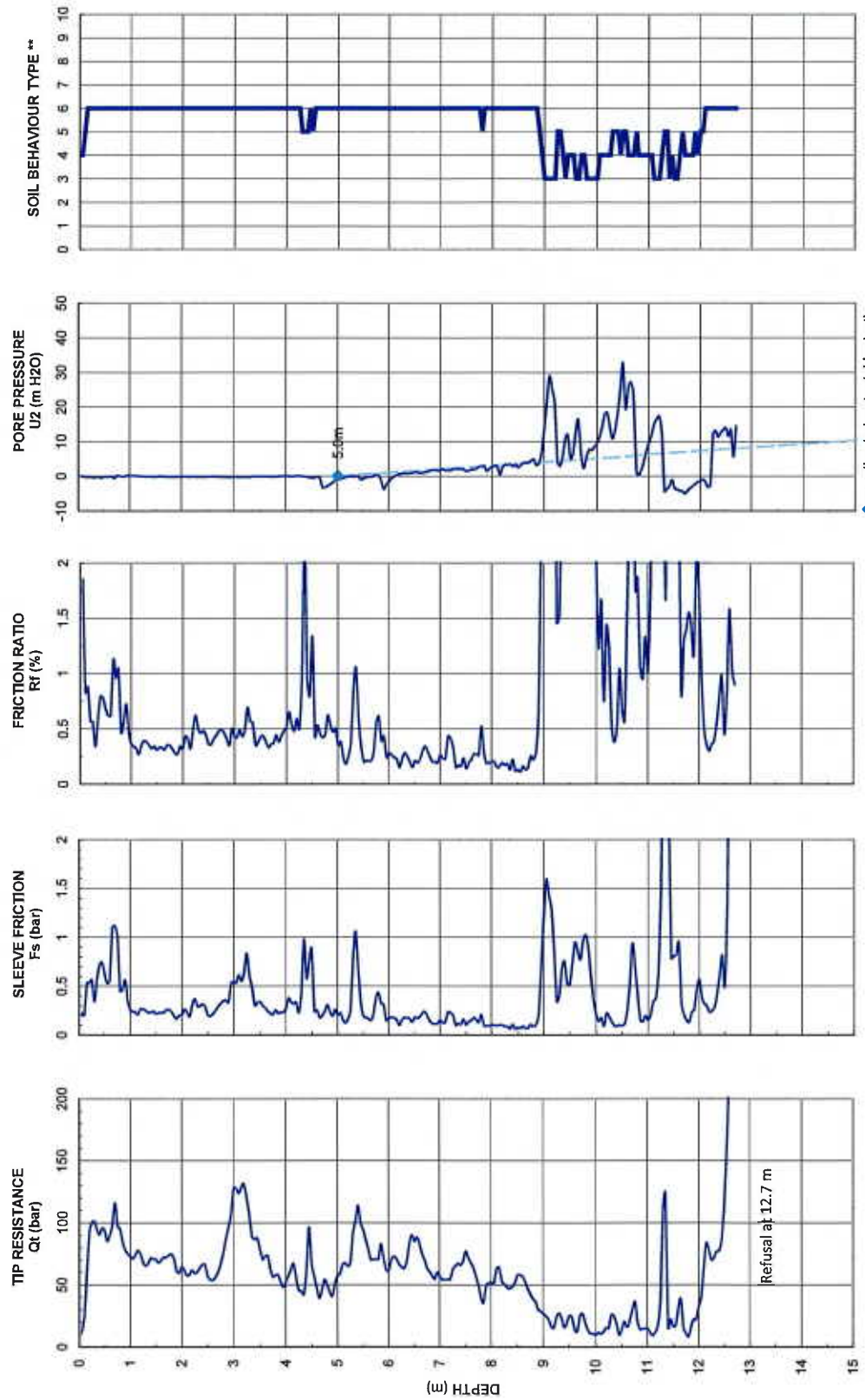
Electronic Cone Penetrometer



¹

Robertson, P.K., 2010, "Soil behaviour type from the CPT: an update.", 2nd International Symposium on Cone Penetration Testing, CPT'10, Huntington Beach, CA, USA.

	2021-Aug-26	WESTRICH MANAGEMENT LTD	GeoPacific Project #: 19852
	Sounding: SCPT21-01	11375, 11345, 11339 WOODSDALE COURT, LAKE COUNTRY	Figure: B.01



◆ = estimated water table depth

** 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



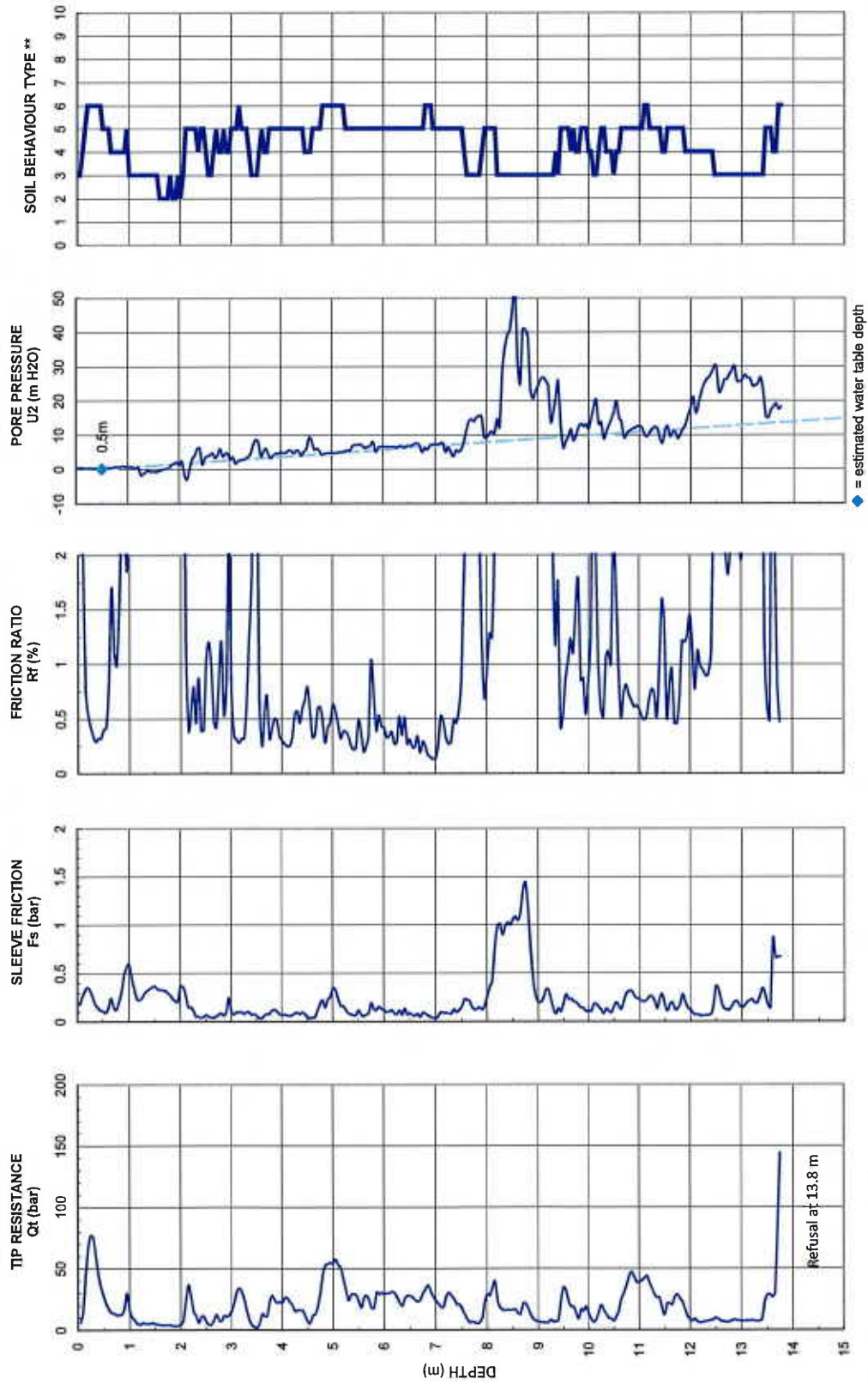
2021-Aug-26

WESTRICH MANAGEMENT LTD
11375, 11345, 11339 WOODSDALE
COURT, LAKE COUNTRY

GeoPacific Project #: 19852

Sounding: CPT21-02

Figure: B.02



** Based on Robertson et. al 1990
1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay

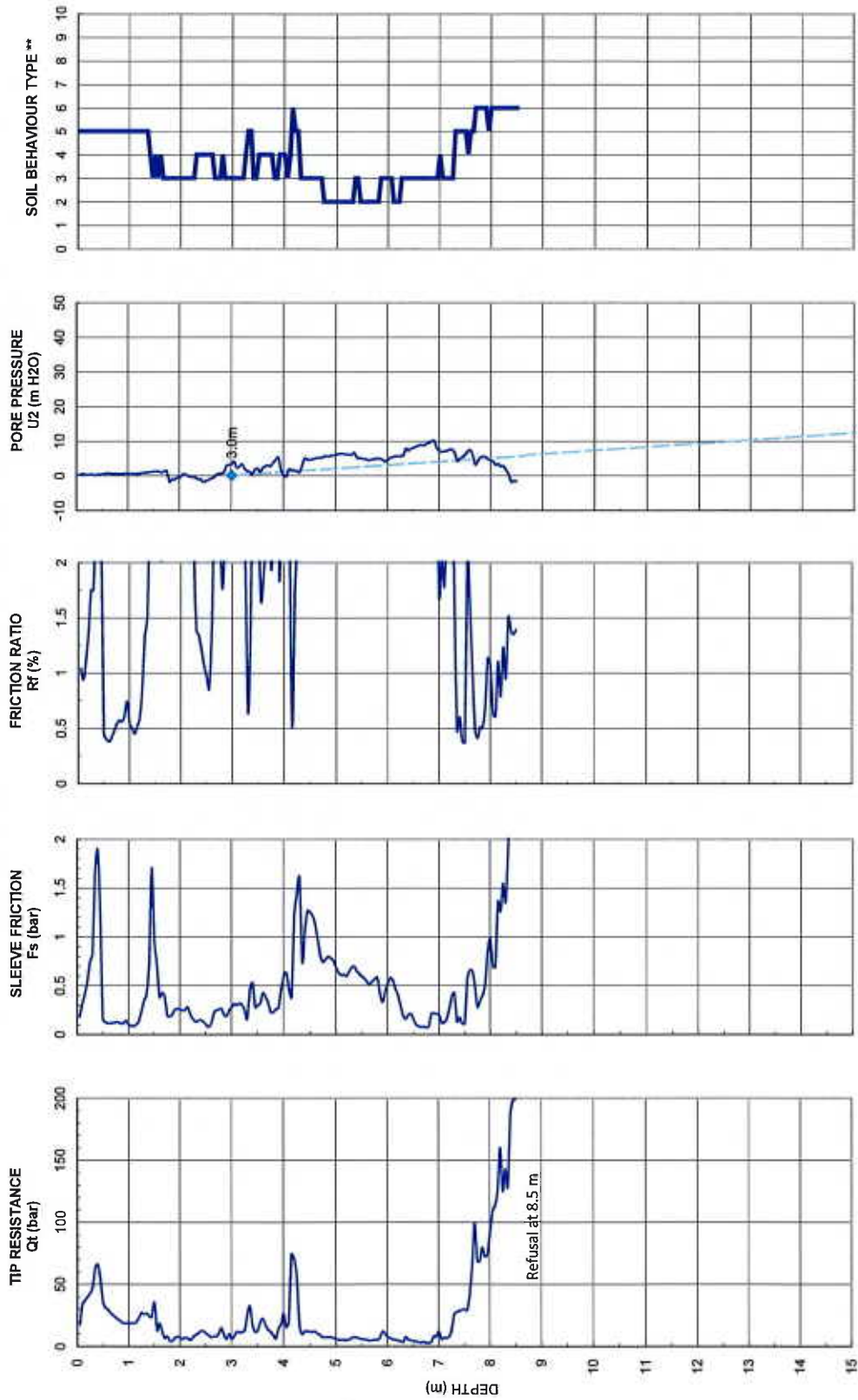
4 Clayey Silt to Silty Clay
5 Silty Sand to Sandy Silt
6 Clean Sand to Silty Sand

7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained

Refusal at 13.8 m

◆ = estimated water table depth

 GEOPACIFIC <small>VANCOUVER EDMONTON CALGARY</small>	2021-Aug-26 Sounding: CPT21-03	WESTRICH MANAGEMENT LTD 11375, 11345, 11339 WOODSDALE COURT, LAKE COUNTRY	GeoPacific Project #: 19852 Figure: B.03
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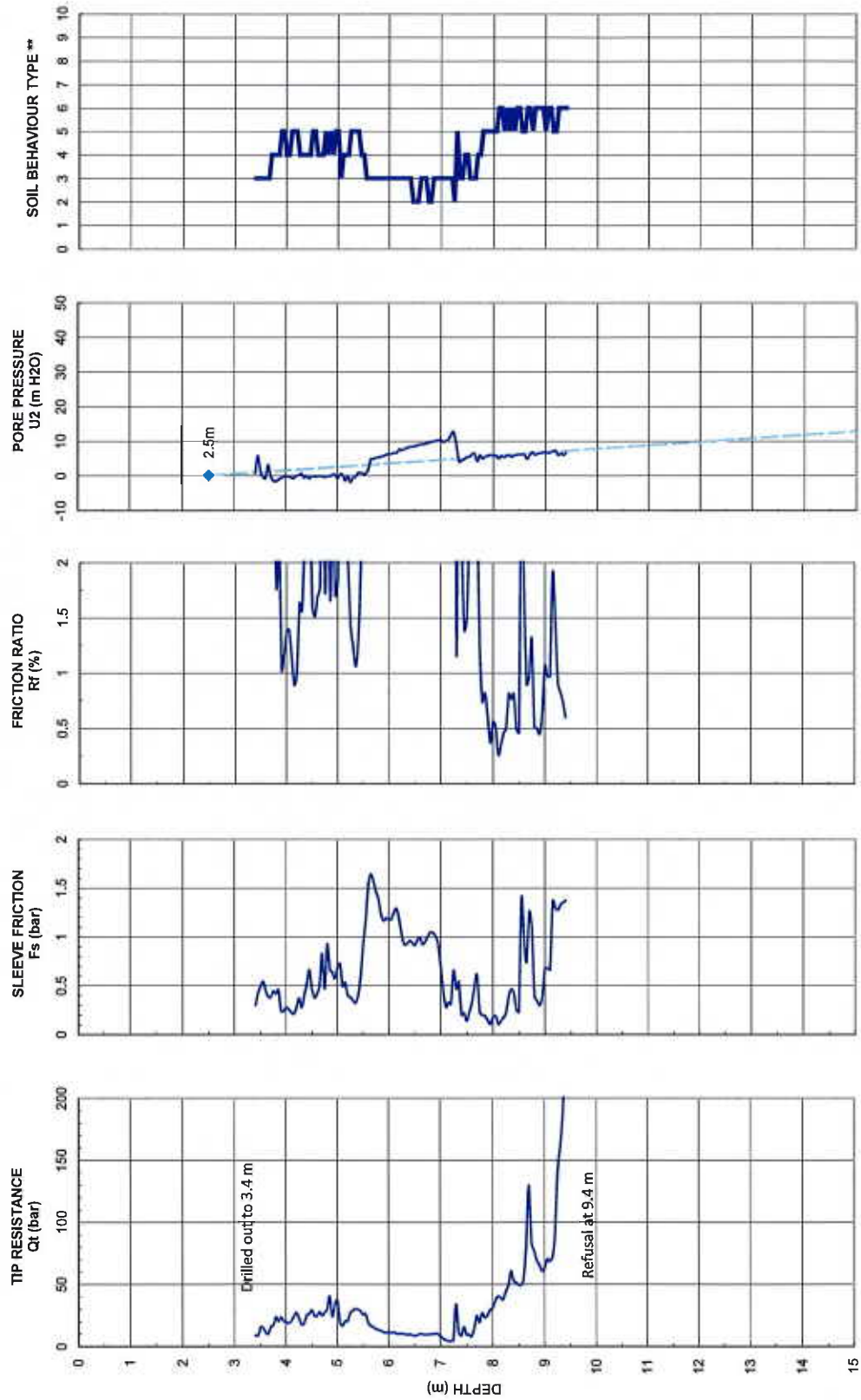
- ** Based on Robertson et. al 1990
- 1 Sensitive Fine Grained
 - 2 Organic Material
 - 3 Clay to Silty Clay
 - 4 Clayey Silt to Silty Clay
 - 5 Silty Sand to Sandy Silt
 - 6 Clean Sand to Silty Sand
 - 7 Gravely Sand to Sand
 - 8 Very Stiff Sand to Clayey Sand
 - 9 Very Stiff Fine Grained



2021-Aug-26
Sounding: CPT21-04

WESTRICH MANAGEMENT LTD
11375, 11345, 11339 WOODSDALE
COURT, LAKE COUNTRY

GeoPacific Project #: 19852
Figure: B.04



- ** 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 - 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 Q_c/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 $N_{1(60)}$.

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

Soil Type	Q_c/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 $Q_c/N_{1(60)}$ 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

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

determined from the cone penetration testing. Generally the correlation is of the form:

where q_c = cone tip resistance, σ_v = 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 CPTeT-IT2. The results are presented on the figures following.

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:

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

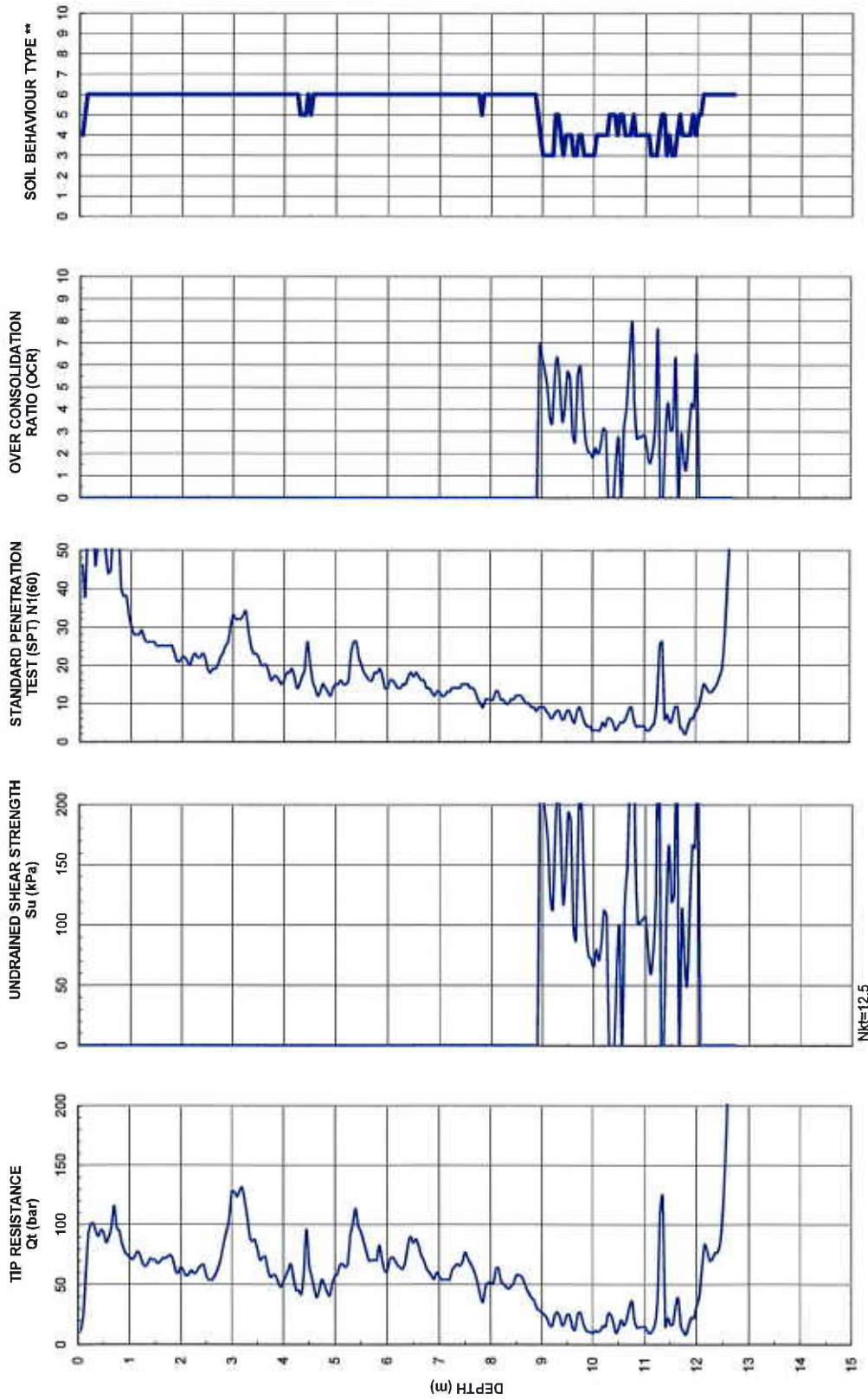
Su/p'_{oc} = The undrained shear strength to effective stress ratio of the over consolidated soil

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.

 <p>GEO PACIFIC VANCOUVER SHERBOURNE CALGARY</p>	<p>2021-Aug-26</p>	<p>WESTRICH MANAGEMENT LTD 11375, 11345, 11339 WOODSDALE COURT, LAKE COUNTRY</p>	<p>GeoPacific Project #: 19852</p>
	<p>Sounding: SCPT21-01</p>	<p>Figure: C.01</p>	



Nkt=12.5

- ** 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



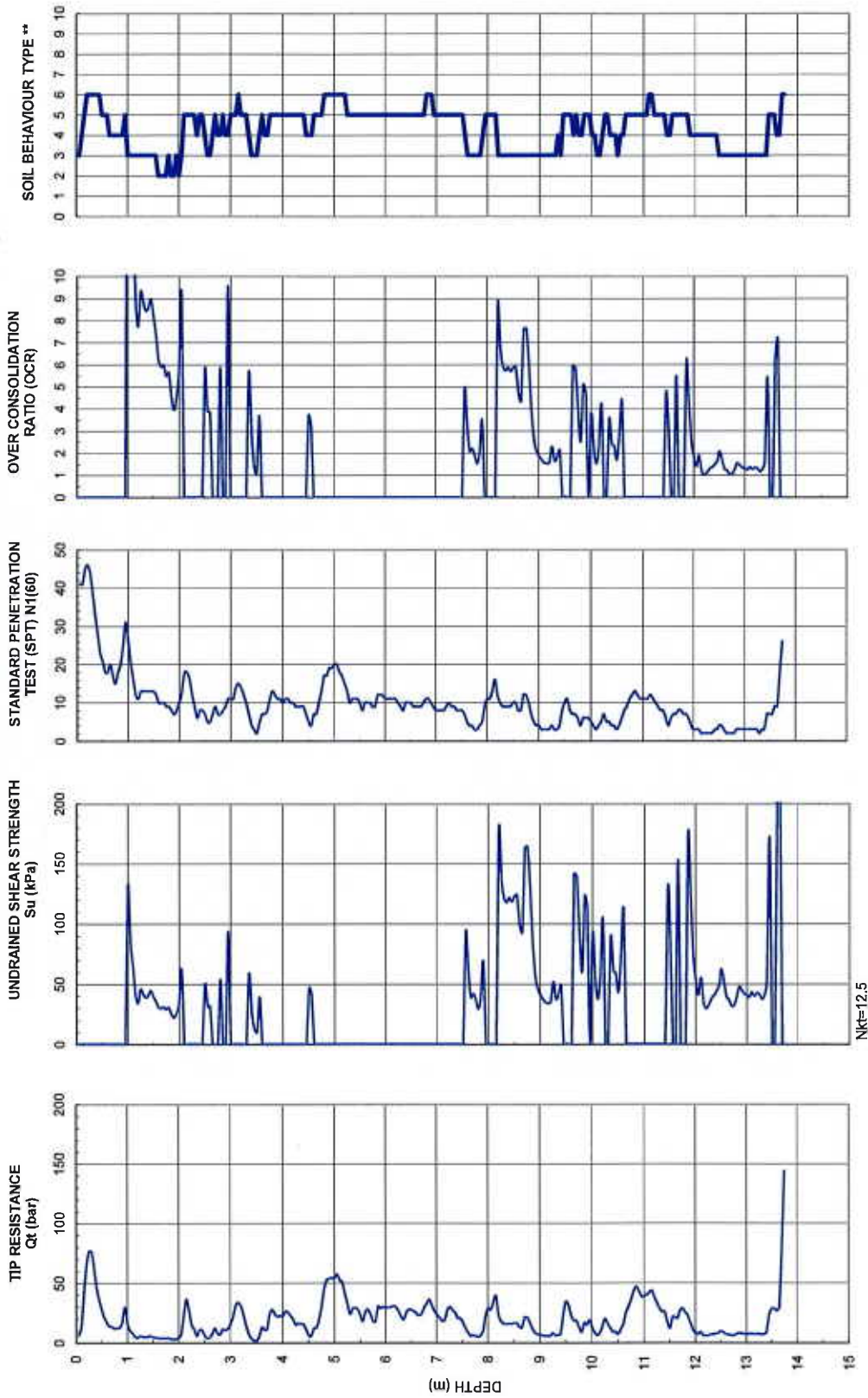
2021-Aug-26

WESTRICH MANAGEMENT LTD
11375, 11345, 11339 WOODSDALE
COURT, LAKE COUNTRY

GeoPacific Project #: 19852

Sounding: CPT21-02

Figure: C.02



** Based on Robertson et. al 1990
1 Sensitive Fine Grained
2 Organic Material
3 Clay to Silty Clay

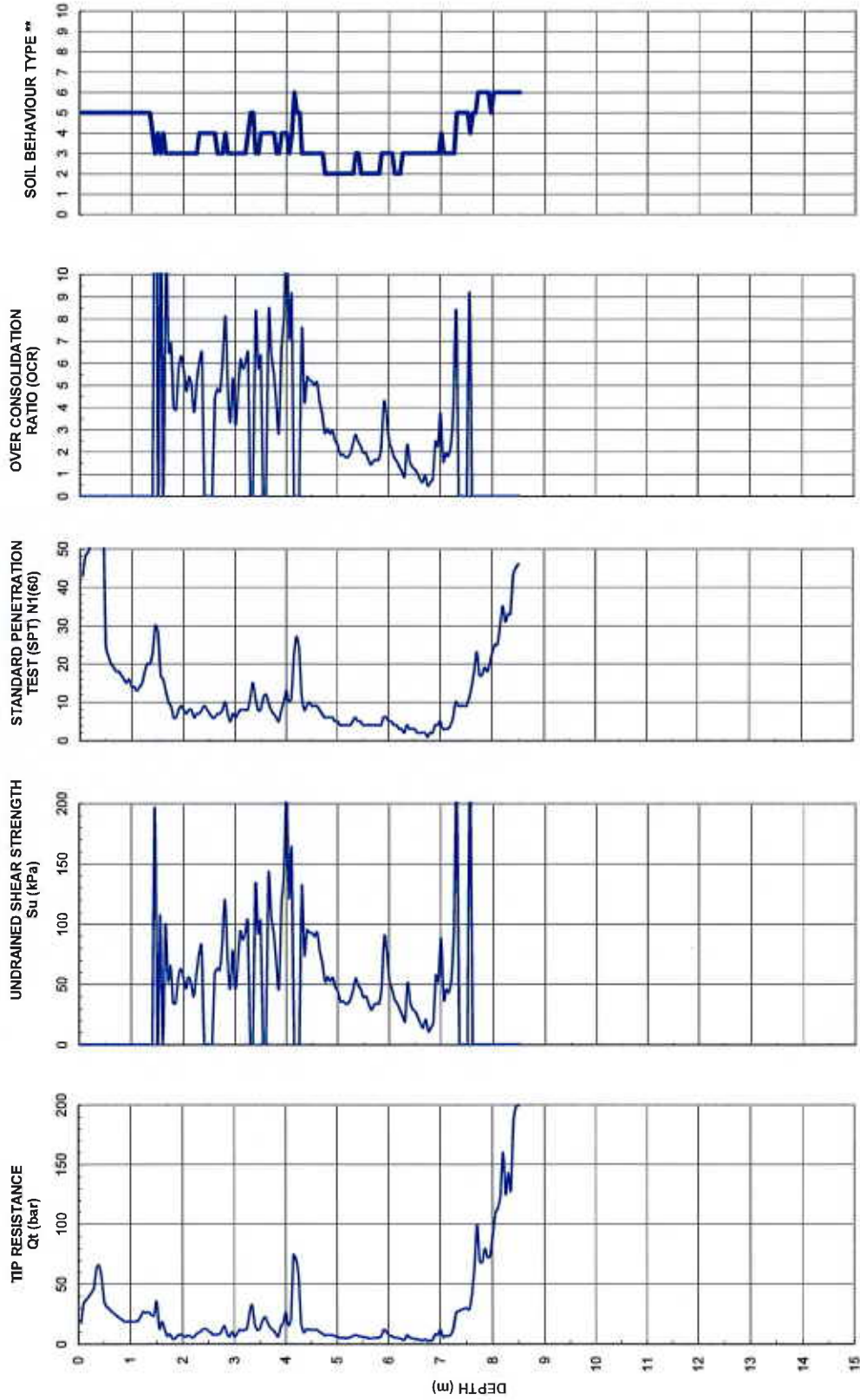
7 Gravely Sand to Sand
8 Very Stiff Sand to Clayey Sand
9 Very Stiff Fine Grained



2021-Aug-26
Sounding: CPT21-03

WESTRICH MANAGEMENT LTD
11375, 11345, 11339 WOODSDALE
COURT, LAKE COUNTRY

GeoPacific Project #: 19852
Figure: C.03



Nkt=12.5

** 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



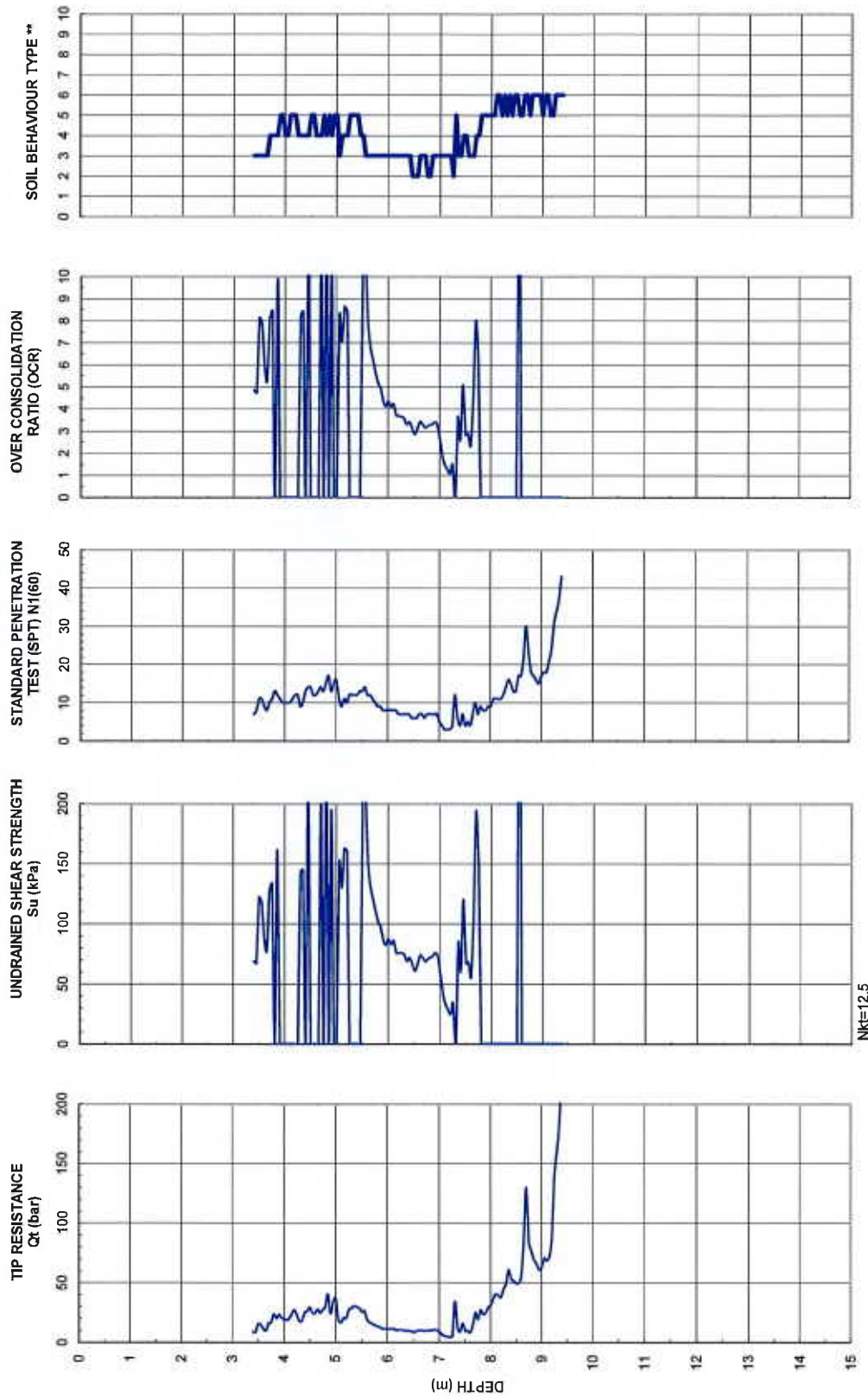
2021-Aug-26

WESTRICH MANAGEMENT LTD
11375, 11345, 11339 WOODSDALE
COURT, LAKE COUNTRY

GeoPacific Project #: 19852

Sounding: CPT21-04

Figure: C.04



Nkt=12.5

- ** 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 National Building Code interpolated seismic hazard value.


SEISMIC INDUCED SETTLEMENT

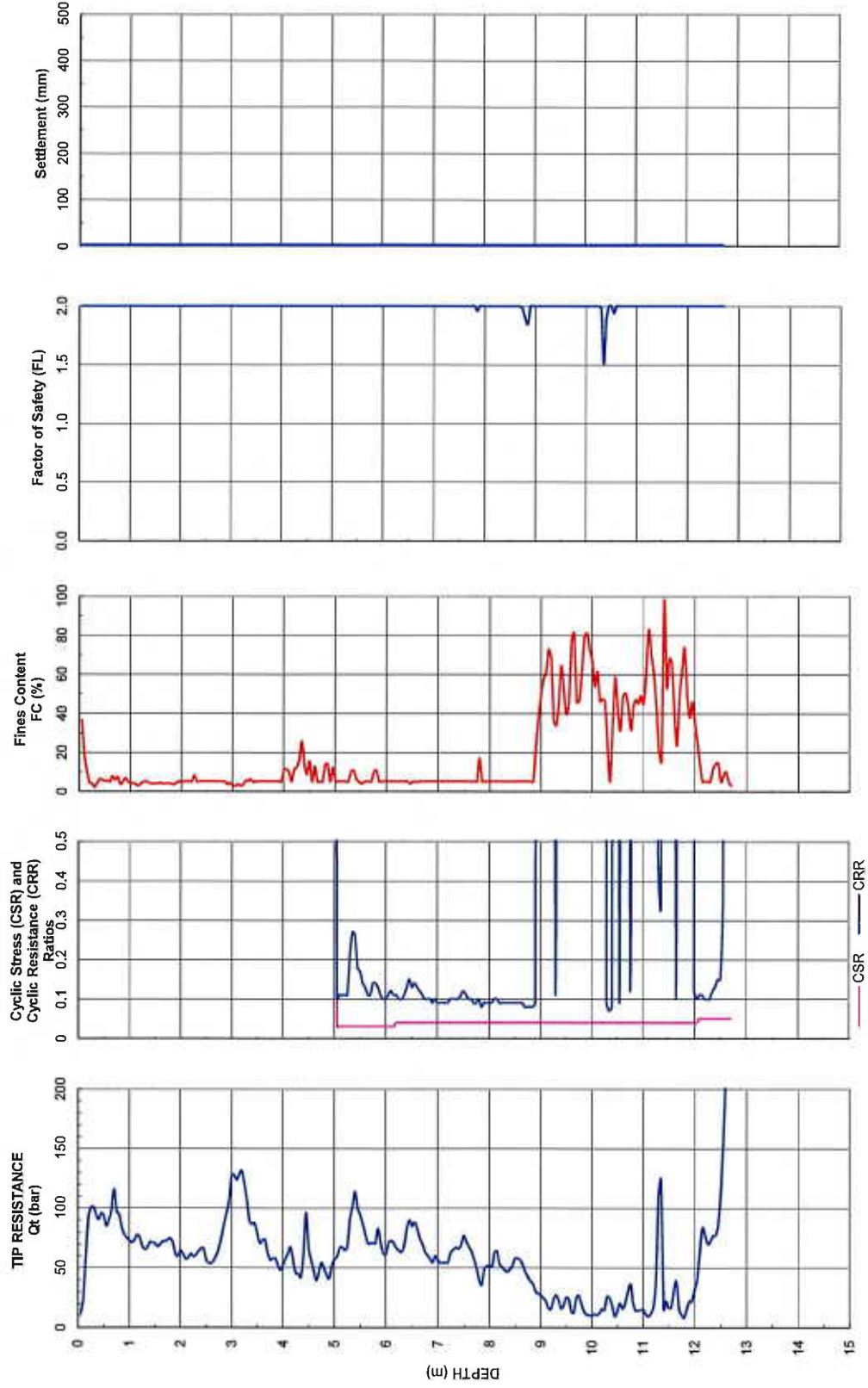
In the event of a significant earthquake, settlement of the ground surface could occur as a result of densification of the looser soil layers as a result of liquefaction or due to the expulsion of sand in the form of sand dykes or sills from beneath the site. Tokimatsu and Seed (1987)² suggest a method 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.

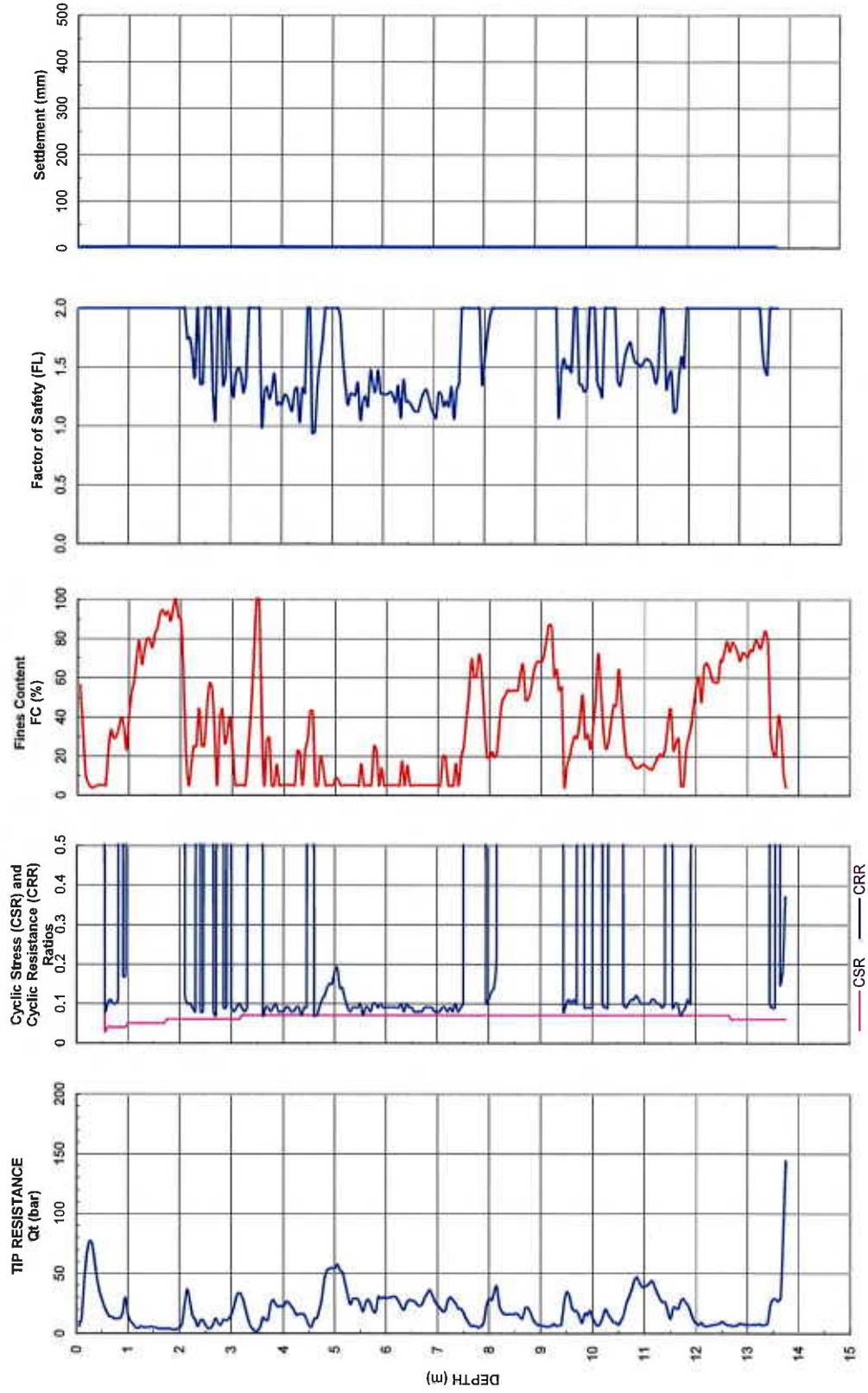
- 1 Youd, T. L., Idriss, I. M. (2001). "Liquefaction Resistance of Soils: Summary Report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", Journal of Geotechnical and Geoenvironmental Engineering, Vol 127, 10, pp. 817-833
- 2 Tokimatsu, K.A.M. and Seed, H.B.,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

	2021-Aug-26 Sounding: SCPT21-01	WESTRICH MANAGEMENT LTD 11375, 11345, 11339 WOODSDALE COURT, LAKE COUNTRY	GeoPacific Project #: 19852 Figure: D.01
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Liquefaction interpretation:
 PGA = 0.06
 magnitude = 7.0
 settlement accumulation max depth = 15m

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	Sounding: CPT21-02		Figure: D.02



Liquefaction interpretation: PGA = 0.06
 magnitude = 7.0
 settlement accumulation max depth = 15m



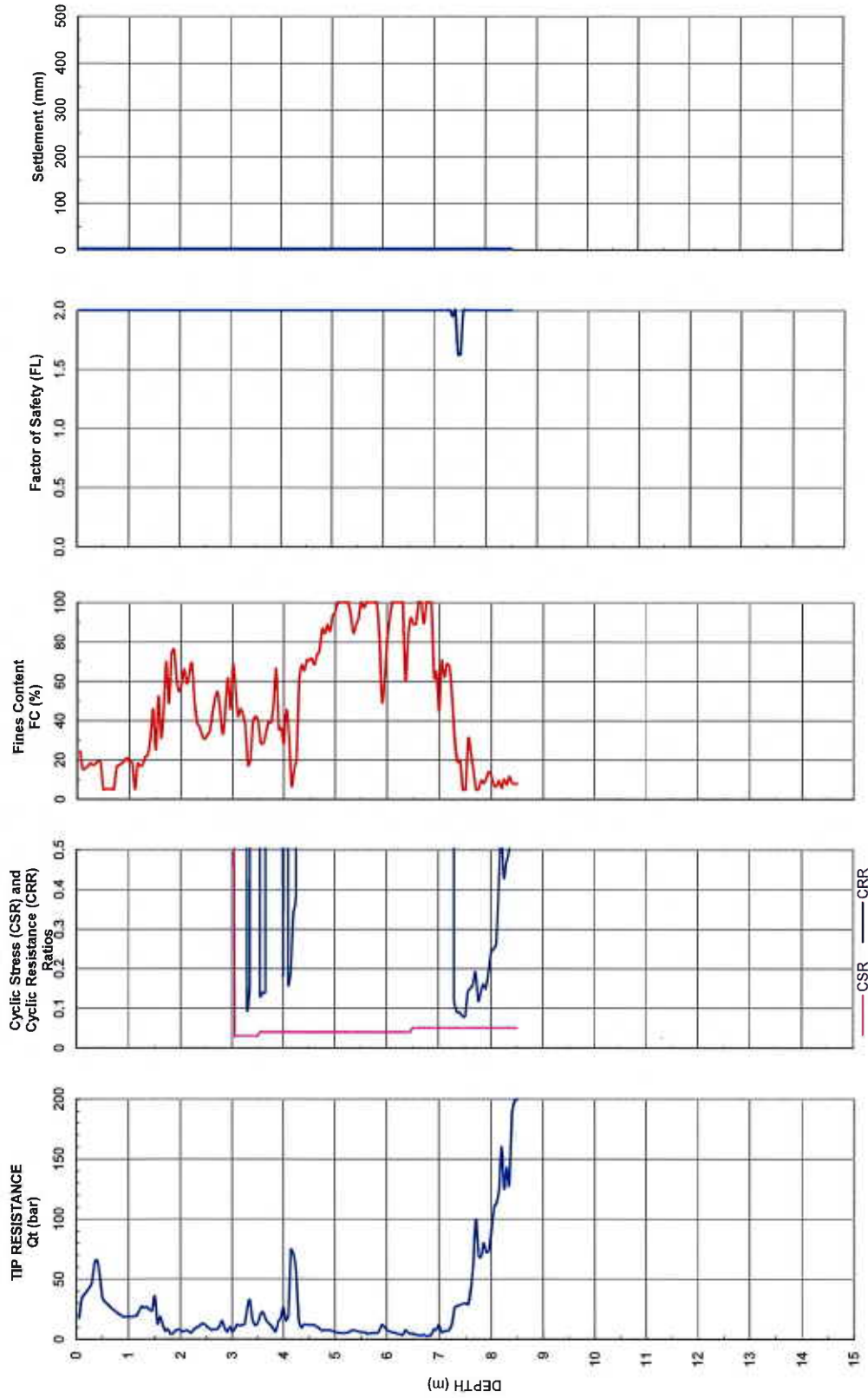
2021-Aug-26

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COURT, LAKE COUNTRY

GeoPacific Project #: 19852

Sounding: CPT21-03

Figure: D.03



Liquefaction interpretation:
PGA = 0.06
magnitude = 7.0
settlement accumulation max depth = 15m



2021-Aug-26

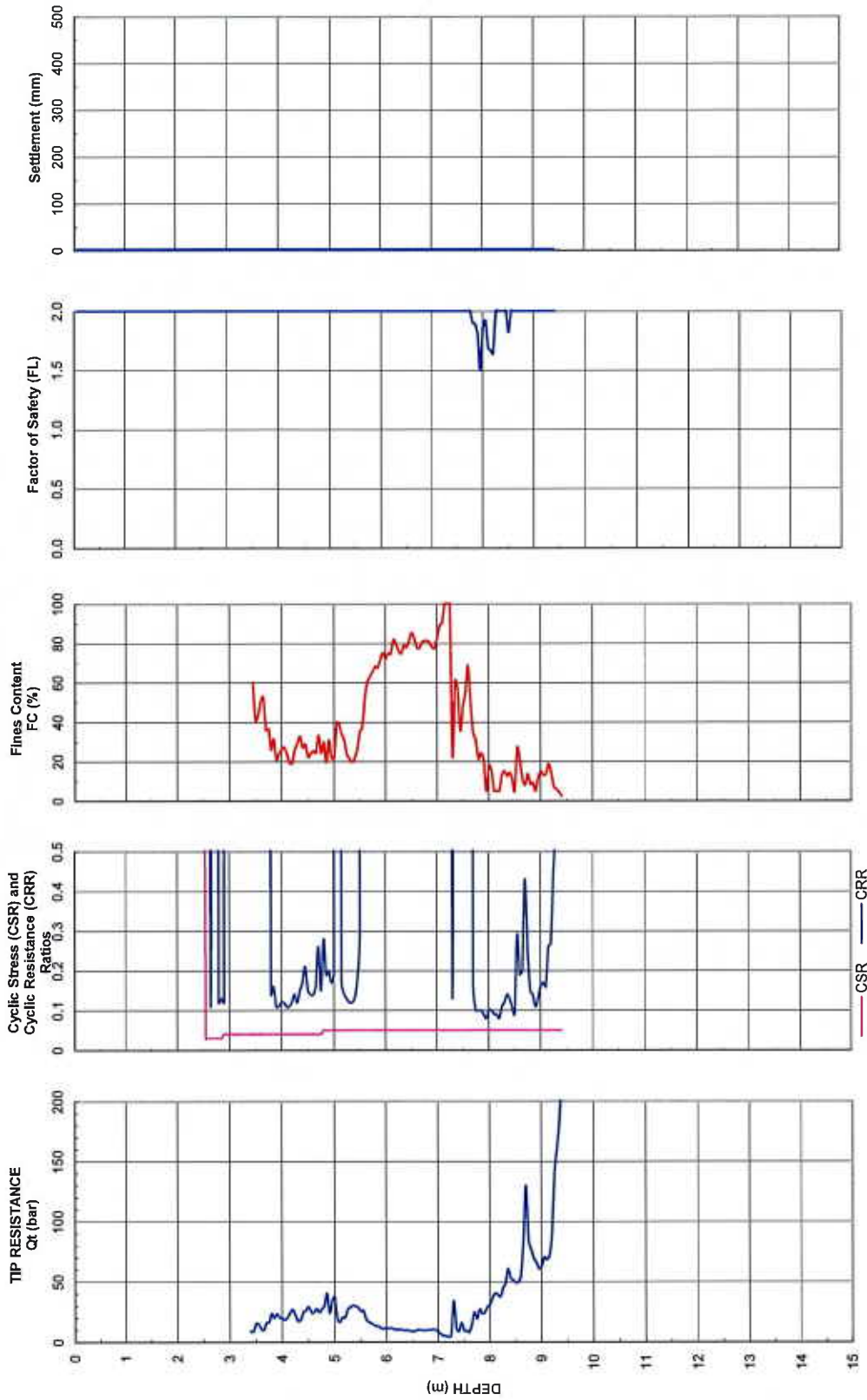
WESTRICH MANAGEMENT LTD

GeoPacific Project #: 19852

Sounding: CPT21-04

11375, 11345, 11339 WOODSDALE COURT, LAKE COUNTRY

Figure: D.04



Liquefaction interpretation:
 PGA = 0.06
 magnitude = 7.0
 settlement accumulation max depth = 15m

APPENDIX E - SHEAR WAVE VELOCITY DATA (V_s)



GEOPACIFIC
VANCOUVER KAHLOOPS CALGARY

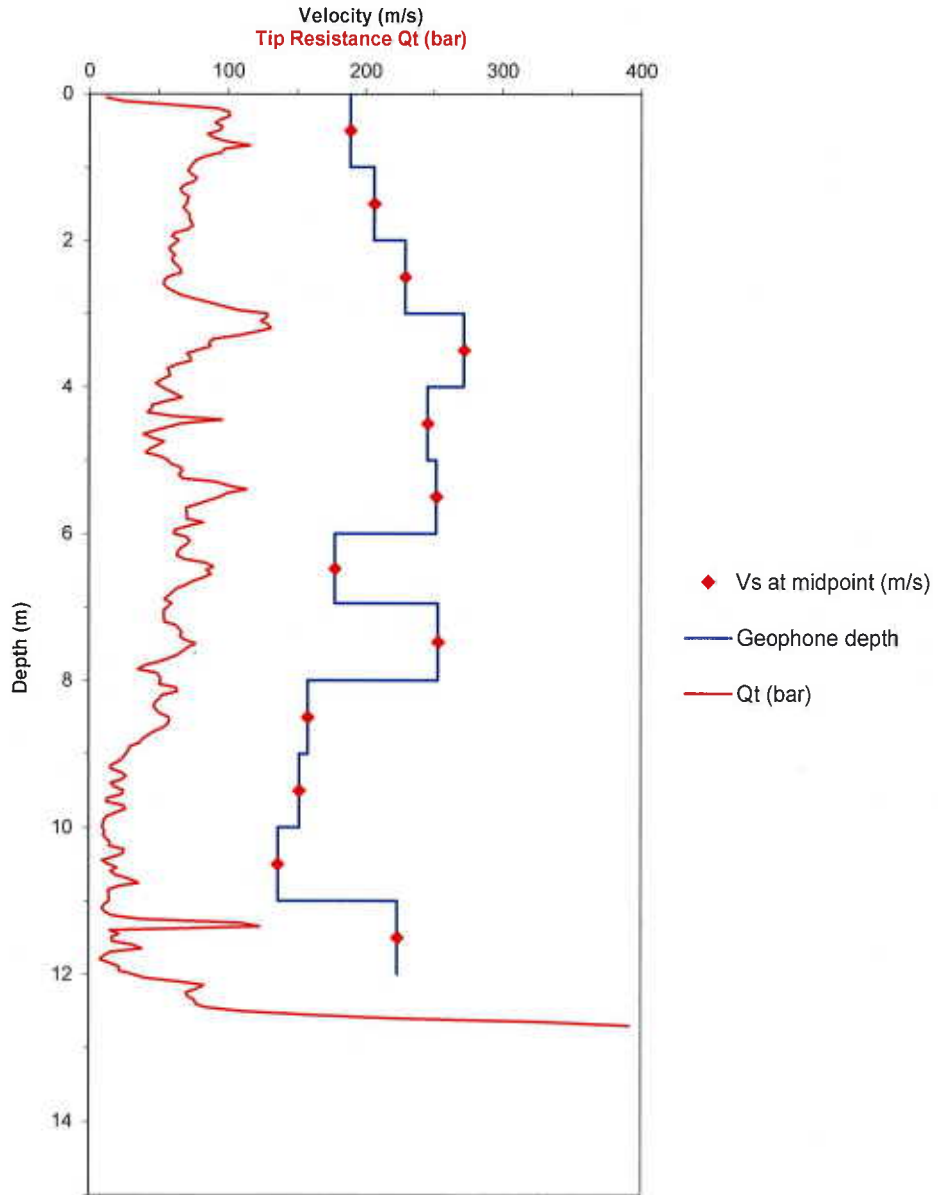
File: 19852
 Project: Proposed Site Redevelopment
 Client: Westrich Management Ltd
 Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC
 Sounding: SCPT21-01
 Date: 2021-Aug-26

Seismic Source: Beam
 Source to cone (m): 0.3

Shear Wave Velocity Data (Vs)

Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference d (m)	Midpoint (m)	Time Difference (ms)	Shear Wave Velocity Vs (m/s)	d/Vs
1.20	1.00	1.04	1.04	0.50	5.53	189	0.0055
2.20	2.00	2.02	0.98	1.50	4.74	206	0.0047
3.20	3.00	3.01	0.99	2.50	4.33	229	0.0043
4.20	4.00	4.01	1.00	3.50	3.66	272	0.0037
5.20	5.00	5.01	1.00	4.50	4.06	246	0.0041
6.20	6.00	6.01	1.00	5.50	3.96	252	0.0040
7.15	6.95	6.96	0.95	6.48	5.34	178	0.0053
8.20	8.00	8.01	1.05	7.48	4.14	253	0.0041
9.20	9.00	9.00	1.00	8.50	6.33	158	0.0063
10.20	10.00	10.00	1.00	9.50	6.59	152	0.0066
11.20	11.00	11.00	1.00	10.50	7.33	136	0.0073
12.20	12.00	12.00	1.00	11.50	4.48	223	0.0045
$\Sigma(d/Vs)$							0.0605
average Vs = $\Sigma d / \Sigma(d/Vs)$							198

File: 19852
Project: Proposed Site Redevelopment
Client: Westrich Management Ltd
Location: 11375, 11345, 11339 Woodsdale Court, Lake Country, BC
Sounding: SCPT21-01
Date: 2021-AUG-26



Environmental Assessment Report

11375 Woodsdale Court, Lake Country, BC

Prepared for:
Westrich Pacific

April 11, 2023

Prepared by:
Okanagan EHS Services Ltd.
11110 Deldor Road
Lake Country, BC
V4V 1V8



OKANAGAN
ENVIRONMENTAL
HEALTH & SAFETY

SCHEDULE _____
This forms part of development
Permit #
Date
Signature

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1.0 Introduction & Project Description

Okanagan EHS Services Ltd. (OKGN) was retained by the proponent to conduct an environmental assessment for the proposed development at 11375 Woodsdale Court, Lake Country, BC.

- Legal description; Plan KAP444, Lot 72, Section 15, Township 20, Osoyoos Division of Yale Land District, except plan H936 H15689 40347. PID: 007-844-948 (Figure 1).

The proposed project site is zoned as Two Dwelling Housing (RU6) with High Density Residential future land use and is 2.04 acres in size.

The purpose of this report is to document the existing conditions of the project area, confirm the presence/absence of watercourses and other sensitive environmental features, and to identify potential environmental impacts of proposed works. This document will also provide recommendations and mitigation measures, where appropriate, to maintain or improve the ecological integrity of both the project site and surrounding natural areas.

The proposed development is within 30m of Winfield Creek, which requires a provincial Riparian Areas Protection Regulation (RAPR) detailed assessment has been conducted.

2.0 Regulatory Framework

2.1 *District of Lake Country*

The project is within the District of Lake Country (DoLC) and must follow the guidance in the Official Community Plan Bylaw 1065. The project is within the Natural Environment Development Permit Areas.

The DoLC's Natural Environment Development Permit Area objectives refer to the following:

1. Development within an environmentally significant area should be considerate of the features located within or nearby the site.
2. Any development that disturbs environmentally significant feature should appropriately restore such feature.
3. Building and structures should be constructed to minimize disturbance to the site and its features.
4. Landscaping of new development will be compatible with the existing environmental features and species of the area.



5. Where appropriate, use thorny shrubs (e.g., hawthorn) or dense plantings of conifers to deter livestock from using riparian restoration areas.
6. Development should not cause negative impacts to riparian areas and their species.
7. Maintain existing ecosystems to ensure development will not impact the ability of wildlife to travel throughout the ecological corridor.

This environmental assessment report has been developed in accordance with the District of Lake Country's Professional Reports & Technical Studies Terms of Reference Policy 186, 2021.

2.1.1 Environmentally Sensitive Areas

The DoLC Terms of Reference Policy (2021) defines environmentally sensitive areas (ESAs) as:

ESA-1 (High): These areas contain locally and provincially significant ecosystems (e.g., vegetation and wildlife characteristics) representing a diverse range of sensitive habitat, extremely rare and/or areas of critical important to rare wildlife species. These features contribute significantly to the overall connectivity of the habitat and ecosystems. Avoidance and conservation of ESA-1 designations should be the primary objective. If development should occur within these areas, compensation to promote no net loss of equivalent functioning habitat may be required only after it proves impossible or impractical to maintain the same level of ecological function.

ESA-2 (Moderate): These areas contain ecosystems local and provincially of moderate significance, uncommon and important to rare wildlife species that contribute toward the overall diversity and contiguous nature of the surrounding natural features. ESA-2 areas should be avoided. If development is pursued in these areas portions of the habitat should be retained and integrated to maintain the contiguous nature of the landscape. Some loss to these ESAs can be offset by habitat improvements to the remaining natural areas found on property.

ESA-3 (Low): These areas are typically polygons delineated as low to moderate conservation values because of important to wildlife (e.g., significance representing disturbed habitats or fragmented features). These areas contribute to the diversity to the landscape, although based on the condition and adjacency of each habitat the significant function within the landscape is limited. If



development is pursued in these areas the impacts should be offset by habitat improvements in other more sensitive natural areas found on property.

ESA-4 (Not Sensitive): These delineated areas contribute little or no value or importance as wildlife habitat (e.g., overall diversity or vegetation, soils, terrain, and wildlife characteristics of the area). Development is encouraged to be focused to these sites before consideration developing higher rated sites of the area. These areas shall not be considered as areas for restoration and enhancement or as recruitment as higher value ESA in offsetting development in other areas.

2.2. Applicable Provincial Legislation

2.2.1 Wildlife Act

The B.C. *Wildlife Act* will apply to this project and controls the timing of vegetation clearing to protect nesting and fledging birds. The *Wildlife Act* protects birds, eggs, all active nests and inactive nests of eagles, peregrine falcons, gyrfalcons, osprey, herons, and burrowing owls.

2.2.2 Water Sustainability Act

The *Water Sustainability Act (WSA)* is the principal law for managing the diversion and use of water resources, including ground water and surface water (wetlands, streams, and lakes). A WSA approval will be required to perform any changes in and about a stream. At the time of this assessment, no changes in and about a stream are proposed.

2.2.3 Riparian Areas Protection Regulation

The Riparian Areas Protection Regulation (RAPR) protects all riparian areas of waterbodies in the province. Any development proposed within 30m of a waterbody must have an assessment and report submitted by a QEP to the province. The RAPR assessment and report will determine the appropriate stream protection and enhancement area (SPEA) which will provide a setback and measures for the proponent to follow throughout development.

A RAPR detailed assessment of the stream within the project area has been completed by OKGN.

2.3 Applicable Federal Legislation

2.3.1 Species at Risk Act



The *Species at Risk Act (SARA)* provides for the legal protection of wildlife species and the conservation of their biological diversity. The purposes of the *Act* are to; prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species and encourage the management of other species to prevent them from becoming at risk.

The *Act* has established the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk, from which prohibitions are created to protect listed threatened and endangered species and their critical habitat.

2.3.2 Migratory Birds Convention Act

Migratory birds, their eggs and nests are protected everywhere in Canada by the *Migratory Birds Convention Act (MBCA)* and its supporting Regulations. There is no regulatory provision to allow for limited take of migratory birds during construction activities.

3.0 Background

OKGN has prepared this report in accordance with local, provincial, and federal requirements. A desktop and field assessment have been conducted to inventory and identify environmentally sensitive species and features within the study area.

4.0 Methods

4.1 Desktop Assessment

The desktop assessment process involved a review of existing information for the study area:

- Conservation Data Centre (Species and Ecosystems at Risk)
- Biodiversity Conservation Strategy
- Critical Habitat Mapping
- Committee on the Status of Wildlife in Canada
- Sensitive Ecosystem Inventory
- Terrestrial Ecosystem Mapping
- Habitat Wizard

4.2 Field Assessment

The site assessment was conducted on March 27, 2023, by Rachel Pidduck, B.Sc., BiT. During the site visit all desktop assessment results mapped polygons within the project area were visited and assessed for accuracy of initial boundary



positioning, ecosystem condition, and identification of potential species at risk (and their habitat features). At this point they were also assigned ecological condition values based on the level of anthropogenic disturbance, adjacency to linear disturbances, and the level of invasive species presence.

At the time of this assessment, a development site plan had not been provided and the preliminary environmental inventory and assessment has been conducted to support the development planning process.

5.0 Assessment Results

5.1 Project Climate Setting

The project area is located within the Okanagan Very Dry Hot variant (xh1) of the Ponderosa Pine (PP) bio-geoclimatic zone. The ponderosa Pine zone is located at low elevations along the very dry valleys of British Columbia's Southern Interior. PP is the driest of the forested zones. July mean temperatures range from 17 to 22 C and precipitation ranges from 250-450 mm per year with December and January being the wettest months on average (Lloyd *et al* 1990).

5.2 Land Use

The current land use of the subject property is two dwelling housing (RU6).

Adjacent land uses include:

- North: Rural Residential (RR2), Tourist Commercial (C9), Woodsdale Rd
- East: Medium Density Multiple Housing (RM5)
- South: Low Density Row Housing (RM2), Agriculture (A1)
- West: Highway Commercial (C11), Single Family Housing (RU1), Highway 97

5.3 Species and Ecosystems At-Risk

A review of the British Columbia Conservation Data Centre (CDC), Committee on the Status of Wildlife in Canada (COSEWIC) and Critical Habitat for Federally Listed Species at Risk identified one potential sensitive species within the project area (Table 1).

The study area is surrounded by well-developed residential lots and busy roadways; Woodsdale Road to the North and Highway 97 to the West. The highly developed nature and lack of connectivity to suitable habitat surrounding the study area would indicate a "low" potential for species at risk to occur within the project area, however, the riparian area located to the east boundary of the subject property contains several environmental and habitat features that provide cover, refuge, and serves as a movement corridor for a range of wildlife species.



Additionally, no species or ecosystems at risk were observed during the field assessment.

Table 1. Species and Ecosystems at Risk

<u>Common Name</u>	<u>Scientific Name</u>	<u>Provincial Status¹</u>	<u>COSEWIC Status²</u>
American Badger	<i>Taxidea taxus</i>	Red	Endangered
Great Basin Gophersnake	<i>Pituophis catenifer deserticola</i>	Blue	Threatened

¹ Provincial Status: Blue-listed species are Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Red-listed species have or are candidates for Extirpated, Endangered, or Threatened status in British Columbia.

² Committee on the Status of Wildlife in Canada (COSEWIC) status:

Endangered = facing imminent extirpation in Canada or extinction

Threatened = likely to become endangered in Canada if limiting factors are not reversed

Special Concern = particularly sensitive to human activities or natural events

5.4 Ecosystem Classification

5.4.1 Terrestrial Ecosystem

Terrestrial Ecosystem Mapping (TEM) polygons identified are summarized in Table 2. During the site assessment these distinct habitat types were reviewed and assessed for accuracy (Figure 2).

Table 2. Ecosystem Communities

Site Unit Symbol	Site Series Name	Provincial Status
UR	Urban/Suburban	-
DM	Douglas-fir – Water birch – Douglas maple	Red

The study area exists in an urban setting with a two-dwelling housing unit (duplex) to the southwest corner and a riparian area adjacent to the east project boundary. Anthropogenic activities typical of an urban environment exist throughout most of the property. Much of the study area is irrigated lawn with a driveway entering from the west, a small storage shed to the southwest corner, various fencing and yard maintenance tools including an old green house and landscaping debris located to the south end of project boundary. Some native and non-native trees and plants including alder (*Alnus sp.*), elm (*Ulmus sp.*), white fir (*Abies concolor*), and raspberry species (*Rubus sp.*). It is expected that,

¹ Conservation Data Center. Government of British Columbia. Accessed on March 19, 2023.

² Committee on the Status of Wildlife in Canada. Government of Canada. Accessed on March 19, 2023.



because the study area is disturbed and completely isolated within an urban setting, there would be a high proportion of invasive species present within the disturbed area located to the south of the subject property.

The riparian fluvial fringe sensitive ecosystem (RI:ff), associated with Winfield Creek, located along the east project boundary flows through a dense Douglas-fir - water birch - Douglas maple (DM) ecosystem community. Vegetation associated with this riparian area includes water birch (*Betula occidentalis*), Douglas maple (*Acer glabrum*), Douglas-fir (*Pseudotsuga menziesii*), red-osier dogwood (*Cornus sericea*), willow (*Salix spp.*), snowberry (*Symphoricarpos albus*), cattail (*Typha latifolia*), and scouring rush (*Equisetum hyemale*).

Located towards the southeast, approximately 15 m uphill from Winfield Creek, there is a slope seepage wetland. Vegetation here is predominantly cattails (*Typha latifolia*) and red-osier dogwood (*Cornus sericea*).

5.4.2 Fish and Aquatic Habitat

Winfield creek (watershed code 310-939400-46200) flows south to north along the east project boundary and discharges into Wood Lake approximately .5 km's from the subject property. Documented resident fish species of Winfield Creek include kokanee (*Oncorhynchus nerka*) and rainbow trout (*Oncorhynchus mykiss*). Located at the southeast corner of the study area there is evidence of beaver activity, and it has resulted in an obstruction to fish passage.

Winfield creek has an average bankfull width of 4.6 m and an average slope of 1%. In the terms of RAPR methodologies, Winfield Creek has been defined as being a 'riffle pool' channel. The creek had an average depth of .5 m and is known to support fish at all life stages (most likely juvenile rearing). The creek has a silty substrate and is densely covered in a canopy of tree and shrub vegetation. There is a history of beaver activity within the creek which causes occasional flooding and action from the local municipality and neighbouring properties.

As a result of the detailed RAPR assessment, a 14.1 m streamside protection and enhancement area (SPEA) will be applied to the protection of the identified waterbody in the project area.



5.5 **Wildlife, Wildlife Features & Movement Corridors**

The riparian fluvial fringe area (RI:ff) located in the east property boundary is a biologically diverse sensitive ecosystem that provides a movement corridor and habitat for a wide variety of mammals, herptiles, avian species and other wildlife.

Three bird species were identified using visual and auditory methods. Black-capped chickadee (*Poecile atricapillus*), pygmy nuthatch (*Sitta pygmaea*), and spotted towhee (*Pipilo maculatus*), as well as three inactive sticks nests (50.04831N, 119.40872W/ 50.04829N, 119.40877W/ 50.04831N, 119.40876W) and one inactive cavity nest (50.04846N, 119.40875W) were identified within the riparian area. Though no active nests were observed within the study area, it is still early in the season to observe nesting activities.

No other wildlife species were observed, however, suitable habitat and signs of wildlife such as an active denning site (photo 6), as well as dig sites, and potential hibernacula for small mammals, snakes and other species were observed throughout the riparian area.

5.6 **Environmentally Sensitive Areas**

Environmentally Sensitive Areas (ESAs) have been determined for the project area. The results are summarized below (refer to Figure 3).

Table 4: Determination of Environmentally Sensitive Areas

ESA Value	ESA Area (m²)	Percentage of Property (%)
High (ESA1)	3,362	33.4
Moderate (ESA2)	0	0
Low (ESA3)	0	0
Not Sensitive (ESA4)	6,717	66.6
Total ESAs	10,079	100

6.0 **Impact Assessment Analysis**

Following the assessment of this subject property and consideration of future proposed development on the site, OKGN has identified the following potential negative impacts to the environment that may occur below.

Temporary impacts:

- Noise, dust, and vibration impact during development to local wildlife
- Invasive weed establishment/propagation
- Spills/ release of deleterious substances to the ground
- Incidental wildlife encounters



Permanent impacts:

- Loss of high-value wildlife habitat and sensitive ecosystems
- Habitat fragmentation
- Loss of carbon sequestration from removal of native vegetation and topsoil

When the final design for the proposed development is complete, a more detailed impact assessment should be conducted.

7.0 Recommendations

The following recommendations are made based on the protection of the natural environment prior to and throughout future development activities:

- Treat the site for invasive weeds prior to stripping and removing topsoil to prevent transference of invasive weeds from this site elsewhere.
- Delineate the stream SPEA with a permanent visible protection measure (e.g., post and rail cedar fence, or planting hedge).
- Minimize loss of topsoil by re-using topsoil on the site for landscaping activities if possible.
- Prior to removing vegetation from the site (including stripping grass), during the migratory bird period (Mar 31 – Aug 15), a wildlife survey should be conducted to ensure that no wildlife are harmed during vegetation removal activities. If wildlife are identified as nesting/denning on the site during this survey, the qualified environmental professional will provide mitigation measures to avoid harm to the wildlife (e.g., buffer setbacks, relocation of wildlife, monitoring etc.)
- Control all stormwater on the site during development, any stormwater discharged from the site must meet local municipal and provincial surface water quality requirements.
- During site grading activities, identify soil stockpiles and manufactured slopes and protect against erosion and sedimentation by implementing silt fencing, straw waddles, temporary soil cover etc.
- Reduce noise and vibration by minimizing idling of equipment when not in use.
- Ensure spill containment and clean up materials are available on site to handle 110% potential spill event. Ensure material safety data sheets for all stored hazardous materials are available on the site.
- Reduce dust by watering the site post-stripping as necessary according to local conditions.



-
- Conduct environmental monitoring by a qualified environmental professional throughout the bulk of the civil construction phase of the project.
 - Retain as much of the wildlife corridor/ high environmental sensitive value areas, tree snags as possible.

7.0 Closure

This environmental assessment was conducted to assess, inventory and map sensitive environmental areas in the project area.

We trust this report and accompanying figures meet your needs in this regard.

Please contact the undersigned with any inquiries.

Prepared By,

Rachel Pidduck, BiT
OKGN EHS Services Ltd.
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Submitted By,

Shannen Ivanitz, R.P. Bio.
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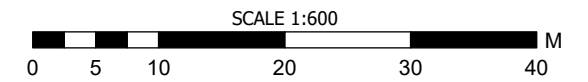
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APPENDIX I - FIGURES

Legend

- - - Project Area (10,079m²)
- Stream
- = = Road
- Species and Ecosystems at Risk
- American Badger
- Sensitive Ecosystem Inventory
- NA,UR
- RI:ff,DM
- Critical Habitat
- American Badger jeffersonii subspecies
- Great Basin Gophersnake
- North Central Okanagan Connectivity
- Connectivity barrier
- High



Environmental Features Map

PROJECT: 11375 Woodsdale Crt
 CLIENT: Westrich Pacific
 CONSULTANT: Okanagan EHS Services Ltd.

DATE: February 26 2023
 FILE NAME: 11375_Woodsdale_Crt.aprx
 COORDINATE SYSTEM: NAD 83 UTM Zone 11N

Approved By:



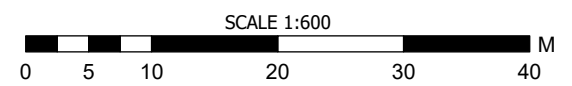
Source Data provided by OKGN EHS Services, ESRI, DataBC. The data used in these maps does not originate from legally recorded surveys. It is part of a GIS database system which may contain errors and/or omissions and is subject to change, therefore accuracy cannot be guaranteed.





Legend

- Project Area (10,079m²)
- ESA-2 Moderate (3,362m²)
- ESA-4 Not Sensitive (6,717m²)
- Est SPEA (14.1m)
- Stream
- Road



Environmental Sensitive Areas Map

PROJECT: 11375 Woodsdale Crt
 CLIENT: Westrich Pacific
 CONSULTANT: Okanagan EHS Services Ltd.

DATE: April 10 2023
 FILE NAME: 11375_Woodsdale_Crt.aprx
 COORDINATE SYSTEM: NAD 83 UTM Zone 11N

Approved By:



Source Data provided by OKGN EHS Services, ESRI, DataBC. The data used in these maps does not originate from legally recorded surveys. It is part of a GIS database system which may contain errors and/or omissions and is subject to change, therefore accuracy cannot be guaranteed.



APPENDIX II – SITE PHOTOS

Picture 1 Winfield Creek. North aspect.



Picture 2 Inactive stick nest.



Picture 3 Inactive nest.



Picture 4 Wildlife tree with inactive cavities.



Picture 5 Active denning site.



Picture 6 Densely vegetated riparian fluvial fringe sensitive ecosystem.



Picture 7 View of northeast portion of study area with riparian area in the background.



Picture 8 View of southwest corner of property from Woodsdale Court.



Picture 9 View of anthropogenically altered side yard to the south. West aspect.



Picture 10 Southwest corner of property adjacent to Woodsdale Court. East aspect.



Picture 11 Yard debris, fencing, and deconstructed greenhouse located to the south of project boundary.



Picture 12 View of the southeast project boundary. West aspect.



Picture 13 Seepage slope wetland located in the southeast corner of study area.



Riparian Areas Protection Regulation: Assessment Report

Please refer to submission instructions and assessment report guidelines when completing this report.

Date

I. Primary QEP Information

First Name	Shannen		Middle Name	
Last Name	Ivanitz			
Designation	R.P. Bio		Company	Okanagan Environmental
Registration #	3086		Email	shannen@okanaganehs.com
Address	7-2070 Harvey Ave			
City	Kelowna	Postal/Z	V1Y 8P8	Phone # 250 864 5831
		ip		
Prov/state	BC	Country	CAD	

III. Developer Information

First Name	Richie		Middle Name	
Last Name	Lam			
Company	Westrich Management Ltd.			
Phone #	780-438-8872		Email	rlam@westrichpacific.com
Address	10309 102 ave			
City	Edmonton	Postal/Zip	T5J 0L1	
Prov/state	Alberta	Country	Canada	

IV. Development Information

Development Type	Multi-family high density		
Area of Development (ha)	0.67	Riparian Length (m)	120
Lot Area (ha)	1.0079	Nature of Development	New
Proposed Start Date	March 1, 2024	Proposed End Date	March 1, 2025

V. Location of Proposed Development

Street Address (or nearest town)	11375 Woodsdale Court		
Local Government	District of Lake Country	City	Lake Country
Stream Name	Winfield Creek		
Legal Description (PID)	007-844-948	Region	Okanagan
Stream/River Type	Stream	DFO Area	Okanagan
Watershed Code	310-939400-46200		
Latitude	50	02	53
Longitude	119	24	31

Completion of Database Information includes the Form 2 for the Additional QEPs, if needed.
Insert that form immediately after this page.

SCHEDULE _____

This forms part of development

Permit #

Date

Signature

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Section 1. Description of Fisheries Resources Values and a Description of the Development proposal

Description of Proposed Development

The subject property is undergoing rezoning to future apartment rental housing units. A final design has been proposed for the development area that involves an apartment building, driveway, and parking area.

SPEA enhancement is recommended for this project. The SPEA is currently in poor condition with broken branches and limbs from rot of the pacific willow trees that occur within the SPEA, (also creating a fire hazard). There are also rows of Colorado spruce trees that have been planted within and just outside of the SPEA, so closely together that no other native species can go and they are contributing little to no ecological value to the riparian ecosystem. It is our recommendation that these trees be thinned extensively to allow light filtering and room for native species to establish.

Once the SPEA enhancement has occurred, planting of native shrubs could be considered, but our opinion is that it should regenerate naturally with little issue. Additional plantings could be considered during the post-development three-year monitoring period.

Description of Fisheries Resource Values

Winfield Creek is located in Lake Country, BC. The British Columbia (BC) single water body query states that the kokanee (*Oncorhynchus nerka*) and rainbow trout (*Oncorhynchus mykiss*) species are present (1995). There were few areas identified containing pools or other valuable features for spawning habitat.

The creek originates from surface run off on the East side of Lake Country, as well as collects urban storm water and is highly modified. Winfield Creek discharges into Wood Lake and is approximately 2 km in length.

The section of Winfield Creek within the study area is approximately 120 meters in length and flows South to North. The creek is located parallel to the East property boundary of the study area. The average channel width was assessed to be 4.7 meters and an average flow rate of 3 meters per second.

The east side of Winfield Creek has recently (within past 2 years) been ecologically restored. Various native plant species including red osier dogwood (*Cornus sericea*), willow species (*Salix spp.*), mock-orange (*Philadelphus lewisii*), rose (*Rosa spp.*), and common snowberry (*Symphoricarpos albus*) have been planted along this section of the creek to the West. Vegetation along the section of the creek to the East, contained within the study area, is very dense and consist predominantly of red osier dogwood (*Cornus sericea*). Other plants species identified include willow (*Salix spp.*), water birch (*Betula occidentalis*), Douglas maple (*Acer glabrum*), and skunk cabbage (*Symplocarpus foetidus*). Ground cover consisted mainly of grasses and cattail (*Typha latifolia*) and weedy species such as great burdock (*Arctium lappa*). A full plant inventory was not possible do to the seasonal timing of the assessment.

2. Results of Detailed Riparian Assessment

Refer to Section 3 of Technical Manual

Date: March 28, 2023

Description of Water bodies involved (number, type)	1
Stream	1
Wetland	
Lake	
Ditch	
Number of reaches	1
Reach #	1

Channel width and slope and Channel Type (use only if water body is a stream or a ditch, and only provide widths if a ditch)

	Channel Width(m)	Gradient (%)		
starting point	5.4		I, <u>Shannen Ivanitz</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u> c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the technical manual to the Riparian Areas Protection Regulation.	
upstream	6.3	1		
	5.6			
	4.4			
	5.1			
downstream	5.4			
	4	1		
	4.1			
	4.7			
	3.9			
	3.4			
Total: minus high /low mean	42.6			
	4.7	1		
	R/P	C/P		S/P
Channel Type	X			

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons		X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Shannen Ivanitz</u> , hereby certify that: a) I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i> ; b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u> ; c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and d) In carrying out my assessment of the development proposal, I have followed the technical manual to the Riparian Areas Protection Regulation.
Polygon No:	1		Method employed if other than TR N/A
SPVT Type	LC	SH	
			X

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	1	If two sides of a stream involved, each side is a separate segment. For all water bodies multiple segments occur where there are multiple SPVT polygons
LWD, Bank and Channel Stability ZOS (m)	14.1	
Litter fall and insect drop	14.1	

Attachment A - DP001085-Draft Permit
Form 3 Detailed Assessment Form
 Riparian Areas Protection Regulation - Qualified Environmental Professional - Assessment Report

	ZOS (m)	14.1	South bank	Yes		No	X
SPEA maximum	14.1	(For ditch use table3-7)					

I, Shannen Ivanitz, hereby certify that:

a) I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the *Riparian Areas Protection Act*;

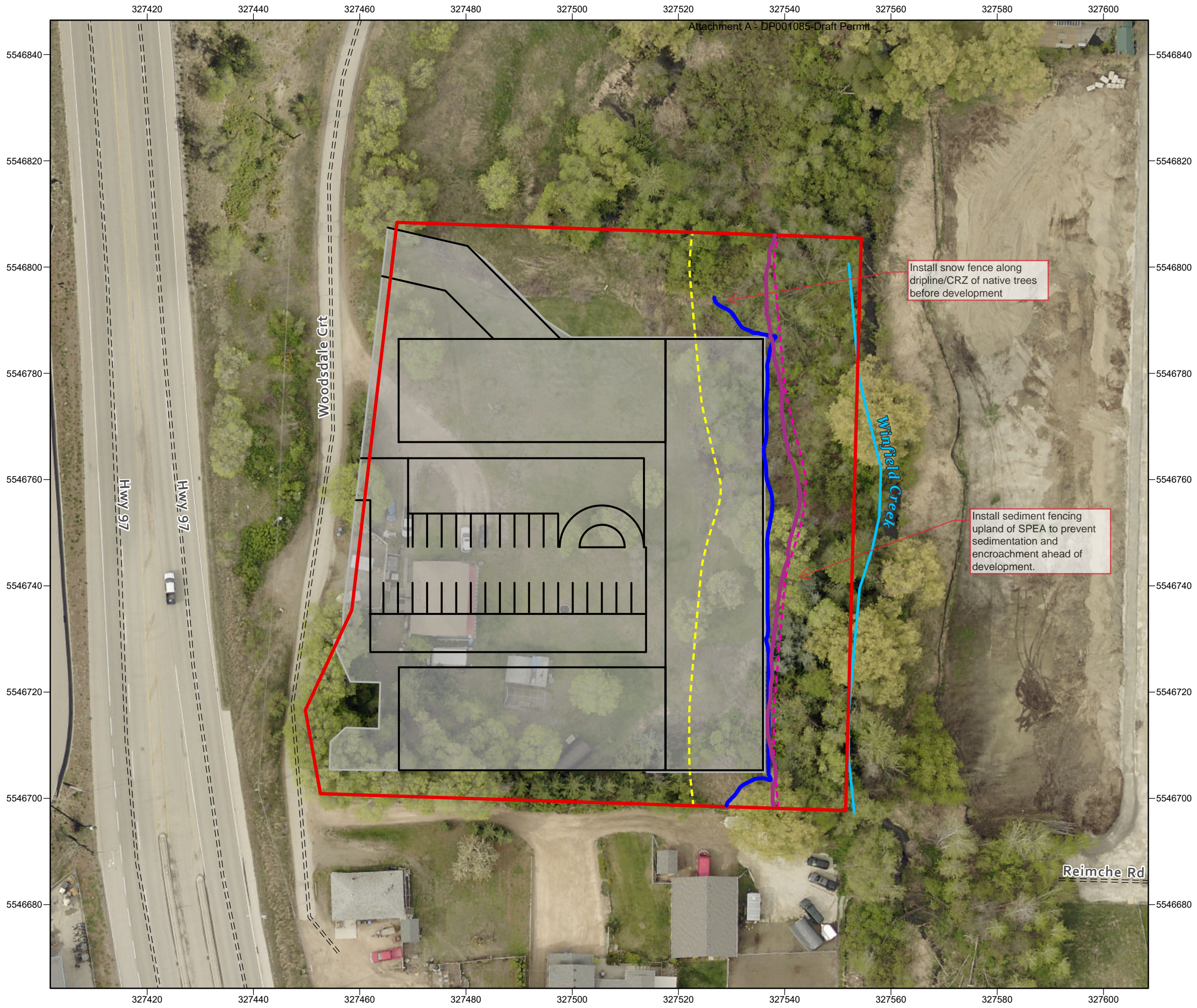
b) I am qualified to carry out this part of the assessment of the development proposal made by the developer Westrich Management Ltd.;

c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and

d) In carrying out my assessment of the development proposal, I have followed the technical manual to the Riparian Areas Protection Regulation.

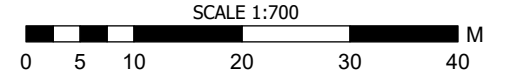
Comments

The reach is 120 meters in length is contained within a heavily vegetated, relatively flat riparian area. The midpoint of the 11 width measurements used to determine the average channel width (4.7 meters) was taken approximately 60 meters North of the South property line of study area.



Legend

- Project Area (10,077m²)
- Proposed Development Area (6,747m²)
- SPEA/LWD/LF/Shade ZOS (14.1m)
- RAA (30m)
- Stream
- Building, Parking Area, Driveway Access
- Road

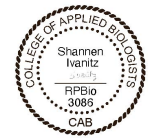


RAPR Site Plan

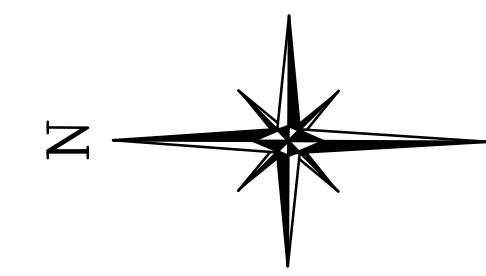
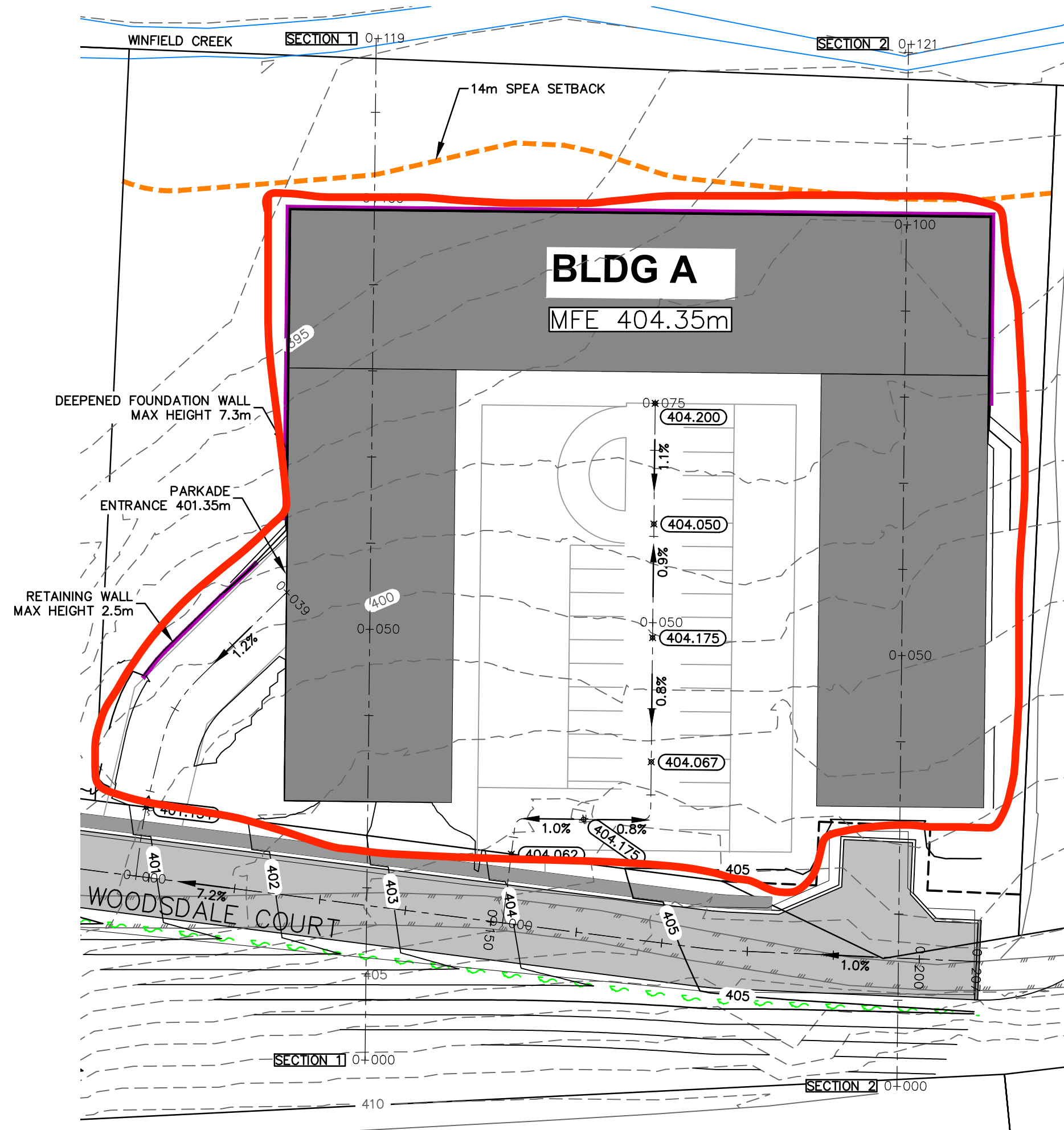
PROJECT: 11375 Woodsdale Crt
 CLIENT: Westrich Pacific
 CONSULTANT: Okanagan EHS Services Ltd.

DATE: January 6 2024
 FILE NAME: 11375_Woodsdale_Crt.aprx
 COORDINATE SYSTEM: NAD 83 UTM Zone 11N

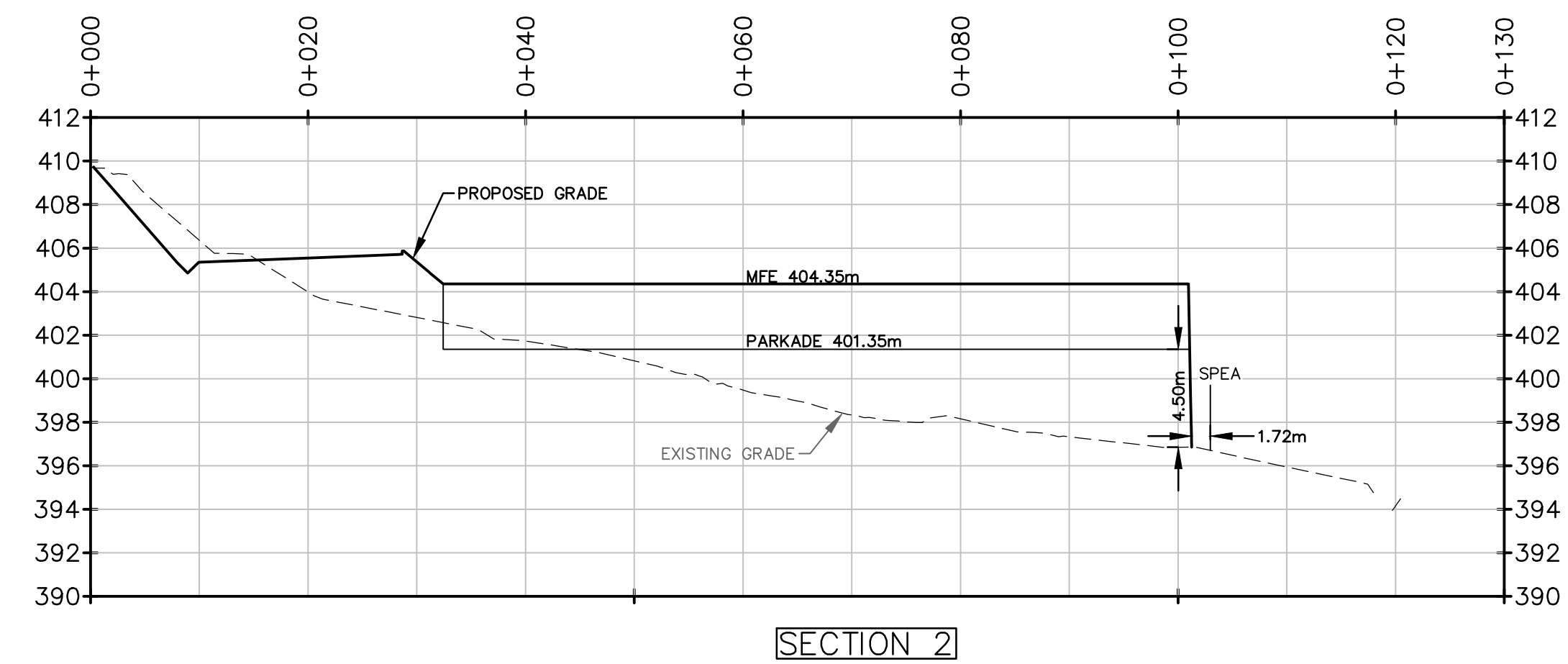
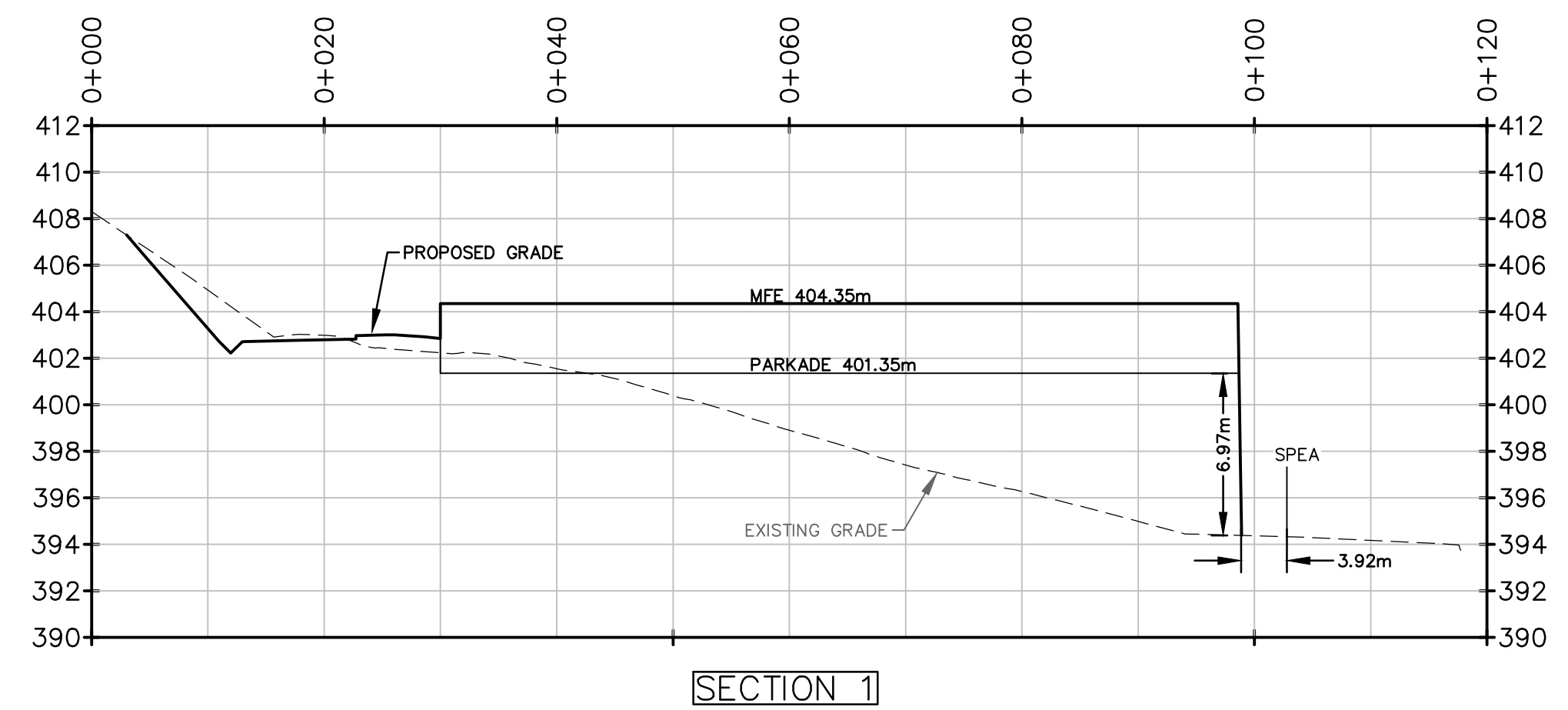
Approved By:



Source Data provided by OKGN EHS Services, ESRI, DataBC, Protech Consulting. The data used in these maps does not originate from legally recorded surveys. It is part of a GIS database system which may contain errors and/or omissions and is subject to change, therefor accuracy cannot be guaranteed.



LEGEND	
—	PROPOSED CONTOURS (0.25m INTERVALS)
— 485.0 —	FINISHED GROUND CONTOUR ELEVATION
(84.71) *	FINISHED GROUND SPOT ELEVATION
- - - -	EXISTING CONTOURS (0.25m INTERVALS)
- - - 485 - - -	EXISTING GROUND CONTOUR ELEVATION
↘ 2.0%	PROPOSED SLOPE (POINTING DOWNHILL)



PRELIMINARY

NOT FOR CONSTRUCTION

LEGEND	
WATER	EX. MANHOLE ○ MH #
SAN. SEWER	PROP. MANHOLE ● MH #
STORM SEWER	POWER POLE ● P.P.
GAS	LAMP STANDARD □ L.S.
U/G UTILITY (ALIGNMENT)	CATCH BASIN □ C.B.
	HYDRANT ⊕ HD
	SURVEY MONUMENT ⊙
	WATER CURB STOP ●
	SANITARY INSPECTION CHAMBER ○
	STORM INSPECTION CHAMBER □
	TRANSFORMER - POWER □
	SERVICE BOX □

PROTECH CONSULTING
 300 - 3275 Lakeshore Rd Kelowna B.C. Phone 860-1771
 PERMIT TO PRACTICE NO.: 1001403

NO.	DATE	BY	REVISION	CH'KD
1	2023.12.19	BDK	ISSUED FOR COORDINATION	DTP

DRAWN	BDK
DESIGN	DTP
APPROVED	
DATE	MARCH 2023
SCALE	
HORIZ.	1:500
VERT.	1:250

DISTRICT OF LAKE COUNTRY DIVISION

11375 WOODSDALE COURT
 PRELIMINARY GRADING PLAN

DRAWING NO. 23005-P02 REV. NO. 1

FILE LOCATION: \\s:\projects\23005\23005_P02.dwg - Name: 11375 Wooddale Court.dwg - Date: 12/19/23 - Production Sheet: 1 of 2 - Preliminary Grading: 02.dwg

Section 4. Measures to Protect and Maintain the SPEA

This section is required for detailed assessments. Attach text or document files, as need, for each element discussed in Part 4 of the RAPR. It is suggested that documents be converted to PDF *before* inserting into the assessment report. Use your “return” button on your keyboard after each line. You must address and sign off each measure. If a specific measure is not being recommended a justification must be provided.

1. Danger Trees	No danger trees were observed within the RAA. A few Pacific Willow with branch rot and associated broken/downed limbs were observed within the SPEA. It is recommended that dry, dead wood be removed from the SPEA and rotting limbs be removed proactively by an arborist to promote undergrowth of native plant species.
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a) I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u></p> <p>c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister’s technical manual to the Riparian Areas Protection Regulation.</p>	
2. Windthrow	No windthrow was observed within the RAA.
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u>;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister’s technical manual to the Riparian Areas Protection Regulation.</p>	
3. Slope Stability	No concerns regarding slope stability were observed within the RAA.
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u>;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister’s technical manual to the Riparian Areas Protection Regulation.</p>	
4. Protection of Trees	Native trees within the SPEA will be protected by snow fencing established at the dripline (critical root zone) of the canopy of the trees. Signage will be implemented to indicate ‘tree protection zone’ to contractors ahead of and during development activities. Invasive trees (e.g., elm species) should be removed to promote native plant growth/establishment.
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u>;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister’s technical manual to the Riparian Areas Protection Regulation.</p>	
5. Encroachment	Sediment fencing will be installed upland of the SPEA boundary, and a kick-off meeting held to communicate the importance of protecting the SPEA boundary during development activities. Permanent cedar post and rail fencing should be installed upland of the SPEA boundary to prevent future encroachment, post-development activity.

Attachment A - DP001085-Draft Permit
FORM 1

Riparian Areas Protection Regulation - Qualified Environmental Professional - Assessment Report

<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u>;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister's technical manual to the Riparian Areas Protection Regulation.</p>	
<p>6. Sediment and Erosion Control</p>	<p>The site is moderately sloped towards the stream. Soil stripping should be minimized to dry season (July-August) to avoid erosion, or covered ahead of significant precipitation events (>10mm/24hr) to prevent erosion. Sediment fencing should be installed upland of the SPEA boundary ahead of development activities.</p>
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u> ;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and in carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister's technical manual to the Riparian Areas Protection Regulation.</p>	
<p>7. Stormwater Management</p>	<p>Stormwater is not permitted to enter the SPEA. Stormwater will be managed upland of the SPEA during development. In significant precipitation events, construction will be halted to minimize turbidity in stormwater and stormwater will be discharged upland of the project area, >50m from the stream. A stormwater management plan is being designed by a professional engineer to tie into the existing woodsdale court municipal stormwater utility.</p>
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u>;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister's technical manual to the Riparian Areas Protection Regulation.</p>	
<p>8. Floodplain Concerns (highly mobile channel)</p>	<p>The stream channel is not considered highly mobile. The headwaters are groundwater fed and no evidence of flooding within the RAA was observed.</p>
<p>I, <u>Shannen Ivanitz</u>, hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Protection Regulation made under the <i>Riparian Areas Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Westrich Management Ltd.</u> ;</p> <p>c. I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Minister's technical manual to the Riparian Areas Protection Regulation.</p>	

Section 5. Environmental Monitoring

Environmental monitoring will occur on the following intervals:

1. Pre-development activity: to meet with proponent and contractors to review SPEA protection measures and ensure implementation of these measures.
2. Monthly during active civil earthworks: to monitor effectiveness of SPEA protection measures.
3. Following significant precipitation events and spring runoff/snow melt events (>10mm/24 hr): ahead of forecasted and following precipitation events to monitor effectiveness of SPEA protection measures.
4. Pre-restoration/enhancement activity: to discuss/review restoration plans with proponent/contractors.
5. Post-restoration activity: to ensure compliance with restoration plans.
6. Annually for 3-years post- restoration activity: to ensure success of restoration plan and mitigation of invasive/noxious weeds.

Section 6. Photos

Photo 1 Riparian habitat from center of proposed development area. Aspect east.



Photo 2 Condition of SPEA immediately adjacent to Winfield Creek. Aspect north.



Section 7. Professional Opinion

Qualified Environmental Professional opinion on the development proposal's riparian assessment.

Date

1. I/We, Shannen Ivanitz

Please list name(s) of qualified environmental professional(s) and their professional designation that are involved in assessment.)

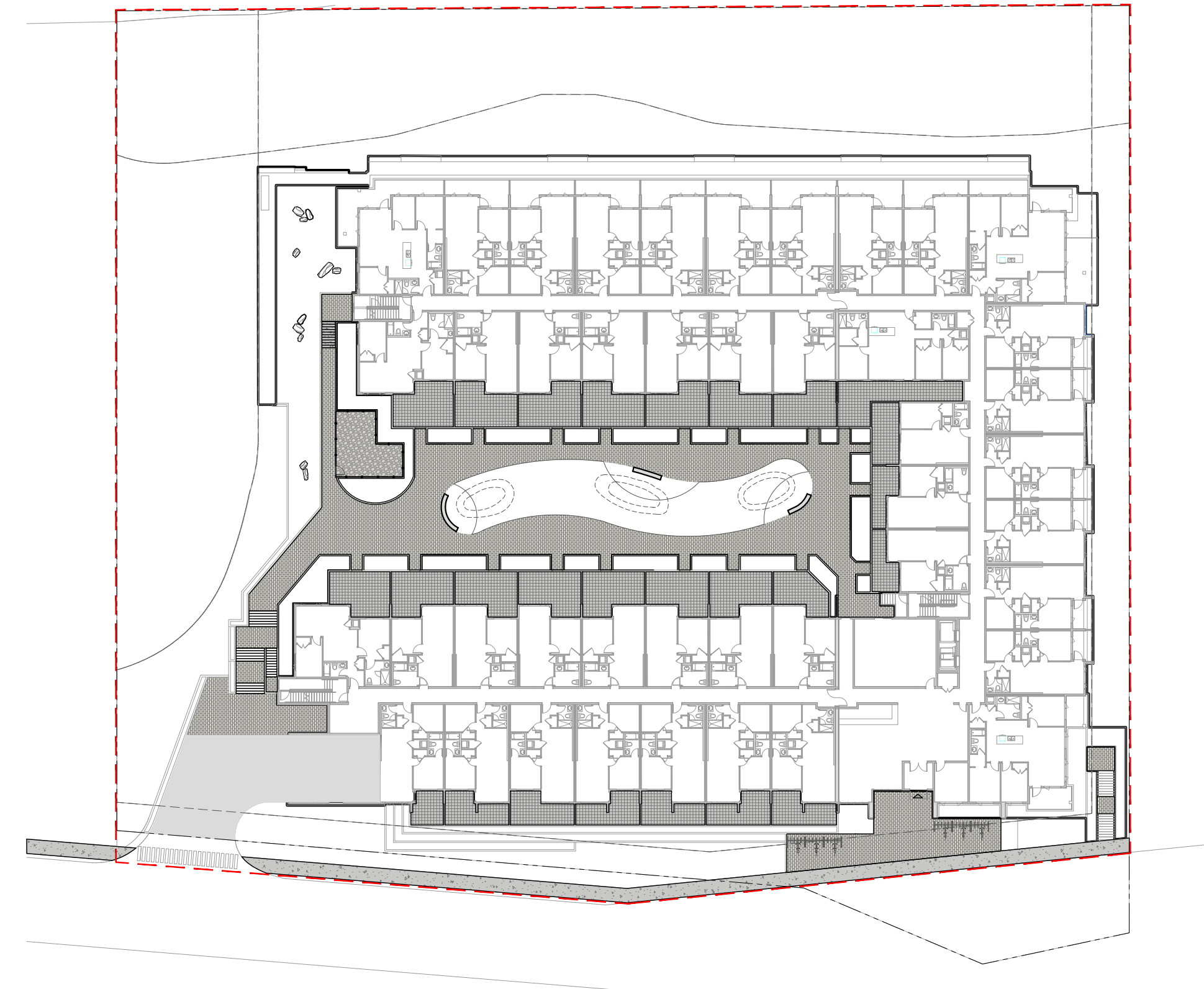
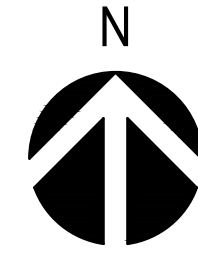
hereby certify that:

- a) I am/We are qualified environmental professional(s), as defined in the Riparian Areas Protection Regulation made under the *Riparian Areas Protection Act*;
- b) I am/We are qualified to carry out the assessment of the proposal made by the developer Westrich Management Ltd., which proposal is described in section 3 of this Assessment Report (the "development proposal"),
- c) I have/We have carried out an assessment of the development proposal and my/our assessment is set out in this Assessment Report; and
- d) In carrying out my/our assessment of the development proposal, I have/We have followed the specifications of the Riparian Areas Protection Regulation and assessment methodology set out in the minister's manual; AND

2. As qualified environmental professional(s), I/we hereby provide my/our professional opinion that:

- a) the site of the proposed development is subject to undue hardship, (if **applicable, indicate N/A otherwise**) and
- b) the proposed development will meet the **riparian protection standard** if the development proceeds as proposed in the report and complies with the measures, if any, recommended in the report.

[NOTE: "Qualified Environmental Professional" means an individual as described in section 21 of the Riparian Areas Protection Regulation.]



WOODSDALE MULTIFAMILY

11375 Woodsdale Court
Lake Country, British Columbia

ISSUED FOR DEVELOPMENT PERMIT

WSP Project No: CA0035266.7542
Date: December 23rd, 2025

DRAWING SHEET NO.
L100
L101
L300
L301

DRAWING NAME
LANDSCAPE PLAN
LANDSCAPE PLAN - LEVEL 6 ROOF TOP
DETAILED PLANTING PLAN
DETAILED PLANTING PLAN - LEVEL 6 ROOF TOP

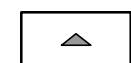
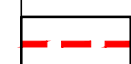
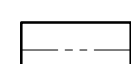
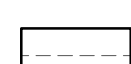
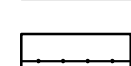
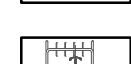
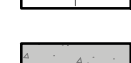
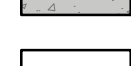





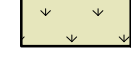

SCHEDULE _____
This forms part of development
Permit #
Date
Signature

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





LEGEND

-  BUILDING ENTRY
-  LIMIT OF WORK
-  PROPERTY LINE
-  SETBACK LINE
-  1.5M CHAINLINK FENCE W/GATE
-  BICYCLE RACK
-  C.I.P. CONCRETE PAVING w/ SAWCUTS
-  C.I.P. CONCRETE SEAT WALL
-  CONCRETE UNIT PAVERS TYPE 1
-  CONCRETE UNIT PAVERS TYPE 2
-  CRUSHED AGGREGATE
-  LAWN
-  RIPARIAN SEED MIX
-  ORNAMENTAL PLANTING
-  PROPOSED TREE

DEVELOPMENT PERMIT NOTES:

1. PLANT MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO MINIMUM STANDARDS ESTABLISHED IN THE CANADIAN LANDSCAPE STANDARD (CURRENT EDITION).
2. THE LANDSCAPE DESIGN DESIGNATED HEREIN IS CONCEPTUAL BUT REFLECTS THE MINIMUM ACCEPTABLE QUALITY AND SIZE.
3. PLANT MATERIAL SELECTIONS ARE CONCEPTUAL ONLY. FINAL PLANTING SELECTIONS MAY VARY DEPENDING UPON AVAILABILITY.
4. ALL PLANTING BEDS SHALL HAVE APPROVED MULCH.
5. ALL LANDSCAPE AREAS TO BE IRRIGATED WITH AN EFFICIENT AUTOMATIC IRRIGATION SYSTEM.
6. THIS DRAWING DEPICTS FORM AND CHARACTER AND IS TO BE USED FOR DEVELOPMENT PERMIT SUBMISSION ONLY. IT IS TO BE INTENDED FOR USE AS A CONSTRUCTION DOCUMENT.
7. REFER TO ENVIRONMENTAL CONSULTANTS FOR ANY SPEA RESTORATION TREATMENT

REVISION:			
REV	DATE	DESCRIPTION	BY
1A	2025-12-23	ISSUED FOR DEVELOPMENT PERMIT	JP
0A	2025-02-10	ISSUED FOR REZONING	SS

DISCLAIMER: THIS DRAWING AND DESIGN IS COPYRIGHT PROTECTED WHICH SHALL NOT BE USED, REPRODUCED OR REVISED WITHOUT WRITTEN PERMISSION BY WSP. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND UTILITY LOCATIONS AND REPORT ALL ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.

ORIGINAL SCALE: _____ DATE: _____

APPROVED BY: _____

CHECKED BY: _____

DRAWN BY (OPTIONAL): _____

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

25mm

DISCIPLINE: _____

wsp

WSP Canada Inc.
Suite 700, 1631 Dickson Avenue, Kelowna, B.C. V1Y 0B5
T 250-880-5500 | www.wsp.com

PROJECT NUMBER: CA00352667542

CLIENT: **WESTRICH**

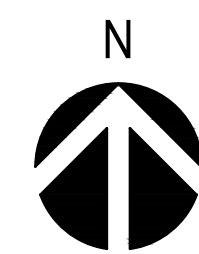
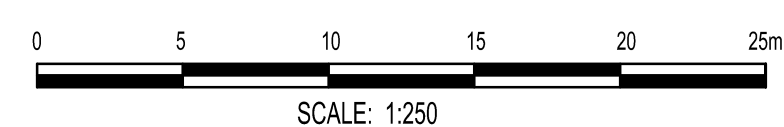
CLIENT REF. #: --

PROJECT: **WOODSDALE - MULTIFAMILY**
11375 WOODSDALE CT, LAKE COUNTRY, BC

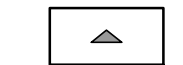



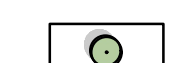
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DRAWING NUMBER: **L100** | REV: **1A**

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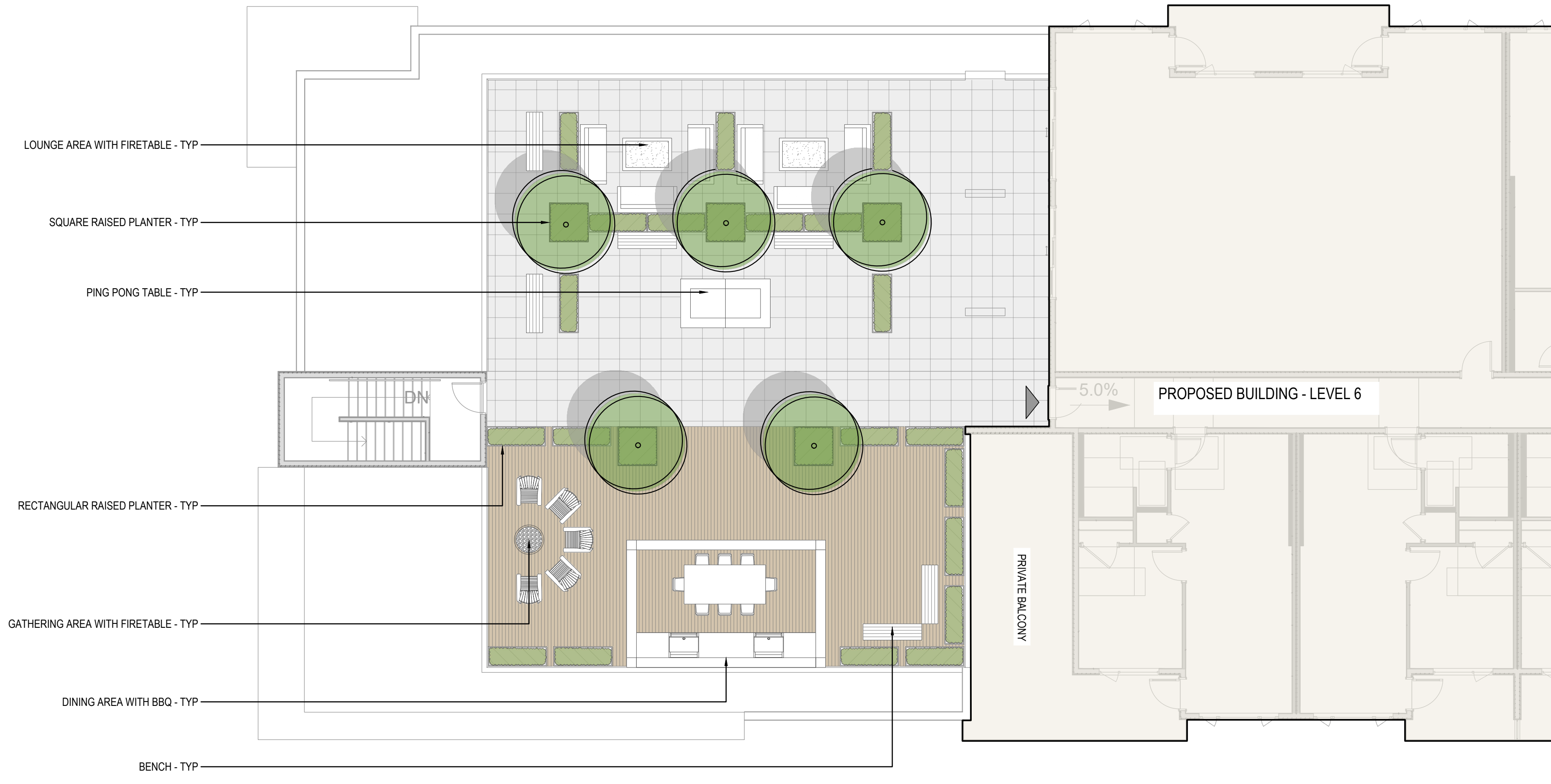


LEGEND

-  BUILDING ENTRY
-  DECK
-  CONCRETE UNIT PAVERS TYPE 1
-  ORNAMENTAL PLANTING
-  PROPOSED TREE

DEVELOPMENT PERMIT NOTES:

1. PLANT MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO MINIMUM STANDARDS ESTABLISHED IN THE CANADIAN LANDSCAPE STANDARD (CURRENT EDITION).
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LOUNGE AREA WITH FIRETABLE - TYP

SQUARE RAISED PLANTER - TYP

PING PONG TABLE - TYP

RECTANGULAR RAISED PLANTER - TYP

GATHERING AREA WITH FIRE TABLE - TYP

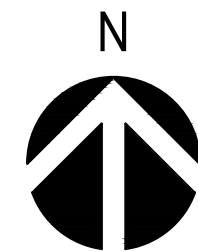
DINING AREA WITH BBQ - TYP

BENCH - TYP

5.0% PROPOSED BUILDING - LEVEL 6

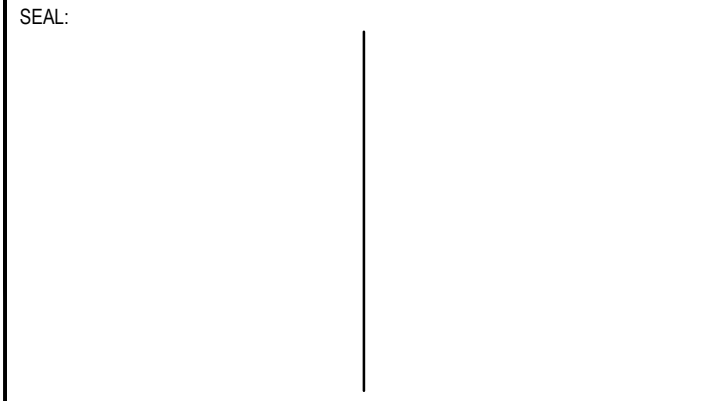
PRIVATE BALCONY

DN




REVISION:

REV	DATE	DESCRIPTION	BY
1A	2025-12-23	ISSUED FOR DEVELOPMENT PERMIT	JP
0A	2025-02-10	ISSUED FOR REZONING	SS



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ORIGINAL SCALE:	DATE:
APPROVED BY:	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
CHECKED BY:	
DRAWN BY (OPTIONAL):	



DISCIPLINE:



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 T 250-980-5500 | www.wsp.com

PROJECT NUMBER: CA00352667542

CLIENT:

WESTRICH



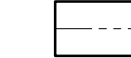
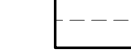

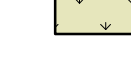

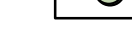
CLIENT REF. # --

PROJECT:
WOODSDALE - MULTIFAMILY
 11375 WOODSDALE CT, LAKE COUNTRY, BC

TITLE:
**LANDSCAPE PLAN
 LEVEL 6**

DRAWING NUMBER: L101	REV. 1A
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LEGEND

-  BUILDING ENTRY
-  LIMIT OF WORK
-  PROPERTY LINE
-  SETBACK LINE
-  LAWN
-  RIPARIAN SEED MIX
-  ORNAMENTAL PLANTING
-  PROPOSED TREE

DEVELOPMENT PERMIT NOTES:

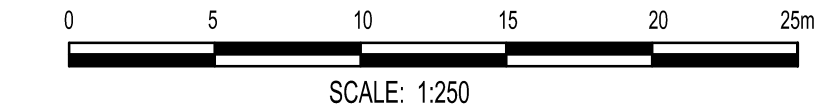
1. PLANT MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO MINIMUM STANDARDS ESTABLISHED IN THE CANADIAN LANDSCAPE STANDARD (CURRENT EDITION).
2. THE LANDSCAPE DESIGN DESIGNATED HEREIN IS CONCEPTUAL BUT REFLECTS THE MINIMUM ACCEPTABLE QUALITY AND SIZE.
3. PLANT MATERIAL SELECTIONS ARE CONCEPTUAL ONLY. FINAL PLANTING SELECTIONS MAY VARY DEPENDING UPON AVAILABILITY.
4. ALL PLANTING BEDS SHALL HAVE APPROVED MULCH.
5. ALL LANDSCAPE AREAS TO BE IRRIGATED WITH AN EFFICIENT AUTOMATIC IRRIGATION SYSTEM.
6. THIS DRAWING DEPICTS FORM AND CHARACTER AND IS TO BE USED FOR DEVELOPMENT PERMIT SUBMISSION ONLY. IT IS NOT INTENDED FOR USE AS A CONSTRUCTION DOCUMENT.
7. REFER TO ENVIRONMENTAL CONSULTANTS FOR ANY SPECIAL RESTORATION TREATMENT

PLANT LIST

SYMB.	QNTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	MATURE PLANT SIZE (H X W)
TREES						
AFJ	8	<i>Acer x freemanii</i> 'Jeffersred'	AUTUMN BLAZE MAPLE	60mm Cal.	B&B	15.00m x 12.00m
QPP	6	<i>Quercus palustris</i> 'Pringreen'	GREEN PILLAR OAK	50mm Cal.	B&B	3.00m x 15.00m
APA	1	<i>Acer palmatum</i> 'Aka Kawa Hime'	CORAL BARK MAPLE	60mm Cal.	B&B	2.70m x 1.80m
APS	17	<i>Acer palmatum</i> 'Sango Kaku'	CORAL BARK MAPLE	50mm Cal.	B&B	7.60m x 6.10m
CCA	3	<i>Cercis canadensis</i>	EASTERN REDBUD	50mm Cal.	B&B	9.10m x 10.70m
POP	5	<i>Populus tremuloides</i> 'NE Arb'	PRAIRIE GOLD ASPEN	60mm Cal.	B&B	12.00m x 3.00m
SRI	4	<i>Syringa reticulata</i> 'Ivory Silk'	IVORY SILK LILAC	50mm Cal.	B&B	7.60m x 6.10m
PERENNIALS / GRASSES						
adg	34	<i>Anuncis dioicis</i> 'Goat's Beard'	GOAT'S BEARD	#01	POTTED	1.80m x 1.20m
abv	138	<i>Astilbe</i> 'Bridal Veil'	ASTILBE 'BRIDAL VEIL'	#01	POTTED	0.90m x 0.60m
ckf	30	<i>Calamagrostis</i> 'Karl Foerster'	FEATHER REED GRASS	#02	POTTED	1.80m x 0.90m
cmv	37	<i>Carex morrowii</i> 'Variegata'	JAPANESE SEDGE 'VARIEGATA'	#01	POTTED	0.60m x 0.60m
cos	52	<i>Cornus sericea</i>	RED OSIER DOGWOOD	#02	POTTED	1.80m x 1.80m
csk	65	<i>Cornus sericea</i> 'Kelsey'	KELSEY DOGWOOD	#02	POTTED	0.90m x 0.90m
epm	73	<i>Echinacea purpurea</i> 'Magnus'	MAGNUS ECHINACEA	#01	POTTED	0.90m x 0.60m
hes	62	<i>Helictotrichon sempervirens</i>	BLUE OAT GRASS	#01	POTTED	0.90m x 0.60m
igg	228	<i>Ilex glabra</i> 'Gem Box'	INKBERRY GEM BOX	#01	POTTED	0.90m x 0.90m
juh	15	<i>Juniperus horizontalis</i>	CREeping JUNIPER	#02	POTTED	0.30m x 2.40m
nef	62	<i>Nepeta x faassenii</i> 'Junior Walker'	CATMINT 'JUNIOR WALKER'	#01	POTTED	0.60m x 0.90m
ner	47	<i>Nepeta racemosa</i> 'Walker's Low'	CATMINT 'WALKER'S LOW'	#01	POTTED	0.90m x 0.90m
pok	115	<i>Pennisetum orientale</i> 'Karley Rose'	ORIENTAL FOUNTAIN GRASS	#02	POTTED	0.90m x 0.90m
pea	27	<i>Perovskia atriplicifolia</i>	RUSSIAN SAGE	#02	POTTED	1.25m x 1.00m
nkw	26	<i>Rosa woodsii</i> 'Kimberley'	KIMBERLEY WILD ROSE	#01	POTTED	0.90m x 1.80m
saj	36	<i>Sedum alboroseum</i> 'Autumn Joy'	AUTUMN JOY STONECROP	#02	POTTED	0.60m x 0.60m
yfg	0	<i>Yucca filamentosa</i> 'Golden Sword'	GOLDEN SWORD YUCCA	#01	POTTED	0.60m x 0.60m

RIPARIAN SEED MIX:

- Slender wheatgrass - 40%
- Perennial rye - 25%
- Kentucky bluegrass - 15%
- Timothy - 10%
- Redtop - 5%
- Junegrass - 5%



REVISION:

REV	DATE	DESCRIPTION	BY
1A	2025-12-23	ISSUED FOR DEVELOPMENT PERMIT	JP
0A	2025-02-10	ISSUED FOR REZONING	SS

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APPROVED BY: _____ DATE: _____


CHECKED BY: _____

DRAWN BY (OPTIONAL): _____

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

25mm

DISCIPLINE: _____



WSP Canada Inc.
Suite 700, 1631 Dickson Avenue, Kelowna, B.C. V1Y 0B5
T 250-980-5500 | www.wsp.com

PROJECT NUMBER: CA00352667542

CLIENT: _____

CLIENT REF. #: _____

WESTRICH

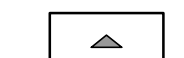




PROJECT: **WOODSDALE - MULTIFAMILY**
11375 WOODSDALE CT, LAKE COUNTRY, BC

TITLE: **LANDSCAPE PLAN**

DRAWING NUMBER: **L300** | REV. **1A**

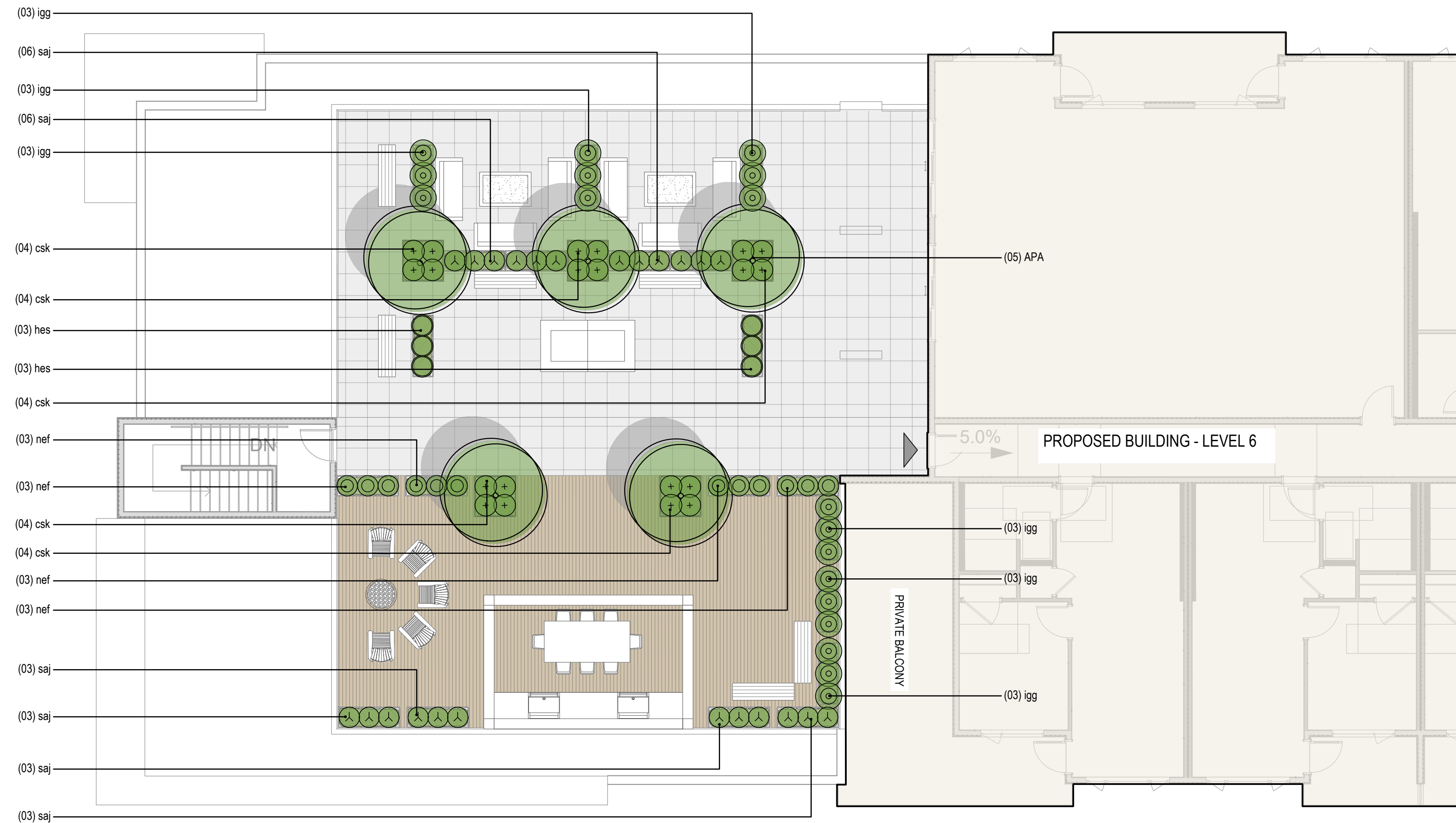
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LEGEND

-  BUILDING ENTRY
-  DECK
-  CONCRETE UNIT PAVERS TYPE 1
-  ORNAMENTAL PLANTING
-  PROPOSED TREE

DEVELOPMENT PERMIT NOTES:

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REVISION:			
REV	DATE	DESCRIPTION	BY
1A	2025-12-23	ISSUED FOR DEVELOPMENT PERMIT	JP
0A	2025-02-10	ISSUED FOR REZONING	SS

SEAL:

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ORIGINAL SCALE: _____ DATE: _____

APPROVED BY: _____


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

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PROJECT NUMBER: CA00352667542

CLIENT:

WESTRICH

CLIENT REF. #: --

PROJECT:

WOODSDALE - MULTIFAMILY

11375 WOODSDALE CT, LAKE COUNTRY, BC

TITLE:

PLANTING PLAN
LEVEL 6

DRAWING NUMBER: L301 | REV. 1A

PLANT LIST

SYMB.	QNTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	MATURE PLANT SIZE (H X W)
TREES						
APA	05	<i>Acer palmatum 'Aka Kawa Hime'</i>	CORAL BARK MAPLE	60mm Cal.	B&B	2.70m x 1.80m
PERRENIALS / GRASSES						
csk	20	<i>Cornus sericea 'Kelsey'</i>	KELSEY DOGWOOD	#02	POTTED	0.90m x 0.90m
hes	6	<i>Helictotrichon sempervirens</i>	BLUE OAT GRASS	#01	POTTED	0.90m x 0.60m
igg	18	<i>Ilex glabra 'Gem Box'</i>	INKBERRY GEM BOX	#01	POTTED	0.90m x 0.90m
nef	12	<i>Nepeta x faassenii 'Junior Walker'</i>	CATMINT 'JUNIOR WALKER'	#01	POTTED	0.60m x 0.90m
saj	24	<i>Sedum alboroseum 'Autumn Joy'</i>	AUTUMN JOY STONECROP	#02	POTTED	0.60m x 0.60m

