MUNICIPAL PLANNING COMMISSION AGENDA
SUMMER VILLAGE OF BIRCHCLIFF
SUMMER VILLAGES ADMINISTRATION OFFICE
OCTOBER 24, 2023 @ 9:00 a.m.

A. CALL TO ORDER

B. ADOPTION OF AGENDA

C. DEVELOPMENT ITEMS

1) 101 Birchcliff Road

D. ADJOURNMENT

Summer Village of Birchcliff – Municipal Planning Commission

Agenda Item

October 24, 2023

101 Birchcliff Road (Lot 3A, Block 2, Plan 8020413)

Development Permit Application

Background:

An application was submitted by the homeowner of 101 Birchcliff Road (Lot 3A, Block 2, Plan 8020413) in the Summer Village of Birchcliff for lakeside escarpment stabilization including block retaining walls, stairs and landscaping. This property is in the R1 District (Lakeshore Residential).

The development proposed will take place on the escarpment of the property. Currently there is a set of stairs and wood platforms leading down to the lake that encroach onto the neighbouring property, this will be removed and replaced with the proposed retaining walls and a new set of stone stairs. 14 trees will be removed from the escarpment to be replaced with native vegetation between the retaining walls and a no mow zone.

As previous applications have been brought forward to MPC for this stabilization work unsuccessfully, administration met with the homeowners and engineers to discuss options on site. We discussed the municipality's expectations when this type of development takes place. While remedial actions are required for the bank, the development being proposed still must be completed in accordance with the Land Use Bylaw regulations, and then adhere to village's desire that these types of developments are completed in the least impactful way, with minimal wall heights and as much vegetation as possible planted after the walls are installed.

The original plan discussed was a roughly 5.5m (18-20 ft) wall as the escarpment is quite steep. Administration expressed that the desire is to keep walls under 2m (6.5 ft) if at all possible. In order to accommodate this, the plan before the MPC today was created. This includes the regrading of the property which will allow for two 6 ft retaining walls, a now mow zone above the shoreline and many plantings of native trees and vegetation between both retaining walls. The block retaining walls and stone stairs along with the added vegetation will achieve the stability required while keeping the bank as natural looking as possible.

The new grade and retaining wall design is to minimize the height requirements for the stabilizing walls. In order to achieve this, a roughly 4 ft wall will need to be constructed on the south property line and a roughly 6 ft wall constructed on the north property line. The north wall does have a small section that will need to be 10 ft. Additional plantings

and trees are proposed in this spot to minimize the visual impact. No provincial approvals are required for the development.

Discussion:

This application is before MPC for the following reasons:

- (LUB, Part Four, Discretionary Uses) Mechanized Excavation, Stripping and Grading is listed as a discretionary use; therefore, the decision must come from the Municipal Planning Commission.
- (LUB, Part Three, 4(5)b(v)) Land located below the top of bank/top of escarpment should be in a natural state, a variance is required.

Recommendation:

After reviewing the application and all relevant planning documents, it is the recommendation of administration to approve the application for the escarpment development. The Municipal Development Plan 6.3.4 states “Birchcliff recognizes that remedial actions may be necessary from time to time, the village strongly desires that banks abutting the shoreline remain as natural as possible to retain natural ecosystems.” Shoreline and bank measures appear necessary according to the geotechnical report in order to retain the bank and ensure the house remains stable.

Adjacent landowners have been notified and no response has been received.

Conditions:

If approved, Administration would recommend the following conditions:

- Irrevocable Letter of Credit value of one hundred fifty percent (150%) of the estimated cost of the proposed landscaping to ensure that the landscaping is carried out with reasonable diligence (in accordance with the approved landscaping plan)
- Deep rooted vegetation to be planted according to the landscaping plan and wherever possible around the retaining wall structure. This includes the amount of plantings as stated in the landscaping plan.
- The following site inspections by a qualified structural engineer are to be completed:
    - Bearing inspection must be conducted on the original subgrade below the gravel base pad.
    - Progress inspection (during construction)
    - Inspections to verify stability of excavation (if required)
    - Final inspection of completion

  Confirmation of these inspections shall be submitted to administration once completed.
- To meet Alberta Building Code, a guard rail as reflected in the drawings shall be properly attached to the block units.

- As reflected in the engineer report, a perforated lateral drainage pipe is to be placed within the drainage rock, behind the wall system. The drainage pipe is to be ported 18' O/C laterally.
- Grading of the site is to be about 2% in landscaped areas and 0.5% in paved or concrete areas to direct drainage away from the top and bottom of the wall system or is to be controlled by a grass or concrete swale system.

Authorities:

For a discretionary use in any district:

- The Municipal Planning Commission may approve an application for a Development Permit:
  - With or without conditions;
  - Based on the merits of the proposed development, including it's relationship to any approved statutory plan, non-statutory plan, or approved policy, affecting the site;
  - Where the proposed development conforms in every respect to this Land Use Bylaw; or
- May refuse an application for a development permit based on the merits of the proposed development, even though it meets the requirements of the Land Use Bylaw; or
- Subject to provisions of section 2.4 (2), the Municipal Planning Commission shall refuse an application for a development permit if the proposed development does not conform in every respect to the Land Use Bylaw.

The MPC may:

- Grant a variance to reduce the requirements of any use of the LUB and that use will be deemed to comply with LUB.
- Approve application even though the proposed development does not comply or is a non-conforming building if:
  - It would not unduly interfere with the amenities of the neighborhood, or
  - Materially interfere with or affect the use, enjoyment, or value of neighboring parcels of land, And
  - It conforms with the use prescribed for that land or building in the bylaw.
- Consider a Variance only where warranted by the merits or the proposed development and in response to irregular lot lines, parcel shapes or site characteristics which create difficulties in siting structures within the required setback or in meeting the usual bylaw requirements, except there shall be no variance for Parcel Coverage or Building Height.

Decision:

In order to retain transparency of the Commission, Administration recommends one of the following:

1. Approve the application with or without conditions *(Section 642 of the MGA),* or
2. Deny the application stating reasons why *(Section 642(4) of the MGA).*

Letter Of Intent. August 10,2023

Our intention is to remove the existing stair case down to the lakeshore, and replace with new retaining walls and staircase to stabilize the lakeshore.

Thank you

[redacted]

Neighbouring Slopes . August 10,2023

The work being performed on the bank at 101 Birchcliff Road will not affect the neighbouring slopes. Side retaining walls will be installed to ensure the work done to the bank will not affect either neighbour. Side retaining walls are designed to hold the land back from going to the side as well as the main retaining walls holding the land back from the lake.

Thank you

[redacted]

Statement of existing and proposed uses. August 10,2023

We are currently using the existing structures and land as our access to lakefront and docking.

Development to take place will also be for access to lakefront and docking, as well as to shore up the cliff at the lakeshore to prevent further erosion of land.

Thank you

[redacted]

Statement Tree Removal. August 10,2023

14 Trees must be removed from the bank area as indicated on drawings. They must be removed to complete the stabilization of the bank. Most trees along existing bank have there roots showing as the erosion has happened. New planting tier to be installed as noted on plans with native vegetation planted on the length of the wall, New native trees and plants to be planted on the top level as noted on plans . No other trees to be effected during construction of retaining wall and stairs.

Thank you

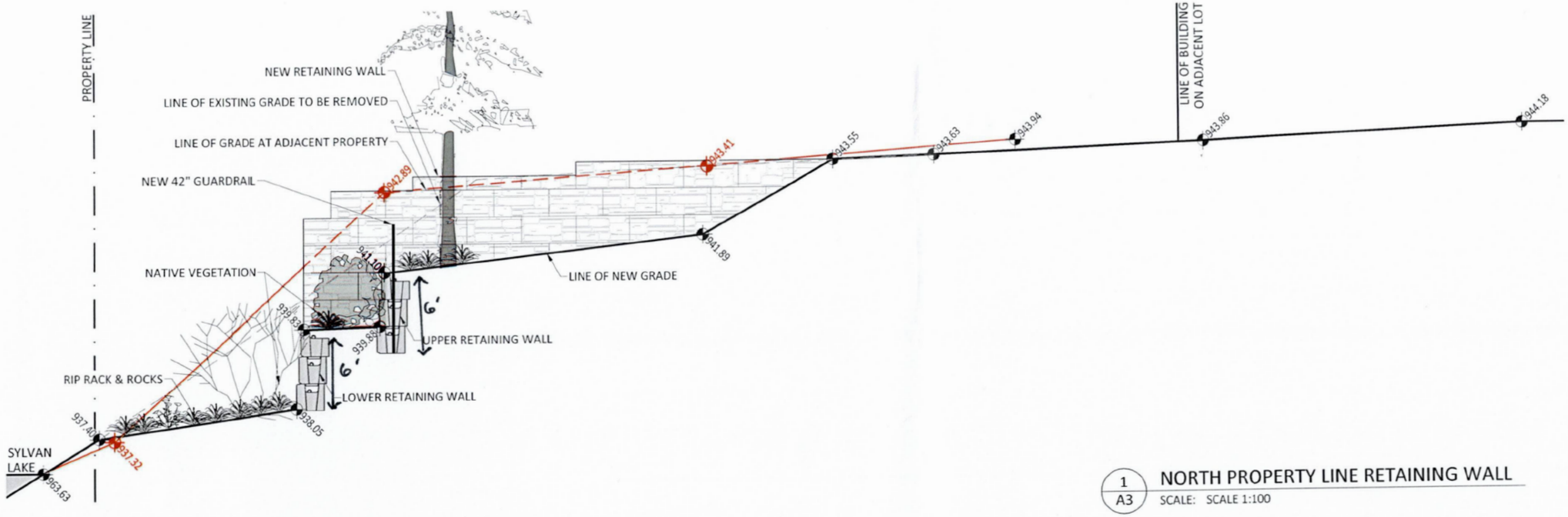
[redacted]

Proposed Development for demolition August 10,2023

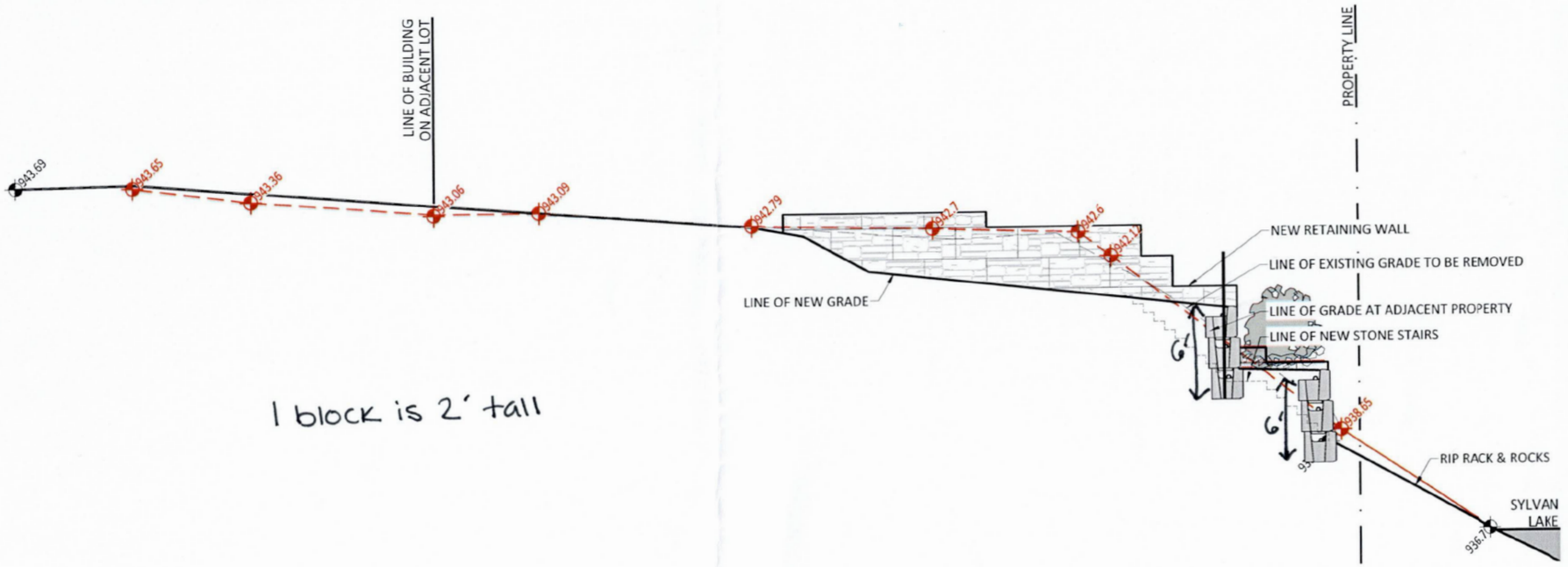
Demolition of existing stair structure will be required. The operation will be carried out in the Fall/winter months when many people are not occupying there summer cabins. Existing wood will be hauled away and disposed of as required. Land will be reclaimed as per engineered drawings with new block wall and stair case installed.

Thank you

[redacted]



1 / A3 NORTH PROPERTY LINE RETAINING WALL
SCALE: SCALE 1:100



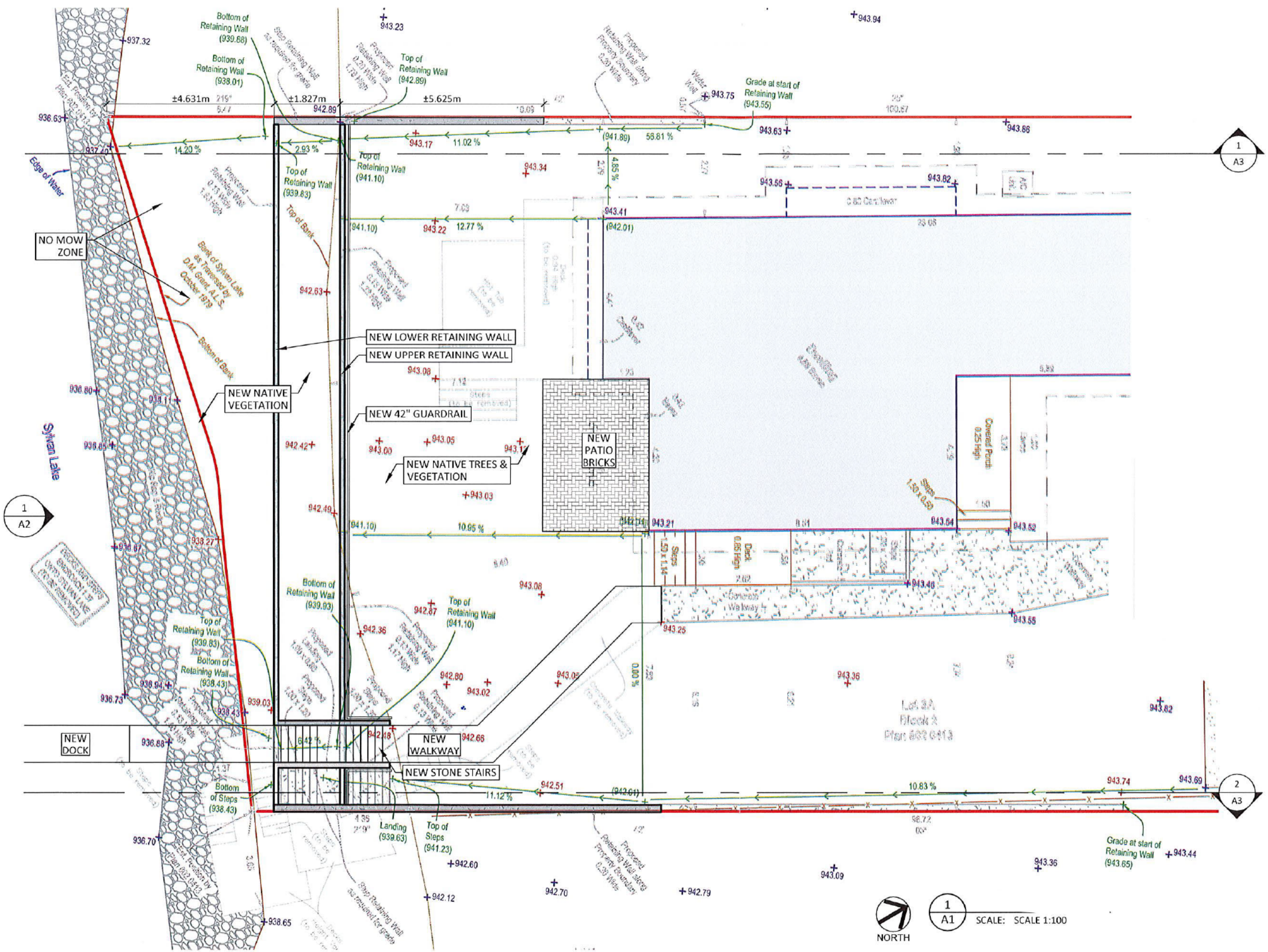
1 block is 2' tall

2 / A3 SOUTH PROPERTY LINE RETAINING WALL/STAIR DETAIL
SCALE: SCALE 1:100

Wendi Ronspies
Design Studio
at Studio Eleven
Red Deer, Alberta T4R 3B1
Phone: 403.896.2496
email: wendir@telus.net

A3

Sections [redacted] Residence
101 Birchcliff Road, Birchcliff, AB
SCALE: 1:100
DATE: September 27, 2023



Wendi Ronspies Design Studio
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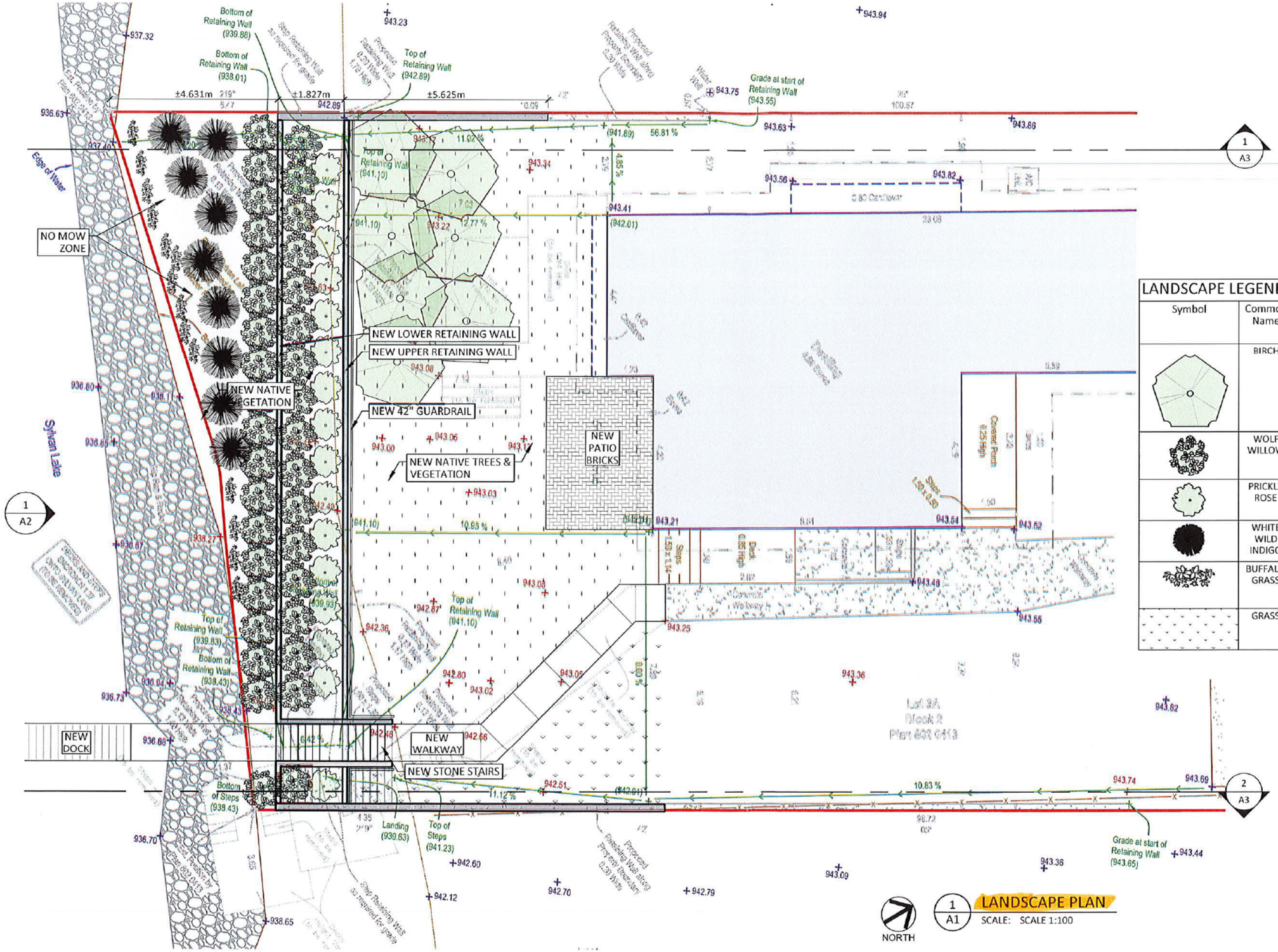
Red Deer, Alberta T4R 3B1
Phone: 403.896.2496
email: wendir@telus.net

A1

Site Plan [redacted] Residence
101 Birchcliff Road, Birchcliff, AB
SCALE: 1:100
DATE: September 27, 2023



LANDSCAPE LEGEND:

Symbol	Common Name	Size at Maturity Height/Spread (Metric)	Qty
	BIRCH	12m/6m	7
	WOLF WILLOW	2m/2m	36
	PRICKLY ROSE	2.1m/1.8m	16
	WHITE WILD INDIGO	.6m/1.2m	9
	BUFFALO GRASS	.152m/.203m	14
	GRASS		

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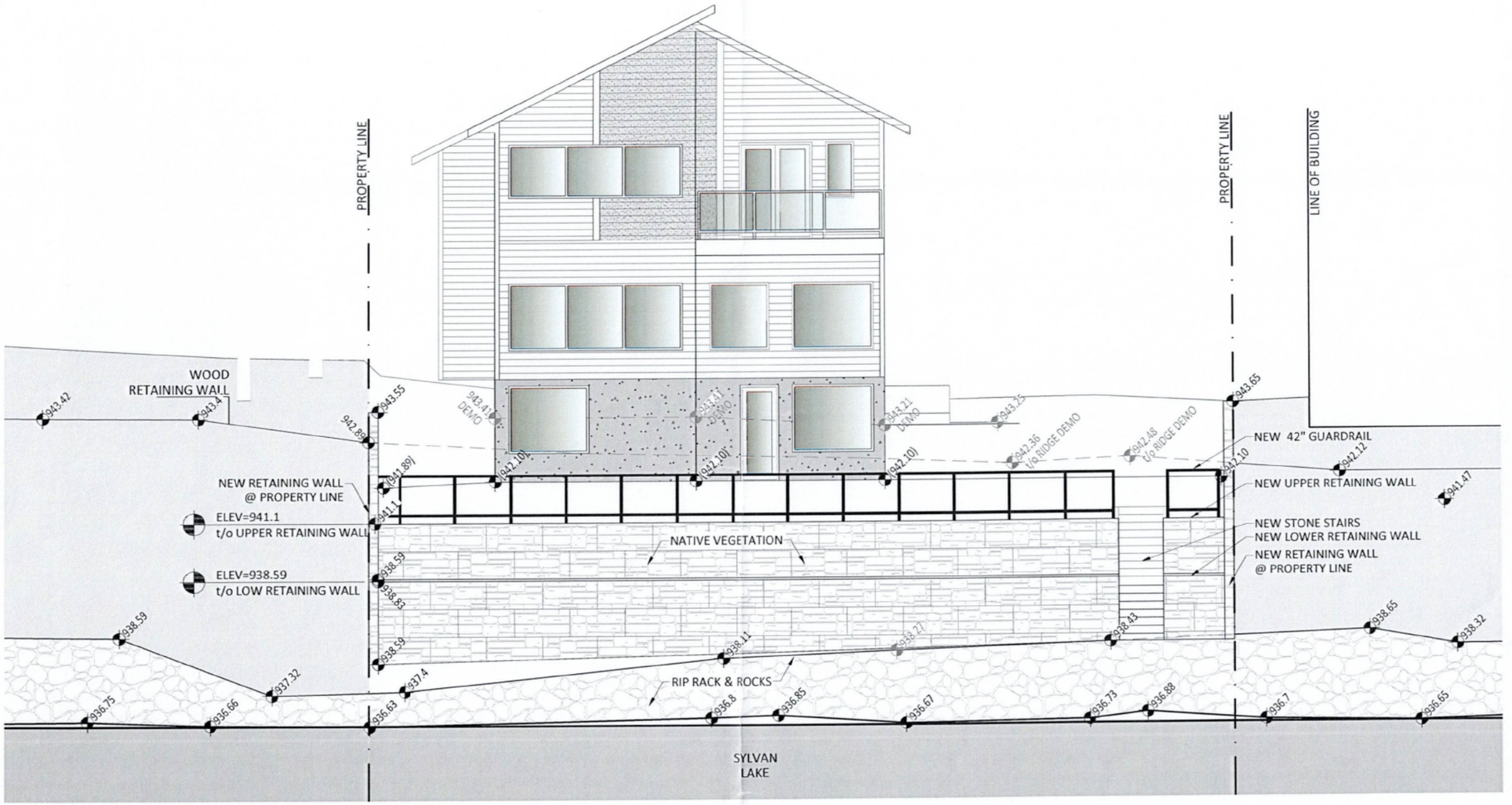
A1

Site Plan
Residence
101 Birchcliff Road, Birchcliff, AB
SCALE: 1:100
DATE: September 27, 2023



1 / A2 ELEVATION FROM SYLVAN LAKE
SCALE: SCALE 1:100

1 block is 2' tall

Wendi Ronspies
Design Studio
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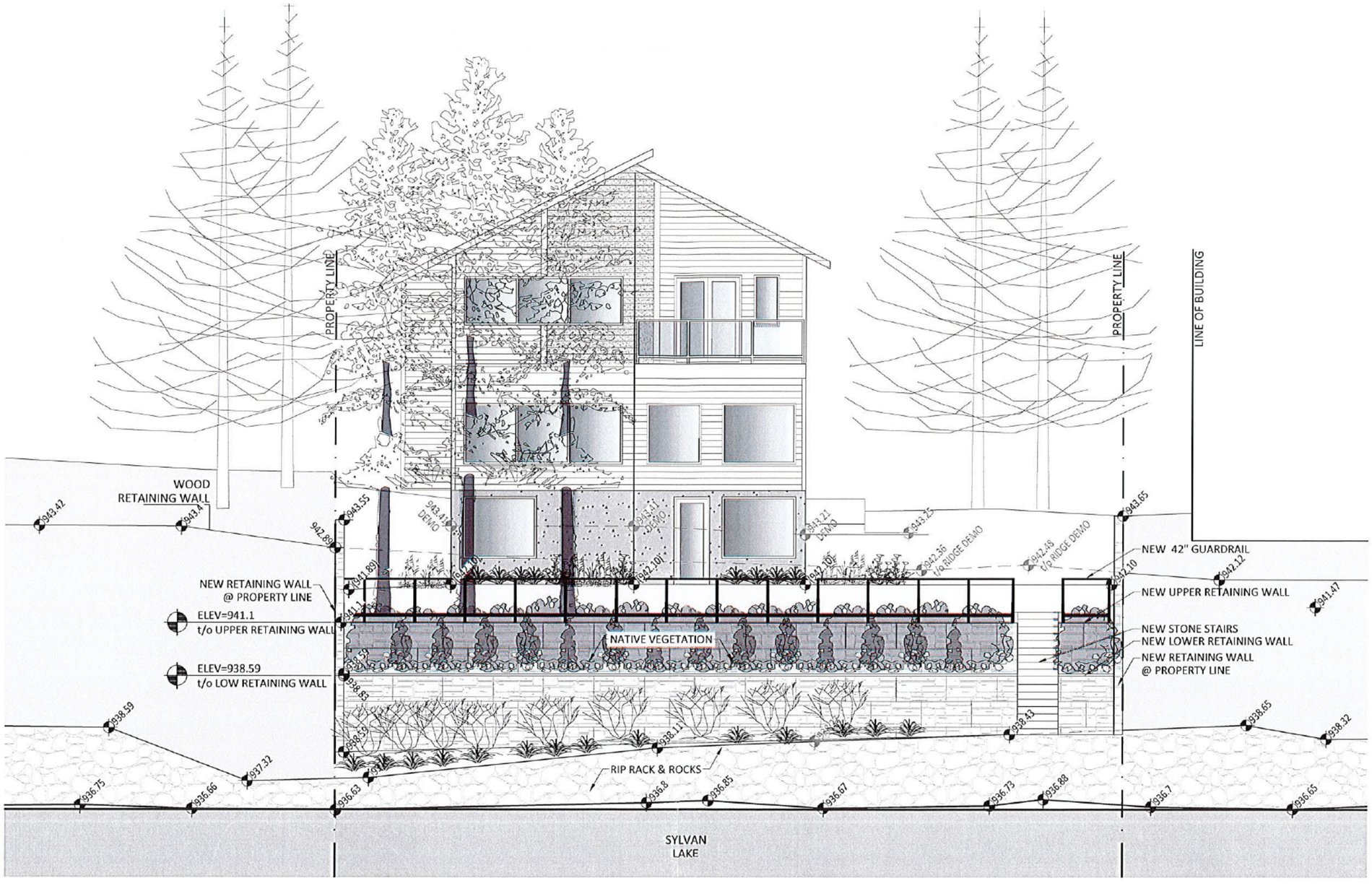
Red Deer, Alberta T4R 3B1
Phone: 403.896.2496
email: wendir@telus.net

A2

ELEVATION [redacted]esidence
101 Birchcliff Road, Birchcliff, AB
SCALE: 1:100
DATE: September 27, 2023

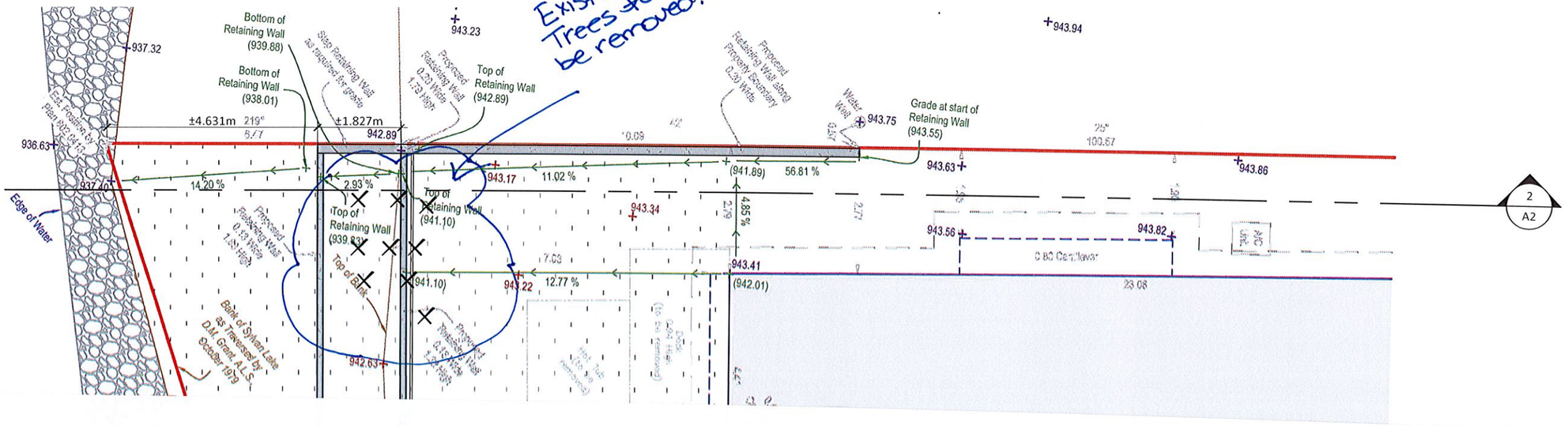


1 / A2 ELEVATION FROM SYLVAN LAKE
SCALE: SCALE 1:100

Wendi Ronspies
Design Studio
at Studio Eleven
Red Deer, Alberta T4R 3B1
Phone: 403.896.2496
email: wendir@telus.net

A2

ELEVATION [redacted] Residence
[redacted] iif Road, Birchcliff, AB
SCALE: 1:100
DATE: September 27, 2023



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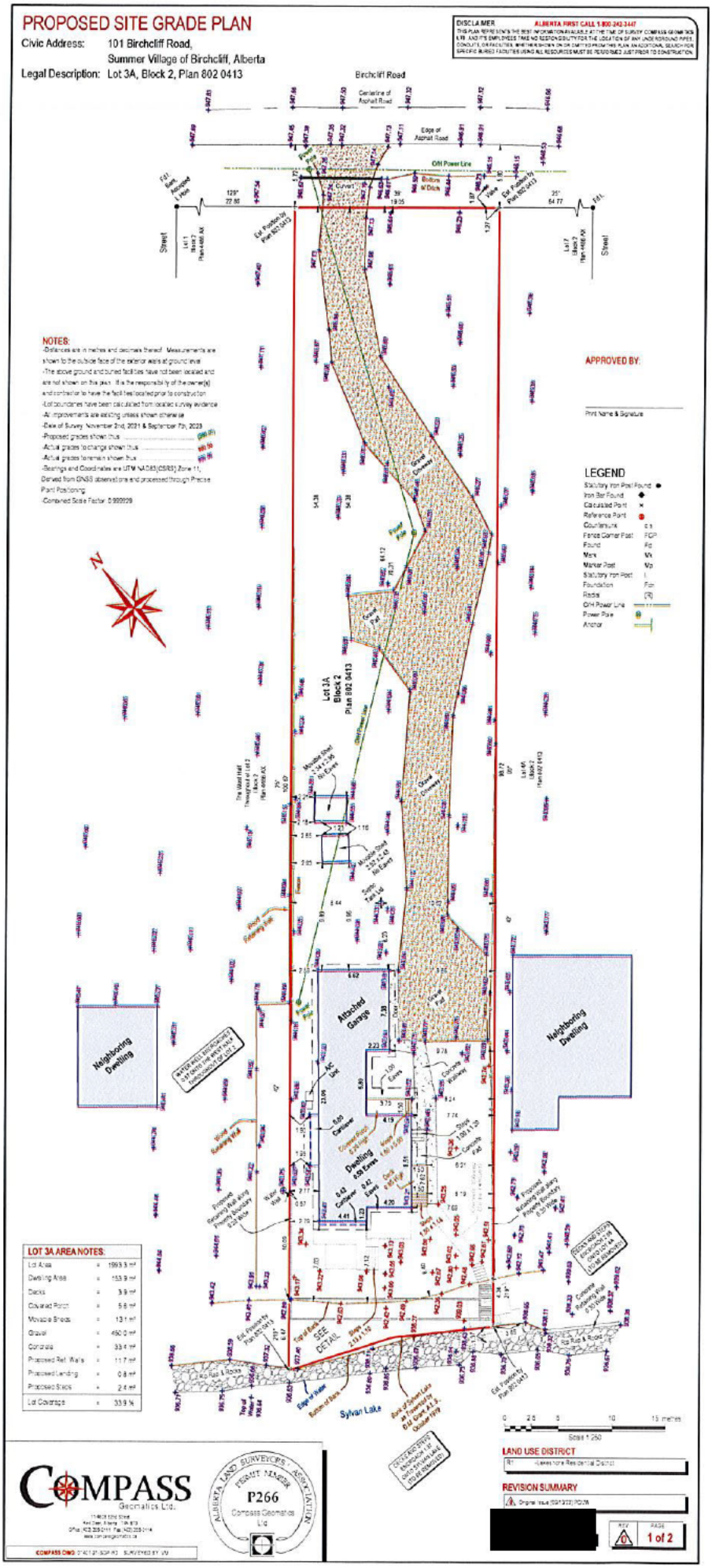
PROPOSED SITE GRADE PLAN

Civic Address: 101 Birchcliff Road,
Summer Village of Birchcliff, Alberta

Legal Description: Lot 3A, Block 2, Plan 802 0413

DISCLAIMER — ALBERTA FIRST CALL 1-800-242-3447



NOTES:

-Distances are in metres and decimals thereof. Measurements are shown to the outside face of the exterior walls at ground level
-The above ground and buried facilities have not been located and are not shown on this plan. It is the responsibility of the owner(s) and contractor to have the facilities located prior to construction
-Lot boundaries have been calculated from location survey evidence
-All improvements are existing unless shown otherwise
-Date of Survey: November 2nd, 2021 & September 7th, 2023
-Proposed grades shown thus: 000.00
-Actual grades to change shown thus: 000.00
-Actual grades to remain shown thus: 000.00
-Bearings and Coordinates are UTM NAD83(CSRS) Zone 11, Derived from GNSS observations and processed through Precise Point Positioning
-Combined Scale Factor: 0.999929

APPROVED BY:

Print Name & Signature

LEGEND

Statutory Iron Post Found	
Iron Bar Found	
Calculated Point	×
Reference Point	
Countersunk	c.s.
Fence Corner Post	FCP
Found	Fd
Mark	Mk
Marker Post	Mp
Statutory Iron Post	I.
Foundation	Fdn
Radial	(R)
OH Power Line	
Power Pole	
Anchor	

LOT 3A AREA NOTES:

Lot Area	=	1999.3 m²
Dwelling Area	=	153.9 m²
Decks	=	9.9 m²
Covered Porch	=	5.6 m²
Movable Sheds	=	13.1 m²
Gravel	=	450.0 m²
Concrete	=	33.4 m²
Proposed Ret. Walls	=	11.7 m²
Proposed Landing	=	0.8 m²
Proposed Steps	=	2.4 m²
Lot Coverage	=	33.9 %

LAND USE DISTRICT

Rl — Lakeshore Residential District

REVISION SUMMARY

[redacted]

REV 0 — PAGE 1 of 2

COMPASS Geomatics Ltd.

ALBERTA LAND SURVEYORS' ASSOCIATION PERMIT NUMBER P266 Compass Geomatics Ltd.

SmithDow & Associates Ltd.

- Foundation and Geotechnical Engineering
- Soil Investigation and Site Assessment
- Slope Stability Reports
- Environmental Audits
- Material Testing: Soil, Asphalt, and Concrete

August 2, 2023

[redacted]

File No: 101 Birchcliff Road

Att[redacted]

Re: Proposed Retaining Wall Design
101 Birchcliff Road
Summer Village of Birchcliff, Alberta

As requested, two rows of Magnumstone block retaining wall designs are submitted with the construction drawings and specifications for the above referenced site. The slope is considered stable with the construction of two rows of block retaining walls. The factor of safety (FS) was found to be about 2.561 which is exceeding the minimum required 1.5 (see attached slope stability analysis with retaining wall modelling). Any upper slope cut near the existing house to allow for the proposed stone retaining wall designs, the foundation of the existing residence must have proper protection to prevent freezing.

The magnumstone block retaining wall closer to the lake and within the subject property is 6.0 feet high with approximately 7 to 10 foot setback distance to the upper magnumstone block wall at which will be about 6 feet high. The height of the upper magnumstone block wall could be slightly lower then 6 feet. The exact second setback distance and height of the upper magnumstone block retaining wall will be determined on-site during construction of the first block retaining wall. The engineering design of the lower wall is anticipated for the upper plateau of the retained area to be vegetated. The provided construction specifications are the same for the lower wall.

As site conditions and subsoil will vary, modifications and revised recommendations by our personnel are warranted during the retaining wall construction process and our inspections.

Please follow the inspection and testing requirements listed, during construction.

Regards,
Smith Dow and Associates Ltd. (Red Deer)

Philip Kwong

Philip Kwong (P.Eng.)

PROFESSIONAL ENGINEER ALBERTA
C.H. PHILIP KWONG

4632 - 62 Street, Red Deer, Alberta T4N 6T3 Phone: (403) 343 - 6888 Fax: (403) 341 - 4710

Smith Dow & Associates Ltd.
- Foundation and Geotechnical Engineering
- Soil Investigation and Site Assessment
- Slope Stability Reports
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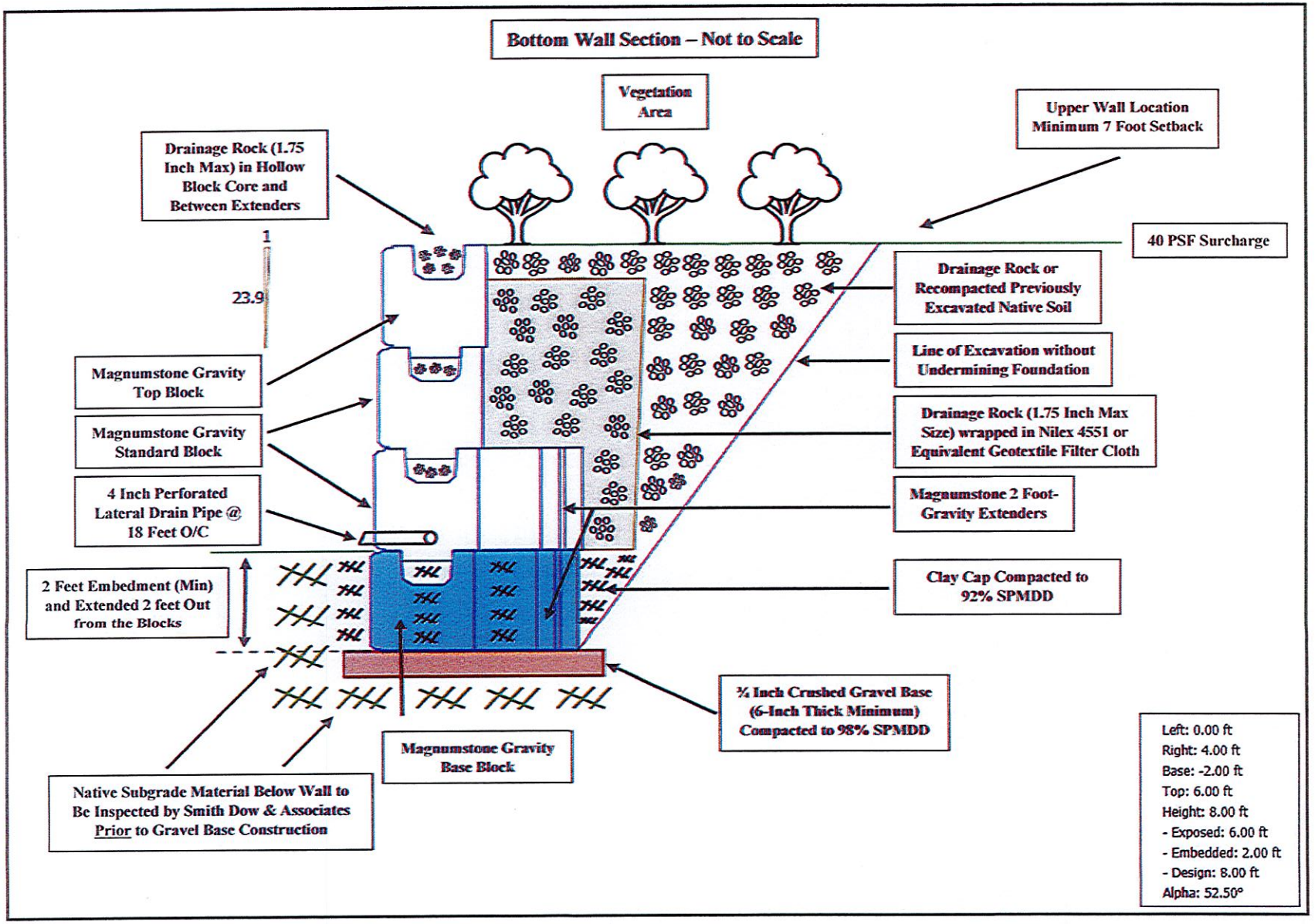
- Material Testing: Soil, Asphalt, and Concrete



Location: 101 Birchcliff Road, Sylvan Lake, Alberta

August 2, 2023

SmithDow & Associates Ltd.
- Foundation and Geotechnical Engineering
- Soil Investigation and Site Assessment
- Slope Stability Reports
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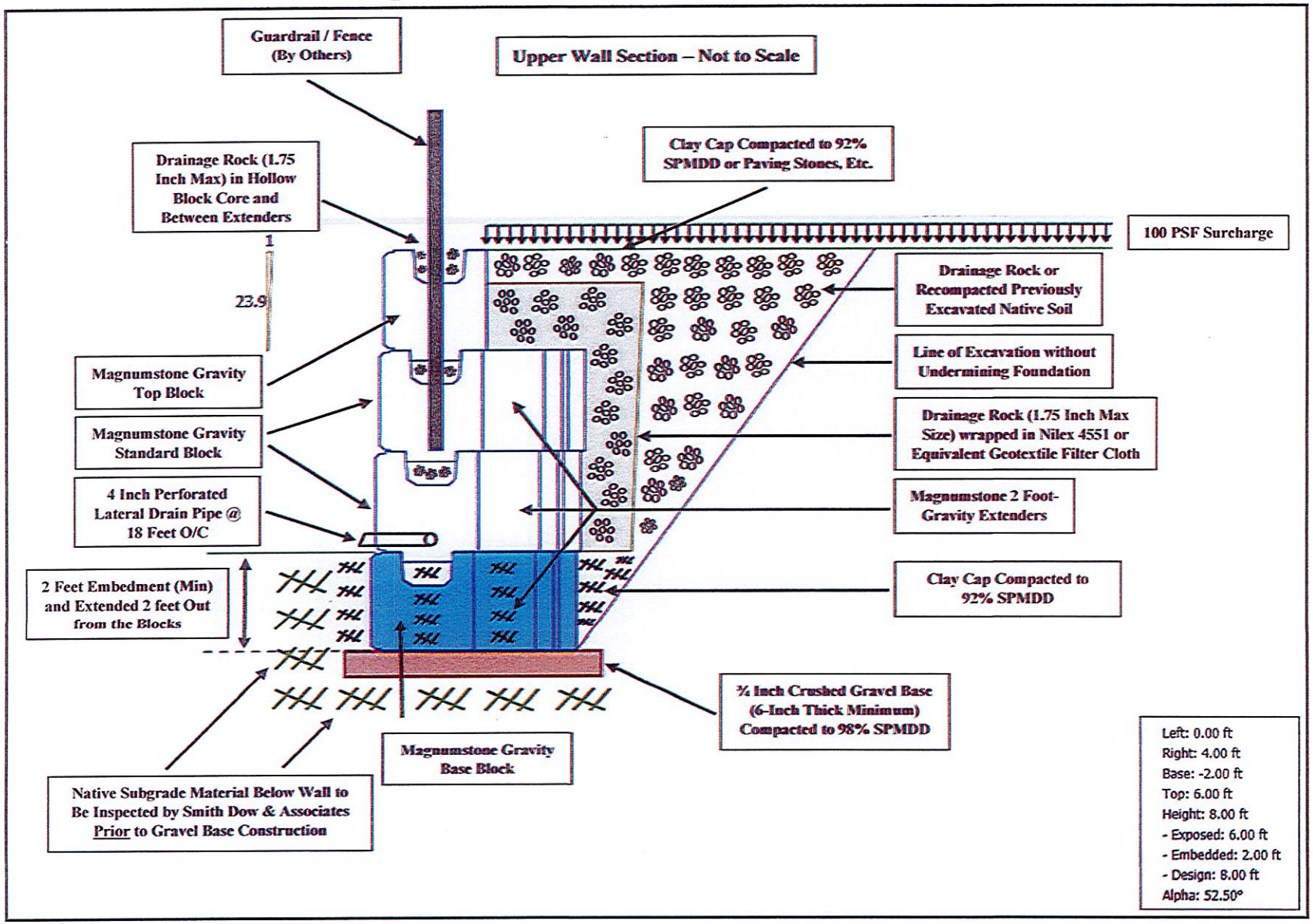


Location: 101 Birchcliff Road, Sylvan Lake, Alberta

August 2, 2023

Construction Notes – Page #1

MATERIALS:

Wall Type: Magnumstone Gravity Wall w/ Extenders

Block dimensions:

Block Type	Height	Depth	Length
Base Block	24 Inches	+/- 25"	38" - 48"
Standard Block	24 Inches	+/- 25"	39" - 48"
Top Block	24 Inches	+/- 25"	39" - 48"

Batter: 2.4° Batter Angle
Backfill: 1.75 Inch Drainage Rock (Max. Size)
Drainage Pipe: 4 Inch Perforated Drainage Pipe
Geotextile: Nilex 4551 fully wrapping drainage rock
Leveling Pad: ¾ Inch Crush Gravel Below the Bottom Block

SITE PREPARATION:

THE CONTRACTOR SHALL REMOVE ALL ORGANIC MATTER, TOPSOIL, BRUSH, SOD OR ANY OTHER ORGANIC / DELETERIOUS MATERIAL IN THE PROPOSED WALL AREA.

PRIOR TO LEVELING PAD CONSTRUCTION, THE SUBGRADE SHALL BE INSPECTED BY SMITH DOW & ASSOCIATED LTD. TO CONFIRM THAT NATIVE IS PRESENT AND IT HAS ADEQUATE BEARING CAPACITY.

SIDE SLOPE PROTECTION:

BOTH ENDS OF THE BLOCK RETAINING WALLS SUPPORTING THE ADJACENT SOIL CAN BE CONSTRUCTED IN A SIMILAR MANNER. THE LENGTHS AND HEIGHTS OF THE BLOCK RETAINING WALL HAVE TO BE SUFFICIENT TO SUPPORT THE ADJACENT SOIL. THEY MUST BE INSPECTED AND MODIFIED BY SMITH DOW AND ASSOCIATES ON SITE AS DEEMED NECESSARY.

DESIGN PARAMETERS

THE FOLLOWING SOIL PARAMETERS WERE USED FOR THE SUBJECT RETAINING WALL:

Soil Type	Unit Weight	Cohesion	Friction Angle
Clay	128 PCF	0 PSF	28°
1.75 Inch Drainage Rock	115 PCF	0 PSF	34°
¾ Inch Crushed Gravel	140 PCF	0 PSF	37°

Loading Conditions: 40 - 100 PSF (Based on lower or upper wall)
Slope Above Wall: Horizontal (up to 2% Max.)
Slope Below Wall: Horizontal (up to 2% Max.)
Seismic Coefficient: N/A for this design
Groundwater: Assumed to be at grade as no site drilling or site-specific survey was available at time of design. The retaining walls are designed with no hydrostatic pressure acting on the wall.

BLOCK PLACEMENT:

BASE BLOCKS ARE TO BE PLACED ON A COMPACTED GRANULAR LEVELING PAD CONSTRUCTED TO THE SPECIFIED THICKNESS BELOW AND COMPACTED TO A MINIMUM OF 98% Standard Proctor Maximum Dry Density (SPMDD).

THE MINIMUM BURIAL DEPTH SPECIFIED BELOW DOES NOT INCLUDE ANY ALLOWANCE FOR TOPSOIL AND VEGETATION WHICH MAY BE UTILIZED. TOPSOIL AND VEGETATION DOES NOT COUNT TOWARDS BLOCK BURIAL DEPTH.

Required Wall Burial Depth: 24"
Gravel Base Pad Thickness: 6"

FENCING / RAILING SYSTEM:

A FENCE / RAILING SYSTEM IS RECOMMENDED FOR ALL WALLS OVER 2 FEET IN HEIGHT.

TO MEET ALBERTA BUILDING CODE GUARD RAIL LOADING CONDITIONS, A GUARD RAIL / FENCE SHOULD BE PROPERLY ATTACHED TO BLOCK UNITS. MAGNUMSTONE SPECIFIC SITE HANDRAIL DETAIL IS ATTACHED IN THIS REPORT.

Construction Notes – Page #2

FACTORS OF SAFETY:

BASED ON THE STATED DESIGN PARAMETERS AND PROPOSED WALL CONFIGURATIONS, THE FOLLOWING SAFETY FACTORS FOR THE SUBJECT DESIGN HAVE BEEN ACHIEVED:

Factor of Safety	Lower Wall (6' Exposed)	Upper Wall (6' Exposed)
Bearing Capacity	5.49	4.47
Overturning	3.08	2.41
Base Sliding	1.99	1.61
Minimum Embedment Depth	24"	24"

THE MINIMUM REQUIRED FACTORED BEARING CAPACITY OF THE FOUNDATION SOIL IS 1900 PSF.

DRAINAGE:

THE FOLLOWING RECOMMENDATIONS HAVE BEEN PROVIDED TO MAINTAIN DRAINED CONDITIONS BEHIND THE WALL.

Drainage Material: 1.75" Drainage Rock (Max. Size)
Drainage Pipe: Minimum 4 Inch Diameter.
Drain Port Spacing: Ported 18 Feet O/C.
Geotextile: Nilex 4551 or Equivalent.

A PERFORATED LATERAL DRAINIAGE PIPE IS TO BE PLACED WITHIN THE 1.75" DRAINAGE ROCK, BEHIND THE ENTIRE WALL SYSTEM (NEAR THE BOTTOM OF WALL ELEVATION). THE DRAINAGE PIPE IS TO BE PORTED 18 FEET O/C LATERALLY.

GRADING OF THE SITE IS TO BE ABOUT 2% IN LANDSCAPED AREAS AND 0.5% IN PAVED OR CONCRETE AREAS TO DIRECT AWAY FROM THE TOP AND BOTTOM OF THE WALL SYSTEM OR IS CONTROLLED BY A GRASS OR CONCRETE DRAINAGE SWALE. DRAINAGE OVER THE WALL SYSTEM IS PERMISSIBLE BUT GRADES MUST BE MAINTAINED TO PREVENT PONDING OF WATER ABOVE THE WALL. STAINING OF BLOCKS AND POTENTIAL FREEZE THAW DAMAGE CAN OCCUR TO BLOCKS WHEN DRAINAGE IS ALLOWED TO PASS OVER THE WALL SYSTEM.

TESING / INSPECTION REQUIREMENTS:

THE FOLLOWING TESTING / INSPECTIONS ARE CRITICAL AND REQUIRED TO PROVIDE FINAL CONSTRUCTION SIGN-OFF:

ENGINEERING INSPECTIONS:

- BEARING INSPECTION MUST BE CONDUCTED ON THE ORIGINAL SUBGRADE BELOW THE GRAVEL BASE PAD
- PROGRESS INSPECTION (DURING CONSTRUCTION)
- INSPECTIONS TO VERIFY STABILITY OF EXCAVATION (IF REQUIRED)
- FINAL INSPECTION OF COMPLETION

COMPACTION TESTING:

- COMPACTION TESTING FOR GRAVEL LEVELING PAD

Additional Construction Notes – Page #3

ADDITIONAL NOTES:

FILL MATERIALS ARE TO BE APPROVED BY SMITH DOW & ASSOCIATES PRIOR TO PLACEMENT.

FILL MATERIALS SHALL BE FREE OF EXCESS MOISTURE, ROOTS, MULCH, SOD, SNOW, FROZEN LUMPS AND ORGANIC DELETERIOUS MATERIAL. ALL ROCK PARTICLES AND HARD EARTH CLODS SHALL BE LESS THAN 6 INCHES IN THE LONGEST DIMENSION. FILL MATERIALS THAT DO NOT MEET THIS CRITERIA ARE BE CONSIDERED UNSUITABLE AND MUST BE REMOVED.

COMPACTION TEST RECORDS FOR THE PLACEMENT OF ANY FILL LOCATED UNDER THE WALL SYSTEM MUST BE CONDUCTED AND APPROVED BY SMITH DOW AND ASSOCIATES PRIOR TO CONSTRUCTION OF THE WALL SYSTEM. IF COMPACTION RECORDS ARE NOT AVAILABLE, SMITH DOW AND ASSOCIATES MUST BE NOTIFIED, AND SITE-SPECIFIC RECOMMENDATIONS CAN BE PROVIDED.

UNSUITABLE SUBGRADE CONDITIONS WILL REQUIRE SITE-SPECIFIC RECOMMENDATIONS BY SMITH DOW AND ASSOCIATES. THESE RECOMMENDATIONS MAY INCLUDE OVER-EXCAVATION AND REPLACEMENT WITH A LEAN CONCRETE MIXTURE OR APPROVED MATERIAL COMPACTED TO 98% OF SPMDD AT A MOISTURE CONTENT WITHIN 2% OF OPTIMUM.

IF THE BEARING CAPACITY OF THE SUBGRADE IS INSUFFICIENT, SMITH DOW & ASSOCIATES WILL PROVIDE SITE-SPECIFIC RECOMMENDATIONS. THESE RECOMMENDATIONS MAY CONSIST OF RECOMPACTION OF THE SUBGRADE MATERIAL, INCREASE IN THE LEVELLING PAD THICKNESS, OR REMOVAL AND REPLACEMENT OF SUBGRADE MATERIALS.

SMITH DOW & ASSOCIATES SHALL VERIFY THAT FILL MATERIALS MEET THE REQUIREMENTS FOR CONSTRUCTION PRIOR TO PROCEEDING WITH RETAINING WALL INSTALLATION. A REPRESENTATIVE SAMPLE OF ANY PROPOSED FILL TO BE SUBMITTED TO SMITH DOW & ASSOCIATES A MINIMUM OF 3 BUSINESS DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION FOR APPROVAL AND LABORATORY TESTING, IF REQUIRED.

SMITH DOW & ASSOCIATES WILL BE RESPONSIBLE FOR COMPACTION TESTING OF ALL FILL MATERIALS AND INSPECTION OF THE RETAINING WALL INSTALLATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INFORM SMITH DOW & ASSOCIATES OF CONSTRUCTION COMMENCEMENT. NO CONSTRUCTION COMPLIANCE, SIGN-OFF, OR WARRANTY CAN BE PROVIDED IF SMITH DOW & ASSOCIATES IS NOT ON SITE FOR INSPECTION OF CONSTRUCTION.

ADDITIONAL TESTING INSPECTIONS WILL BE REQUIRED FOR FAILED COMPACTION TESTS OR IF CONSTRUCTION COMPLICATIONS ARE ENCOUNTERED. TESTING METHODS, FREQUENCY OF TESTING AND INSPECTIONS, AND VERIFICATION OF MATERIAL SPECIFICATIONS SHALL BE AT THE DISCRETION OF SMITH DOW & ASSOCIATES.

BOTH SIDES OF ALL BURIED BLOCKS ARE TO BE BACKFILLED AND COMPACTED AT THE SAME TIME, PRIOR TO ADDITIONAL BLOCK PLACEMENT. ONCE PLACED, NO EXCAVATION IN FRONT OF THE WALL IS ALLOWED FOR THE LIFETIME OF THE STRUCTURE WITHOUT CONSULTATION WITH SMITH DOW & ASSOCIATES.

ALL WALL COMPONENTS ARE TO BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

FOR AREAS WHERE A HARD SURFACE SUCH AS CONCRETE OR ASPHALT WILL BE CONSTRUCTED AGAINST THE BLOCKS, A 3/8 Inch (10mm) THICK FIBER-BOARD SHOULD BE INSTALLED BETWEEN THE WALL AND SURFACE TO ALLOW FOR SEASONAL MOVEMENT WITHOUT IMPEDANCE.

AT THE END OF EACH WORKDAY, THE FILL SHALL BE COMPACTED AND SLOPED AWAY FORM THE WALL FACE AT A MINIMUM 2% SLOPE TO MINIMIZE PONDING OF WATER AND SATURATION OF THE FILL MATERIALS. A TEMPORARY SOIL BERM SHALL BE CONSTRUCTED NEAR THE SLOPE CREST TO PREVENT SURFACE WATER RUNOFF FROM OVERTOPPING THE WALL AND SATURATING FILL MATERIALS. DURING FREEZING TEMPERATURES OR WHEN SNOW OR ICE ARE ANTICIPATED, THE WALL FOOTPRINT SHOULD BE COVERED WITH INSULATED TARPS OR LOOSE SOIL THAT CAN BE EASILY REMOVED THE FOLLOWING DAY. THE CONTROL OF SURFACE DRAINAGE AND SEEPAGE OF GROUNDWATER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

THE SLOPE STABILITY MODELLING AND ANALYSIS WAS PERFORMED BASED ON THE PROVIDED CROSS-SECTIONS AND ASSUMED SOIL DATA.

A SPECIFIC SITE PLAN WAS NOT AVAILABLE TO SMITH DOW & ASSOCIATES AT THE TIME OF THIS RETAINING WALL DESIGN AND THE EXACT LOCATION OF THE RETAINING WALL WILL HAVE TO MODELLED BY OTHERS OR BE FIELD FIT.

Additional Construction Notes – Page #4

SPECIAL PROVISIONS:

THE LOCATION OF THE WALL SYSTEM AND EXISTING STRUCTURES MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

A COMPLETE SET OF THE MOST RECENT VERSION OF THESE DESIGN DRAWINGS SHALL BE ON SITE AT ALL TIMES DURING CONSTRUCTION.

SMITH DOW & ASSOCIATES ASSUMES NO LIABILITY FOR THE INTERPRETATION OR VERIFICATION OF SUBSURFACE CONDITIONS FOR SUITABILITY OF SOIL DESIGN PARAMETERS, OR THE INTERPRETATION OF SUBSURFACE GROUNDWATER CONDITIONS WHICH WERE APPLICABLE PRIOR TO CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR REVIEWING AND VERIFYING THAT THE ACTUAL SITE CONDITION AND PARAMETERS ARE AS DESCRIBED HEREIN PRIOR TO AND DURING CONSTRUCTION. THE CONTACTOR SHALL BE ON SITE TO VERIFY THAT CONSTRUCTION IS COMPLETED IN ACCORDANCE WITH THESE NOTES AND DRAWING.

IF ANY UNEXPECTED ROCK FORMATIONS, UTILITIES, FILL MATERIALS OR GROUNDWATER ARE ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR IS TO CONTRACT SMITH DOW & ASSOCIATES IMMEDIATELY.

ANY CHANGES TO DESIGN PARAMETERS (SOIL OR GROUNDWATER CONDITIONS, ETC.) OR STRUCTURE GEOMETRY (SPECIFIED WALL HEIGHT AND WIDTH) SHALL REQUIRE DESIGN REVISIONS. SMITH DOW & ASSOCIATES MUST BE NOTIFIED AND ALLOWED TO REVISE THE DESIGN PRIOR TO COMMENCING CONSTRUCTION.

NO LOAD OR SLOPE IN EXCESS OF THOSE SHOWN WITHIN THIS DESIGN PACKAGE ARE PERMITTED WITHOUT WRITTEN CONSENT OR APPROVAL FROM SMITH DOW & ASSOCIATES.

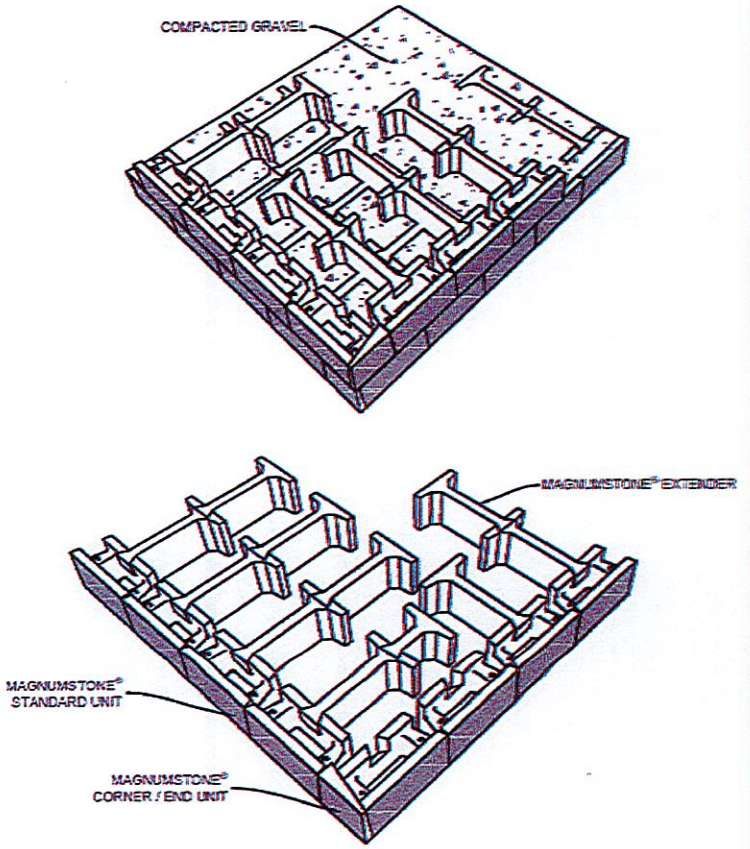
TO MINIMIZE THE RISK OF ROOTS AFFECTING THE WALL, DECIDUOUS TREES SHOULD BE INSTALLED SUCH THAT THEIR CANOPY DOES NOT EXTEND PAST THE FACE OF THE RETAINING WALL.

IF ANY UNDERGROUND UTILITIES ARE LOCATED IN DIRECT PROXIMITY TO THE SUBJECT RETAINING WALL SMITH DOW & ASSOCIATES MUST BE NOTIFIED PRIOR TO CONSTRUCTION.

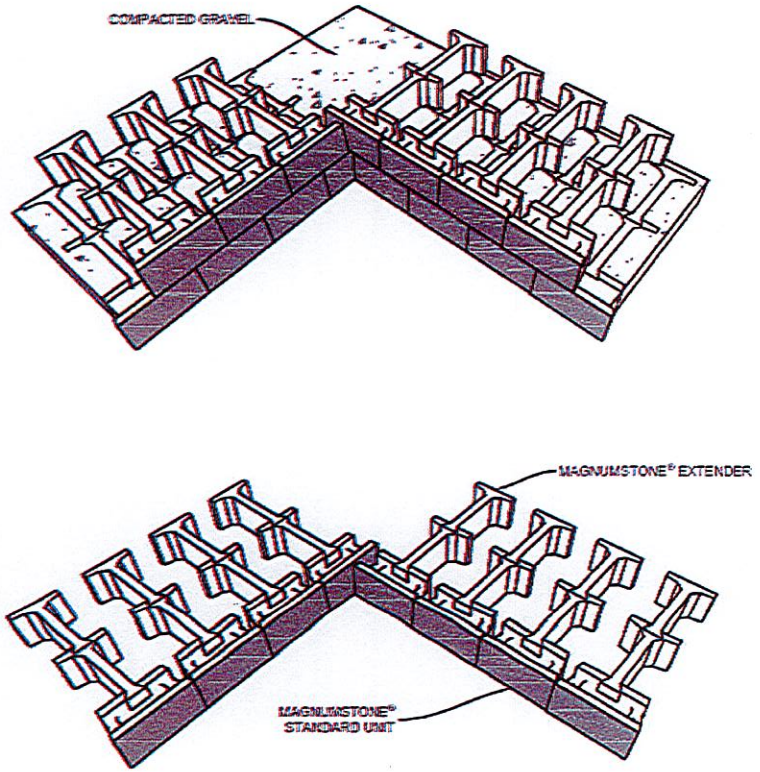
THE DESIGN IS ONLY VALID FOR THE PROPOSED WALL AS SHOWN HEREIN FOR 101 BIRCHCLIFF ROAD, SYLVAN LAKE, ALBERTA.

SmithDow & Associates Ltd.

- Foundation and Geotechnical Engineering
- Soil Investigation and Site Assessment
- Slope Stability Reports
- Environmental Audits
- Material Testing: Soil, Asphalt, and Concrete



OUTSIDE CORNER



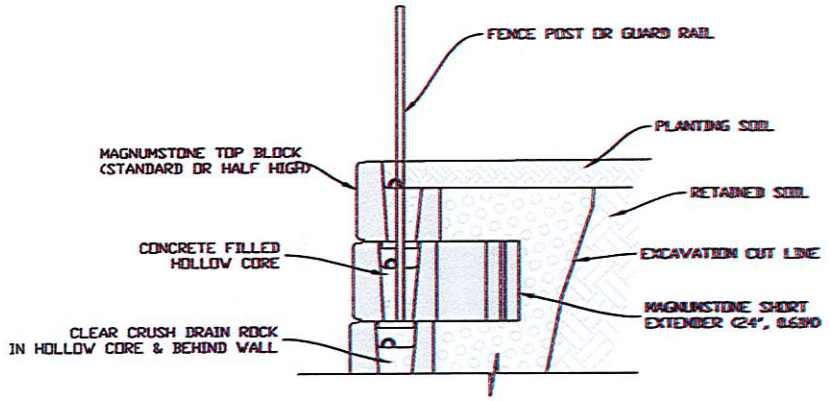
INSIDE CORNER

4632 - 62 Street, Red Deer, Alberta T4N 6T3

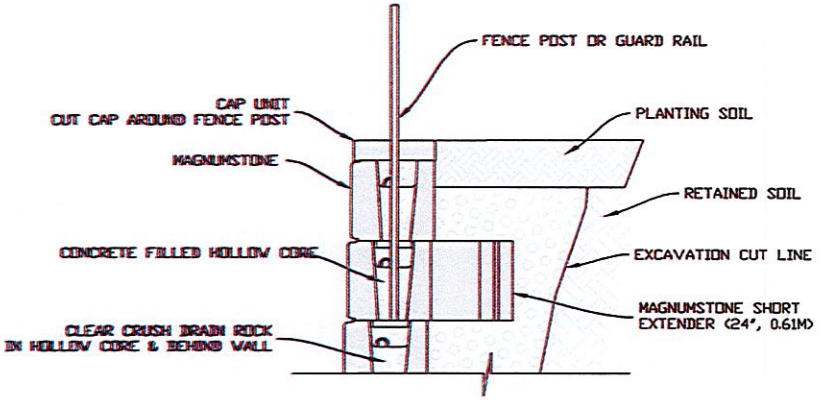
Phone : (403) 343 - 6888 Fax: (403) 341 - 4710

MagnumStone

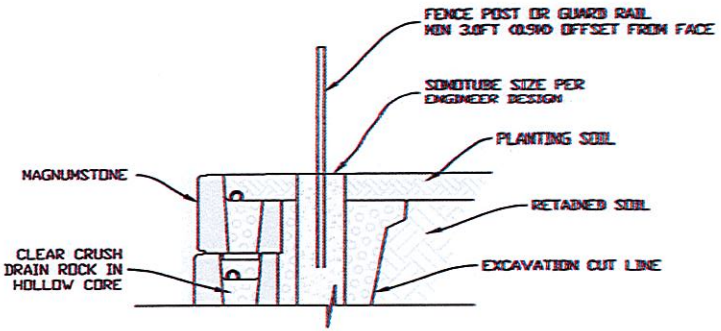
>>>RAILING IN AND BEHIND WALL



RAILING THROUGH HOLLOW CORE



RAILING THROUGH HOLLOW CORE W /CAP



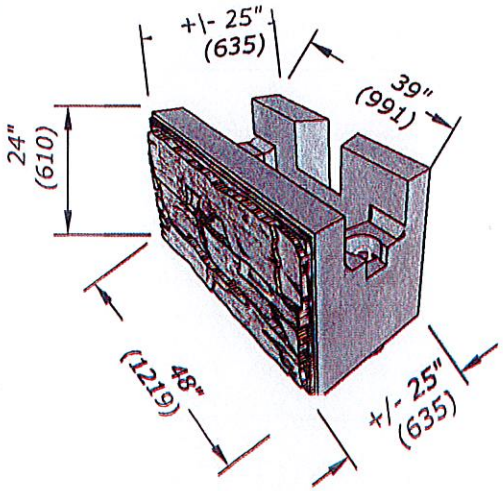
RAILING BEHIND WALL

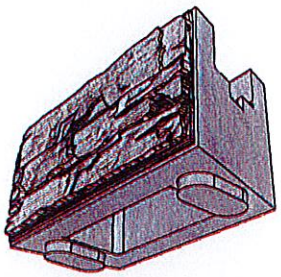
MagnumStone® RETAINING WALLS

These preliminary details are intended solely to act as an aid when designing a wall. This drawing should not be used for final design or construction. Each site-specific wall should be certified and signed by a registered geotechnical engineer in the State or Province that it is being built. The accuracy and use of the details in this document are the sole responsibility of the user.

MagnumStone®
RETAINING WALLS

STANDARD

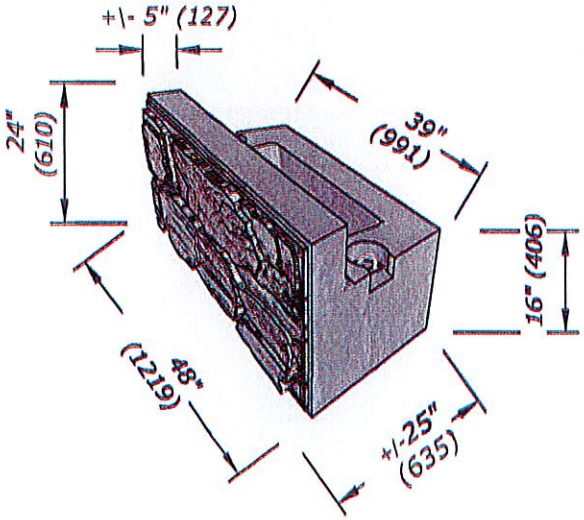


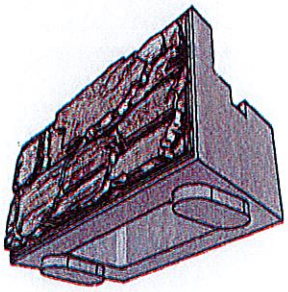


STANDARD BLOCK

Height	24"	610mm
Depth	+/-25"	+/-635mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	1345 lbs	621 Kgs
Volume Voids	6.1 ft3	0.17 m3
Gravel Fill Weight	2150 lbs	975 Kgs
Face Area	8 sq ft	0.745 m2
Batter/Setback	2.4 deg	

*Face width will vary depending on face textures (check with local producer)

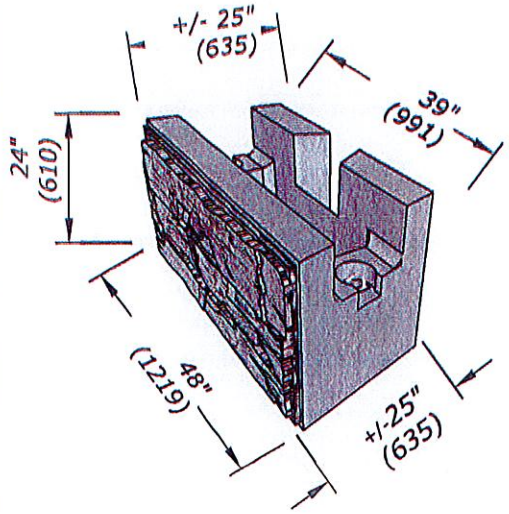


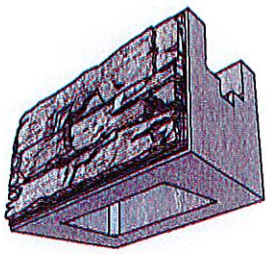


TOP BLOCK

Height	24"	610mm
Depth	+\-25"	+/- 635mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	1220 lbs	553 Kgs
Volume Voids	6.1 ft3	0.17 m3
Gravel Fill Weight	2003 lbs	909 Kgs
Face Area	8 sq ft	0.745 m2
Batter/Setback	2.4 deg	

*Face width will vary depending on face textures (Check with local producer)



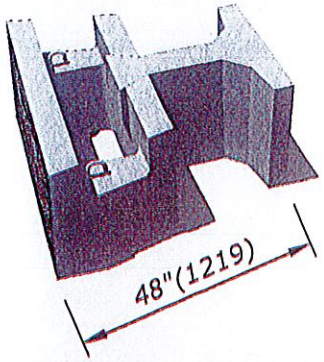


BASE BLOCK

Height	24"	610mm
Depth	+/-25"	+/-635mm
Face Width	48"	1219mm
Back Width	38"	991mm
Weight	1325 lbs	602 Kgs
Volume Voids	6.1 ft3	0.17 m3
Gravel Fill Weight	2130 lbs	966 Kgs
Face Area	8 sq ft	0.745 m2
Batter/Setback	2.4 deg	

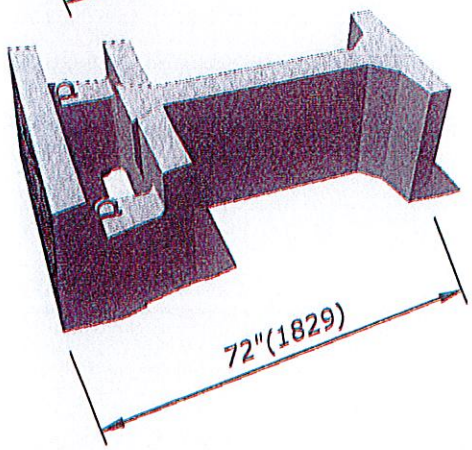
*Face width will vary depending on face textures (Check with local producer)

*Face Style Varies Check with local producer / Weights and dimmensions are nominal
Assumption: Concrete = 143 pcf (22.5 Kn/m3) / Aggregate 110 pcf (5.267)



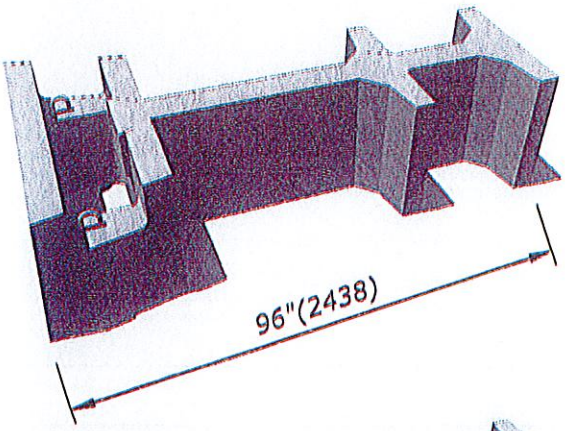
48"(1219)

Height	24"	610mm
Depth	48"	1219mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	1920 lbs	870 Kgs
Volume Voids	18.2 ft3	0.511m3
Gravel Fill Weight	3925 lbs	1780kg



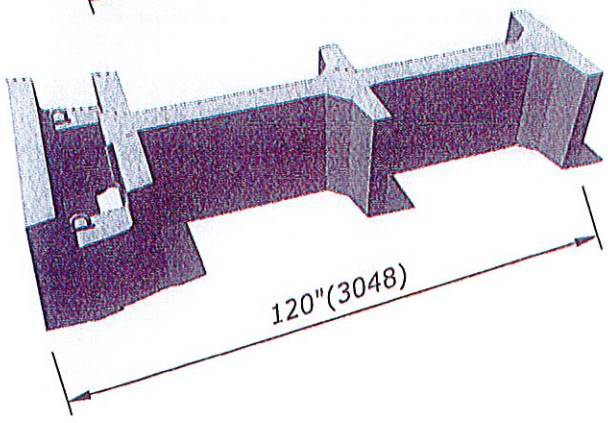
72"(1829)

Height	24"	610mm
Depth	72"	1829mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	2220 lbs	1006 Kgs
Volume Voids	31.9 ft3	0.894m3
Gravel Fill Weight	5732 lbs	2600 Kg



96"(2438)

Height	24"	610mm
Depth	96"	2438mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	2795 lbs	1267 Kgs
Volume Voids	45.4 ft3	1..271m3
Gravel Fill Weight	7789 lbs	3533 Kg



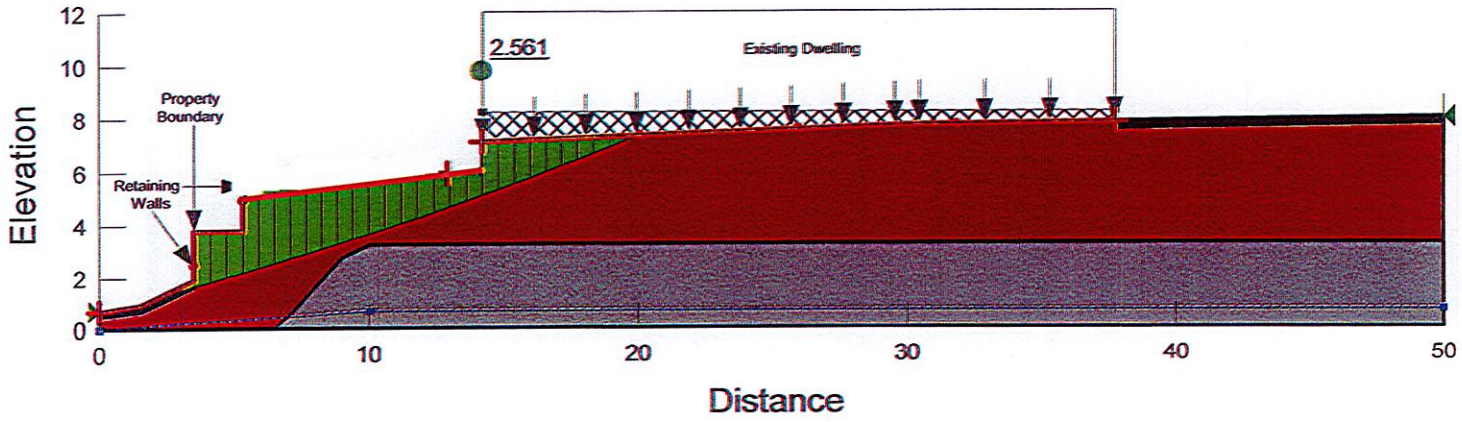
120"(3048)

Height	24"	610mm
Depth	120"	3048mm
Face Width	48"	1219mm
Back Width	39"	991mm
Weight	3098 lbs	1405 Kgs
Volume Voids	54.8 ft3	1.534m3
Gravel Fill Weight	9126 lbs	4139 Kg

*All face widths will vary depending on face textures
(Check with local producer)

*Face Style Varies Check with local producer / Weights and dimmensions are nominal
Assumption: Concrete = 143 pcf (22.5 Kn/m3) / Aggregate 110 pcf (5.267)

101 Birchcliff Road
Summer Village of Birchcliff, AB
Cross Section #2
(2023 Modified Slope)



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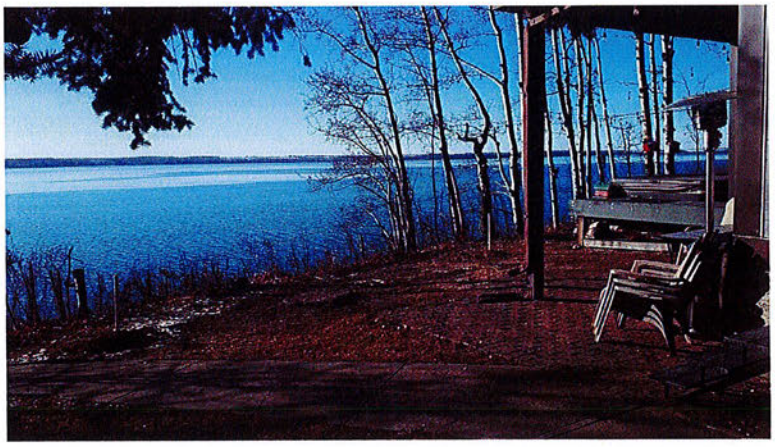
- Soil Investigation and Site Assessment
- Slope Stability Reports
- Environmental Audits
- Material Testing: Soil, Asphalt, and Concrete

Engineer Report from original application

Proposed Slope Stabilization and Retaining Structure
101 Birchcliff Road
Summer Village of Birchcliff, Alberta



File No: 101 Birchcliff Road

December 15, 2021

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- Material Testing: Soil, Asphalt, and Concrete

December 15, 2021

[redacted]

File No: 101 Birchcliff Road

[redacted]

Re: Proposed Slope Stabilization and Retaining Structures
101 Birchcliff Road
Summer Village of Birchcliff, Alberta

At your request, we conducted a geotechnical investigation at the above referenced location on October 13, 2021. At the time of site drilling, the subject property contained an existing residential structure with a basement and a detached garage on the site. It is our understanding that the existing septic tank, residence and garage will remain on site in their current place.

The subject slope to be analyzed was a southwest facing slope primarily covered with minor vegetation and decking structures. The slope began to decline at a fairly steep gradient from the slope crest towards Sylvan Lake. The southwest facing downward slant contained various gradients as per the two provided cross-sectional drawing from Compass Geomatics. Our scope of work for this report is strictly for recommendations regarding slope stabilization and erosion control of the southwest slope facing the lake. All existing structures and their conditions (residence, garage, septic tank, ect.) are not included within the scope of this report.

The observed localized erosional features associated with the slope were considered and posed minor threat to the existing slopes. However, the erosion along the slope should be addressed to protect the existing slope surface.

The purpose of this investigation was to determine the general extent and nature of the subsurface materials encountered along with some basic engineering properties of the subsurface soil. Environmental studies are beyond the scope of this report.

Field Investigation

Two (2) bore holes were required at this site. Both test holes were opened near the crest of the slope in accessible areas. A specialized track mounted drilling rig with continuous flight auger was utilized to drill the test holes. The approximate locations of the test holes are shown on drawing #1.

The holes were advanced incrementally by auguring approximately 1.6 meters into the ground and withdrawing soil on the auger vanes. All samples retained were carefully sealed to prevent moisture loss and subsequently taken to our Soil Mechanics Laboratory for further analysis.

The in-situ strength of the soil was determined in the field by conducting a series of standard penetration tests and obtaining the corresponding blow count - N values. Where cohesive materials were encountered, pocket penetrometer tests were performed.

Subsurface Features

A) Subsoil Conditions

The soil profiles, as logged at the borehole locations, are shown on drawing No.'s 2 through 4 inclusive, Appendix A. Results of field and laboratory tests are shown on the borehole logs.

The soil profile at the test hole areas consisted of surficial topsoil, native clayey silt till, native clay till and siltstone / sandstone bedrock. The geotechnical report should be read in conjunction with information provided in the attached soil logs.

Topsoil / Organic Silt

Topsoil / organic silt material was encountered across all test holes locations. The topsoil / organic material was primarily a mixture of topsoil and silt. Its thickness ranged from approximately 100 – 125 millimeters thick at the test hole locations. It should be noted that the thickness and characteristics of the fill material may vary across the site during site construction.

The fill material is unsuitable as foundation material to support any structural load. Exterior flatworks, brick / stoneworks, etc. resting on the on-site fill soil could experience some differential movement. Any fill material placed near the slope crest or along the slope will reduce the stability of the slope with the existing slope parameters. All excavated soil during construction should be moved from the sloped portion of the property.

Clayey Silt Till

Clayey silt till was encountered beneath the topsoil / fill material. The native clayey silt till was detected in various regions within both test holes. In borehole #1, the clayey silt regions were encountered at 0.6 – 0.9 meters and 7.9 – 11.9 meters. In borehole #2, the clayey silt till was noted at depths of approximately 0.6 – 1.2 meters. The olive brown colored native clayey silt soil was primarily stiff in consistency. The native clayey silt till was characterized with white mineral deposits, stones to pebbles, rusting, grey streaks, coal specks and bedrock fragments. Damp interlayers were noted at occasional elevations within the native clay deposit.

Clay Till

In the upper regions of both boreholes, clay till deposits were documented directly below the clayey silt till. The clay till was encountered at depths of approximately 1.2 – 4.0 meters across borehole #1 and #2. The light brown colored native clayey soil was primarily stiff to very stiff in consistency with some firm interlayers. The native silty clay till was characterized with white mineral traces, rust stains, coal, stones, bedrock fragments, grey siltstone traces and some tan color zones within the clay till region.

The on-site clayey soil with a plastic index of about 19.6% can be classified as inorganic clay with medium plasticity. The clayey soil has a medium potential to swell when in contact with water. It is imperative penetration of surface and subsurface water (such as pipe leakage) into the native clay subgrade soil should be prohibited. All subsurface plumbing work must be completed to the highest standard to prevent leaking. Any leakage could cause undesirable movement of the slab or exterior flatworks and reduce the stability of the slope.

Sandstone / Siltstone

Sandstone / siltstone extended to the bottom of both test holes. In borehole #1 locale, the first section of bedrock material was encountered at a depth of approximately 4.3 meters and extended to 6.2 meters. The second section of bedrock material discovered in borehole #1 was found to immediately after the clayey silt till at depths of roughly 12.2 meters below grade. The tan / golden brown bedrock material was slightly weathered and dense to very dense in consistency in the upper regions of both boreholes. As drilled depth increased, it became very dense to hard in consistency. Difficult augering was experienced in the bedrock regions of the two test holes.

In view of the presence of relatively shallow bedrock measured from the slope surface and varied bedrock hardness, installation of pile foundation could be difficult. Predrilling to allow driven piles socketed into the shallow bedrock and encased in concrete might be required. Alternatively, tiebacks near the bottom section of the driven piles might be required to secure the piles at the bottom. Test piles should be installed to ensure the piles can be driven to the required embedded depth with no vibration impacting the structural integrity of surrounding structures.

B) Groundwater

Underground water was detected at various elevations in each of the boreholes on October 13, 2021. Two slotted PVC standpipes were installed in borehole #1 and #2 locations for monitoring the groundwater levels. On October 20 and 28 of 2021, the watertable measurements were recorded and summarized as follows in the table below. Both water table measurements were very similar during the two site visits. Topographic survey and borehole elevations were provided by Compass Geomatics as shown on their cross-sectional slope profile.

Hole	Approximate Borehole Elevation (meters)	Groundwater Level recorded in standpipes (meters)	Groundwater Level Measured from Existing Grade (mbg)
1	943.05	936.65	6.40m
2	943.02	936.72	6.30m

mbg = meters below grade

It should be noted that the water conditions were observed in a relatively short term and may not represent stabilized ground water readings. The groundwater table has the potential for short term upward fluctuations during periods of snow melt or precipitation. These seasonal fluctuations will impact subgrade support conditions and excavations.

C) Stability of Slope

Field observation revealed the southwest facing slope appeared to have apparent signs of erosion within the subject property at the time of site drilling. Though groundwater or seepage was not directly noticed on the slope surface neighboring the building site, the potential of seepage or springs cannot be wholly discounted of under all circumstances.

Slope stability analyses was carried out using the slope computer program (Geostudio) to evaluate the stability of the existing southwest facing slope profile in its current state and with the proposed construction of new retaining system to stabilize the stability of the slope. The slope stability analyses were to determine the factors of safety (FS) for various slip planes through compelling development features.

The slope factors of safety (FS) based on the proposed slope retaining wall configurations constructed throughout from the slope crest were analyzed.

The following conservatively assumed soil parameters were used:

Soil Type	Unit Weight (kN/m3)	Cohesive Strength (kPa)	Angle of Internal Friction (degree)
Topsoil / Organic	15	0	10
Native Clayey Soil	20	10	32
Bedrock	22	0	50

Essentially, a factor of safety (FS) of less than 1 indicates that failure is expected. Given the possibility of soil variation, groundwater fluctuation, erosion and other factors, slopes with FS ranging between 1.0 and 1.3 are considered to be marginally stable. A "long term" stable slope to have a calculated FS of at least 1.5 is required for structures constructed at or near the slope.

On account of the present slope configuration, existing vegetation and decking structures on the slope, the stability of the slope based on the cross-sectional profiles from Compass Geomatics were analyzed under the following conditions.

a) The first stage of the slope stability analysis was under "normal" groundwater conditions and existing slope parameters found in cross-sectional profiles #1 and #2.

   The first stage of the slope stability analyses of the existing slope profiles confirms a long-term factor of safety (F.S.) of 1.417 for cross section #1 and 1.758 for cross section #2. This means the existing parameters of the slope along cross section of hole #2 crest is deemed stable. The F.S.'s of 1.758 exceed the minimum required FS of 1.5. Whereas, the slope cross section along hole #1 is on a borderline of F.S. = 1.417 which is less than the minimum requirement of F.S. of 1.5. Proper retaining wall structure should be provided to protect the slope surface.

b) The second stage of slope stability analysis was under the assumption of simulated high groundwater level utilizing the cross-sectional profiles #1 and #2.

   The second stage of the slope stability assessment also confirmed a long-term factor of safety (F.S.) of 1.196 for cross section #1 and 1.552 for cross section #2. The F.S. of 1.196 reveal that the cross-sectional profile #1 is only marginally stable. Under these conditions, only the cross-sectional profile #2 exceeds the minimum required FS = 1.5.

c) The third stage of slope stability analysis is using the cross-sectional profile #1 and proposed slope modifications to help stabilize the slope.

   The third stage of the slope stability analysis with the proposed slope modifications and a properly designed retaining wall reveals a factor of safety (F.S.) of 1.870 can be obtained. This means the construction of an engineered retaining wall with setback and measurements as per the slope stability drawings increases the factor of safety to over 1.5. The F.S. of 1.870 exceed the minimum required FS of 1.5. The new engineered retaining wall should be maintained at least one meter inside of the property line.

d) The final stage of slope stability analysis is using the cross-sectional profile #1 and proposed slope modifications with an engineered retaining wall to help stabilize the slope with the addition of a simulated high groundwater table.

   The final stage of the slope stability analysis with the proposed slope modifications and an engineered retaining wall reveals a factor of safety (F.S.) of 1.617. This means the construction of an engineered retaining wall maintaining about one meter inside of the sloped property line with the addition of a simulated high groundwater still maintains a factor of safety of over 1.5. The F.S. of 1.617 exceed the minimum required FS of 1.5.

   On November 22, 2021, our office conducted a meeting to discuss retaining wall construction parameters. Present at this meeting was Mike Touchette, Martin Touchette and Philip Kwong. The proposed slope configuration from the last two stages of slope stability reflects the construction and design parameters that were discussed.

In order to maintain the stability of the slope, it is imperative the following should be adhered to:

a) In view of the presence of steep slope, customer prefers to use driven H steel piles with wood lagging to be installed along the slope. Installation of the driven H steel piles will likely minimize excavation along the slope and could be more cost effective. However, vibration of the driven steel piles could impact the existing and surrounding structures. As well, all driven H piles and tieback must be properly designed by a qualified structural engineer and the shallow depth and varied hardness of the bedrock could create some difficulty in piling. Review of the pile designs could be required during test pile installation.

b) Full time pile inspection by our personnel during construction of retaining wall and backfilling operation. As quality and elevation of the bedrock will vary at each pile location, our personnel has to confirm its required depth and penetration resistance.

c) Proper drainage and site grading must be maintained in order to maintain the stability of the slope.

d) All other recommendations in this geotechnical report.

The following sections regarding recommendations for retaining wall construction parmeters, soil compaction, the slope developments, site grading, subsurface drainage, and different stages of site inspections as required must also be adhered to for maintaining the stability of the slope during and after construction.

Recommendations

A) Driven Steel Piles

By virtue of our findings at the two test hole locations and the customer intent of creating a retaining structure with driven H steel piles and wood lagging, driven steel can be considered for the support of structural loading of the proposed retaining structure. The driven H steel piles may be designed as end bearing piles embedded in the bedrock and with a combination of tie-backs to support the required lateral loading. All end bearing piles should be driven to practical refusal in the dense to hard shale bedrock deposits.

1) The bedrock is relatively close to the slope surface, especially near the property line area. It is advisable that the driven steel H piles should be maintained about 1.5 meters or more inside the property line and more towards the slope crest in order to provide additional frost covering for the piles. The required horizontal distance of the driven piles away from the property line has to be reviewed by our personnel during test pile installation.

2) For piles driven to practical refusal, the factored ULS end bearing resistance may be determined by multiplying the cross-sectional area of the pile at the tip by 0.35 Fy. Fy is the yield strength of the steel. The maximum permissible value of Fy should be supplied by the manufacturer.

3) The factored ULS resistance values are determined by multiplying the ultimate resistance values by a geotechnical factor of 0.4.

4) All driven H steel piles must be driven to practical refusal under an imparted energy of 32, 600 Joules. For preliminary design, refusal criteria can be taken as 5 blows per 25 millimeters over the last 150 millimeters. Our representative will determine the actual refusal criteria required during pile driving operations, when the pile weight, driving energy, pile details and load carrying capacities are determined / known.

5) Practical pile refusal depths are roughly estimated in the upper regions of the sandstone/siltstone stratums. Test piles can be installed to ensure the steel pipe piles can be driven to the required depths due to change in siltstone elevations and varying soil deposits encountered in the test hole locations. As hard driving is anticipated, thicker pile wall should be contemplated. Any piles not reaching the refusal criteria must be extended using proper welding techniques.

6) All driven steel piles should be embedded about one meter or deeper into the bedrock to minimize the frost jacking of the piles. Where less pile embedment into the bedrock can be achieved, some potential frost jacking on the driven piles could occur. This could be obvious for shallow steel sheet piles of about one meter above the lake water are installed along the slope toe for boat ramp storage.

7) Any structures built on the slope including deck must be supported by properly designed driven piles.

8) Frost heave forces will also act on the underside of tieback anchors embedded within the freezing zone. An upward heaving pressure in the order of 1000 kPa or greater could be encountered. The potential of frost heaving forces can be greatly reduced by the placement of compressible material or by providing a void of at least 100mm between the underside of the tieback anchors and soil.

The finished grade adjacent to the tieback anchors should be properly sloped away to prevent the surface runoff from infiltrating and collecting in the void space or in the compressible medium. If water is allowed to accumulate in the void space or the compressible medium becomes saturated, frost heaving pressure will become evident.

9) In the pile design, a structural engineer should be consulted to ensure that the foundation is adequate to support the vertical, horizontal and dynamic loading of the proposed retaining structure.

10) Site classification for seismic site response for the subject property is E.

11) If driven piles are installed in frozen ground, the zone of frost should be predrilled. Predrilled pilot holes should be no greater than 90 percent of the pile diameter.

12) Pile driving may result in significant vibrations which may be unacceptable for adjacent structures. In areas where this is a concern, continuous monitoring of vibrations induced in adjacent structures is recommended in order to assess the potential damage and the need for modification of procedures. A detailed damage survey of nearby structures is recommended prior to pile driving.

13) In accordance with the Alberta Building Code, full time inspection by our geo-technical personnel is necessitated to confirm that the piles are installed in accordance with design assumptions and that the driving criteria to reach load carrying capacities are satisfied. A complete driving record of blows per 300 millimeters of penetration for each pile should be obtained and reviewed by the pile designer.

B) Soil Lateral Pressure

Due to current slope configurations, soil parameters and erosion noted near the crest of the slope, construction of a retaining structure is needed to sure the long-term stability of the slope.

1) All retaining walls must be properly designed by a qualified structural engineer to ensure they can withstand the following anticipated soil lateral pressures and over-burden load.

2) The lateral pressures are dependent on the soil type behind the wall, the wall orientation, exposure to frost action, the slope of the backfill away from the wall, and compactive effort used.

3) For the general case of a permanent vertical wall with horizontal backfill, lateral earth pressures may be computed using the following equation:

$$P = KQ + KrH$$

Where:

P = Lateral earth pressure at depth H below ground level (kPa)
Q = Surcharge loading at the ground surface (kPa)
K = Coefficient of lateral earth pressure
r = Total unit weight of soil backfill compacted to at least 95% Standard Proctor Maximum Dry Density (kN/m^3)
H = depth below ground level (meters)

3) Recommended designed values for these parameters will depend on the type of backfill used. Recommended designed values are given in the table below:

Lateral Earth Pressure Parameter		
Type of Backfill	**Total Unit Weight (kN/m^3)**	**Coefficient of Lateral Earth Pressure K**
Free draining material (40mm Rock)	21	0.4
Clay	20	0.7

The values given above are for backfill compacted to 95 % Standard Proctor Maximum Dry Density. If the density of the backfill is increased, the lateral pressures acting on the wall should be reviewed.

The following should also be considered in the wall design:

1) Prior to the placement of drain rock between the retaining wall and slope, a layer of geotextile filter cloth should be placed to completely wrap around the drain rock, including the top to prevent fine material from contaminating the draining medium.

2) Applicable surcharge loading should be applied if applicable.

3) It is imperative that proper steps be taken to prevent any water that infiltrates the backfill soil from accumulating behind the wall. If water is allowed to permeate the soil behind the wall, large additional pressures will be applied to the wall. The drain rock surface should be covered with approximately 300 millimeters of compacted clay to prevent water from seeping into the draining medium.

C) General Slope Recommendations

The following general recommendations apply to maintain the stability of the slope during and after construction at this site.

1) In order to reduce the possibility of surficial sloughing, the slopes outside of the new retaining wall structure must be kept well vegetated at all times. The factor of safety of a slope will increase slightly as vegetation is maintained on the slope surface to protect the subgrade soil from weathering.

2) The native soil could be susceptible to erosion. Surface drainage and roof water must be discharged on the ground surface and kept away from the developed slope and the new retaining structure. No water is permitted to discharge below grade as that could cause erosion and potential slope failure.

3) All underground services should be installed to the highest standards to minimize the risk of seepage infiltration into the slope area due to leaking water.

4) No fill or excavated material may be placed at the top of the slope with the exception of any designed retaining wall.

5) Automatic sprinkler system, ornamental fountains, other water retaining structure are prohibited.

6) The finished site grade should be properly sloped to direct all surface water from the house and sloped areas. A minimum grade slope of 3% is advised at this site.

D) Foundation Concrete

A water soluble sulphate concentration test were completed on one soil samples randomly collected from a selected borehole locations indicated a water soluble concentration of 0.046%. In accordance with current CSA standards, the degree of sulphate exposure may be considered negligible and the use of sulphate resistant hydraulic cement is not required for concrete in contact with local soil. It is advisable water soluble sulphate concentration tests should be completed on any imported fill to verify the sulphate resistant requirements for concrete elements in contact with fill material.

Concrete element exposed to de-icing salts or other substances containing chlorides should be designed in accordance with an exposed concrete classification pertaining to concrete exposed to chloride attack. As well, subsurface concrete could be subject in seasonal saturated conditions. Air-entrainment should be incorporated into any concrete elements that are exposed to freeze-thaw to enhance its durability. In accordance with Clause 4.1.1.1 of CSA A23.1-19, where more than one exposure condition applies to concrete elements, the concrete shall be designed to meet the highest specified 28 day compressive strength, the lowest water-to-cementing materials ratio, the highest range in air content, and the most stringent cement type requirement.

E) Construction Monitoring

The engineering design recommendations presented in this report are based on the assumption that an adequate level of inspection will be provided during construction and that all construction will be carried out by a qualified contractor experienced in construction.

- for pile construction - verification of the penetration resistance along the pile shaft and documentation of the install and configuration of each pile by our representative.

Closure

This report is based on the findings at the borehole locations. Should conditions encountered during construction appear to be different from those shown by the test holes, this office should be notified immediately so that we may reassess our recommendations on the basis of the new findings. Recommendations presented herein may not be valid if an adequate level of inspection is not provided during construction or if relevant building code requirements are not met.

Soil conditions, by their nature, can be highly variable across a construction site. The placement of fill during and prior to construction activities on a site can contribute to variable near surface soil conditions. A contingency should be included in the construction budget to allow for the possibility of variations in soil conditions, which may result in modification of the design, and / or changes in construction procedures.

This report has been prepared for the exclusive use of [redacted] and their agents, for specific application to the development at 101 Birchcliff Road, Summer Village of Birchcliff, Alberta. Any use that a third party makes of this report, or any reliance or decisions based on this report, are the sole responsibility of those parties. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty is made, either expressed or implied.

Sincerely,
Smith Dow and Associates Ltd. (Red Deer)

Philip Kwong

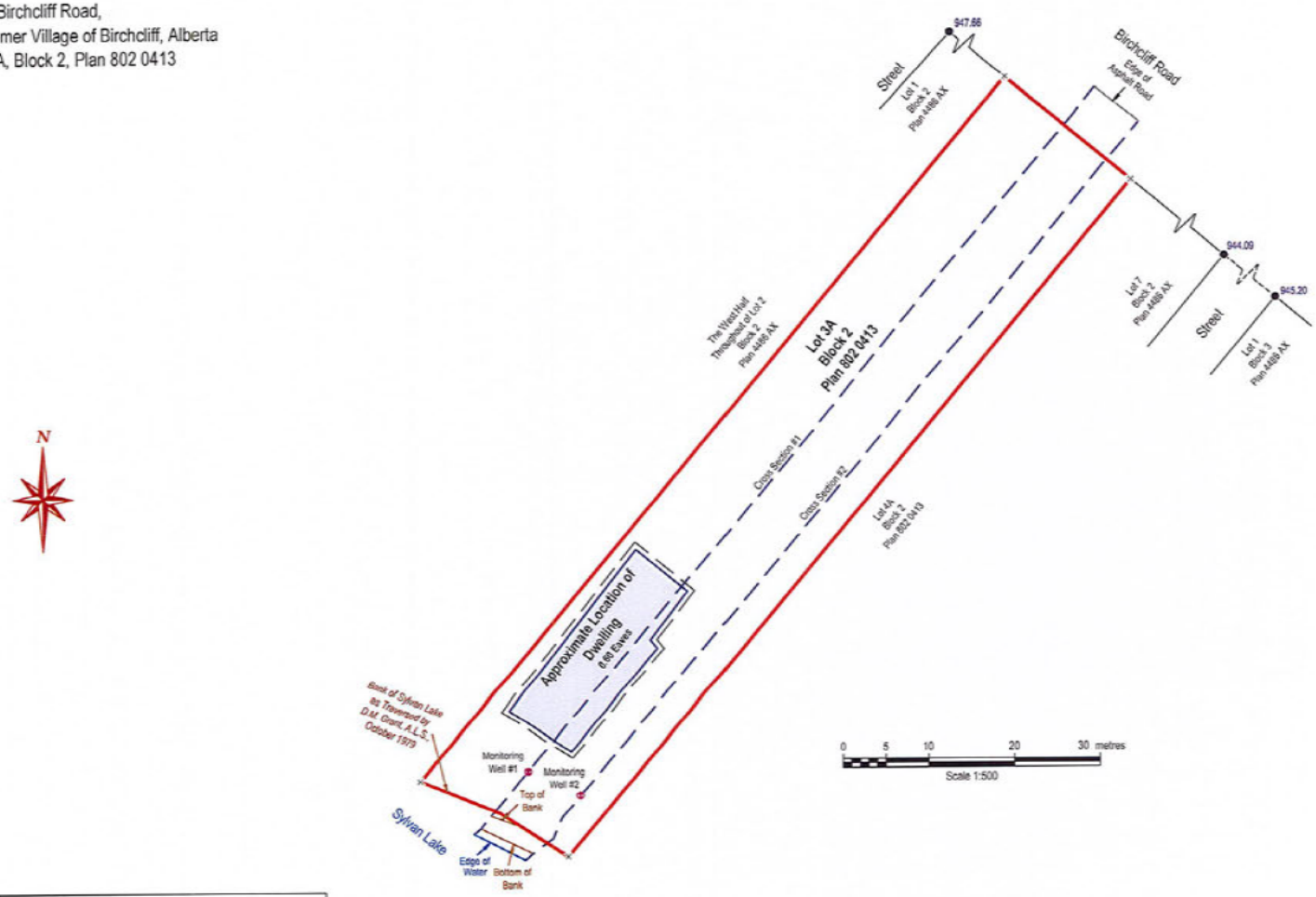
Philip Kwong (P.Eng)

PROFESSIONAL ENGINEERS ALBERTA
C.H. PHILIP KWONG

APPENDIX-A

PLAN SHOWING CROSS SECTIONS

Civic Address: 101 Birchcliff Road,
Summer Village of Birchcliff, Alberta
Legal Description: Lot 3A, Block 2, Plan 802 0413



COMPASS Geomatics Ltd.
11-4608 62nd Street
Red Deer, Alberta T4N 6T3
Office: (403) 256-0111 Fax: (403) 256-0114
www.compassgeomatics.ca

ALBERTA LAND SURVEYORS' ASSOCIATION
PERMIT NUMBER
P266
Compass Geomatics Ltd.

COMPASS DWG: 01407-21-MISC-R0 SURVEYED BY: CN

REVISION SUMMARY
Original Issue (11/10/21) DR/PC

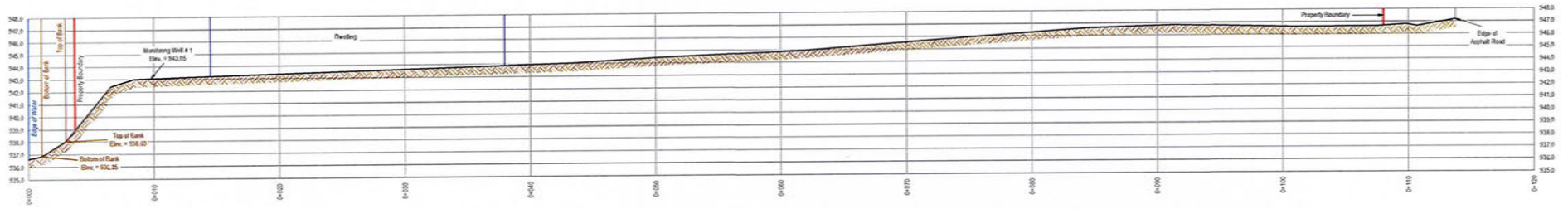
CLIENT [redacted]

REV. 0 | PAGE 1 of 3

PLAN SHOWING CROSS SECTION # 1

Civic Address: 101 Birchcliff Road,
Summer Village of Birchcliff, Alberta

Legal Description: Lot 3A, Block 2, Plan 802 0413



CROSS SECTION # 1 OF LOT 3A

Scale 1: 200 (Horiz.)
1: 200 (Vert.)

COMPASS Geomatics Ltd.
11-4808 52nd Street
Red Deer, Alberta T4N 6T3
Office (403) 356-0111 Fax (403) 356-0114
www.compassgeomatics.ca

ALBERTA LAND SURVEYORS' ASSOCIATION
PERMIT NUMBER
P266
Compass Geomatics Ltd.

N

REVISION SUMMARY

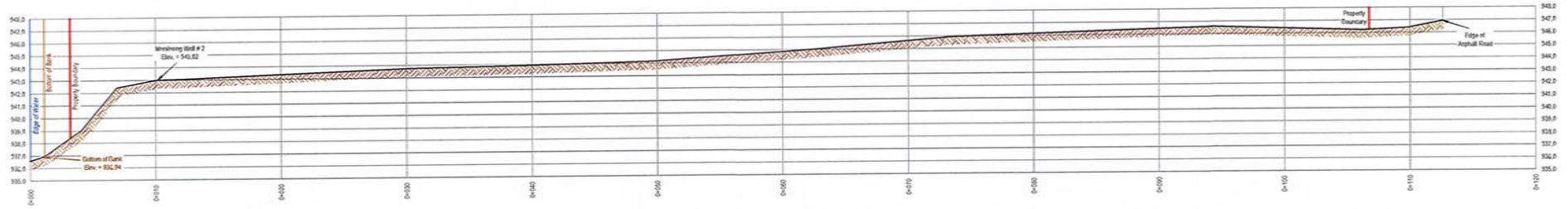
0 ORIGINAL ISSUE (11/10/21) DR/FC

Rev. 0 | Page 2 of 3

PLAN SHOWING CROSS SECTION # 2

Civic Address: 101 Birchcliff Road,
Summer Village of Birchcliff, Alberta

Legal Description: Lot 3A, Block 2, Plan 802 0413



CROSS SECTION # 2 OF LOT 3A

Scale: 1: 250 (Horiz.)
1: 250 (Vert.)

COMPASS Geomatics Ltd.
11-4650 43rd Street
Red Deer, Alberta T4N 6T3
Office (403) 356-0111 Fax (403) 356-0114
www.compassgeomatics.ca

ALBERTA LAND SURVEYORS' ASSOCIATION
PERMIT NUMBER
P266
Compass Geomatics Ltd.

N

REVISION SUMMARY

0	ORIGINAL ISSUE (11/10/21) DRPC

REV. 0 | PAGE 3 of 3

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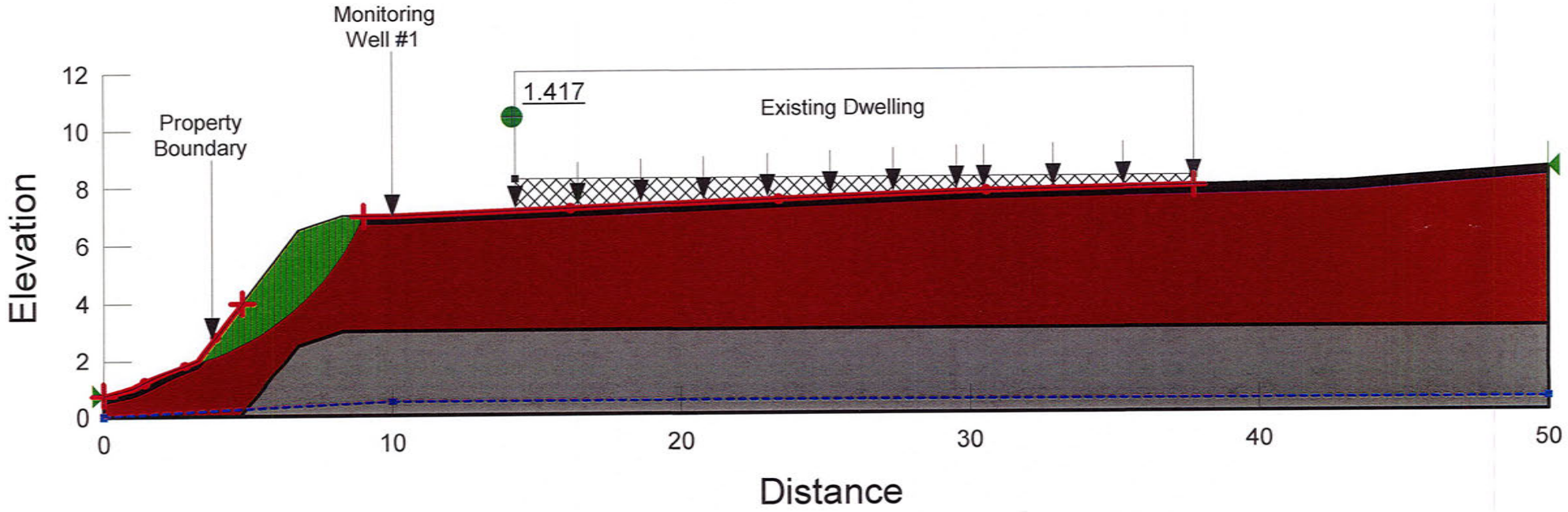
Summer Village of Birchcliff, AB
Cross Section #1



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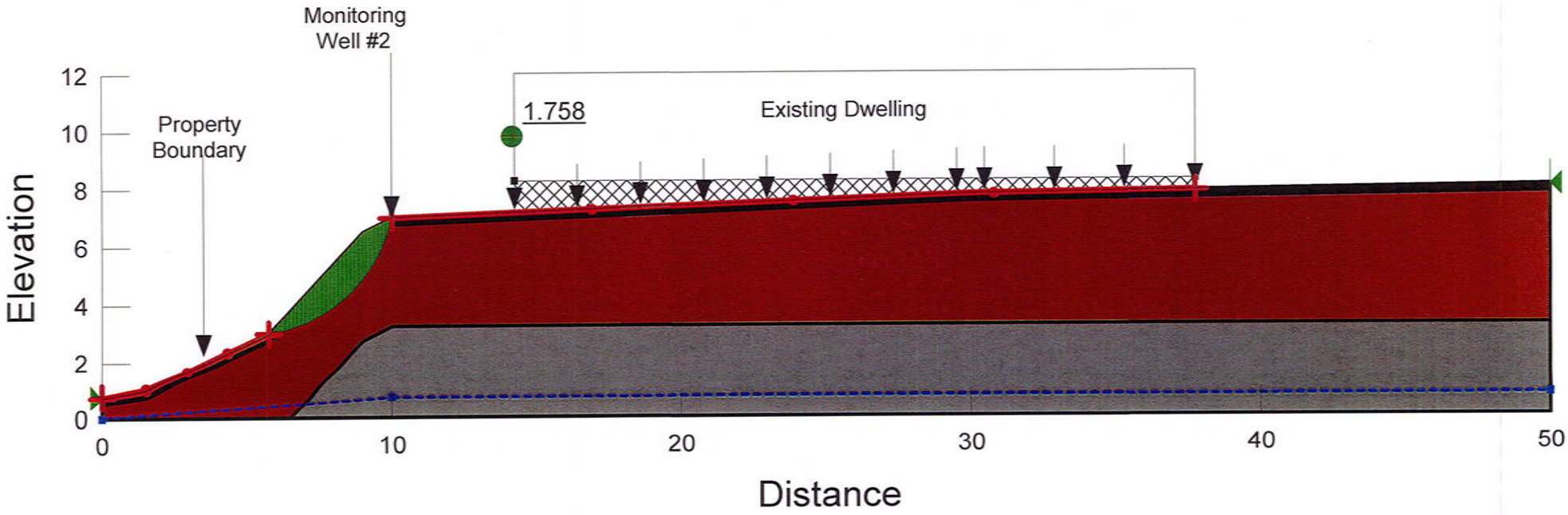
Summer Village of Birchcliff, AB
Cross Section #2



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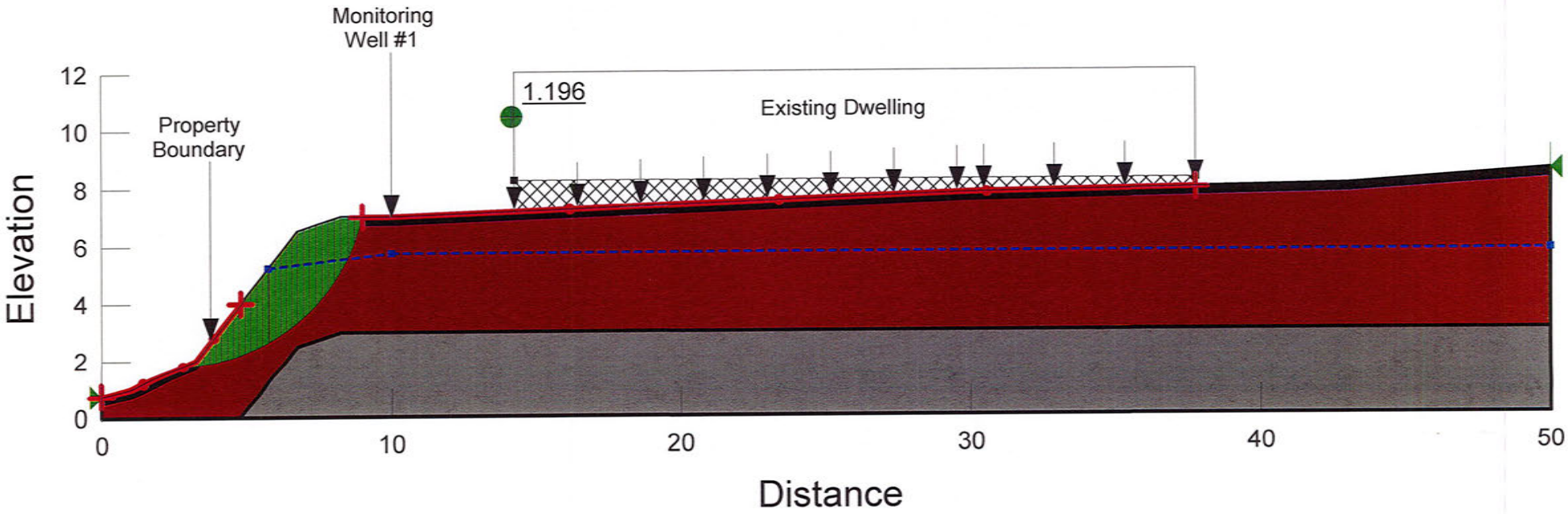
Summer Village of Birchcliff, AB
Cross Section #1
(Simulated High Groundwater)



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Summer Village of Birchcliff, AB
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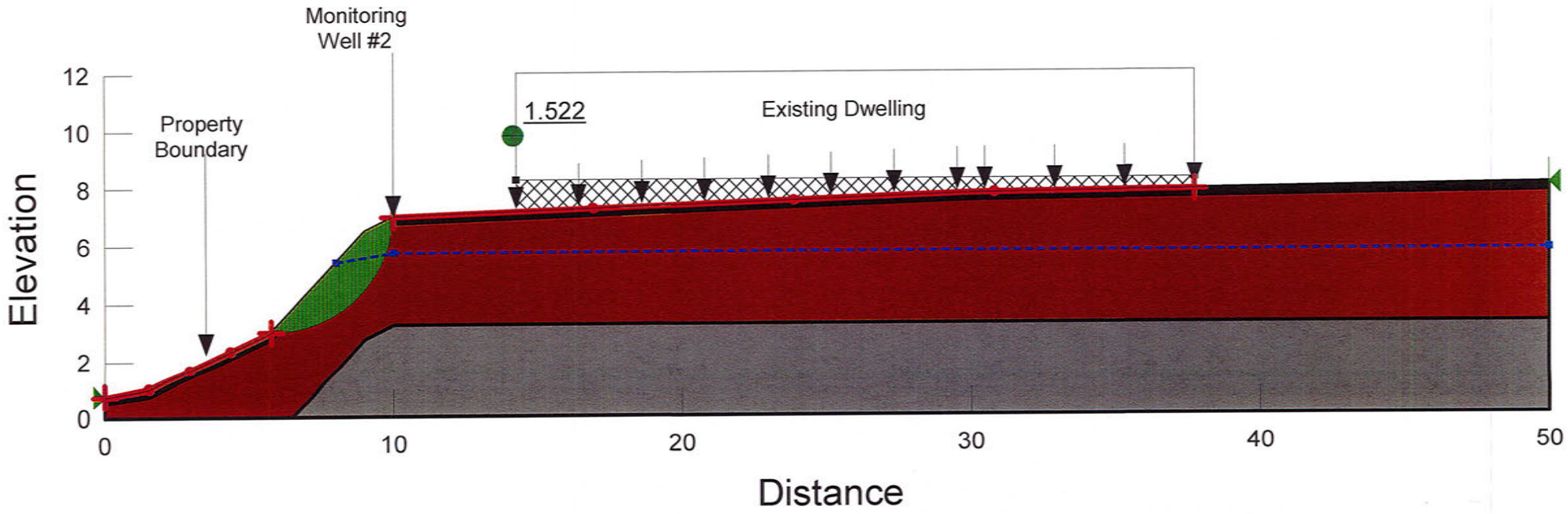

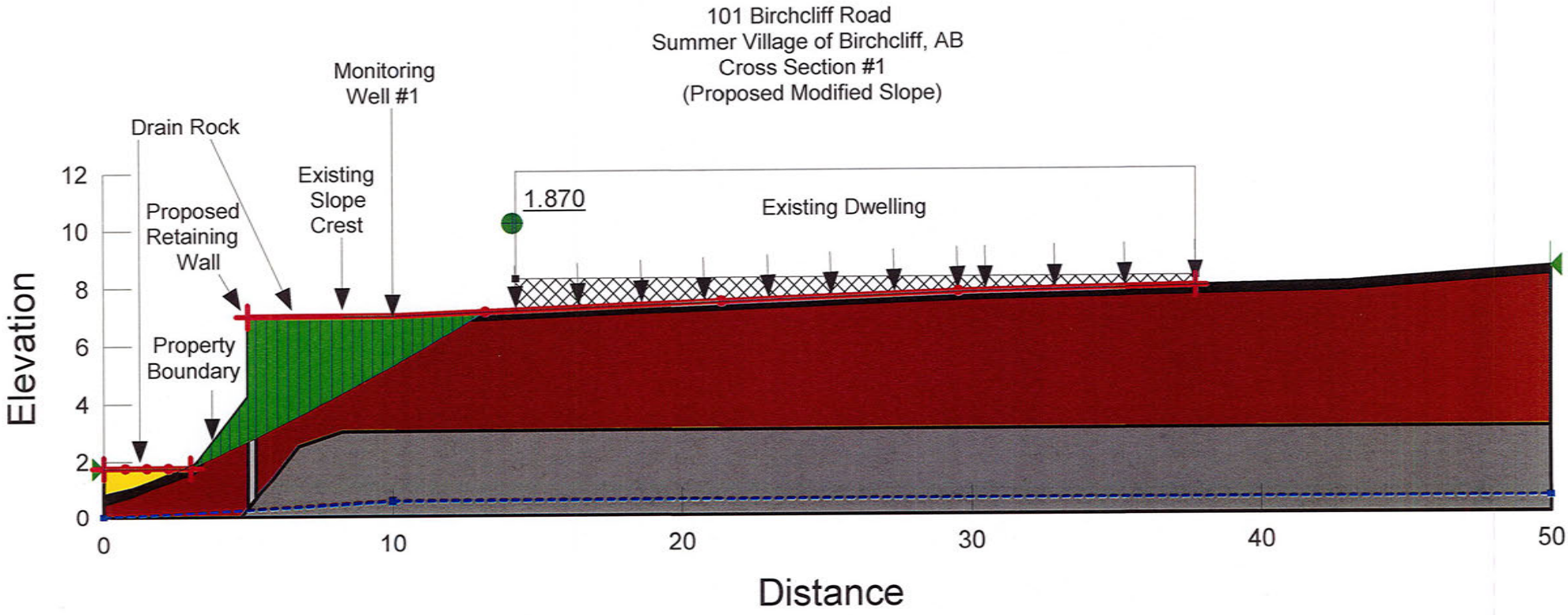
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Summer Village of Birchcliff, AB
Cross Section #1
(Proposed Modified Slope)
Monitoring
Well #1
Drain Rock
Existing
Slope
Crest
1.870
Existing Dwelling
Proposed
Retaining
Wall
Property
Boundary
Elevation
12
10
8
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4
2
0
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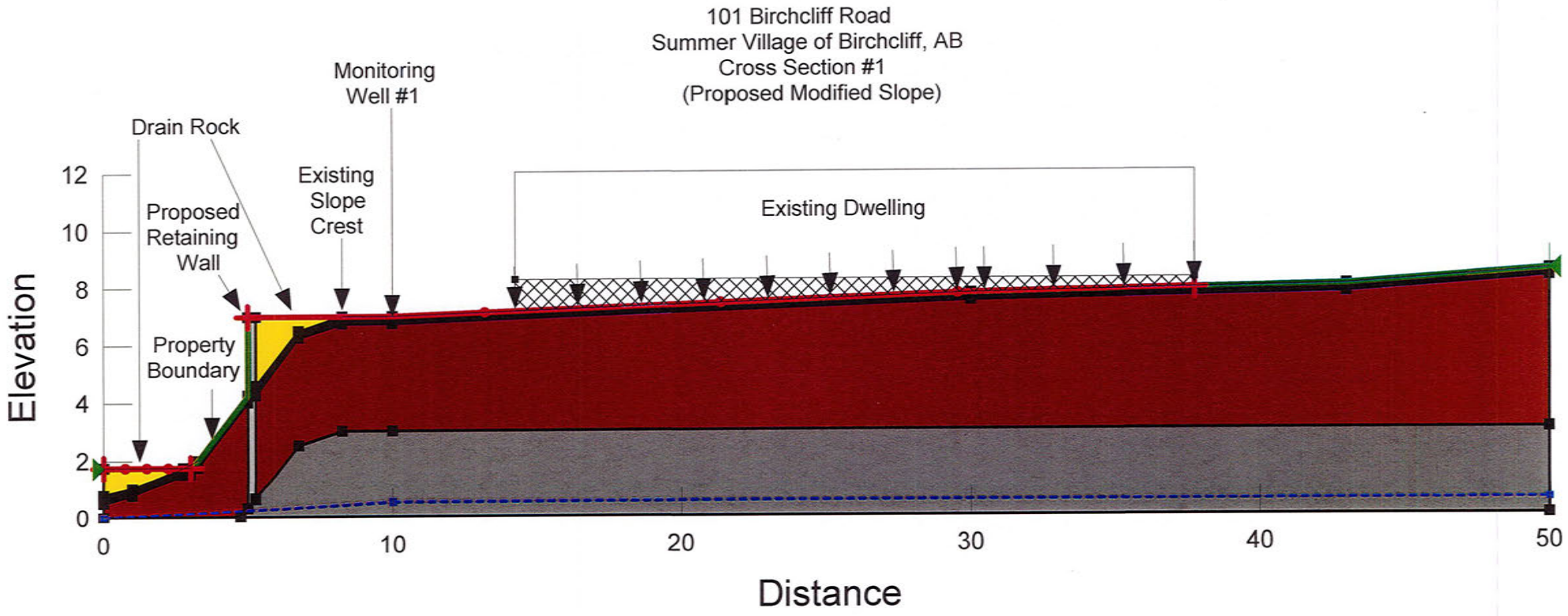
20
30
40
50
Distance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Summer Village of Birchcliff, AB
Cross Section #1
(Proposed Modified Slope)
Monitoring Well #1
Drain Rock
Existing Slope Crest
Proposed Retaining Wall
Property Boundary
Existing Dwelling
Elevation
12
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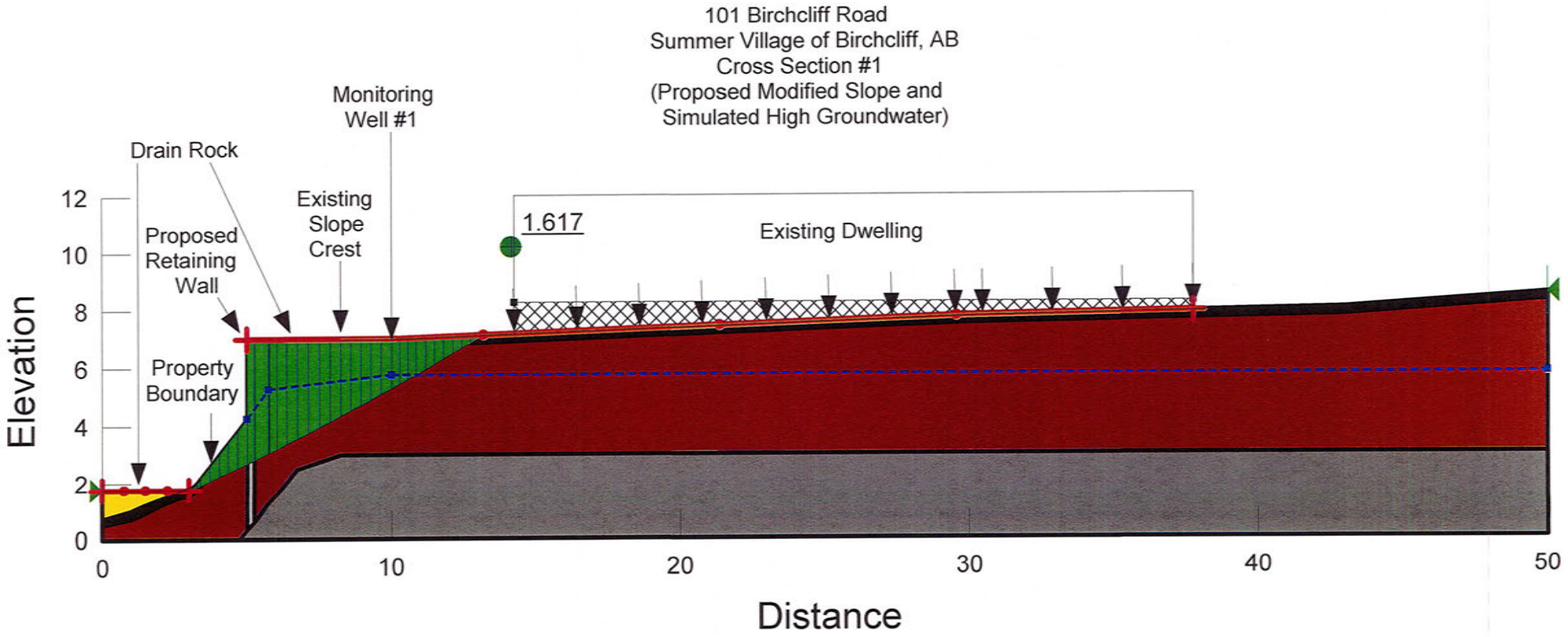
Distance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Summer Village of Birchcliff, AB
Cross Section #1
(Proposed Modified Slope and
Simulated High Groundwater)
Monitoring
Well #1
Drain Rock
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Slope
Crest
1.617
Existing Dwelling
Proposed
Retaining
Wall
Property
Boundary
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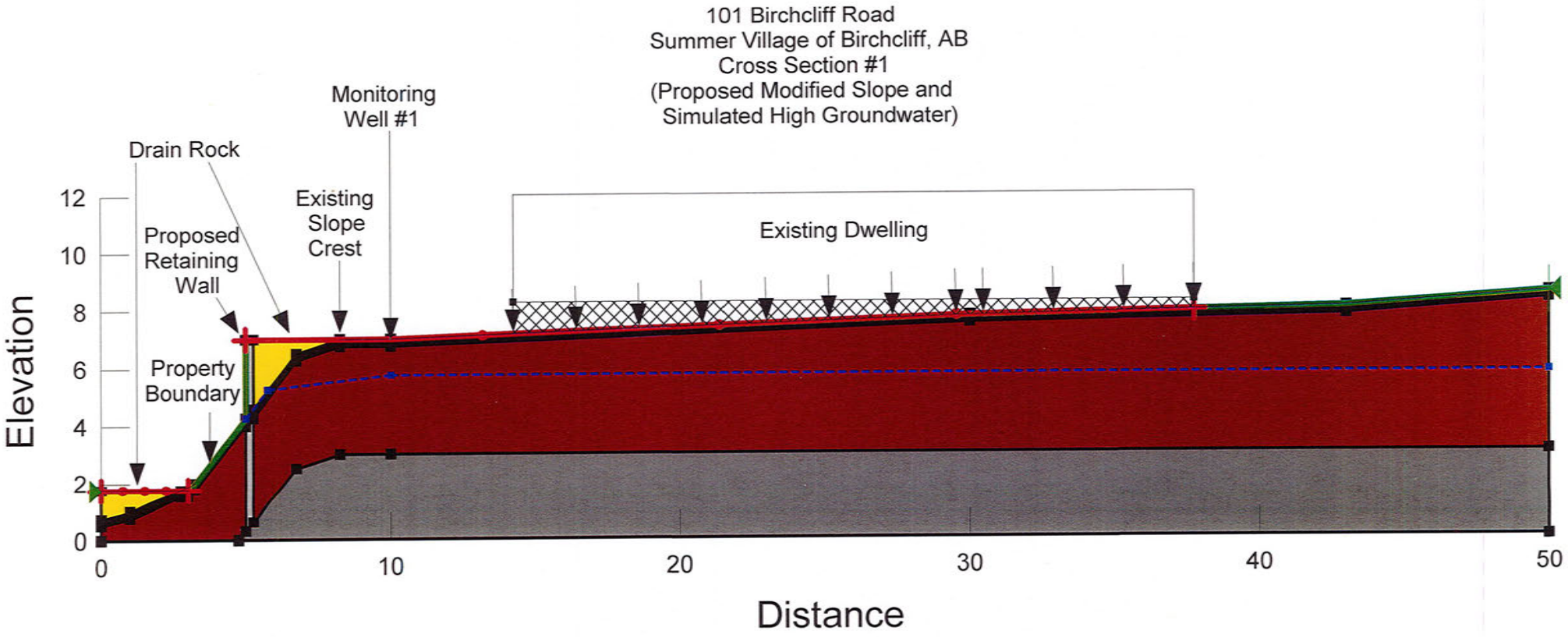
101 Birchcliff Road
Summer Village of Birchcliff, AB
Cross Section #1
(Proposed Modified Slope and
Simulated High Groundwater)
Monitoring
Well #1
Drain Rock
Existing
Slope
Crest
Existing Dwelling
Proposed
Retaining
Wall
Property
Boundary
Elevation
12
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8
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30
40
50
Distance

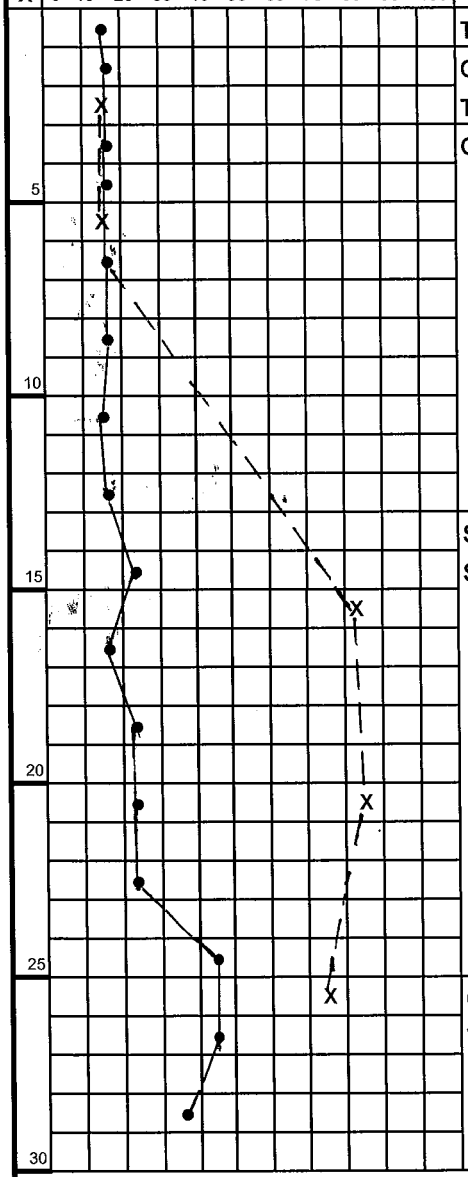
SMITH DOW & ASSOCIATES LTD.
-------Engineering Consultants-------

Project: 101 Birchcliff Road
SV of Birchcliff, Alberta

DWN HB	CKD MK	DATE October 13, 2021	FILE #	HOLE 1

STRENGTH----------
MOISTURE----------
PENETRATION----------

▲ 100 200 300 400 500
● 10 20 30 40 50
X 0 10 20 30 40 50 60 70 80 90 100



DATUM
GROUND ELEV-

CLASSIFICATION		SYMBOL	TEST DATA	SAMPLE	Depth feet	Depth meters
Topsoil./Silt	roots to rootlets, black/tan, humus 100				1	
Clayey Silt	tan, silty, low to non-plastic				2	
Till	coal fragments, low plastic, stiff				3	
Clay Till	pebbles, white mineral specks				4	1
	low plastic, olive/tan				5	
	stiff, white mineral traces		N=16	X	6	
	pebbles				7	2
	tan, low plastic				8	
	rust stains				9	
	stiff to very stiff				10	3
	coal specks		N=17	X	11	
	grey siltstone traces				12	
	sand lenses/laminations, weathered				13	4
Sandstone /	sandstone, dense, laminated				14	
Siltstone	golden brown, brittle				15	
	coal traces		N=81	X	16	5
	very dense, dry				17	
	sandstone				18	
	laminated				19	6
	very dense				20	
	olive/tan		N=85	X	21	
	slightly brittle				22	7
	golden brown				23	
	laminated				24	
	water, very dense				25	
Clayey Silt	rust stains, carbonates		N=76	X	26	8
Till	coal traces, low to non-plastic				27	
	dense to very dense, grey streaks				28	
	wet, water, rust specks				29	
	olive, compact to medium dense				30	9

FILL	CLAY	TILL	Q - Unconfirmed Strength, kN/m2
TOPSOIL	PEAT	COAL	d - Dry Unit Weight, kN/m3
SAND	GRAVEL	WATER	S - Sulphate Concentration, %
SILT	SILTSTONE	LIMITS	N - Penetration Resistance, blows

Tube	/
Penetrometer	X
No Recovery	■

TEST HOLE LOG AND LAB DATA

DWG # 2

SMITH DOW & ASSOCIATES LTD.
-------Engineering Consultants-------

Project: 101 Birchcliff Road
SV of Birchcliff, Alberta

DWN HB	CKD MK	DATE October 13, 2021	FILE #	HOLE 1b

STRENGTH----------
MOISTURE----------
PENETRATION----------

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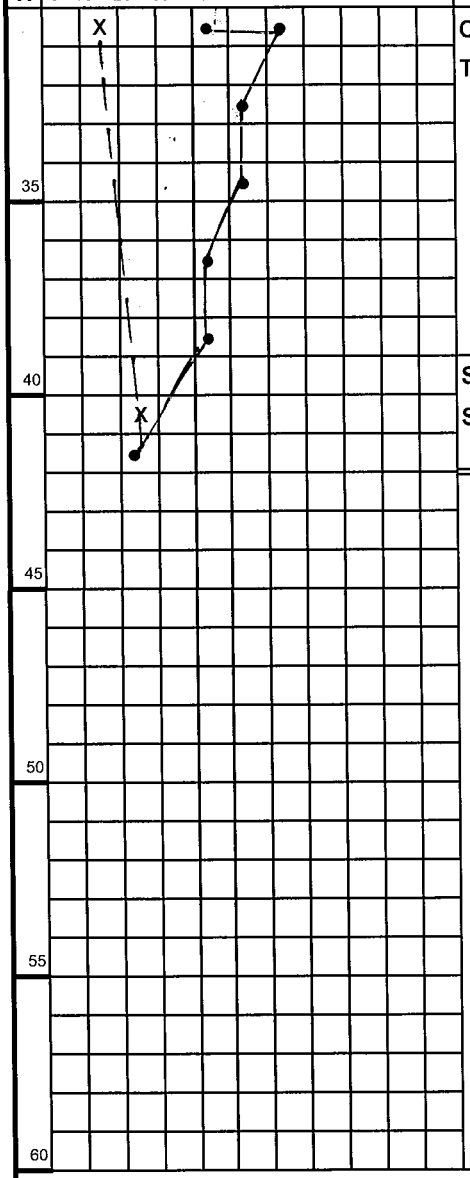
X 0 10 20 30 40 50 60 70 80 90 100

DATUM
GROUND ELEV-



CLASSIFICATION		SYMBOL	TEST DATA	SAMPLE	Depth feet	Depth meters
Clayey Silt	coal specks		N=16	X	31	
Till	sandy with siltstone fragments				32	
	water, olive brown				33	
	wet, sandy				34	11
	sandstone traces				35	
	medium dense				36	
	sandstone layers, grey olive				37	12
	water				38	
	clayey silt, rusting				39	
Sandstone /	some laminations, coal traces				40	13
Siltstone	light olive, very dense		N=25	X	41	
	slightly weathered				42	
					43	14
	End of Hole				44	
	(Standpipe In)				45	
					46	15
					47	
					48	
					49	16
					50	
					51	
					52	17
					53	
					54	
					55	
					56	18
					57	
					58	
					59	
					60	19

FILL	CLAY	TILL	Q - Unconfirmed Strength, kN/m2
TOPSOIL	PEAT	COAL	d - Dry Unit Weight, kN/m3
SAND	GRAVEL	WATER	S - Sulphate Concentration, %
SILT	SILTSTONE	LIMITS	N - Penetration Resistance, blows

Tube	/
Penetrometer	X
No Recovery	■

TEST HOLE LOG AND LAB DATA

DWG # 3

SMITH DOW & ASSOCIATES LTD.
-------Engineering Consultants-------

Project: 101 Birchcliff Road
SV of Birchcliff, Alberta

DWN HB	CKD MK	DATE October 13, 2021	FILE #	HOLE 2

STRENGTH----------
MOISTURE----------
PENETRATION----------

▲ 100 200 300 400 500
● 10 20 30 40 50
X 0 10 20 30 40 50 60 70 80 90 100

DATUM
GROUND ELEV-

CLASSIFICATION		SYMBOL	TEST DATA	SAMPLE	Depth (feet)	Depth (meters)
Topsoil	125mm black, humus, roots				1	
Clayey Silt	low to non-plastic, rootlets, silty				2	
Till	rust and coal specks				3	
	clayey, low plastic, stiff				4	1
Clay Till	tan to brown				5	
	stiff, low plastic, stiff		N=18	X	6	
	white mineral deposits				7	2
	clayey, rusting, medium to low plastic				8	
	olive/brown, stones				9	
	coal & bedrock fragments, stones				10	3
	firm to stiff, rust stains		N=11	X	11	
	low plastic				12	
Sandstone / Siltstone	weathered, golden brown				13	4
	dense				14	
	laminated				15	
	dense		N=46	X	16	5
	golden brown				17	
	very dense, rusting				18	
	laminated				19	6
	rusting				20	
	very dense to hard		N=81	X	21	
	laminations				22	7
	golden brown				23	
	rusting				24	
					25	
	water, very dense/hard		N=85	X	26	8
	wet				27	
	End of Hole				28	
	(Standpipe In)				29	
					30	9

FILL	CLAY	TILL	Q - Unconfirmed Strength, kN/m2
TOPSOIL	PEAT	COAL	d - Dry Unit Weight, kN/m3
SAND	GRAVEL	WATER	S - Sulphate Concentration, %
SILT	SILTSTONE	LIMITS	N - Penetration Resistance, blows

Tube	/
Penetrometer	X
No Recovery	■

TEST HOLE LOG AND LAB DATA

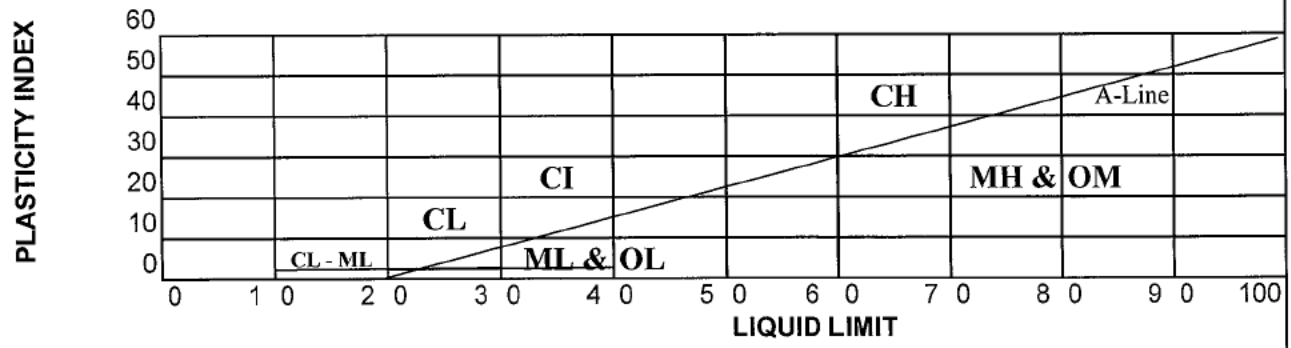
DWG # 4

Smith Dow & Associates Ltd.
4632-62Street
Red Deer, Alberta
Phone 403-343-6888
Fax 403-341-4710

Client	[redacted]
Project #	101 Birchcliff Road
Date	26-Oct-21
Location	Summer Village of Birchcliff, AB

Location	Depth (meters)	Liquid Limit	Plastic Limit	Plasticity Index	Flow Index
Hole 2	2.1	36.3	16.7	19.6	8.5

Location	Depth (meters)	Inherent Swelling Capacity	Soil Classification
Hole 2	2.1	Medium Swell	CI
			Inorganic clay, sandy clay,silty
			of medium plasticity



ATTERBERG LIMIT TEST - ASTM D4318


C-1


C-1