

# AGRICULTURAL ASSESSMENT

## 2402 Hayman Rd, West Kelowna, BC



Prepared For:  
Desjardins Contracting Ltd.

Prepared By:  
Ecoscape Environmental Consultants Ltd.

May 2022



## 2402 HAYMAN RD, WEST KELOWNA, BC

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Lot 9, Osoyoos Division of Yale District Plan KAP5381, District Lot 1118 & 2189, Except Plan  
KAP67336  
PID: 010-346-635

### *Agricultural Assessment*

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## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>- 4 -</b>
1.1	Property Information & Proposed Works.....	- 4 -
1.2	Land Use of Surrounding Area .....	- 5 -
<b>2.0</b>	<b>SITE ASSESSMENT AND METHODOLOGY .....</b>	<b>- 6 -</b>
2.1	Land Capability Classification for Agriculture in British Columbia.....	- 6 -
<b>3.0</b>	<b>SOIL SURVEY CHARACTERISTICS.....</b>	<b>- 7 -</b>
<b>4.0</b>	<b>CLIMATE .....</b>	<b>- 9 -</b>
<b>5.0</b>	<b>FARM PLAN .....</b>	<b>- 10 -</b>
<b>6.0</b>	<b>POTENTIAL ENVIRONMENTAL IMPACTS OF FILL PLACEMENT.....</b>	<b>- 10 -</b>
<b>7.0</b>	<b>BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES .....</b>	<b>- 11 -</b>
7.1	General Requirements .....	- 11 -
7.2	Monitoring .....	- 12 -
7.3	Disturbance Limits .....	- 13 -
7.4	Site Clearing and Grubbing .....	- 13 -
7.5	Topsoil Management .....	- 14 -
7.6	Subgrade Preparation .....	- 15 -
7.7	Soil Replacement .....	- 16 -
7.8	Erosion and Sediment Control .....	- 18 -
7.9	Drainage/Water Management.....	- 19 -
7.10	Air Quality & Dust Management.....	- 20 -
7.11	Noise and Vibration Management.....	- 21 -
7.12	Emergency Spill Response.....	- 21 -
7.13	Site Clean Up .....	- 22 -
7.14	Invasive Plant Management and Site Restoration.....	- 22 -
<b>8.0</b>	<b>SUMMARY AND CONCLUSION .....</b>	<b>- 26 -</b>
<b>9.0</b>	<b>CLOSURE.....</b>	<b>- 27 -</b>
<b>10.0</b>	<b>REFERENCES .....</b>	<b>- 28 -</b>

## FIGURES

FIGURE 1 .....	Site Location
FIGURE 2 .....	Proposed Works
FIGURE 3 .....	Soils & Agricultural Capability
FIGURE 4 .....	Soil Drainage
FIGURE 5 .....	Digital Elevation Model Analysis

## APPENDICES

APPENDIX 1 .....	Site Plan by: Desjardins Contracting Ltd.
APPENDIX 2 .....	Cross Sections by: Desjardins Contracting Ltd.
APPENDIX 3 .....	Driveway Designs by: Desjardins Contracting Ltd.
APPENDIX 4 .....	House Site Plan by: ZED Studio
APPENDIX 5 .....	Stormwater Management Plan by: RSB Engineering
APPENDIX 6 .....	Soil Survey

## 1.0 INTRODUCTION

### 1.1 Property Information & Proposed Works

Ecoscape Environmental Consultants Ltd. (Ecoscape) has been retained by Desjardins Contracting Ltd. (client) on behalf of the landowners, Manjinder and Parneet Dhaliwal, to complete an agricultural assessment ("*Agrologist Report*") at 2402 Hayman Rd, West Kelowna, BC (subject property), to fulfill the requirements of an amendment to an existing ALC Soil and Fill Use application (ALC File No. 62880) for fill placement for the purposes of farm use.

The subject property is 13.223 acres (5.3 ha), legally described as Lot 9, Osoyoos Division of Yale District Plan KAP5381, District Lot 1118 & 2189, Except Plan KAP67336, PID: 010-346-635 (**Figure 1**), located within the municipality of the City of West Kelowna within an agricultural area, bounded by Hayman Road and Issler Park to the south, Rollingdale winery to the east, agricultural parcels to the north, Black Swift Vineyards to the northwest, and Xen Xeriscape Endemic Nursery to the west.

City of West Kelowna municipal zoning of the subject property is A1 (agriculture) and mapping provided by the ALC indicates the property is located entirely within the Agricultural Land Reserve (ALR). The property is currently undeveloped and not being used for agriculture, with some evidence of recent clearing (log piles). There is an existing single-family residence outside the property boundary in the eastern corner of the parcel that is not included the development plans (2398 Hayman Rd, PID 024-836-702).

The purpose of this report is to provide an agricultural assessment of existing conditions for the subject property and a farm plan for the proposed fill placement works, as described below and detailed in **Appendices 1 – 3** and **Figure 2**. The proposed works entail the following:

- 1) Retention of existing topsoil on the subject property and reseeding of any disturbed areas or exposed slopes which are not proposed for cultivation, using an agricultural grass seed mix, to prevent invasive species and noxious weed growth within the subject property. The seed mix must include only species which are native to the Okanagan and non-invasive.
- 2) Placement of fill material in the amount of approximately 84,971 m<sup>3</sup> within a placement area of approximately 34,301 m<sup>2</sup> with an *average* depth of 2.48 m (**Appendices 1 & 2**).
- 3) Fill placement is planned to commence as soon as possible upon the receipt of the appropriate permits and approvals, and is expected to complete by December 31, 2023.
- 4) Fill will be transported by 13-yard dump trucks, with access to the property off of Hayman Rd. As the property does not currently have a vehicle access road, a gravel driveway will need to be constructed prior to fill placement activities, and designs have been included in **Appendix 3**. Volumes proposed for import for road construction are included in total volumes listed in (2). Trucking records will be maintained to include truck operator (name and business license), date of fill placement, volume of fill, and source location. Heavy equipment (i.e. graders) will be used to distribute the fill material.



- 5) All fill sources will be sampled and analyzed by an ISO/IEC17025:2017 accredited lab according to the BC Contaminated Sites Regulation (CSR) standards for agriculture and the ALC Bylaw No.2 and evaluated by a Qualified Professional in Agrology (P.Ag.) to ensure fill meets the CSR and ALC standards prior to fill placement. Approved Phase I or Phase II ESA studies conducted recently by a qualified professional will also be acceptable in addition to a soil inspection by a P.Ag.
- 6) The purpose of the Proposed Fill Placement Activities is to raise the land to a uniform grade to reduce the topographic limitations of the property, including frost pockets, draws, and low areas, in order to plant vines.
- 7) Site preparation for the planting of grape vines (*Vitis vinifera*) will commence following fill placement. Approximately 12 acres of vines will be planted in a N-S orientation. Vines will be sourced from Vine Tech, and an automated drip irrigation system will be installed. Future development plans include a wine shop and tasting room with a small boutique style footprint and a parking area. The processing facility is still to be determined but it would either be off site or below the wine shop. Ahead of detailed site plans prepared by a contractor or civil engineer, the *approximate* location and area of the facility is shown on **Figure 2**.
- 8) The landowner also intends to construct a single-family home in the northern corner of the property, outside the fill placement area. Ahead of detailed site plans prepared by a contractor or civil engineer, the *approximate* location and orientation of the home has been depicted in **Figure 2**. Preliminary house plans are included in **Appendix 4**.
- 9) According to the landowner, The City of West Kelowna constructed a drainage swale connected to a culvert under Hayman Road without landowner permission. The City is requiring the swale to be redesigned as part of this application. Engineered designs will be provided pending approval of this application from the ALC.
- 10) A Stormwater Management Plan was prepared by RSB Engineering and is included as **Appendix 5**.

## 1.2 Land Use of Surrounding Area

Land use in the surrounding area is largely agricultural, with neighboring wineries and nursery operations, with some residential homes on private lands (**Table 1**).

**TABLE 1. Land use of surrounding properties.**

Direction	Zoning*	Ownership	Land Cover/Use
North	A1	Private	Agriculture/Rural
South	P1	Private	Park/Residential
East	A1	Private	Agriculture/Rural
West	A1	Private	Agriculture/Rural

\*A1 = Agriculture

P1 = Parks and Open Space

## 2.0 SITE ASSESSMENT AND METHODOLOGY

A site assessment of the subject property to document existing conditions and review surrounding lands was carried out by Theresa Loewen, M.Sc., P.Ag., on April 26, 2022 (**Photos 1 – 10**).

The subject property is undeveloped with evidence of previous disturbance from the presence of invasive species and clearing of trees. There are no existing structures within the subject property, and no fill appears to have been previously placed on the property. The property is not currently being used for agricultural purposes, although the landowner has observed recreational use of the property by the public as a dog park.

Other sources of information queried for the assessment include:

- British Columbia Soil Information Finder Tool (BC SIFT);
- Agricultural Land Commission (ALC);
- Provincial Land Capability for Agriculture Rating System;
- Biogeoclimatic Maps;
- Agricultural Land Commission's Best Management Practices; and
- Provincial Best Management Practices (BMPs).

### 2.1 Land Capability Classification for Agriculture in British Columbia

The British Columbia Soil Information Finder Tool (BC SIFT) was accessed on May 20, 2022 to query soil survey and agricultural capability data for the subject property. Agricultural capability polygons present within the subject property can be seen in **Table 2** and **Figure 3**.

**TABLE 2. Agricultural capability ratings within the subject property (BC SIFT, 2022).**

Polygon	Unimproved Class <sup>1</sup>	Subclass 1 <sup>2</sup>	Subclass 2	Improved Class	Composition
Parkhill	6	A	-	3	100%
Trout Creek	5	A	-	2	80%
	6	A	-	3AP	20%
Gammil	6	A	-	3T	60%
	5	A	-	2AT	40%

<sup>1</sup> Class 1 land has minimal limitations when associated with the most amenable climates in the Province. In Class 2 to Class 5, the limitations increase. Class 6 lands have limitations that preclude arable agricultural activities yet are capable of sustaining native and/or perennial uncultivated agriculture. Class 7 lands have limitations that preclude all arable and natural grazing agricultural systems, regardless of the climate.

<sup>2</sup> A = soil moisture deficiency, P = stoniness, R = shallow soil over bedrock and/or bedrock outcroppings, T = topography

In BC, agricultural capability ratings and limitations are assessed through a classification system which describes seven land capability classes for agriculture (Classes 1 to 7)<sup>1</sup>. The land capability classification for agriculture has two main components: the capability class and the capability subclass, where the class identifies the potential for agriculture, and the subclass identifies

<sup>1</sup> [Agricultural Land Commission](#) May 2022.



limitations or special management practices needed to improve the soil, such as topography, stoniness, soil moisture deficiency, low fertility, etc. The best agricultural lands are rated Class 1 because they have the ideal climate and soil to allow a farmer to grow the widest range of crops. Class 7 is considered non-arable, with no potential for soil bound agriculture. As the class numbers increase from Class 1 to Class 7, the range of crops decreases. Regular management practices required to make land productive include, drainage, irrigation, stone picking, fertilization etc<sup>1</sup>.

Soil polygons within the subject property are classified as agricultural capability class 5 (limitations that restrict the capability of producing perennial forage crops or other specially adapted crops) and 6 (nonarable but is capable of producing native and/or uncultivated perennial forage crops), with subclass A (soil moisture deficiency). Improved ratings include classes 2 and 3 with limitations of soil moisture deficiency, stoniness, and topography.

Growing-season moisture deficits are common in the Okanagan, and can be managed with an established irrigation system. Soil drainage for the property based on available data is rapidly drained and well drained, as shown on **Figure 4**.

According to the BC SIFT (2022), slopes in the area range from 1% to 29%, with an average slope of 6%. For the subject property, the average slope is 16% with some areas in excess of 60% (**Figure 5**). Elevation ranges within the subject property from 482 m to 505 m (**Figure 5**).

To improve the topographic limitations, filling and grading areas of steep slopes and low-lying areas can help to reduce or eliminate frost pockets.

### 3.0 SOIL CHARACTERISTICS

A soil survey was conducted on September 2, 2022 and the results are included in **Appendix 6**.

The following describes the general characteristics of the geologic history and deposits contributing to existing soil conditions.

Several glacial advances and retreats together with glaciofluvial action have produced a variety of deposits and sediments that form most of the soil parent materials within the area (Wittneben, 1986).

The British Columbia Soil Information Finder Tool (BC SIFT) was accessed on May 20, 2022 to query the soil survey data, as displayed in **Table 3** and **Figure 3**.

**TABLE 3. Surficial deposit characteristics in the area of the subject property (BC SIFT, 2021).**

Soil Name	Texture	Drainage	Deposition Mode	Classification	Percent Composition
Parkhill	Sandy Loam	Rapidly Drained	Glaciofluvial	Eluviated Eutric Brunisol	70%
Trout Creek	Sandy Loam	Well Drained	Glaciofluvial	Eluviated Eutric Brunisol	80%
Gammil	Loamy Sand	Rapidly Drained	Glaciofluvial	Eluviated Eutric Brunisol	60%

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### **The Parkhill Soil Group<sup>2</sup>**

Parkhill soils are classified as Eluviated Eutric Brunisol (E.EB), with approximately 2% coarse fragments by volume. These soils have the general properties specified for soils of the Brunisolic order and the Eutric Brunisol great group. They differ from Orthic Eutric Brunisols by having an eluvial horizon, Ae or Ae<sub>j</sub>, at least 2 cm thick. The underlying horizon may be a B<sub>tj</sub> with thin clay skins on some surfaces or, less commonly, a B<sub>fj</sub>. Otherwise, they have the diagnostic properties of Orthic Eutric Brunisols.

Parkhill soils are generally characterized by native soil profiles undisturbed by agriculture, where the water table is not present in the soil at any time and there are no root restricting layers.

Drainage is rapidly drained, where water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the control section, and are usually coarse textured, or shallow, or both. Water source is precipitation.

Parent materials were deposited by glaciofluvial action, where material is moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames eskers, and kame terraces, and have a medium acidic to neutral pH (5.6 – 7.4).

According to Wittneben (1986), Parkhill soils have developed in deep, sandy, fluvioglacial deposits. Surface and subsurface textures are sand or loamy sand, very occasionally gravelly sand. These soils are rapidly drained, rapidly pervious, have low water holding capacity and slow surface runoff. The main limitations to agriculture are low water and nutrient holding capacity, but are otherwise suited to agriculture including orchards and vineyards.

### **The Trout Creek Soil Group<sup>3</sup>**

Trout Creek soils are also classified as Eluviated Eutric Brunisol (E.EB), as described above, with approximately 32% coarse fragments by volume.

Trout Creek soils are generally characterized by native soil profiles undisturbed by agriculture, where the water table is not present in the soil at any time and there are no root restricting layers.

Drainage is well drained, where water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section, and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations, but additions are equaled by losses.

Parent materials were deposited by glaciofluvial action, where material is moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are

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<sup>2</sup> British Columbia Soil Information Finder Tool (BC SIFT), 2022

<sup>3</sup> British Columbia Soil Information Finder Tool (BC SIFT), 2022



stratified and may occur in the form of outwash plains, deltas, kames eskers, and kame terraces, and are weakly calcareous (< 6% CaCO<sub>3</sub> equivalent).

According to Wittneben (1986), Trout Creek soils have developed in gravel-free, coarse, or moderately coarse textured fluvial veneer between 60 and 100 cm thick overlying gravelly, very coarse textured fluvioglacial deposits. Surface and subsurface textures are sandy loam or loamy sand which change abruptly in the subsoil to very gravelly sand. These soils are well to rapidly drained, rapidly pervious, have moderate to low water storage capacity and slow surface runoff. The main limitations to agriculture are low water holding capacity and adverse topography, but are otherwise well-suited for agriculture including tree fruits and vineyards.

### **The Gammil Soil Group<sup>4</sup>**

Gammil soils are also classified as Eluviated Eutric Brunisol (E.EB), as described above, with approximately 52% coarse fragments by volume.

Gammil soils are generally characterized by native soil profiles undisturbed by agriculture, where the water table is not present in the soil at any time and there are no root restricting layers.

Drainage is rapidly drained, where water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the control section, and are usually coarse textured, or shallow, or both. Water source is precipitation.

Parent materials were deposited by glaciofluvial action, where material is moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames eskers, and kame terraces, and are weakly calcareous (< 6% CaCO<sub>3</sub> equivalent).

According to Wittneben (1986), Gammil soils are deep, coarse-textured, stony and gravelly fluvioglacial deposits capped by 10 – 25 cm of sandy materials. Surface textures are gravelly sandy loam, sandy loam, or loamy sand while subsurface textures vary from gravelly loamy sand to gravelly sand. These soils are well to rapidly drained, rapidly pervious, have low water holding capacity and slow surface runoff. The main limitations to agriculture are stoniness, low water holding capacity and adverse topography, but areas with gentle slopes are suitable for tree fruits, grapes, or hay production.

## **4.0 CLIMATE**

The subject property occurs within the Okanagan Very Dry Hot Ponderosa Pine (PPxh1) biogeoclimatic zone that is described by the Biogeoclimatic Ecosystem Classification (BEC) program (Lloyd et al., 1990). The PPxh1 is the driest forested zone in British Columbia, occurring only at lower elevations in the southern valleys of BC, at the northern extent of a much larger range than runs through eastern Washington and Oregon. Areas of the PPxh1 zone have cool winters with low

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<sup>4</sup> British Columbia Soil Information Finder Tool (BC SIFT), 2022

snowfall, and hot, dry, summers with growing-season moisture deficits resulting in a mosaic of open forest and grassland ecosystems (Iverson & Uunila, 2006).

Climate data for the subject property indicates the subject property has approximately 169 frost free days, 2,196 growing degree days above 5°C, mean annual precipitation of 332 mm, and summer heat moisture index of 142 (BC SIFT, 2021).

According to climate normal data from Environment Canada from the “Kelowna East” station between 1981 and 2010, the average annual total precipitation (rain and snow) is 414 mm with an average of 329.6 mm of rainfall. The highest precipitation typically occurs between May and July, which is generally followed by a moisture deficit during the late summer. Temperature extremes for the area occur in December and July, and daily average temperatures were -2.6°C and 20.4°C, respectively.

## 5.0 FARM PLAN

The purpose of the fill placement is to reduce the agricultural limitations of topography and stoniness, by importing fill of agricultural quality and raising the land to a uniform grade to eliminate the frost pockets, draws, and low areas, in order to plant grape vines (*Vitis vinifera*). An automated drip irrigation system will be installed to reduce the soil moisture deficiency limitation.

The subject property is 13.223 acres and is not currently being used for agriculture. The landowner proposes to cultivate approximately 12 acres, with the remaining area planned for a single-family home, wine shop, cellar, and processing facilities. Site preparation for planting will commence following fill placement. Vine rows will be planted in a N-S orientation. Vines will be sourced from Vine Tech. Future development plans include a wine shop and tasting room with a small boutique style footprint and a parking area, as shown on **Figure 2**. The processing facility is still to be determined but it would either be off site or below the wine shop.

## 6.0 POTENTIAL ENVIRONMENTAL IMPACTS OF FILL PLACEMENT

Ecoscope has not completed an environmental impact assessment for this project. Ecoscope anticipates that, with due diligence and the appropriate mitigation measures in place, the risks for adverse impacts from fill placement to the environment and surrounding area can be appropriately mitigated.

Ecoscope recognizes that the proposed works could result in the following potential impacts:

- Potential for the release of deleterious substances (e.g., fuel, oil, concrete, hydraulic fluid) to the environment during the proposed works or as a result of improper storage, equipment re-fueling, and/or poorly maintained equipment.
- Potential for the release of sediment due to improper containment measures or lack of attention to detail during the placement of materials using heavy equipment.
- Disturbance beyond the proposed footprint if not clearly marked or identified before and during the works. Clear and visible fencing or flagging around the site will aid in preventing disturbance outside of the proposed works area.



- Potential for the establishment of invasive plant species during disturbance of land within the study area. An agricultural seed mix should be used to revegetate any disturbed area from the proposed works and must not include any invasive grass species or species not native to the Okanagan.
- Potential for sediment accumulation on road surfaces and noise disturbances to surrounding residents from fill placement traffic.

The following Best Management Practices and Mitigation Measures should be adhered to in order to protect potential aquatic and terrestrial life.

## 7.0 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Recommendations to avoid or minimize the potential impacts that may arise during the proposed fill placement works are summarized below and based on Best Management Practices of the Province of BC and the Agricultural Land Commission.

Best Management Practices (BMPs) must be adhered to throughout construction to mitigate the risk associated with the proposed works. The most relevant best management practices that should be adhered to during the proposed work include:

- All works should generally conform to the Develop with Care Guidelines (2014) and other standard Best Management Practices for British Columbia found at:  
<https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/best-management-practices/develop-with-care>
- All applicable ALC bylaws and policies, including but not limited to: Bylaw No.2, Policy P-10, P-13 and L-23.

### 7.1 General Requirements

- All conditions outlined within this report and the ALC Approval Letter must be followed throughout the entirety of the proposed works period. ***Copies of all permits and/or approvals must be kept onsite at all times for reference.***
- All fill sources must be sampled and analyzed by an ISO/IEC17025:2017 accredited lab according to the BC Contaminated Sites Regulation (CSR) standards for agriculture and the ALC Bylaw No.2 and evaluated by a Qualified Professional in Agrology (P.Ag.) to ensure fill meets the CSR and ALC standards ***prior to fill placement.*** Approved Phase I or Phase II ESA studies conducted recently by a qualified professional will also be acceptable.
- ***Trucking records must be maintained*** to include truck operator (name and business license), date of fill placement, volume of fill, and source location.
- The release of fine sediments, construction debris or other substances deleterious to the environment or watercourses must be prevented at all times.

- Ensure that onsite machinery is in good operating condition, clean and free of leaks, excess oil or grease.
- No works may take place in or around a stream, as defined by the *Water Sustainability Act*, without a Provincial permit in-hand. An EM must be onsite full time during any instream works.
- Road surfaces adjacent to the project area must be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed (i.e., swept or scraped) on a regular basis and disposed of appropriately.
- Existing topsoil must be retained where possible, stockpiled outside the fill placement area, tarped, and kept free of invasive species establishment. Topsoil must be replaced after fill placement has completed.
- Soil must not be salvaged, moved, stockpiled, or replaced during conditions of adverse soil moisture content including when the soil is frozen (to prevent slumping) or powdery dry.
- Compaction must be minimized by selecting soil materials with low clay contents for replacement in the root zone.
- The use of native material (salvaged topsoil and overburden) is preferable to the use of materials sourced from off site to avoid potential issues with drainage and excessive stoniness in the upper soil profile.
- Surface drainage from the reclaimed area must be maintained at all times in order to prevent erosion, flooding, siltation or other degradation of soils, adjacent lands or waterways.
- Any run-off must be diverted into catchment ponds or silt traps prior to discharge into natural watercourses or road ditches.

## 7.2 Monitoring

On-site supervision by a qualified registered professional with expertise in soils and reclamation is required during the soil salvaging, stockpiling, storage and soil replacement process. A Qualified Professional in Agrology (P.Ag.) should be retained for monitoring (EM) to oversee fill activities and conduct site inspections to document compliance with the ALC requirements, BMPs, permit conditions, and other recommendations. In the event that greater disturbance occurs due to unforeseen circumstances, the EM will recommend further measures to protect or restore the natural integrity of the site.

- A pre-construction meeting should be held between the EM and the contractor(s) undertaking the work onsite to ensure a common understanding of the ALC guidelines, mitigation measures and best practices required for the project. The EM will attend other routine meetings, as required.

- It is the contractor's responsibility to provide the EM with a detailed construction schedule and inform the EM of any changes to that schedule.
- The EM will be an approved Qualified Professional in Agrology (P.Ag.) authorized to halt construction activities should an incident arise that is causing undue harm (unforeseen or from lack of due care) to terrestrial, aquatic, or riparian resource values.
- A copy of this report describing mitigation measures and BMPs will be kept readily available at the site for reference while the work is being conducted.
- Reports will be submitted to the ALC at a frequency outlined in the Approval Letter based on volume of material placed. A final report will be generated upon the substantial completion of construction works summarizing the project activities and listing any deficiencies noted throughout the works.

### 7.3 Disturbance Limits

- Disturbance limits should be clearly delineated before the start of works. Disturbance beyond the identified development footprint must not occur without further assessment.
- Native vegetation, including trees, shrubs, and groundcover, must be retained as much as possible to mitigate the establishment of additional invasive plant species.
- Material stockpiling must not take place within the drip line of trees.
- In the event that land and/or natural vegetation is disturbed or damaged beyond the development footprint area, these areas should be restored and/or replanted with plant material native to the area under the direction of the EM.

### 7.4 Site Clearing and Grubbing

- Disturbance beyond the identified development footprint must not occur without further assessment.
- Native vegetation, including trees, shrubs, and groundcover, must be retained as much as possible to mitigate the establishment of invasive plants and to maintain the existing ecological value within the study area.
- In the event that land and/or natural vegetation is disturbed or damaged beyond the development footprint area, these areas must be restored and/or replanted with plant material indigenous to the area under the direction of the EM.
- Whenever possible, equipment/machinery used must not be operated or stored within the drip line of trees and equipment must not come into contact with trees outside of the marked limits of disturbance, which could result in physical damage to the bark or limbs.



Avian nesting timing windows should be considered if trees are to be removed, to protect nesting birds within and adjacent to the proposed work area. The general nesting period of migratory birds in Canada within Zone A1a and A2 is March 31<sup>st</sup> to August 15<sup>th</sup> (BC MoFLNRORD 2020). The following methods should be implemented in relation to nesting bird work windows:

- Section 6 of the Federal Migratory Birds Convention Regulation protects both the nests and eggs of migratory birds. The project area falls within the Canadian Avian Nesting Zone A1 (MECCS 2020). The general avian nesting period for migratory birds within this zone is March 26<sup>th</sup> to August 9<sup>th</sup>. Section 34 of the Provincial Wildlife Act protects all birds and their eggs, and Section 34(c) protects their nests while they are occupied by a bird or egg. The project area falls within the Northern Okanagan Basin ecodistrict. The avian nesting period for all birds within this ecodistrict is **February 1st to September 14th** (Birds Canada 2021).
- If vegetation clearing activities are required during the identified avian nesting period, pre-clearing nesting surveys may be required by an Environmental Monitor (EM) to identify active nests.
- If active nests are found within the construction limits, a buffer will be established around the nest until such time that the environmental monitor (EM) can determine that nest has become inactive. The size of the buffer will depend on the species and nature of the surrounding habitat. Buffer sizes will generally follow provincial BMP guidelines or other accepted protocol (e.g., Environment Canada). In general, a minimum 20 m buffer will be established around songbird nests or other non-sensitive (i.e., not at risk) species.
- Clearing and other construction activities must be conducted within **72 hours** following the completion of any pre-clearing nest surveys. If works are not conducted in that time, the nest surveys are considered to have expired and a follow-up survey will be completed to ensure that no new nests have been constructed.
- Wherever possible, trees with high wildlife value, such as veteran trees and large snags, must be conserved. Hazardous trees with wildlife value within the vicinity of the construction works should be assessed by a certified wildlife/danger trees assessor to determine levels of risk.
- Best management practices relating to raptors and their nests can be found in Guidelines for Raptor Conservation during Urban and Rural Land Development in BC (2013).

## 7.5 Topsoil Management

Prior to any extraction, all existing topsoil must be salvaged under the direction of the qualified registered professional for use during reclamation. Additional salvaging of subsoil and overburden may be necessary on sites where backfill sourced from off-site is not readily available, topsoil is

shallow or where there is limited overburden available. The recommendations for soil handling procedures are as follows:

- Soil must be salvaged from all of the following areas:
  - the proposed pit or quarry area;
  - the access roads; and,
  - the proposed stockpile areas for the subsoil and overburden.
- Topsoil, subsoil and any overburden must be salvaged and stored separately. o
  - Separation between piles should be no less than 3 m.
- Topsoil must be salvaged using an excavator with a clean-out bucket.
- Materials must be transported to an appropriately designated storage area that will not be disturbed by extraction activities in order to avoid double handling of materials.
- A uniform layer of bark mulch or sawdust should be laid down on the storage surface prior to placement of any salvaged material.
- The areas required for stockpile storage must be based on estimates of initial soil salvaging volumes.
- Stockpiled soils must be windrowed and located in an area where they will not be disturbed and will not impede site drainage.
- Drainage from, onto and around the stockpiles must be controlled by ditches, drains or intercepts as required.
- Stockpiled soil must not be removed from the property without written permission from the Commission.
- Salvage piles should be limited in height (2 to 3 meters). Higher piles must not exceed a 3H:1V slope (horizontal: vertical).
- Stockpiles must be seeded and established with an appropriate plant cover or other suitable soil erosion control measure must be applied to protect the stockpiles from wind or water erosion.

## 7.6 Subgrade Preparation

The Commission frequently requires the backfilling of pits to ensure that the final elevation is consistent with adjacent land and the property's relative original elevation. Therefore, once all extraction activities are complete, the pit should be filled with suitable material that consists of either the stockpiled overburden and/or fill sourced from offsite. Subgrade preparation must proceed as follows:

- If imported fill is used to backfill, the fill must have the following characteristics:

- must be of mineral origin only (organic soils are not permitted as fill material but can be used as a top-dress);
  - have a coarse fragment content less than 5% with no boulders >25 cm in the top 1 metre of the soil profile; and,
  - the texture of the soil must be no coarser than loamy sand and no finer than silt loam.
- The following are prohibited materials in the ALR and must not be used as fill: o concrete or demolition waste, including masonry rubble, concrete, cement, rebar, drywall, and wood waste;
  - asphalt;
  - glass;
  - synthetic polymer;
  - treated wood; and,
  - unchipped lumber.
- The final contours of the subgrade must be gently sloping in such a manner as to conform to the surrounding landscape.
- Depending on the site topography, any permitted side slopes and/or benches should be recontoured so that slopes are no steeper than 3.5H:1V (horizontal: vertical) to allow for use of farm equipment on the slopes. Steeper slopes may be allowed in some cases depending on the configuration of the field in order to maximize the amount of flat land (e.g., long narrow extraction pits).
- To avoid severe erosion of topsoil, land that is intended for the production of annual crops should have slopes no greater than 20H:1V or 5% slope (Class 1).
- In the Lower Fraser Valley and Metro Vancouver, the slopes must be less than 1% on cropland to minimize sheet and rill erosion.
- If necessary, upon completion of backfilling, the subgrade should be chisel plowed to a minimum depth of 60 cm in two directions at right angles.

## 7.7 Soil Replacement

Once the subgrade materials have been regraded, available topsoil and/or other suitable soil materials must be used to provide a rooting bed for crops.

### General Recommendations

- Any stockpiled soils must be replaced in the reverse order from which they were removed.
- The recommended soil profile should consist of (from surface to at depth):
  - 20 – 30 cm of topsoil;
  - 30 cm of subsoil;
  - 50 cm of free draining subgrade; and,

- Overburden or backfill (variable thickness).
- The placement of stakes, flagged to the desired replacement thickness, must be employed to assist the machine operator.
- Soil materials should be end dumped and leveled with low ground pressure equipment, such as tracked bulldozers.
- Vehicles and equipment must be restricted to designated roads or routes, so that ripping and subsoiling activities can be limited to these specific areas.
- Random, repeated running of equipment over leveled areas must be minimized wherever possible.

#### Subsoil Placement:

- If subsoil has been retained, the subsoil must be replaced in one lift.
- If fill is used as subsoil, then the fill must have a coarse fragment (fragments >2 mm diameter) content of less than 5% and must not contain any boulders (rock fragments >25 cm).
- Once the subsoil is in place, roughening the subsoil surface is required to hold topsoil in place following initial placement.
- If compaction does occur, rip the affected areas to a depth of 60 cm or more with shanks spaced 60 cm apart and then cross rip perpendicular to the first direction.

#### Topsoil Placement:

- Topsoil thickness should be equivalent to what was present before disturbance.
- Coarse fragments must not be introduced in the top 25 cm of the soil profile.
- Prior to replacement of the topsoil, soils must be screened separately to remove coarse fragments.
- Where the percentage of the coarse fragment content by volume is less than 5%, screening is not necessary. The qualified registered professional must determine if screening is necessary.
- Screening must be carried out under appropriate soil moisture conditions.
- Topsoil should not be replaced in areas such as roads or wet depressions that will not be used for productive agriculture unless required for grass establishment for erosion control.
- If the native topsoil has been removed, then a 20 - 30 cm lift of imported topsoil must be uniformly spread over the disturbance area. The texture of the soil must be no coarser than loamy sand or finer than silt loam.

- A suitable organic matter should be top-dressed over the reclamation area. This organic matter may be added in the form of animal or poultry manure or as a cereal or forage cover crop and turned into the soil.

## 7.8 Erosion and Sediment Control

The following section details the mitigations and recommendations related to erosion and sediment control (ESC) that must be adhered to throughout the duration of the project where applicable.

- Stockpile locations, staging and equipment storage areas, and environmentally sensitive areas should be delineated at the start of construction.
- Works involving ground disturbance should not be conducted during heavy rains wherever feasible to reduce the potential for sediment and erosion issues. Exposed soils along slopes must be stabilized and covered where appropriate using erosion control blankets (ECB), poly sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, seepage, or other unexpected causes.
- Silt fence and other appropriate ESC measures should be installed prior to the start of construction in appropriate locations as identified by the EM. Silt fence must be installed between the proposed development and any areas of potential migration to mitigate the risks to resources associated with runoff and sediment transport. Silt fencing must be installed as directed by the EM in a field-fit manner. Silt fence must be staked into the ground and trenched a minimum of 15 cm to prevent flow underneath the fence and must remain taut to prevent material from moving over the fence. Silt fencing should contain sufficient storage capacity to collect runoff and sediment deposition during storm events. Silt fencing will be monitored on a regular basis and any damages or areas where the integrity and function of the fencing has been compromised should be repaired or replaced promptly. Silt fence must remain in place where required until the completion of the project;
- If erosion becomes a problem during construction and there is a risk of siltation to the adjacent naturally vegetated areas and watercourses (i.e. during heavy rain events), silt fence must be installed immediately adjacent to the development footprint to mitigate for potential sediment transport and erosion downslope of the works. Silt fence must be staked into the ground and trenched to prevent flow underneath the fence.
- ESC recommendations by the EM must be implemented within 24 hours.
- It is the contractor's responsibility to inspect all mitigation measures daily and additional measures will be installed, maintained, and repaired or replaced as required using a field-fit, adaptive approach.



- Road surfaces adjacent to the project area must be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed (i.e., swept or scraped) on a regular basis and disposed of appropriately.
- The release of silt, sediment, sediment-laden water, or any other deleterious substance into any ditch, watercourse (creek, river, lake, wetland), ravine, or other drainage feature must be prevented at all times. Similarly, there is to be no sediment release into areas of vegetation growth or sensitive areas in levels that would adversely alter growing or hydraulic conditions.
- No equipment refueling can take place within 30 m of a watercourse;
- It is the contractor's responsibility to regularly monitor weather forecasts and adjust ESC measures or proposed construction activities as required based upon the existing conditions of the site.
- Erosion and sediment control (ESC) should incorporate the measures described below to mitigate risks during construction works. The plan is generally based upon provincial BMPs and other specifications and includes the following principles:
  - Construction works should be conducted during periods of warm, dry weather with no forecasted precipitation;
  - Construction works should be scheduled to reduce the overall amount of time soils are exposed;
  - Natural drainage patterns should be maintained where possible;
  - Existing native vegetation should be retained where possible; and,
  - Stormwater and sediment-laden runoff should be directed away from exposed soils within the construction area.
- Exposed soils along slopes should be stabilized and covered where appropriate using geotextile fabric, polyethylene sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, seepage, or other unexpected causes; and,
- Adjacent roadways should be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed and disposed of appropriately.

## 7.9 Drainage/Water Management

A drainage plan must be prepared for the site by a qualified registered professional to ensure that water is appropriately managed on and offsite. Prior to the installation, drainage plans must be submitted to the Commission for review and approval. The following drainage and erosion control measures should be considered when designing the plan; however, this will vary depending on specific site conditions:

- Interceptor drains and grassed water runs to slow the velocity of runoff water and prevent erosion.
- Placement of toe slope drains to collect and remove seepage from the subsoil.

- Use of temporary diversion drainage on new areas of topsoil and seeded areas.
- Sedimentation impoundments to protect water quality in downstream areas. The size and location of impoundments is determined by runoff volumes, erosion rates, and required retention times.
- Installation of a soil drainage system (subsurface drainage as needed). This will depend on the end use and agricultural capability.
- Installation of a layer of porous drainage material to reduce the amount of water in the soil.
- The drainage must be installed upon completion of rehabilitation of each phase and prior to establishing any perennial crops other than forage.
- The reclaimed area must be monitored by the qualified professional following re-seeding to determine if sufficient drainage has been provided. If poorly drained areas persist, it may be necessary to install additional drainage structures.

### 7.10 Air Quality & Dust Management

Air quality standards must be met at all times during the project. Dust control can be achieved by reducing the spatial extents and amount of time that soils are exposed to construction activities. Reducing traffic speed and volume can also reduce dust concerns. Surface and air movement of dust during project activities can be mitigated through preventive measures and design criteria.

Dust generating activities include dust from wheels of vehicles and machinery and stockpiling and movement of soil.

Avoidance, containment, and suppression of dust and dusty processes must be ensured by the following measures, where applicable:

- Exposed soils will be watered as required to suppress dust. Sediment-laden runoff must not be conveyed to any watercourses or surface water drainages. Oil and other petroleum products will not be used for dust suppression. Alternative dust suppressants will be approved by the EM prior to application;
- All road surfaces must be kept clean and free of fine materials (i.e., swept or scraped) regularly to prevent the increase of airborne particulate matter;
- Road sweeping/cleaning of entrance and access;
- All material leaving site in fully enclosed trailers (tarpred);
- Wetting of material prior to disturbance (if appropriate);
- Provision and use of water truck with sprayers over vehicle entrance and onsite haul routes/roads;
- Provision and use of water truck with sprayers provided in strategic positions in working area and stockpiles as appropriate to conditions;

- Reduction of speed by vehicles onsite;
- Closing down various or all operations during severe wind events;
- Operator procedures i.e. good housekeeping to keep clean and tidy site;
- Transport management; and
- Additional measures may include cleaning, dampening of haul roads and limiting site speeds, and further onsite restrictions as required.

At all times during fill placement, dust will be monitored by visual assessments. The contractor is responsible for the operation of the dust management plan and all site operatives will be trained and required to take necessary mitigation action. They will also be required to take preventative action to avoid dust.

### 7.11 Noise and Vibration Management

- Works will generally be conducted in accordance with City of Kelowna bylaws, within business hours (i.e. 7:00AM to 7:00PM, Monday to Friday).
- Idle time of construction equipment and contractor vehicles must be kept to a minimum to reduce noise and the release of greenhouse gases. The contractor will inform and educate employees and sub-contractors on the importance of minimizing idling time and develop guidelines to direct the practice of reducing unnecessary idling. In general, contractor vehicles and equipment will be turned off when not in use.

### 7.12 Emergency Spill Response

Spills of deleterious substances can be prevented through awareness of the potential for negative impacts and with responsible housekeeping practices onsite. Maintenance of a clean site and the proper use, storage, and disposal of deleterious liquids and their containers are important to mitigate the potentially harmful effects of spills and/or leaks. The following BMPs are adapted from Chilibeck et al. (1992) to provide guidance in the control of deleterious substances.

- Construction debris and stockpiled material must be removed from the site regularly and disposed of appropriately.
- All potential wildlife attractants, including food, beverages, and other strong smelling or perfumed materials must be removed from the site daily.
- The contractor will ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.
- No equipment refueling or servicing is to be undertaken within 30 m of a watercourse whenever possible.
- All spill events will be recorded and reported to the site supervisor and EM. In the event of a spill, the site supervisor will be immediately notified by workers onsite. The supervisor will then be responsible for contacting a mechanic (if necessary), the Project Manager and the EM.

- Spills occurring on dry land will be contained, scraped and disposed of appropriately. Contaminated material will be stored on tarps and covered to prevent mobilization and will be disposed of in accordance with the *Environmental Management Act*.
- Spills shall be contained, absorbed, and disposed of in accordance with the regulations outlined in the *Environmental Management Act* and using the following general steps:
  - Assess, monitor and prevent the hazard or threat;
  - Stabilize, contain, remove and clean up the hazard or threat;
  - Evacuate persons;
  - Recover and rehabilitate wildlife;
  - Restore wildlife habitat;
- Take other steps to address the long-term impacts resulting from the spill.
- Copies of contact phone numbers for notification of all of the required authorities in the event of a spill/emergency response should be posted and clearly visible at the site.
- Spill containment kits must be kept readily available onsite during construction in case of the accidental release of a deleterious substance to the environment. Any spills of a toxic substance should be immediately reported to the **Emergency Management BC 24-hour hotline at 1-800-663-3456**.

### 7.13 Site Clean Up

Site cleanup and restoration refers to activities used to return disturbed areas within the subject property to a state resembling the natural state. Note that protection of existing ecosystems is generally much more efficient than ecosystem enhancement and restoration following construction. The following recommendations apply to the site cleanup efforts:

- Silt fencing, snow fence and other temporary mitigation features must be removed upon substantial completion of works when the risk of surface erosion and sediment transport has been adequately mitigated with other permanent measures.
- All equipment, supplies, waste, concrete, and other non-biodegradable materials must be removed from the site following the substantial completion of construction activities.

### 7.14 Invasive Plant Management and Site Restoration

Any areas of exposed soils, slopes, or general disturbance where agricultural planting is not proposed should be reseeded with an agricultural grass seed mix native to the Okanagan, to prevent the establishment of invasive species. Should further restoration be required, plant species selected should be native to the area and suitable to the growing conditions where the plantings have been proposed. Specifically, the northeast slope on the property along the neighboring property line will need to be remediated with restoration plantings once fill placement has completed, as it is not proposed for agricultural plantings due to the steep slope.

- Grass seed mixes must be approved by the EM before purchase and use. Restoration grass mixes cannot include species considered invasive within BC;
- All seed mixes will be submitted to a certified seed testing laboratory for germination and purity analysis. Seed analysis certificates are to be provided prior to purchase;
- Grass seed should be broadcast and hand-raked into the soil. For steep slopes or large areas, hydroseed may be used; and,
- Grass seed mixes should be suitable for the environmental conditions seen in **Table 4** below. These conditions may be given to a seed provider to determine the most appropriate species to provide.

**TABLE 4. Recommended Native Grass Seed Mix for Disturbed Areas.**

Common Name	Scientific Name	Percent
Tall wheatgrass	<i>Thinopyrum ponticum</i>	25%
Slender wheatgrass	<i>Elymus trachycaulus</i>	15%
Blue bunch wheatgrass	<i>Elymus spicatus</i>	25%
Rough Fescue	<i>Festuca campestris</i>	10%
Idaho Fescue	<i>Festuca idahoensis</i>	11%
Perennial rye	<i>Lolium perenne</i>	10%
Sandberg bluegrass	<i>Poa secunda</i>	2%
Junegrass	<i>Koeleria macrantha</i>	1%
Canada bluegrass	<i>Poa compressa</i>	1%

The timing of grass seeding is critical to optimize success and it is recommended that seeding should occur in spring between April and June or fall between September and October. Over seeding may be required in concurrent growing seasons to obtain adequate coverage and reduce competition by invasive plant species.

Watering should occur for the first two growing seasons, until grass is established. Spring and fall irrigation should be timed to water every 3 or 4 days. In summer, watering should be deep, but infrequent – occurring once per week. Irrigation should be timed to augment rainfall and a rainfall sensor would help to reduce water consumption. Hand watering and drip irrigation are both acceptable methods. Care should be taken during watering to ensure that overland flows do not result in sedimentation to neighboring properties. A target of 80% plant survival is recommended after two years.

Weed control must be practiced at all times.

- Weeds must be controlled before seed set. The most common practices include:



- Cultural methods such as reseeding with an appropriate vegetative mix that can out-compete weeds;
  - Mechanical methods such as tillage, mowing, mulching or use of black plastic sheeting; and,
  - Chemical methods such as the use of herbicides.
- All newly reclaimed areas must be reseeded as soon as possible after soil replacement.

Special care should be taken to minimize the presence of non-native and invasive species. Prevention of the spread of non-native and invasive species can be achieved by limiting disturbance to soils and native vegetation where possible. Areas that have previously been disturbed should be restored with native plantings or grass seeding. Infestation areas should be controlled with regular removal of weeds. The basic principles of weed control include:

- Suppression of weed growth;
- Prevention or suppression of weed seed production;
- Reduction of weed seed reserves in the soil; and
- Prevention or reduction of weed spread.

Exotic plants are those which are not native to BC, but have been introduced to the area through human activity. Invasive plants are exotic plants that are able to reliably outcompete native species, spreading into native areas and eroding the functionality of native ecosystems. Invasive plants must be managed as part of works. *Successful management of invasive plants during the construction phase improves the success rate of the maintenance phase.* Due to disturbed nature of the property, a concerted effort must be made to reduce invasive species. Any areas where invasive species are removed, and ground is disturbed, must be reseeded.

There is a duty to control noxious weeds under the BC *Weed Control Act*. As per Section 2 of the act, “In accordance with the regulations, an occupier must control noxious weeds growing or located on land and premises, and on any other property located on land and premises, occupied by that person.” Consequently, these species should be given highest priority for management. A comprehensive list of plants designated as noxious weeds, both regionally and throughout BC, can be seen in Schedule A of the BC *Weed Control Regulation*.

#### Management Strategies and Activities:

- Removing Whole Plants (*ex. Manual Removal, Grubbing with Hoes, Scuffle Hoeing, Severing Roots, Whole Plant Removal with Large Equipment*)
- Cutting (*ex. Bladed Hand Tools, Pruners, Loppers, Shears, and Saws, Brushcutters and Stringtrimmers, Chainsaws, Mowing/Cutting with Larger Equipment, Stump Grinding*)
- Covering with Sheet Barriers (*ex. Mulching, tarping, solarizing*)
- Community-Scale Control (*ex. Competitive planting, burning, grazing, mechanized tilling*)

- Biocontrol
- Chemical control (ex. Herbicide) - *A BC-licensed herbicide applicator should be consulted as to the legal requirements for application of herbicide on site.*

#### Types of Invasive Plants:

- Some invasive plant species are annuals – meaning they only live for one year and die off over the winter. The seeds they drop are required to maintain the population into the next year. In a population of annual species, mowing, string-trimming, and other mechanical means may be used to cut the plants above the roots.
- Some invasive plant species are biennials – meaning they live for two years and die off before their third. Their first year is often focused on growth and does not produce seeds. During this time, it can often be recognized as a flat, radial growth of leaves called a “rosette”. Because of this low growth habit, rosettes must be removed by hand and cannot be mowed or string-trimmed. In their second year they typically grow a tall stock which produces flowers and then seeds. In this second year, the plant can be removed mechanically as normal, or, in some species, only the seed stalk can be cut, leaving the rest of the plant in the ground.
- Some invasive plant species are perennials – meaning they live for multiple years. In this case, the entire plant must be removed or it will continue to produce and drop seeds and continue to increase the size of the population. In this case, *mowing and string-trimming will be ineffective at removing the population.*
- Some species, such as *Cirsium arvense* (Canada thistle) or *Rumex crispus* (curled dock), have specific management requirements, which can be communicated by the environmental monitor once these species have been identified.
- In areas sufficiently far from watercourses, herbicide may be used. Consult a BC-registered herbicide applicator for application services and best management practices around herbicide application.

#### Timing:

- *It is important that invasive plants be removed before they have gone to seed.* Depending on the species, individual plants can produce thousands of seeds. Allowing these seeds to develop and enter the soil can prolong the restoration period.
- Invasive plant management visits should be documented. The labour required during each visit should decrease as invasive plant populations are removed.

Ongoing invasive species control will be required within any areas with exposed/disturbed soils and restoration areas in the first few years until vegetation becomes established. Species that are aggressive have the potential to outcompete native species.

The contractor will ensure that all equipment and vehicles are washed and free of weed seeds prior to mobilization and de-mobilization. Vehicles and equipment should not be stored, parked, or

staged within weed infested areas if possible. Contractor clothing should also be inspected daily for signs of weed seeds. If found, weed seeds should be disposed of in a contained refuse bin for offsite disposal.

Invasive plant species must be disposed of in a landfill; however, invasive species material must not be composted in the yard waste section of the landfill. Invasive plant species must not be transported to or deposited in other natural areas.

## 8.0 SUMMARY AND CONCLUSION

The purpose of this report is to provide an agricultural assessment of existing conditions for the subject property and a farm plan for the proposed fill placement works at 2402 Hayman Rd, West Kelowna, BC.

A review of the subject property and assessment of available data revealed that the agricultural capability of the property may be improved from Class 5 and 6 to Class 2 and 3 with the reduction of soil moisture deficiency, topography, and stoniness limitations by the establishment of an irrigation system, fill placement in low-lying areas and grading of steep slopes to reduce frost pockets, and importation of fill that has been screened and meets the ALC requirements for fill quality.

The subject property is situated in an agricultural area, surrounded almost entirely by other vineyard and winery operations, and is within the “Westside Wine Trail” area in the Mount Boucherie neighborhood. For these reasons, the property is well-suited for agricultural development, specifically a vineyard and winery operation.

An overview of the potential impacts of fill placement, best management practices, and mitigation measures have been recommended for the placement of fill, and Ecoscape anticipates that with due diligence and the appropriate mitigation measures in place, the risks for adverse impacts to the agricultural capability and the environment can be appropriately mitigated.

## 9.0 CLOSURE

This report has been prepared for the exclusive use of Desjardins Contracting Ltd. (client). Ecoscape has prepared this report with the understanding that all available information on the present and proposed condition of the site has been disclosed. The client has acknowledged that in order for Ecoscape to properly provide its professional service, Ecoscape is relying upon full disclosure and accuracy of this information.

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted,

ECOSCAPE Environmental Consultants Ltd.

Prepared by:



Theresa Loewen, M.Sc., P.Ag.

Agroecologist

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Attachments:	Site Photographs
	Figure 1 Site Location
	Figure 2 Proposed Works
	Figure 3 Soils & Agricultural Capability
	Figure 4 Soil Drainage
	Figure 5 Digital Elevation Model Analysis
	Appendix 1 Site Plan by: Desjardins Contracting Ltd.
	Appendix 2 Cross Sections by: Desjardins Contracting Ltd.
	Appendix 3 Driveway Designs by: Desjardins Contracting Ltd.
	Appendix 4 House Site Plan by: ZED Studio
	Appendix 5 Stormwater Management Plan by: RSB Engineering
	Appendix 6 Soil Survey

## 10.0 REFERENCES

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**Photo 1.** View facing east of the proposed fill placement area showing the undulating topography, single family residence outside the property boundary in the south (right side of photo), and neighbouring Rollingdale winery property (red arrow) (all photos taken April 26, 2022).



**Photo 2.** View facing south of land sloping down from Hayman Road (red arrow), with residential houses in the background.





**Photo 3.** View facing east including log piles from recent clearing, at the northern extent of fill placement area.



**Photo 4.** View of facing south of fill placement area, and neighbouring Xen nursery to the west (red arrow).





**Photo 5.** View facing south of fill placement area including log piles from clearing.



**Photo 6.** View facing west of Xen nursery (red arrow) and fill placement area.





**Photo 7.** View facing north with approximate location of proposed home site (red arrow), outside fill placement area.



**Photo 8.** View facing northwest of fill placement area.





**Photo 9.** View facing northeast from Hayman Road of drainage swale constructed by the City of West Kelowna without landowner permission, proposed for redesign.



**Photo 10.** View of drainage swale proposed for redesign.



## FIGURES





Subject Site  
2402 Hayman Road  
Plan No.: KAP5381  
PID: 010-346-635  
West Kelowna  
5.3 ha

\*Refer to the legend for blanket  
Species at Risk Occurrence Data

**FIGURE 1**  
Site Location and Species at Risk Occurrences

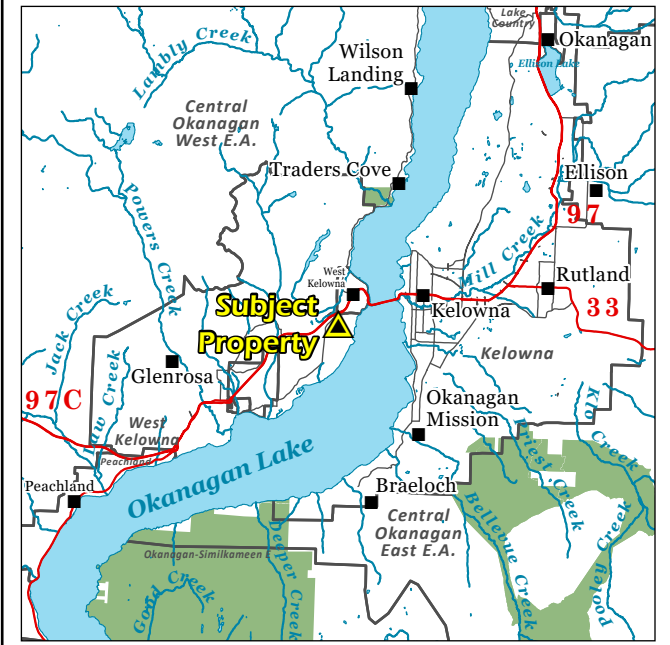
Project:	Agricultural Capability Assessment
Location:	2402 Hayman Rd, West Kelowna
Project No.:	22-4231
Prepared for:	Desjardins Contracting Ltd.
Prepared by:	Ecoscape Environmental Consultants Ltd. Dan Austin, GIS Specialist
Coordinate System:	NAD83-UTM Zone 11
Imagery:	RDCO 2021
Field Visit:	April 26, 2022
Map Date:	May 20, 2022

**LEGEND**

- ▲ WSI Survey
- ★ WSI Incidental
- Streams
- ▭ Subject Property
- ▭ Cadastre
- ▭ Okanagan Critical Habitat (Species at Risk)
- ▭ BC Conservation Data Center (CDC) Polygons\*

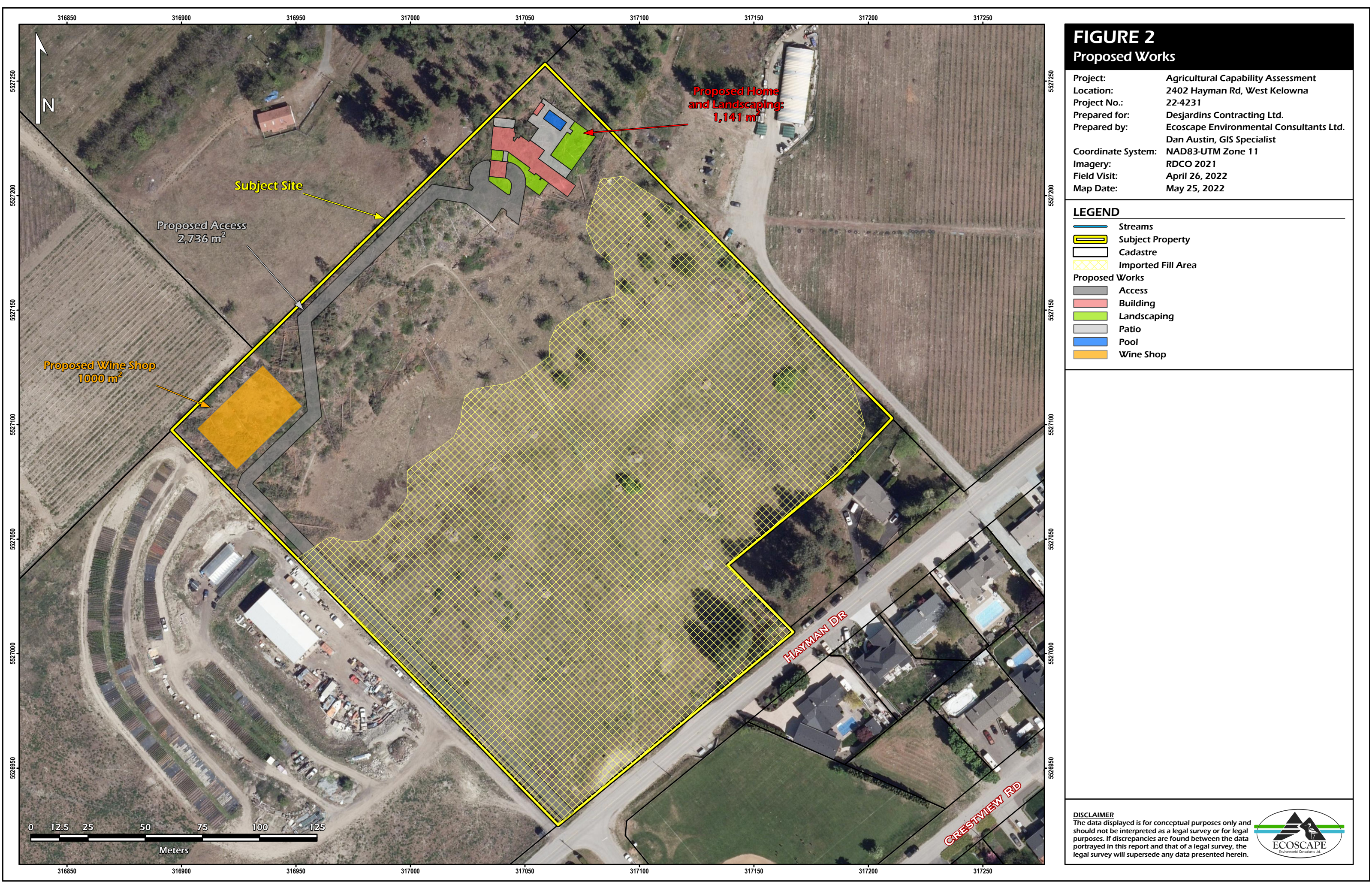
\*A large Okanagan Critical Habitat polygon covers the entire map and subject property area representing the following wildlife species but is not shown on this figure:  
- Great Basin Gophersnake (*Pituophis catenifer deserticola*)

**Regional Location of Subject Property**



**DISCLAIMER**  
The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.







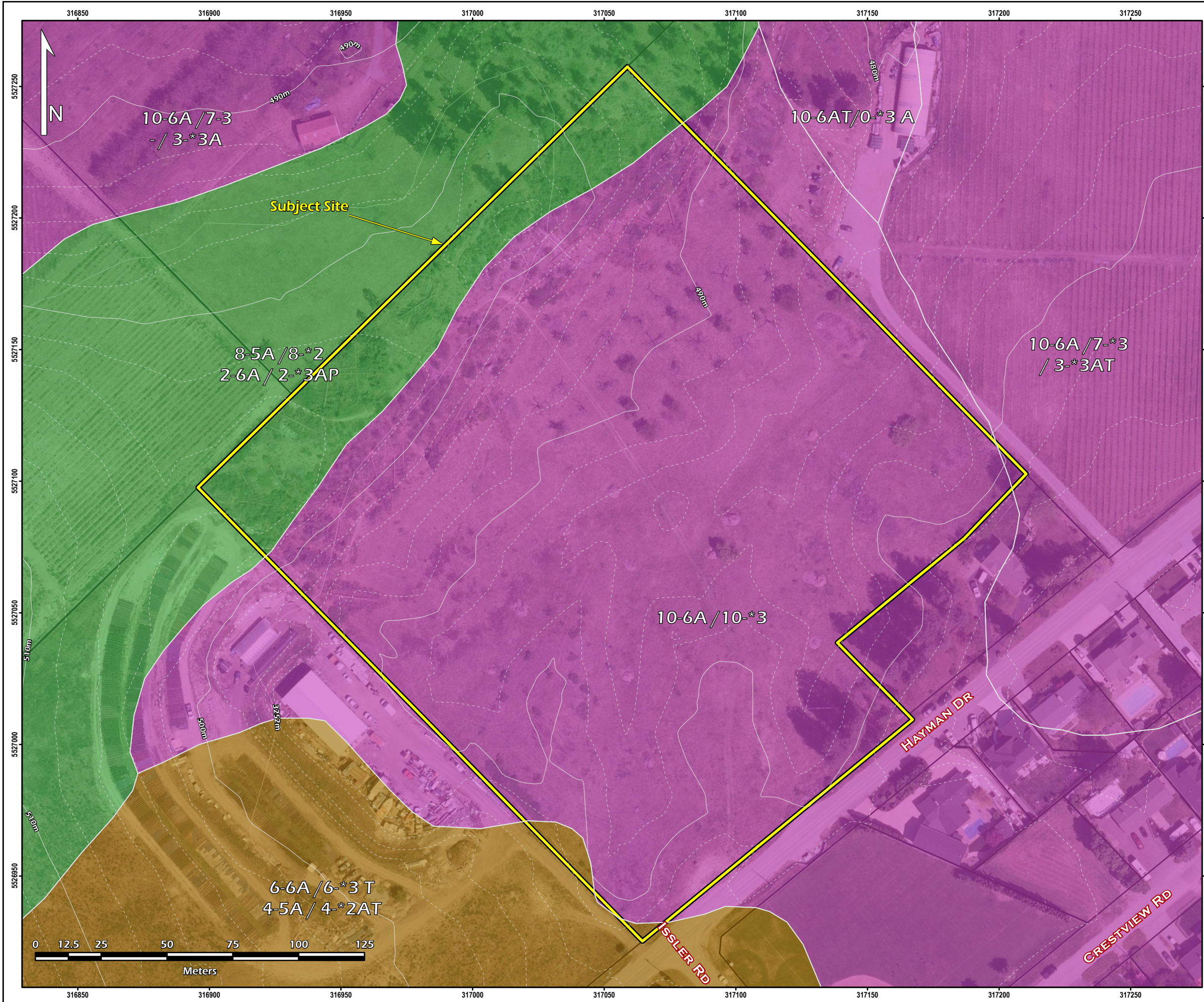


FIGURE 3

Agricultural Capability

Project:

Agricultural Capability Assessment

Location:

2402 Hayman Rd, West Kelowna

Project No.:

22-4231

Prepared for:

Desjardins Contracting Ltd.

Prepared by:

Ecoscape Environmental Consultants Ltd.  
Dan Austin, GIS Specialist

Coordinate System:

NAD83-UTM Zone 11

Imagery:

RDCO 2021

Field Visit:

April 26, 2022

Map Date:

May 20, 2022

LEGEND

Subject Property

Cadastre

Agricultural Capability

Soil Name

GAMMIL

PARKILL

TROUT CREEK

Agricultural Capability Label

Soil Subclass

Soil Class

Primary Decile (improved)

Soil Class

Soil Subclass

Secondary Decile (improved)

Primary Decile (unimproved)

10-6A / (7\*3A)

/(3\*3AT)

\* denotes improved value

Class	Description
1	Land in this class either has no or only very slight limitations that restrict its use for the production of common agricultural crops.
2	Land in this class has minor limitations that require good ongoing management practises or slightly restrict the range of crops, or both.
3	Land in this class has minor limitations that require good ongoing management practises or slightly restrict the range of crops, or both.
4	Land in this class has limitations that require special management practises or severely restrict the range of crops, or both.
5	Land in this class has limitations that restrict its capability to producing perennial forage crops or other specially adapted crops
6	Land in this class is nonarable but is capable of producing native and or uncultivated perennial forage crops.
7	Land in this class has no capapbility for arable or sustained natura grazing.
Subclasses	Description
A & M	Soil moisture deficiency
C	Adverse climate (excluding precipitation)
D	Undesirable soil structure
E	Erosion
F	Low fertility
I	Inundation (flooding by streams, etc.)
N	Salinity
P	Stoniness
R	Shallow soil over bedrock and/or bedrock outcroppings
T	Topography
W	Excess water (groundwater)
S & X	Cumulative and minor adverse conditions

DISCLAIMER

The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.





## FIGURE 4

### Soil Drainage

Project:	Agricultural Capability Assessment
Location:	2402 Hayman Rd, West Kelowna
Project No.:	22-4231
Prepared for:	Desjardins Contracting Ltd.
Prepared by:	Ecoscape Environmental Consultants Ltd. Dan Austin, GIS Specialist
Coordinate System:	NAD83-UTM Zone 11
Imagery:	RDCO 2021
Field Visit:	April 26, 2022
Map Date:	May 20, 2022

#### LEGEND

- Streams
- Subject Property
- Cadastre
- Soil Drainage
  - Rapid Drainage
  - Well Drained

**DISCLAIMER**  
The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.





**FIGURE 5**  
**Digital Elevation Model Analysis**

Project:

Location:

Project No.:

Prepared for:

Prepared by:

Coordinate System:

Imagery:

Field Visit:

Map Date:

Agricultural Capability Assessment

2402 Hayman Rd, West Kelowna

22-4231

Desjardins Contracting Ltd.

Ecoscope Environmental Consultants Ltd.

Dan Austin, GIS Specialist

NAD83-UTM Zone 11

RDCO 2021

April 26, 2022

May 24, 2022

**LEGEND**

Streams

Subject Property

Cadastre

Slope Class (percent)

Level (<0.5)

Nearly Level (0.5 - 1.9)

Very Gentle Slope (1.9 - 5.2)

Gentle Slope (5.2 - 8.8)

Moderate Slope (8.8 - 15)

Strong Slope (15.0 - 29.6)

Very Strong Slope (29.6 - 44.5)

Extreme Slope (44.5 - 70)

Steep Slope (70.0 - 100)

Very Steep Slope (>100.001)

Statistics	Slope (%)	Elevation (masl)
Average	16.05	491.13
Mininum	0.18	482.24
Maximum	63.63	505.60
Std. Dev.	8.75	5.79

**DISCLAIMER**  
The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.



## **APPENDIX 1**

### **Site Plan by: Desjardins Contracting Ltd.**



DESJARDINS  
CONTRACTING LTD.  
2402 HAYMAN LOT  
GRADE PLAN

LEGEND

SECTION LINE 

VOLUME  
IMPORT  $84971\text{m}^3$

TOTAL DISTURBED  
AREA  
 $34301\text{m}^2$

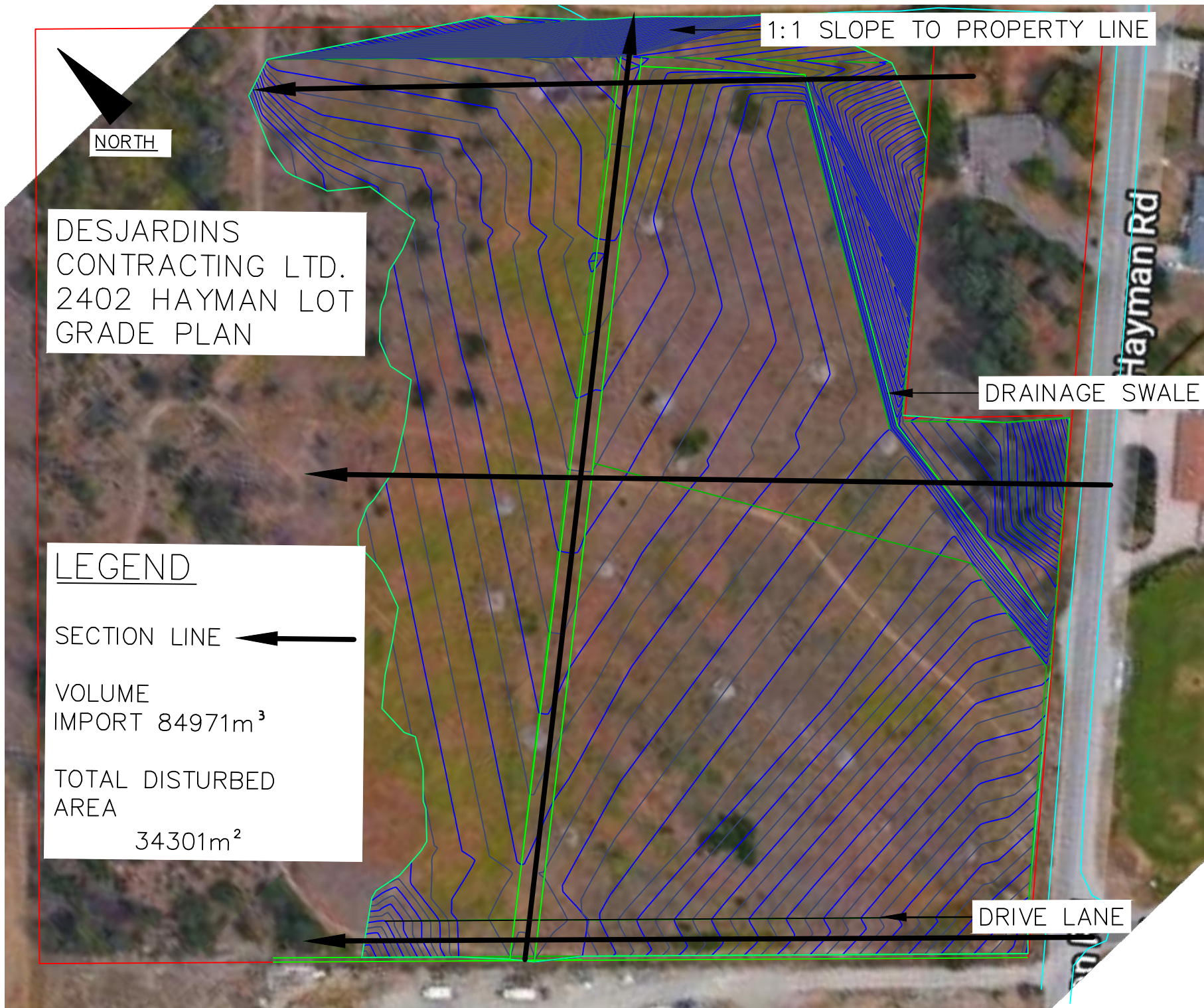
1:1 SLOPE TO PROPERTY LINE

DRAINAGE SWALE

DRIVE LANE

NORTH 

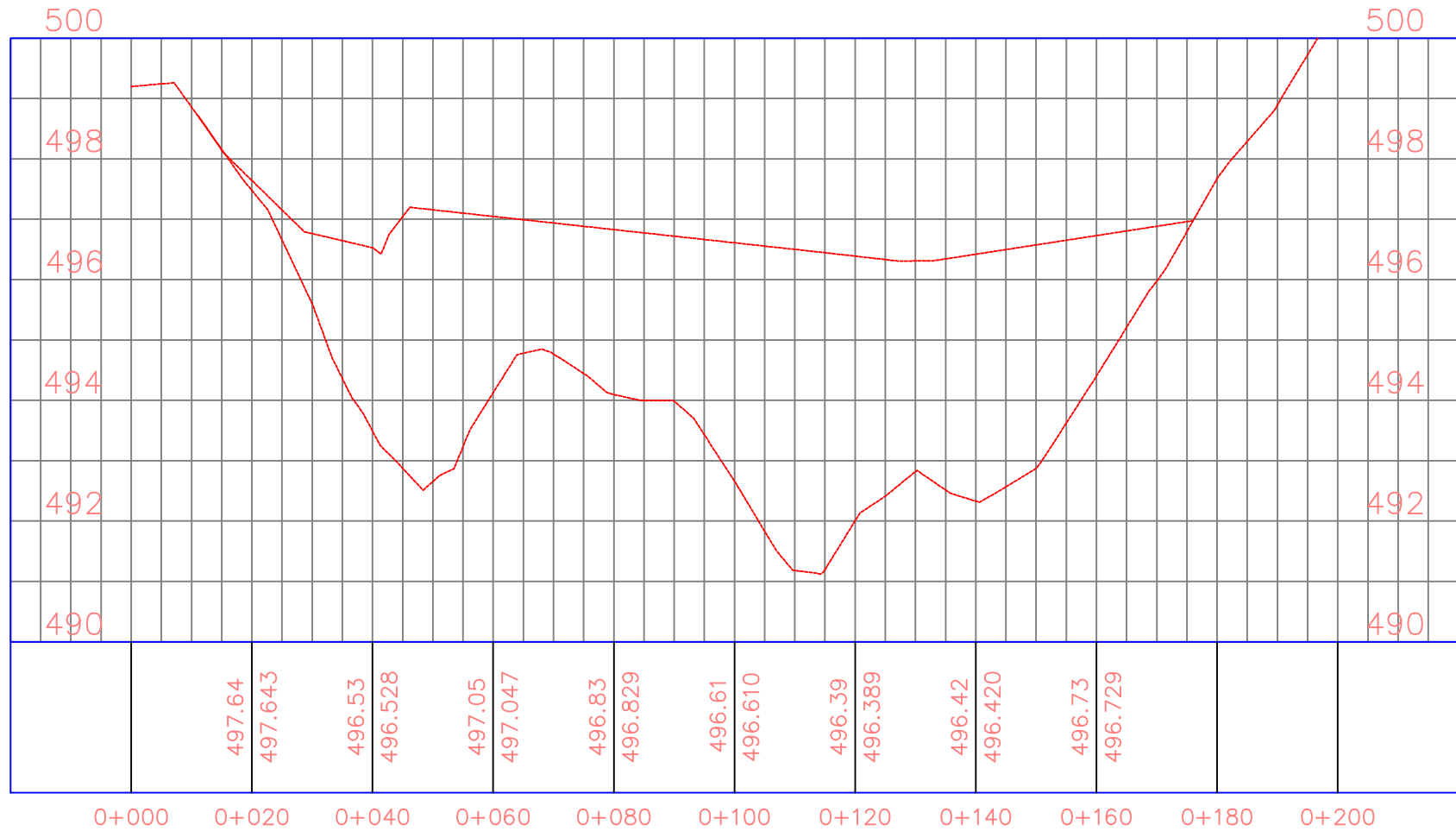
Hayman Rd



## **APPENDIX 2**

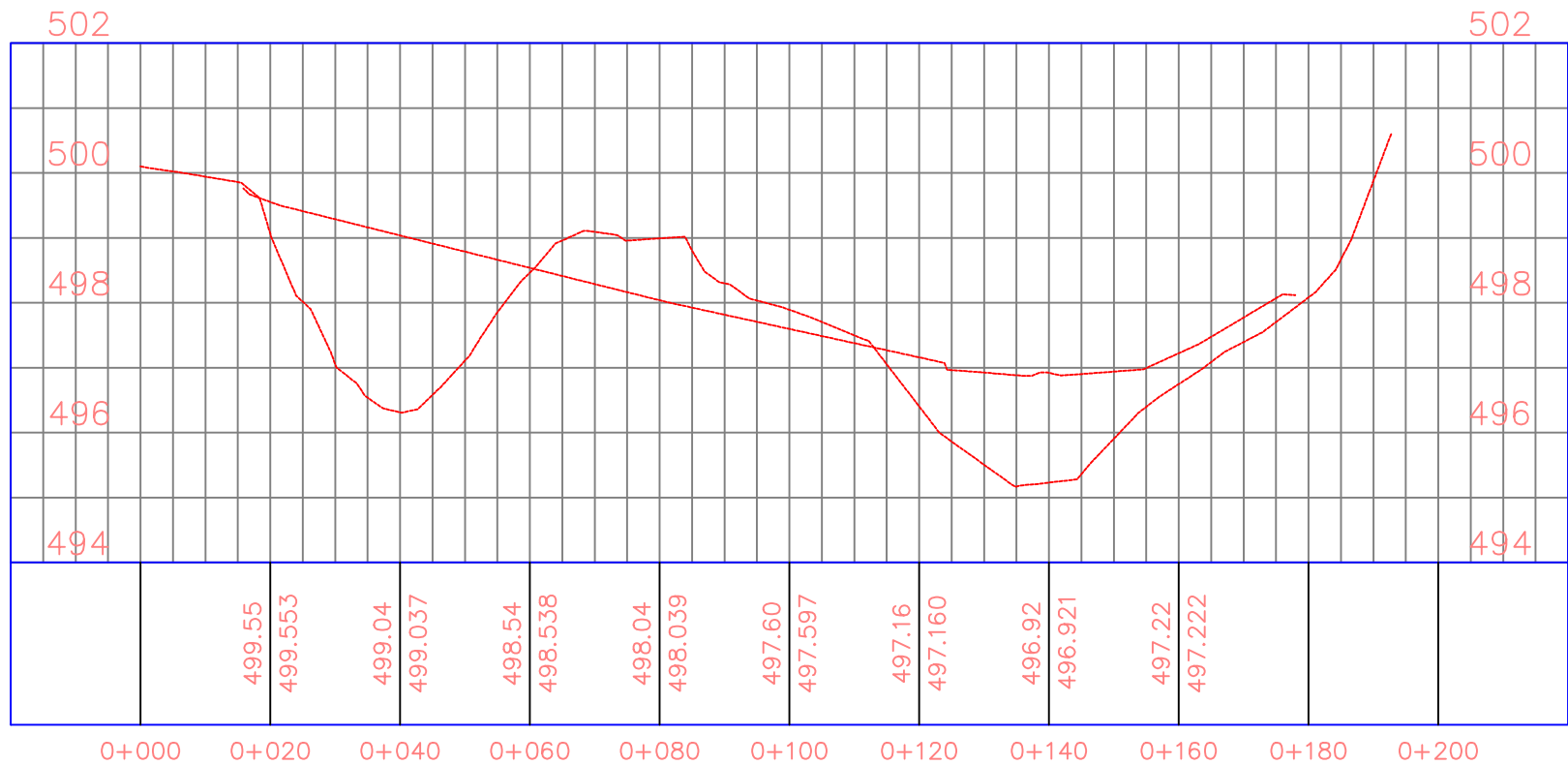
### **Cross Sections by: Desjardins Contracting Ltd.**

# CENTER SITE PROFILE



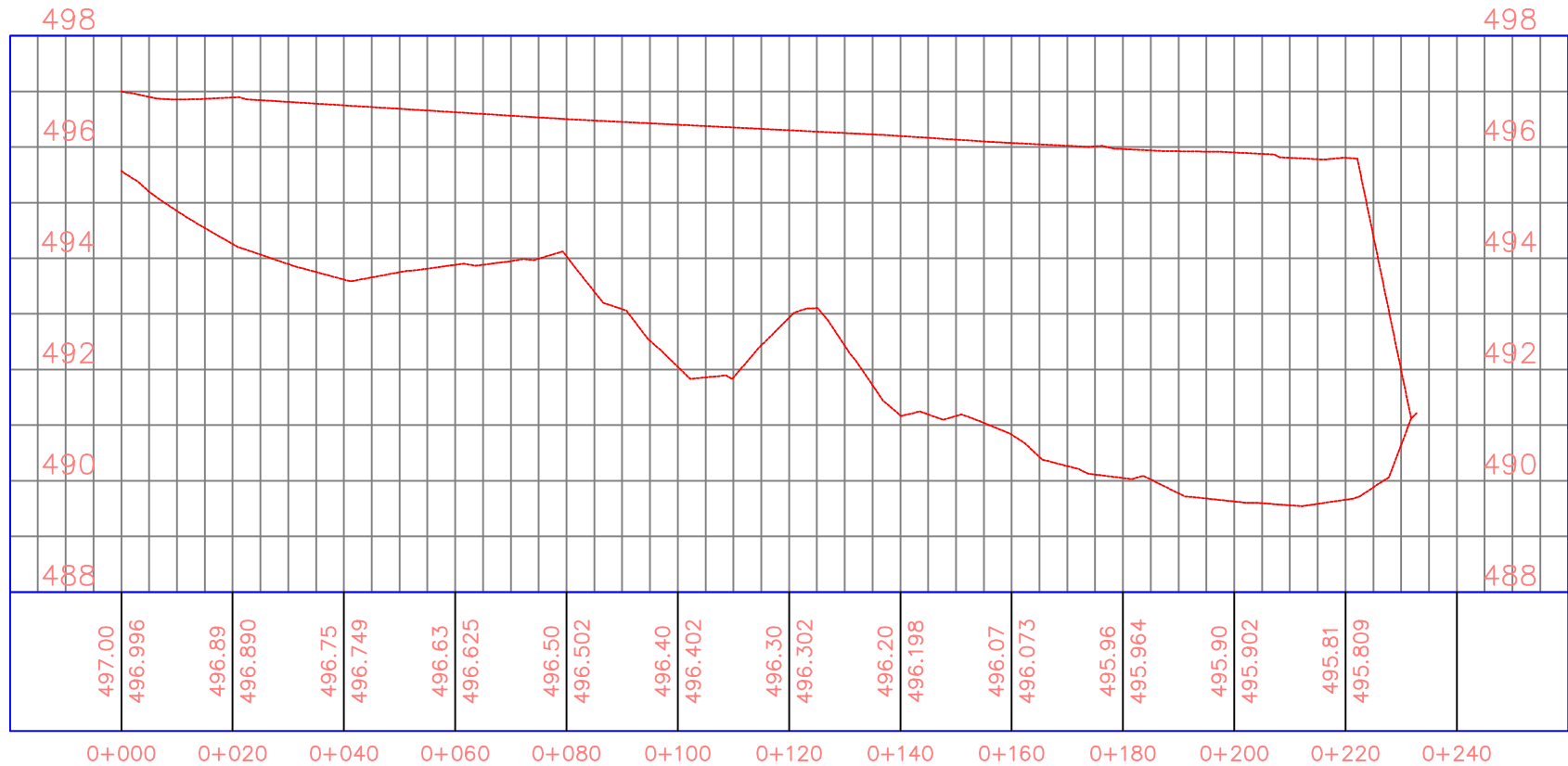
DESJARDINS CONTRACTING  
2402 HAYMAN  
2022-05-09

# DRIVE LANE PROFILE



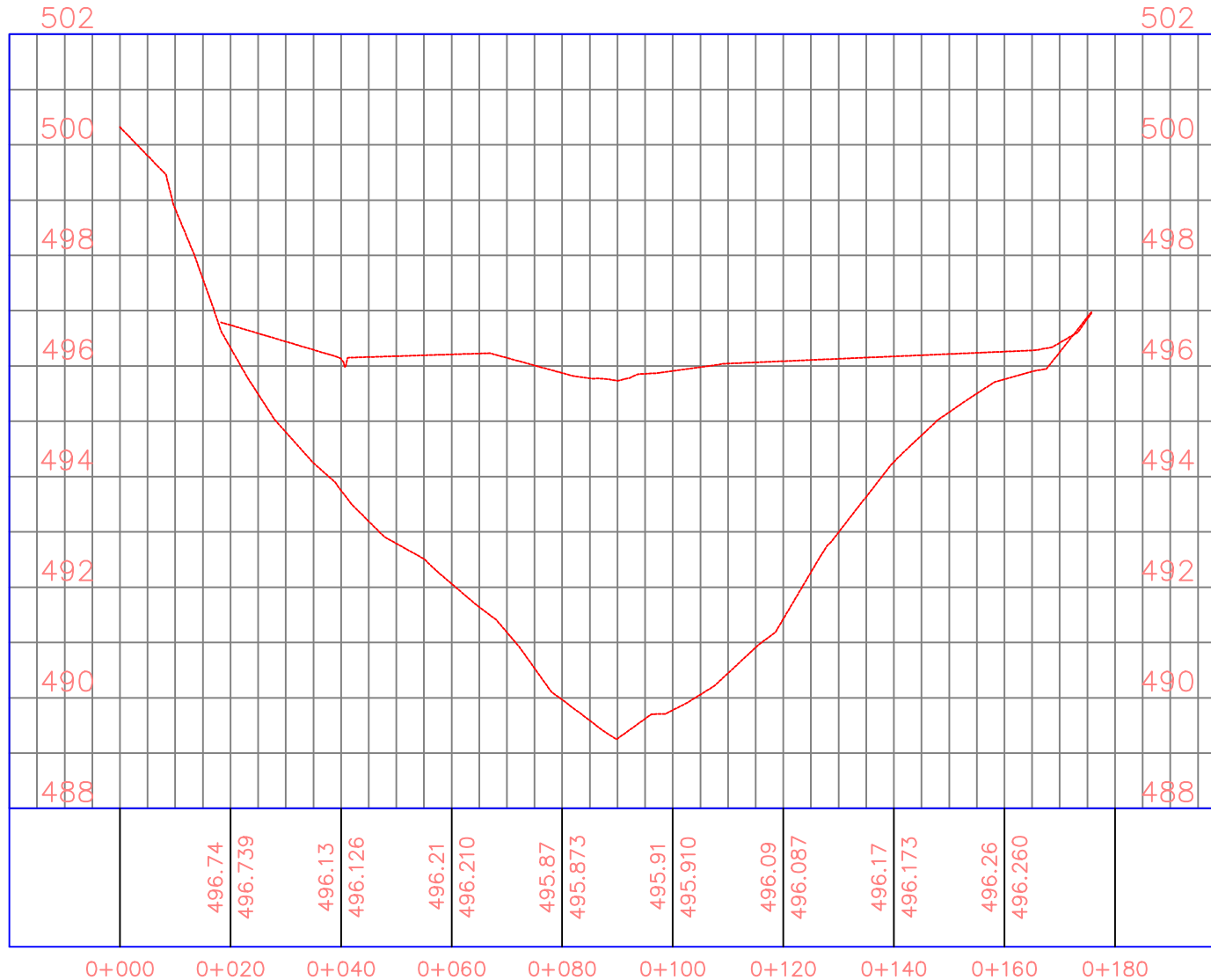
DESJARDINS CONTRACTING  
 2402 HAYMAN  
 2022-05-09

# LOW POINT PROFILE



DESJARDINS CONTRACTING  
2402 HAYMAN  
2022-05-09

# NORTH EAST PROFILE

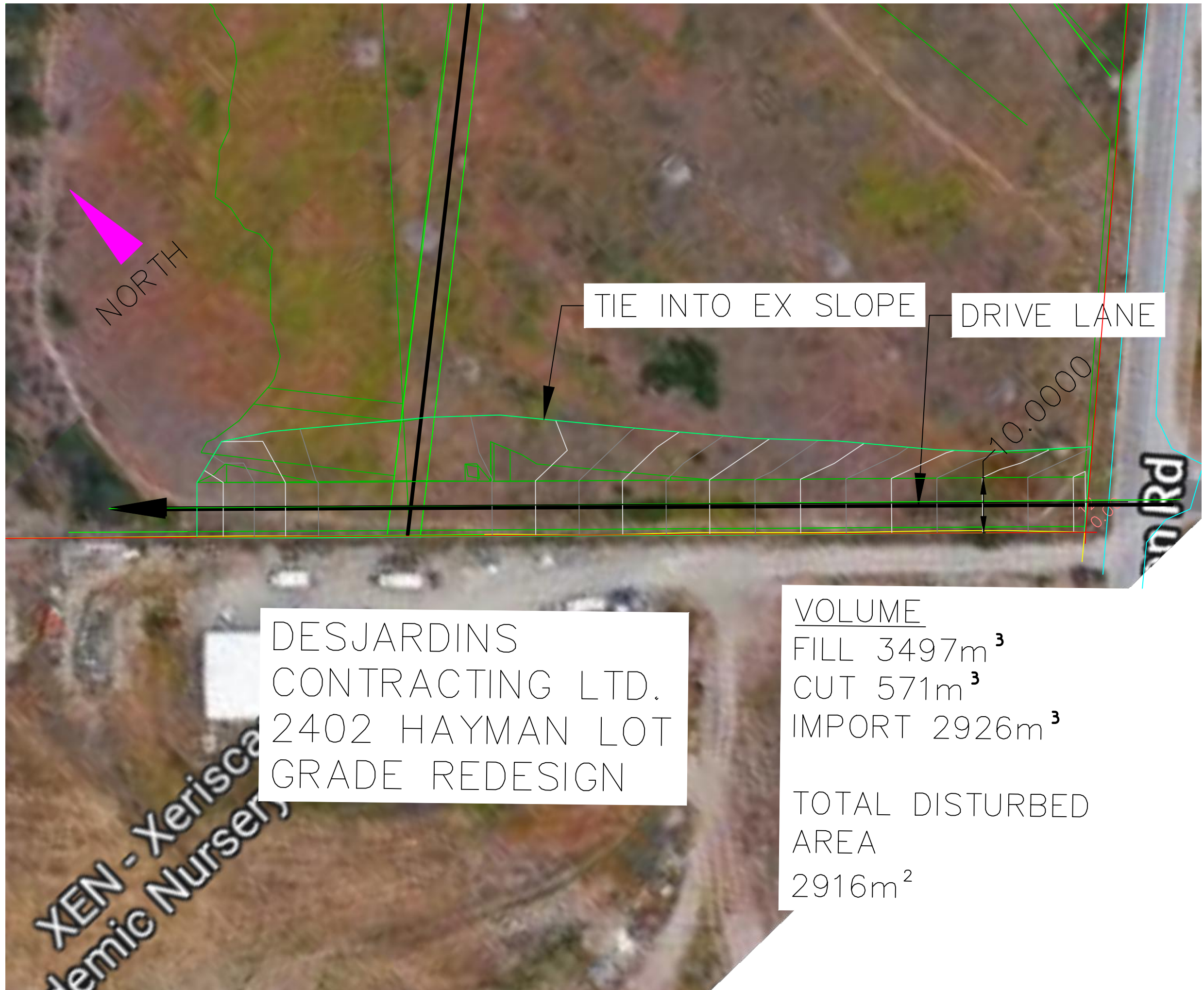


DESJARDINS CONTRACTING  
 2402 HAYMAN  
 2022-05-09

## **APPENDIX 3**

### **Driveway Designs by: Desjardins Contracting Ltd.**

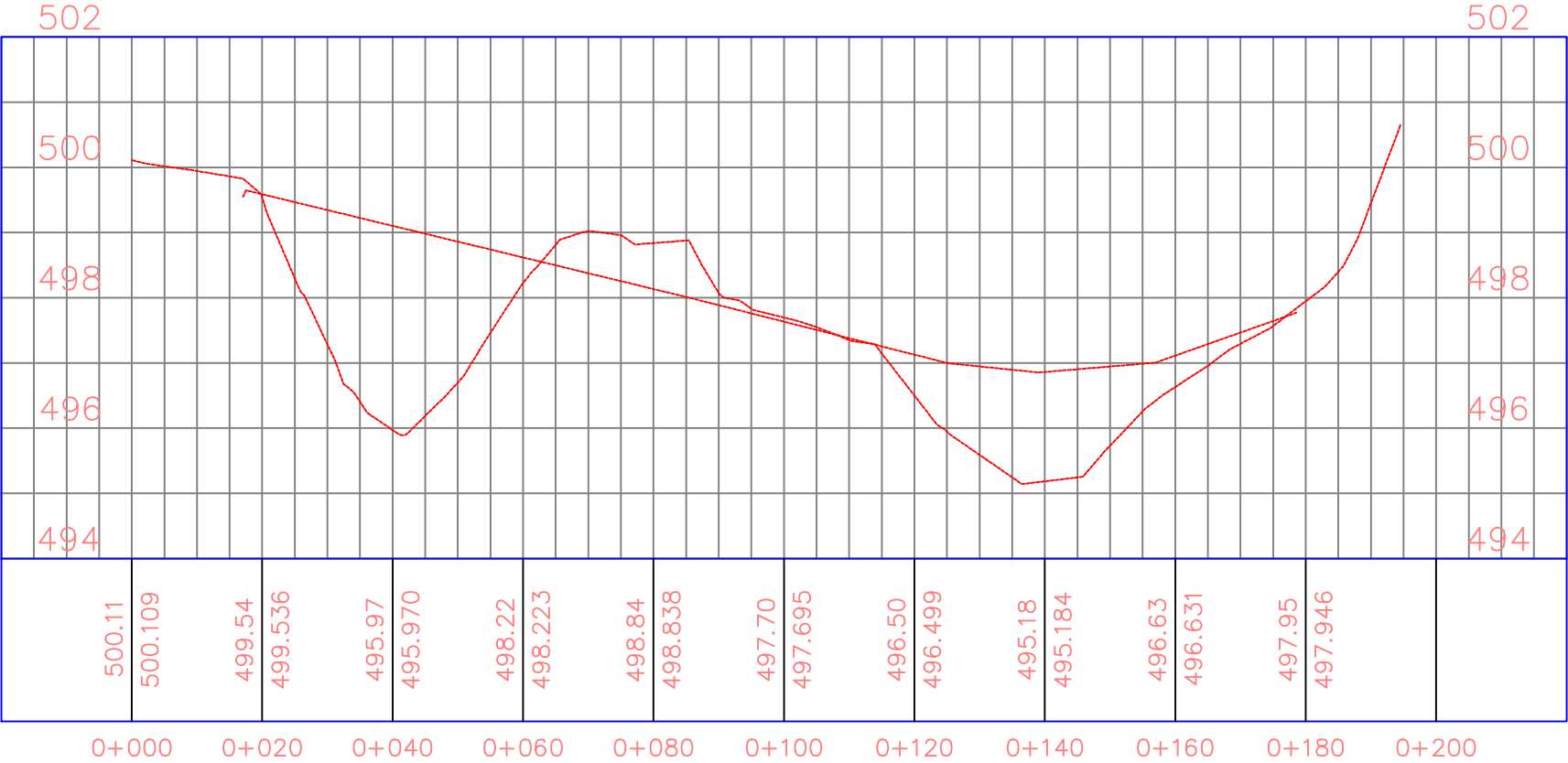




DESJARDINS  
CONTRACTING LTD.  
2402 HAYMAN LOT  
GRADE REDESIGN

VOLUME  
FILL 3497m<sup>3</sup>  
CUT 571m<sup>3</sup>  
IMPORT 2926m<sup>3</sup>  
  
TOTAL DISTURBED  
AREA  
2916m<sup>2</sup>

ROADWAY (1) PROFILE



DESJARDINS CONTRACTING  
2402 HAYMAN  
2022-05-09

## **APPENDIX 5**

### **Stormwater Management Plan by: RSB Engineering**



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## Project 10.2 Obtain Drainage Easement – Hayman Drive to Boucherie Road

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Proposed Works: Establish a drainage easement or Right-of-Way from Hayman Drive to Boucherie Road.

Implementation: Overland flow from Hayman Drive near Issler Road travels overland across private property enroute to Boucherie Road. It is not known if this flow route is within a protected drainage easement or Right-of-Way. This work is considered a Low priority, since the risk of flooding and/or property damage is considered low.

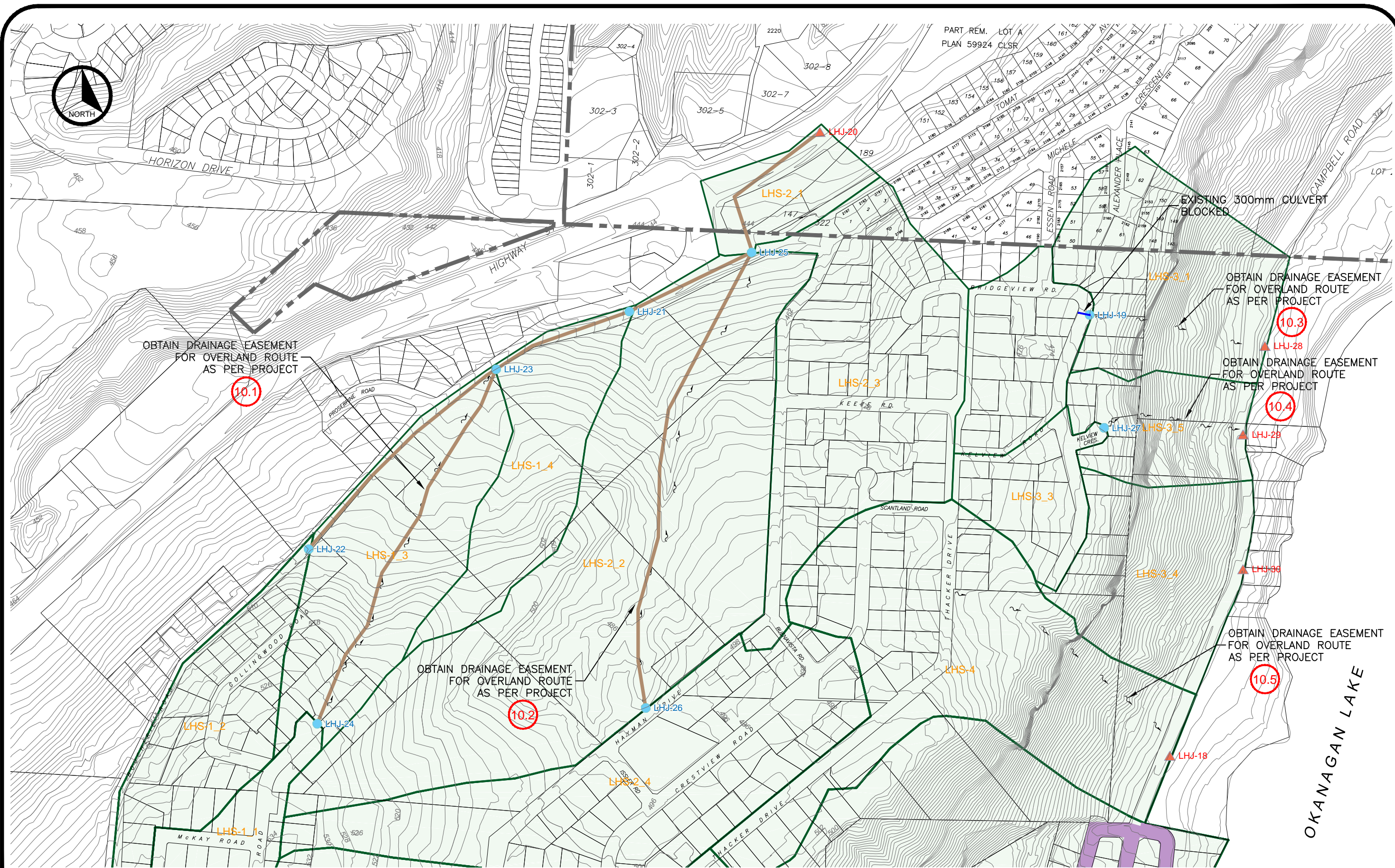
Consequences if not completed: Without an established easement or Right-of-Way, the District will not have the authority to enter onto the property and to install, repair, maintain or replace the drainage works.

Priority: 3

Location:







LEGEND

- |                     |                     |                    |
|---------------------|---------------------|--------------------|
| CATCHMENT BOUNDARY  | MODEL JUNCTION      | LHJ-21 JUNCTION ID |
| MODEL CHANNEL/DITCH | MODEL OUTFALL       | LHJ-2 OUTFALL ID   |
| MODEL PIPE          | LHS-16 CATCHMENT ID | 2m CONTOUR         |

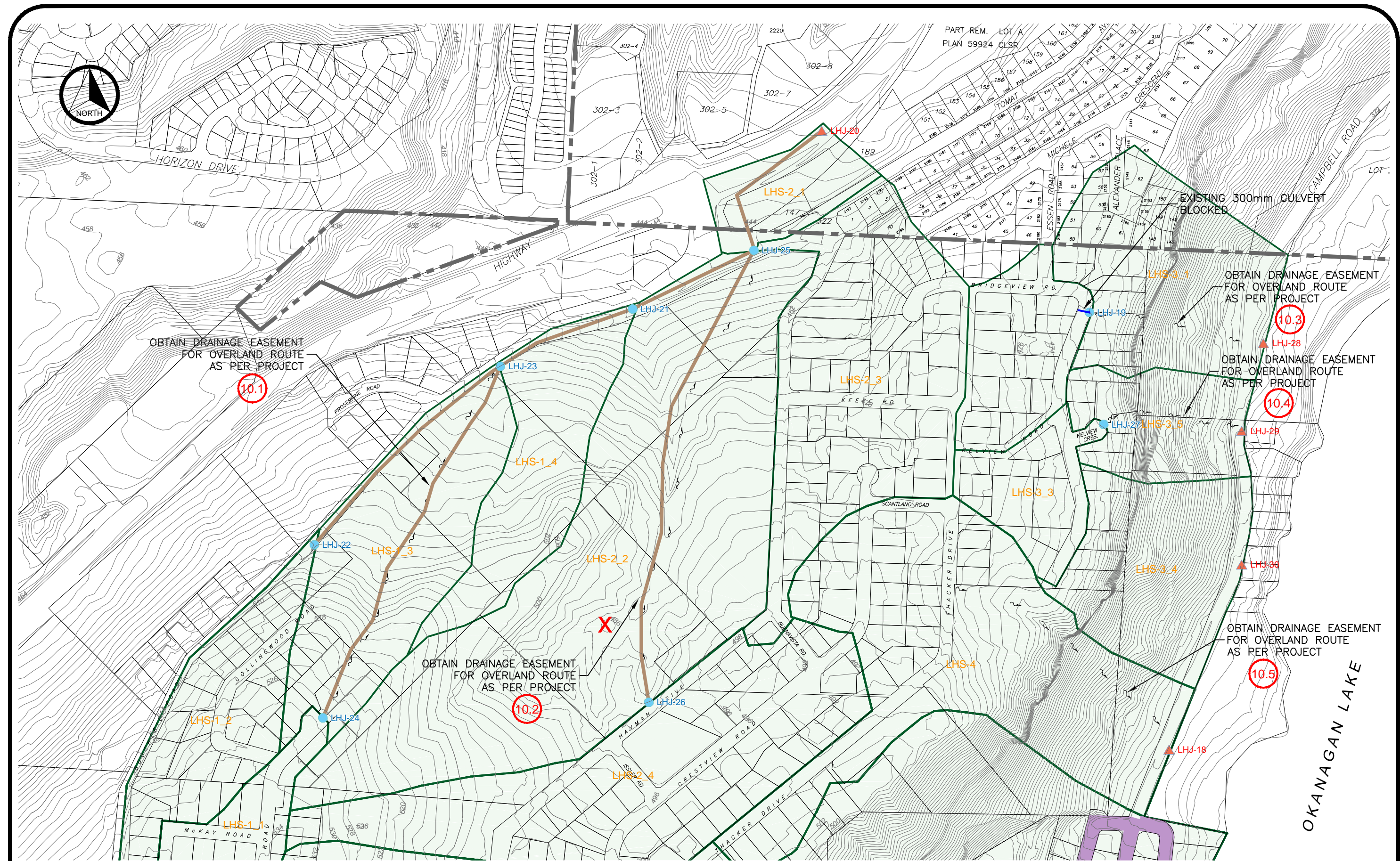
524 CONTOUR ELEVATION

	10.2	
	10.3	

FIGURE 10.2  
LAKEVIEW HEIGHTS BASIN  
EXISTING SYSTEM  
SCALE 1:5,000







LEGEND

- |                     |                     |                    |
|---------------------|---------------------|--------------------|
| CATCHMENT BOUNDARY  | MODEL JUNCTION      | LHJ-21 JUNCTION ID |
| MODEL CHANNEL/DITCH | MODEL OUTFALL       | LHJ-2 OUTFALL ID   |
| MODEL PIPE          | LHS-16 CATCHMENT ID | 2m CONTOUR         |

524 CONTOUR ELEVATION

	10.2	
	10.3	

FIGURE 10.2  
LAKEVIEW HEIGHTS BASIN  
EXISTING SYSTEM  
SCALE 1:5,000



## **APPENDIX 6**

### **Soil Survey**





## Technical Memorandum

---

**Date:** September 2, 2022  
**To:** Manjinder and Parneet Dhaliwal  
**Care of:** Dave Desjardins, Desjardins Contracting Ltd.  
**From:** Theresa Loewen, Ecoscape Environmental Consultants Ltd.  
**File:** 22-4231 | Version 1  
**Subject:** **Soil Survey at 2402 Hayman Rd, West Kelowna, BC**

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### 1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. (Ecoscape) has been retained by Desjardins Contracting Ltd. (the client) to conduct a soil survey for 2402 Hayman Rd, West Kelowna, BC (subject property) in accordance with Agricultural Land Commission (ALC) decision letter dated August 22, 2022, as supplemental information for the ALC Soil and Fill Use application (ALC File No. 62880).

### 2.0 SOIL SURVEY

A soil survey was conducted on September 2, 2022 by Theresa Loewen, M.Sc., P.Ag.

One (1) soil test pit was excavated on the subject property in accordance with ALC Policy P-10 (one detailed test pit for every 1 – 5 ha of the subject property, which is 5.3 ha) (**Appendix Figure; Photos 1 - 2**). The soil test pit was excavated to 1 meter. Soil survey results are listed in **Tables 1 and 2**.

Based on the results and field observations, the soil is classified as a Parkhill Eluviated Eutric Brunisol that it is mapped as.

**TABLE 1. Soil Field Coding Sheet (Page 1).**

Soil Test Pit	Horizon	Horizon Depth (cm)	Horizon Thickness (min/max)	Horizon Boundary (dist/form) <sup>1</sup>	Coarse Fragment (% by vol)	Soil Texture <sup>2</sup>	1° Structure <sup>3</sup> (Grade/Class/Kind)	Consistence (dry) <sup>4</sup>	Colour
Soil Pit 1	LFH	3 - 0							
	Ahe	0 - 8	5/10	C/W	0	SL	WM/M/SBK	1	2.5 Y 4/2
	Ae	8 - 46	28/37	G/I	0	LS	S/VC/SBK	5	2.5 Y 5/2
	Bm	46 - 88	38/43	C/W	0	LS-S	M/VC/SBK	1	2.5 Y 5/3
	Cca	88 +	-	-	0	S	W/C/SBK	1	2.5 Y 5/3

<sup>1</sup>Horizon Boundary: C = clear, G = gradual / W = wavy, I = irregular<sup>2</sup>Soil Texture: S = sand, L = loam<sup>3</sup>Structure: W = weak, WM = weak to moderate, M = moderate, S = strong / M = medium, C = coarse, VC = very coarse / SBK = subangular blocky<sup>4</sup>Consistence: 1 = loose, 5 = very hard**TABLE 2. Soil Field Coding Sheet (Page 2).**

Soil Test Pit	Horizon	Mottles	Roots <sup>1</sup> (Abundance/Size/Orientation/Distribution)	Effervescence <sup>2</sup>	Secondary Carbonates <sup>3</sup>	Rooting Depth	Comments
Soil Pit 1	LFH						
	Ahe	-	A/V/V/MX	-			
	Ae	-	P/V/V/MX	-			
	Bm	-	P/V/V/MX	-			
	Cca	-	F/V/V/MX	S	6/F/C		Secondary carbonates

<sup>1</sup>Roots: A = abundant, P = plentiful, F = few / V = very fine / V = vertical / MX = matrix<sup>2</sup>Effervescence: S = strong, bubbles form thick foam<sup>3</sup>Secondary Carbonates: 6 = discontinuous, spotted / F = few / C = coarse

### 3.0 AGRICULTURAL CAPABILITY RATINGS

The majority of the subject property has been mapped as Parkhill soils of Class 6 with limitations of soil moisture deficiency (**Table 3**). A site-specific review revealed that the soils, as sampled in the location shown on the Appendix Figure, are consistent with Parkhill Eluviated Eutric Brunisol soils, due to the low coarse fragments by volume and an eluvial horizon at least 2 cm thick, as well as textures of sand or loamy sand.

**TABLE 3. Agricultural capability ratings within the subject property (BC SIFT, 2022).**

Polygon	Unimproved Class <sup>1</sup>	Subclass 1 <sup>2</sup>	Subclass 2	Improved Class	Composition
Parkhill	6	A	-	3	100%
Trout Creek	5	A	-	2	80%
	6	A	-	3AP	20%

**TABLE 3. Agricultural capability ratings within the subject property (BC SIFT, 2022).**

Polygon	Unimproved Class <sup>1</sup>	Subclass 1 <sup>2</sup>	Subclass 2	Improved Class	Composition
Gammil	6	A	-	3T	60%
	5	A	-	2AT	40%

<sup>1</sup> Class 1 land has minimal limitations when associated with the most amenable climates in the Province. In Class 2 to Class 5, the limitations increase. Class 6 lands have limitations that preclude arable agricultural activities yet are capable of sustaining native and/or perennial uncultivated agriculture. Class 7 lands have limitations that preclude all arable and natural grazing agricultural systems, regardless of the climate.

<sup>2</sup> A = soil moisture deficiency, P = stoniness, R = shallow soil over bedrock and/or bedrock outcroppings, T = topography

With improvements, the agricultural capability of the soils may be improved from Classes 5 and 6 to Classes 2 and 3 with irrigation, fill placement in low-lying areas, the removal of stones/screening of material, and the addition of topsoil where applicable of textures ranging from sandy loam to silt loam.

#### 4.0 CONCLUSION

With the appropriate amendments such as an established irrigation system, fill placement in low-lying areas to reduce frost pockets and improve drainage, the removal of stones/screening of material, and the addition of topsoil to improve soil textures, it is Ecoscape's opinion that agricultural capability ratings may be improved. Imported fill must meet the agricultural requirements of the ALC as evidenced by laboratory testing prior to fill placement.

With these amendments, the subject property could support a range of soil-bound horticultural crops such as tree fruits, grapes, or ground crops. Non-soil bound agriculture could also be an option.

#### 5.0 LIMITATIONS

This memo has been prepared by Ecoscape and is intended for the sole and exclusive use of the client for the purposes set out in this memo. Ecoscape has prepared this report with the understanding that all available information on the past, present, and proposed conditions of the subject property have been disclosed. Ecoscape has relied upon personal communications with the client and other information sources to corroborate the documents and other records available for the subject property. Ecoscape presents facts, assumptions, and opinions in this memo, based on information where applicable including but not limited to information provided by the client, publicly available information sources and data, field observations, laboratory data, and professional assessment. The client has also acknowledged that in order for Ecoscape to properly provide the professional service, Ecoscape is relying upon full disclosure and accuracy of this information.

Any use of this report by a third party, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Ecoscape accepts no responsibility for damages, if any, suffered by any third party as a result of actions or decisions made based on this report.

## 6.0 CLOSURE

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted,  
ECOSCAPE Environmental Consultants Ltd.

Prepared by:

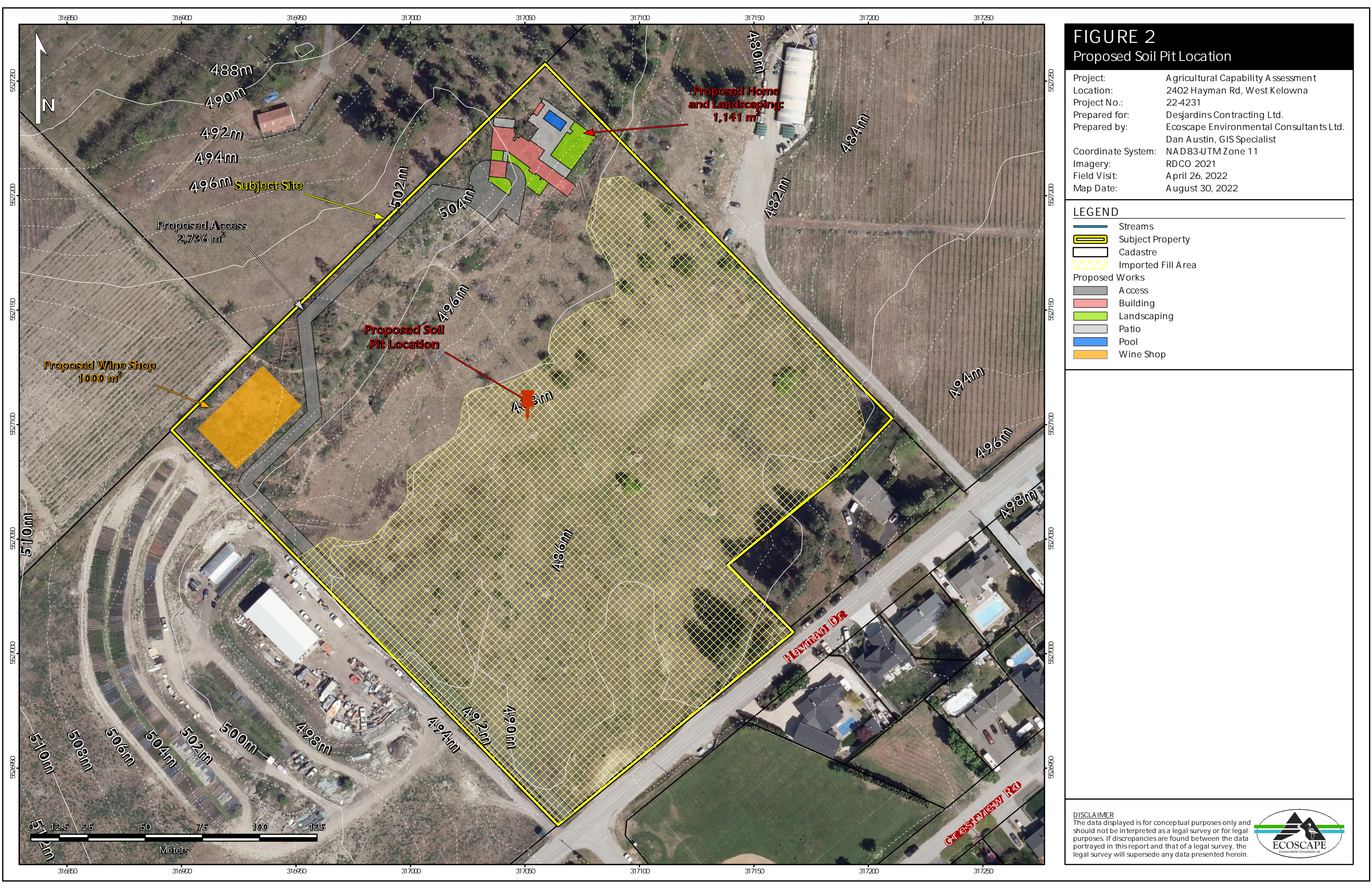


Theresa Loewen, M.Sc., P.Ag.  
Agroecologist  
Direct Line: (250) 491-7337 ext. 214

Appendix:      Figure 2: Soil Survey  
                         Photographs

## **APPENDIX: Figures**







## PHOTOGRAPHS



**Photo 1.** View of soil test pit, facing northwest (all photos taken Sept 2, 2022).





**Photo 2.** Landscape view of soil test pit, facing northwest.