

Agricultural Land Capability Assessment – 13028 Stave Lake Road, Fraser Valley Regional District, BC

Prepared for: Rick Mathers

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Table of Acronyms

ABK	Agular blocky
AG-2	Agricultural 2 zone is for <i>Farm Use</i> and <i>Residential Use</i> on <i>lots</i> at least 4.0 ha in <i>lot area</i>
ALCA	Agricultural Land Capability Assessment
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
BC	British Columbia
Ha	Hectare
C ABK	Coarse angular blocky
C SBK	Coarse subangular blocky
m ²	Meters squared
M ABK	Medium angular blocky
M SBK	Medium subangular blocky
R-4	Rural 4 zone is for rural <i>Residential Use</i> on <i>lots</i> at least 8.0 ha in <i>lot area</i>

1.0 Introduction

McTavish Resource & Management Consultants Ltd. (McTavish) was retained by the “Client” to carry out an Agricultural Land Capability Assessment (LCA) on deposited fill areas at 13028 Stave Lake Road (referred to as “the Property”). The Property resides in the Agricultural Land Reserve (ALR). The assessment followed the Agricultural Land Commission (ALC) criteria Policy P-10 (BC Agricultural Land Commission, 2017). The LCA was completed to assess the effects of unauthorized fill importation on the agricultural land capability of the Property.

2.0 Site Description

The Property, located at 13028 Stave Lake Road (detailed in Table 1), is in the Fraser Valley Regional District. This 3.97 Ha property borders Stave Lake Road on its western boundary. Each of the three directly adjacent properties to the north, east, and south reside fully within the ALR (Table 2) and are not being actively farmed. The three properties to the west of Stave Lake Road only partially reside within the ALR.

There is a dwelling near the west end of the Property, immediately adjacent to Stave Lake Road. At the time of the site investigation, a flock of sheep were present in a small barn on the west end of the Property. There is currently no soil-based agriculture on the Property. From historical aerial imagery, the land on the eastern half of the property was cleared of trees at some point between July of 2021 and June of 2022. Satellite imagery does not indicate that there has been any historical farming on the property.

A temporary road using crushed rock, approximately 7m wide, from Stave Lake Road heading east toward the east end of the Property. Near the east end of the Property a temporary turnaround had been constructed using crushed rock and was connected to the access road. In addition to the gravel road, fill had been deposited on the north side of the temporary access road near the center of the Property. Prior to laying crushed rock or depositing fill, it appeared that topsoil had been stripped and stockpiled on site in anticipation of replacement after temporary access and turnaround removal. Based on a conversation with the excavator operator, the location of the turnaround exists was a high point of the property. McTavish observed that the property sloped downward to the north, east, and south of this high point. Operators had done some minor grading of the area where this high point existed, to produce a level turnaround. According to personnel on site, the landowner intends to build a new sheep barn on the imported fill.

TABLE 1. PROPERTY DETAILS FOR 13028 STAVE LAKE RD.

Property Details	
Full Address	13028 Stave Lake Road
Property ID (PID)	012-779-750

Legal Description	LOT 4, PLAN NWP2569, SECTION 25, TOWNSHIP 18, NEW WESTMINSTER LAND DISTRICT
Area (m ²)	38673.21
Zoning	AG-2

TABLE 2. SURROUNDING PROPERTY INFORMATION

Direction	Property ID	Address	Area (Ha)	Zoning	In the ALR?	Current Land Use
North	012-779-741	13080 STAVE LAKE RD	3.87	AG-2	Yes	Forested
East	005-715-806	13025 BURNS RD	15.4	AG-2	Yes	Forested
Northwest	013-394-398	13079 STAVE LAKE RD	7.99	R-4	Partially	Agriculture / Forested
West	009-275-177	13015 STAVE LAKE RD	7.98	R-4	Partially	Agricultural/ Forested
Southwest	013-394-401	12999 STAVE LAKE RD	7.99	R-4	Partially	Forested
South	012-779-768	12978 STAVE LAKE RD	34.9	AG-2	Yes	Forested

3.0 Methods

The agricultural land capability assessment was conducted to determine the current agricultural capability of the Property. The assessment was carried out in two phases: 1) a desktop assessment of published resources; and 2) a field assessment to characterize site conditions. Based on the desktop and field results the agricultural capability was confirmed or revised. Analysis of the agricultural capability considers climate and microclimate, site conditions, soil type, land use, and/or management inputs.

4.0 Desktop Assessment

Before undertaking the field assessment, a desktop review was completed. This review provided guidance for the placement of the detailed soil pit investigation sites that would allow for pits to be installed based on mapped soil polygons and cropping history rather than placement driven by property boundaries alone.

5.0 Desktop Assessment Results

5.1. Published Soil Series

The BC Soil Information Finder Tool (Province of BC, 2018) was utilized to review the published soil mapping and data; and the published agricultural capability mapping and classifications.

In Canada, soils are classified using a hierarchical system that groups soils into Orders, Great Groups, Subgroups, Families, and Series based on their parent material and development as well as their chemical, physical, and biological properties. Soil series are the most specific unit of classification and provide specific information about soils within a series mapping unit. In BC there are hundreds of series which are mapped (from previous soil surveys) and described in provincial reports and presented on the BC Information Finder Tool map. Information for each soil series, as determined by the historic soil survey, may include soil classification, soil type (organic or mineral), parent material, land formations and slope, and soil profile descriptions.

Two soil polygons are mapped on the Property. Polygon 1 (~ west ¼) is 100% Durieu. Polygon 2 (remainder of Property) is mapped as a combination of two soil series (Durieu and Scat) Refer to Table 3 and Appendix I.

Durieu Soil Series

Durieu soils are mineral soils that have developed on moderately fine glaciomarine deposits. The dominant soil textures are silt loam or loam in upper horizons but may include sandy loam at depth. Durieu is moderately well drained, removing water somewhat slowly in relation to supply. Excess water may be removed slowly due to low perviousness, shallow water table, or lack of gradient. The soil is strongly acidic, being at or below a pH of 5.6. Durieu soils are generally free of any coarse fragments. Normal Durieu soil classification is an Orthic Ferro-Humic Podzol.

Scat Soil Series

Scat soils are mineral soils that have two distinct modes of deposition. The uppermost soil consists of Eolian material deposited by wind, resulting in uniform deposits of very fine sand and silt. Uppermost soil is strongly acidic, being at or below a pH of 5.6. At depth, soil is of glaciomarine origin and medium to neutral acidity (pH of 5.6 to 7.4). A soil texture of silty clay or silty clay loam can typically be expected. The B and C horizons typically have minimal (2%) coarse fragments. This soil is poorly drained. Excess water is evident in the soil for a large part of the time, resulting in gleyed B and C horizons. A perched water table may exist.

TABLE 3. SUMMARY OF PUBLISHED MAPPED SOIL SERIES ON SITE

Mapped Soil Series	Soil Polygon Classification	%	Area (Ha)
Durieu	Orthic Ferro-Humic Podzol	85	3.22
Scat	Orthic Humic Gleysol	15	0.59

5.2. Published Agricultural Capability

The BC Soil Information Finder Tool (Province of BC, 2018) was also used to review the published agricultural capability mapping and classifications.

In BC, land is rated for its agricultural capability through a classification system known as The Land Capability Classification for Agriculture in British Columbia (Kenk and Cotic, 1983). Using this system, land in BC is rated between Class 1 to 7, where Class 1 is land best suited for agriculture and Class 7 is nonarable land and various subclasses describe the factor(s) that limit agriculture.

The agricultural land capability classification indicates the range of crops that can be grown and/or the management inputs required based on soil and climate parameters. The ratings can be “unimproved” based on the conditions that exist at the time of the survey without any management inputs or “improved” based on the rating after the limitations have been alleviated through improvements. **Appendix II** provides a summary of the BC agricultural capability classifications.

According to published agricultural capability ratings, ~23% of the property is 6:4T~4:3TWD [6:T~4:3td] and the remaining ~77% as 5:2WDT~3:3TWD~2:5W [5:2TD~3:3TD~2:3WD] (Province of BC, 2018). A map indicating the published agricultural ratings at the Site is provided in **Appendix I**.

The **W** subclass applies to soils for which excess free water limits their use for agriculture. The excess water is due to imperfect or poor drainage due to high water tables, seepage, or runoff from surrounding areas. The **D** subclass denotes undesirable soil structure. These soils may be difficult to till, require special management for seedbed preparation, or have trafficability problems. Also included in the subclass are soils that may have insufficient aeration, trouble absorbing or distributing water, or have the rooting zone restricted by a factor other than a high water table. The **T** subclass applies to soils for which topography is a limiting factor. Use of farm machinery, uniformity of growth and maturation of crops, and increased potential for water erosion are potential outcomes of a land affected by topographical constraints.

The published improved capability ratings for the Property are ~23% of the property is 6:4T~4:3TD and the remaining ~77% as 5:2TD~3:3TD~2:3WD (Table 4). This means the class 2 and 3 soils could be improved by addressing excess water issues, thereby removing the ‘W’ subclass. Any soil rated as 5W could be improved to 3WD, given the same attention to addressing excess water. It is considered

impractical to improve topography limitations in most cases. Undesirable soil structure (**D**) can potentially be improved one class rating through deep tillage or soil amelioration of soil texture.

TABLE 4. SUMMARY OF MAPPED AGRICULTURAL CAPABILITY RATINGS ON SITE

Percentage	Current Ag Cap	Improvable Ag Cap
77%	5:2WDT~3:3TWD~2:5W	5:2TD~3:3TD~2:3WD
23%	6:4T~4:3TWD	6:4T~4:3TD

6.0 Field Assessment

The field assessment was carried out on January 23rd, 2024, and included general observations of the Property as well as soil pit installations. The Property can be divided into three distinct areas, based on recent activities and condition of soils (and vegetation).

1. Undisturbed or nearly intact soil profiles on the center and the west portions of the Property, not affected by fill importation.
2. Undisturbed or nearly intact soil profiles soil in low lying wet areas at the eastern most portion of the Property, not affected by fill importation.
3. Recently deposited fill and gravel led construction access road

Using an excavator, seven soil pits were installed to classify soils and assess the agricultural land capability. Three soil pits were installed in undisturbed soils. Three pits were installed in the deposited fill area. One pit was installed on the temporary turnaround, although the plan landowner indicated this fill will be removed. Observations of site conditions that may promote or limit agriculture such as existing farm infrastructure, environmental conditions, drainage, and topography were made across the Property in all areas where accessibility was possible.

6.1. General Soil Conditions

The undisturbed soil on site was confirmed to be of the Durieu soil series. All three pits in the undisturbed soil contained a Bf diagnostic horizon, indicating an accumulation of iron and/or aluminum oxides. The soil texture in the upper two horizons was either silt loam or loam and became sandier at depth. The coarse fragment percentage in all horizons was low. These characteristics are all consistent with Durieu series.

6.2. Revised Land Capability for Agriculture

The revised LCA for the Property was determined by information collected from six of the seven soil test pits (refer to *Appendix II* for full soil pit descriptions and photos), and the assessment of local landforms, drainage, and vegetation. Pit 4 was not used to assess the revised LCA ratings for the Property as it was placed within the temporary road. The revised agricultural capability varied from the provincially mapped

capabilities summarized in Table 4. In total, four LCA Polygons have been delineated for the Property (Appendix I), with three being assigned an unimproved and improved LCA rating (Table 5).

For Polygon 1 (undisturbed soils) the LCA is revised to a capability rating of 3WT. This agrees with the provincially mapped soils except for the mapped undesirable soil structure limitation. There wasn't evidence of this limitation in the soil pits excavated in this polygon. The excess water (W) limitation can be improved to a class 2W through water management practices including surface and subsurface drainage and appropriate tillage. The topography (T) limitation is not considered practical to improve. As a result, the improved rating for this polygon is 3T.

For Polygon 2 (low lying undisturbed soils) the LCA is revised to a capability rating of 5W. This agrees with the provincially mapped ratings (see table 4.) The excess water (W) limitation is improvable to class 4 W through water management practices including surface and subsurface drainage and appropriate tillage. As a result, the improved rating for this polygon is 4W.

For Polygon 3 (fill area) the LCA is revised to a capability rating of 4PD. Both limitations are a result of the importation and packing of fill material and are not seen in undisturbed soils elsewhere on site. The undesirable soil structure and/or low perviousness (D) limitation is improvable through additions of organic matter and deep tillage to break-up root restricting layers. Stoniness (P) is improvable by removing cobbles and stones, either manually or by mechanical means. Coarse gravels are not considered practical to remove, and this limitation remains after improvement. As a result, the improved rating for this polygon is 3PD.

Class 3 land, as described by the ALC, contains limitations which require moderately intensive management practices or moderately restrict the range of crops, or both. Class 4 land, as described by the ALC, contains limitations that require special management practices or severely restrict the range of crops, or both. The limitations may seriously affect one or more of the following practices: timing and ease of tillage, planting and harvesting, and methods of soil conservation. Class 5 lands, as described by the ALC, contain limitations that restrict its capability to produce perennial forage crops or other specially adapted crops, such as cranberries (which are suited to unique soil conditions not amenable to a wide range of common crops). However, if the crop is adapted to the unique soil conditions, productivity may be high. These lands can be cultivated, and some can be used for cultivated field crops, provided unusually intensive management is employed and/or (as noted) the crop is particularly adapted to the conditions peculiar to these lands.

The provincially mapped capabilities had limitations due to undesirable soil structure (D) across the entire property. However, this was only observed in the fill area, and was not seen in our soil pits across areas of undisturbed soil.

TABLE 5. REVISED AGRICULTURAL CAPABILITY

Polygon	Current Ag Cap	Improvable Ag Cap	Area (Ha)
1	3WT	3T	1.97
2	5W	4W	0.96
3	4PD	3PD	0.14
Unassessed	-	-	0.88

6.3. Fill Area and Volume

The deposited fill occupies approximately 1,422 m². The total area where fill was deposited is benched with a smaller lower section and a larger upper section, hereafter called Fill Area 1 and Fill Area 2, respectively. Fill areas and soil pit locations can be seen in Appendix I. Fill depths were determined with the aid of an excavator operator on site. The fill was excavated until native soil was encountered. The average depth of the fill in pits 6 and 7 was used to calculate the volume of fill in Fill Area 2. The depth of Pit 5 was used to calculate the volume of fill in Fill Area 1.

TABLE 6. FILL VOLUME CALCULATIONS FOR 13028 STAVE LAKE RD

Section	Depth (m)	Approximate Area (m ²)	Estimated Volume (m ³)
Fill Area 1	1.8	328	591
Fill Area 2	1.91	1,094	2,089
Total	-	1,422	2,680

6.4. Effects of Fill on Agricultural Capability

Where fill has been imported, the capability rating on the Property was determined to be 4PD. The upper ~50cm of the material was heavily compacted, likely due to the continued distribution and compaction of fill material in layers by the excavator, as well as from excavator track-packing. It should be noted that operators were stopped due to the ALC order during the process of filling.

Topsoil was stripped prior to McTavish consultants being on site and was stockpiled adjacent to the temporary road. No buried topsoil was found in any of the fill; however, it is not possible to determine whether or not all topsoil was properly stripped and salvaged. According to the landowner, topsoil will be replaced across the property once the temporary road and turnaround are removed. Some garbage was found within the fill (e.g., plastic PVC pipe), but the amount was minimal.

Within the fill area, the agriculture capability has been reduced due to the introduction of coarse fragments and soil compaction. However, by leveling the ground the topography limitation has been removed. Once the topsoil is replaced, compaction is ameliorated in the upper ~50 cm, and cobble, stone, and boulder-sized coarse fragments are removed from the upper 25 cm the 4PD limitation is possible to be reduced to a 3PD limitation.

7.0 Soil Laboratory Results

Four soil samples were collected, one soil sample was taken from the topsoil at the east end of the Property. The remaining three samples were taken from the subsoil in each of the three pits (one in Area 1, two in Area 2) installed in the imported fill.

The soil texture in all four samples was similar. All four samples were reported as sandy loam. The pH of all fill samples was either neutral or slightly alkaline, while the native soil had a moderately acidic pH of 5.4. Nutrient levels measured in the topsoil sample (Pit 3) were within the expected range (generally low to deficient) for recently cleared Podzolic soils and for the time of year the sample was taken.

The fill samples had elevated levels of sulfur, in the form of sulfate, at the high end of optimum ranges. It should be noted that the native soil sample was taken from the Ah topsoil horizon, while the fill samples are subsoil samples.

Full lab results for each pit can be seen in **Appendix V**.

8.0 Recommendations

As a result of the importation of fill onto the Property, the agricultural capability of a portion of the land has decreased. The impacted area at the time of the site visit included the fill area, and the temporary road and turnaround. This was assessed by comparing the Polygon 1 (native soil) with a rating of 3WT and Polygon 3 (imported fill) with a rating of 4PD.

To improve the capability of the fill placement area, McTavish recommends the following:

- Replacement of stripped topsoil and the addition of soil amendments to improve topsoil structure and depth.
- Subsoiling or deep tillage to improve the compaction and undesirable soil structure (D), particularly in the fill and at the fill topsoil interface.
- Rock picking of the upper 50 cm of the fill material to reduce the excess stoniness limitation (P)

With these recommendations, the fill placement area will have comparable capability for agriculture to the surrounding native soils.

9.0 Summary and Conclusions

Based on McTavish's field assessment, the majority of the assessed area of the Property (1.97 ha) is rated **Class 3WT**. This area, delineated and labeled as Polygon 1, is located in the center portion of the property. The eastern end of the Property (0.96 ha), labeled as Polygon 2, is low lying and has more limitations to agricultural capability associated with excess water, giving it a **Class 5W** rating. Both polygons are associated with the Durieu soil series. The final area, labeled Polygon 3, is the area which has been altered

by the importation of unauthorized fill. This area has had the topsoil stripped and stockpiled and has been leveled with the deposition of fill. In its current state at the time of assessment, this area has a **Class 4PD** rating. For both Polygon 1 and Polygon 2, the existing excess water (W) limitation can likely be improved by one class through typical practices such as surface and subsurface drainage as well as appropriate tillage. Other methods such as land leveling/deposition of soil within depressional areas can also be considered. Evaluation of a suitable drainage outlet may require pumping or arrangements with adjacent landowners due to the low-lying topography of the Property. For Polygon 3 (fill area), the Class 4PD undesirable soil structure and/or low perviousness limitation will likely be improved through deep tillage to remediate root restricting layers. The increased stoniness can be improved through removal of coarse fragments, particularly those of cobble-sized (> 7.5 cm) or larger within the upper 25 cm of fill material, prior to replacement of topsoil.

Overall, the imported fill has added an undesirable soil structure limitation and increased the stoniness, while removing a topography limitation by leveling the ground. It is the professional opinion of McTavish Consultants that the fill has slightly reduced the agricultural capability of the property, but this could be alleviated through stockpiled topsoil replacement, subsoiling and/or deep tillage, and rock picking of the fill material.

We trust this is the information that you require at this time. Should you have any questions regarding this report please contact the undersigned.

Sincerely,



Justin McTavish, B.Sc, P.Ag

Vice President, Agriculture and Soils | Sr. Partner

McTavish Resource & Management Consultants Ltd.

W: www.mctavishconsultants.ca | M: 604.992.2229 | E: justin@mctavishconsultants.ca










Alex Kramer, M.Sc, A.Ag | Project Lead, Agriculture and Soils

10.0 References

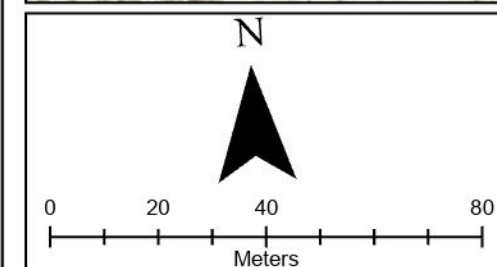
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Appendix I. Maps and Figures

LEGEND

-  Assessed Area
-  Non-assessed Area
-  13028 Stave Lake Road
-  Soil Pit
-  Temporary Access Road
-  Temporary Fill Area
-  Fill Area

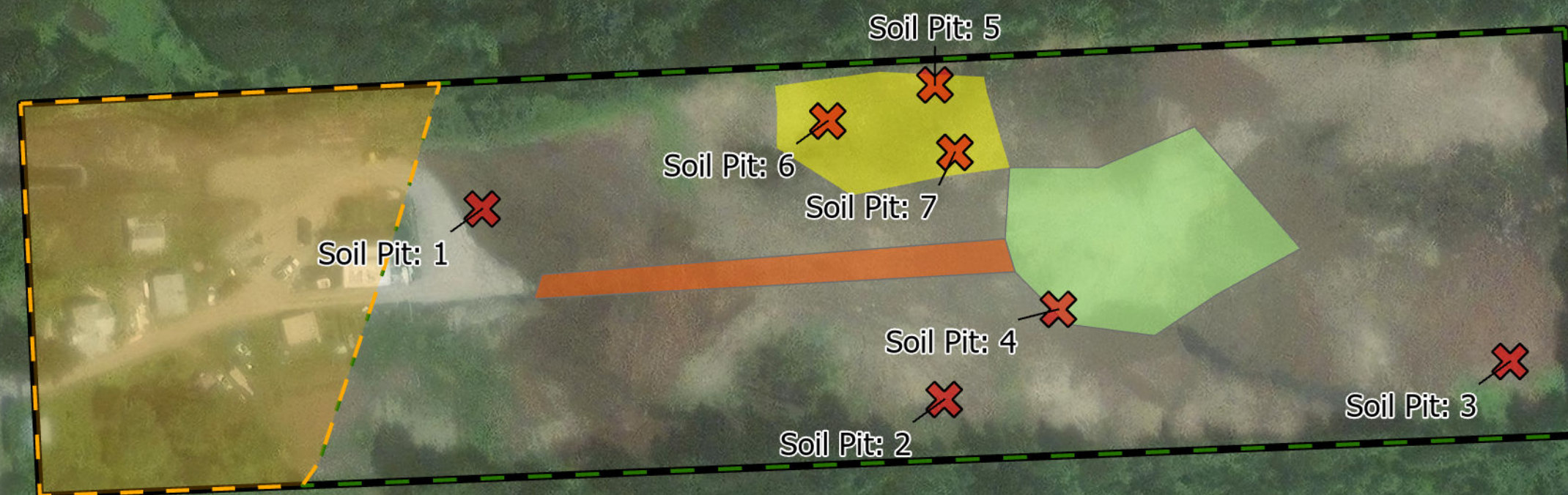
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


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Projection: NAD 1983 BC Environment Albers

Project ID: OT-115
Project Description: 13028 Stave Lake Road
Agricultural Land Capability Assessment
Created By: Max Hoyer, A.Ag

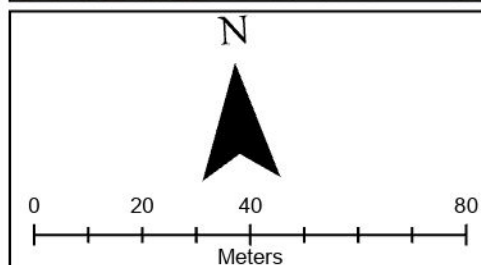
13028 Stave Lake Road - Areas of Imported Fill



LEGEND

-  Assessed Area
-  Non-Assessed Area
-  Polygon 1
-  Polygon 2
-  Polygon 3
-  Soil Pit

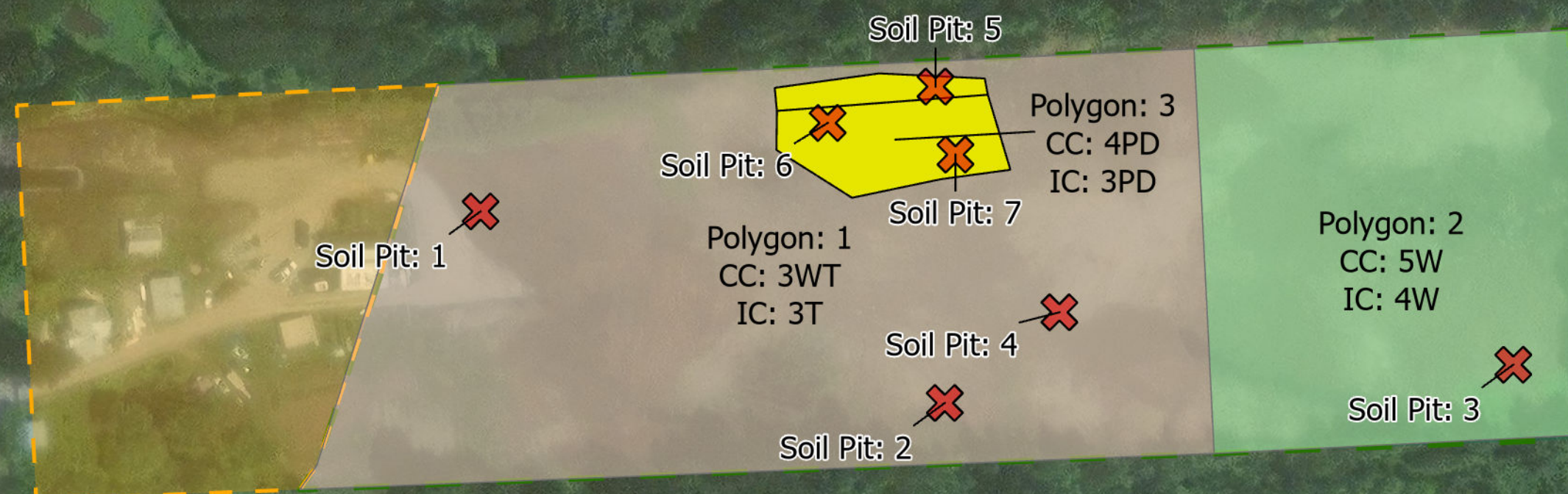
LOCATION OVERVIEW






Scale: 1:1,400
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Project ID: OT-115
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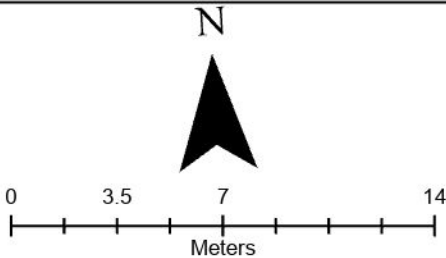
13028 Stave Lake Road - Field Assessed Agricultural Capability Ratings



LEGEND

-  Soil Pit
-  Assessed Area
-  Non-assessed Area

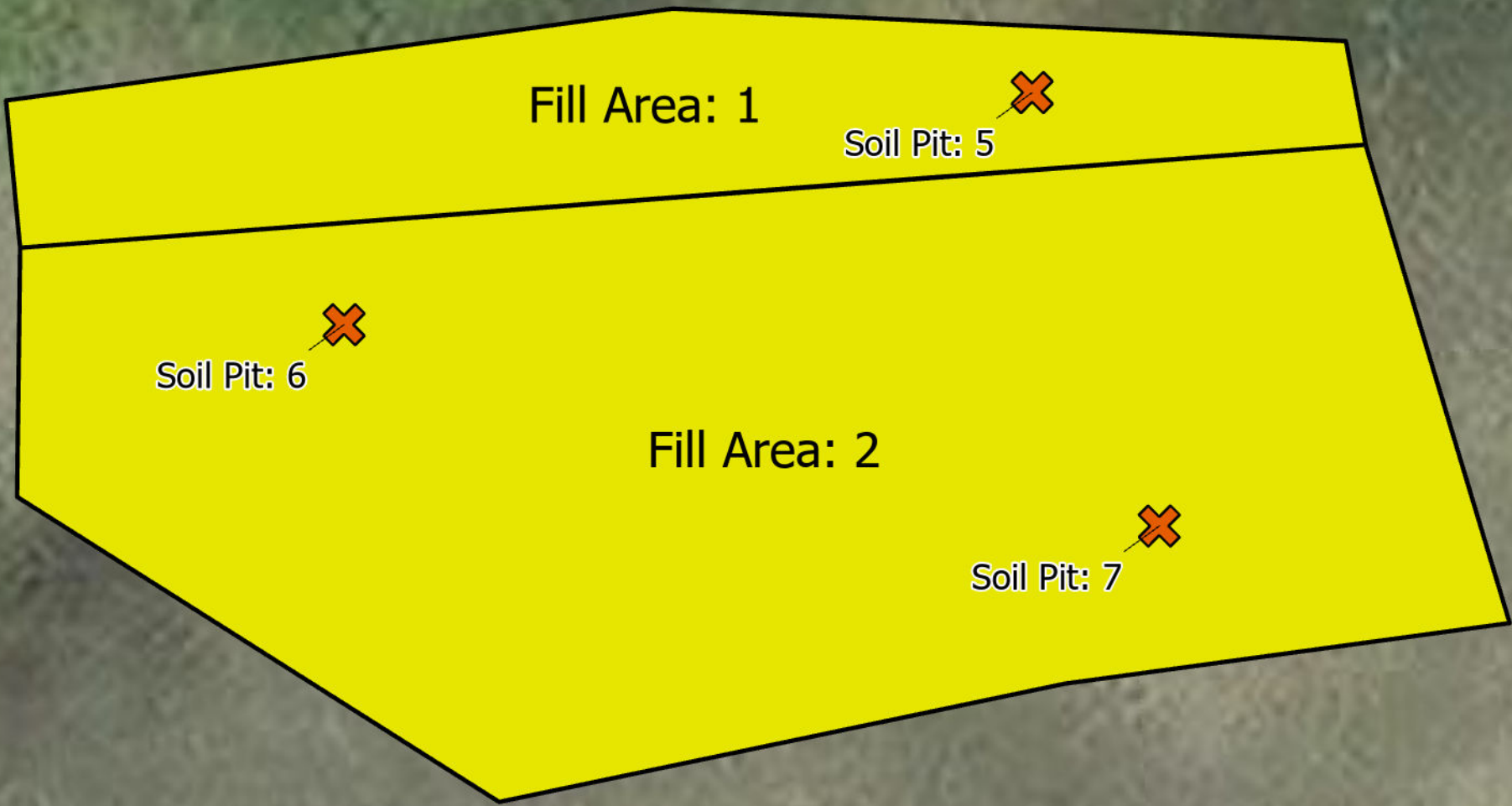
LOCATION OVERVIEW








Scale: 1:250
Projection: NAD 1983 BC Environment Albers

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Project Description: 13028 Stave Lake Road
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**13028 Stave Lake Road - Area
of Imported Fill**



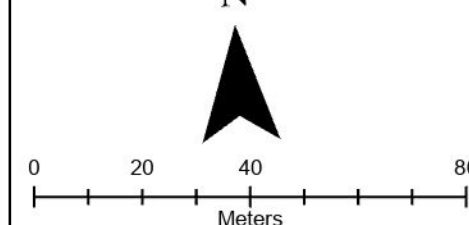
LEGEND

-  Assessed Area
-  Non-assessed Area
-  13028 Stave Lake Road
-  Soil Pit
-  Published Soil Polygon Boundaries

LOCATION OVERVIEW



N



Scale: 1:1,400
Projection: NAD 1983 BC Environment Albers

Project ID: OT-115
Project Description: 13028 Stave Lake Road
Agricultural Land Capability Assessment
Created By: Max Hoyer, A.Ag

13028 Stave Lake Road - Published Soil Series and Agricultural Capability

Soil Series 1: 100% DURIEU
Soil Series 2: NA
CC: 6:4T~4:3TWD
IC: 6:4T~4:3TWD

Soil Pit: 1

Soil Pit: 6

Soil Pit: 5

Soil Series 1: 80% DURIEU
Soil Series 2: 20% SCAT
CC: 5:2WDT~3:3TWD~2:5W
IC: 5:2WDT~3:3TWD~2:5W

Soil Pit: 4

Soil Pit: 2

Soil Pit: 7

Soil Pit: 3

Appendix II. Land Capability for Agriculture Classification System

In BC, land is rated for its agricultural capability through a classification system known as *The Land Capability Classification for Agriculture in British Columbia* (Kenk and Cotic, 1983). Using this system, land in BC is rated between Class 1 to 7, where Class 1 is land best suited for agriculture and Class 7 is non-arable land (**Table App.1**). Various subclasses describe the factor(s) that limit agriculture (**Table App.2**). Classes and subclasses that are not relevant to this document have been removed.

The agricultural land capability classification indicates the range of crops that can be grown and/or the management inputs required based on soil and climate parameters. The ratings can be “unimproved” based on the conditions that exist at the time of the survey without any management inputs or “improved” based on the rating after the limitations have been alleviated through improvements.

Table App.1 Descriptions of relevant BC Land Capability Classifications for Agriculture

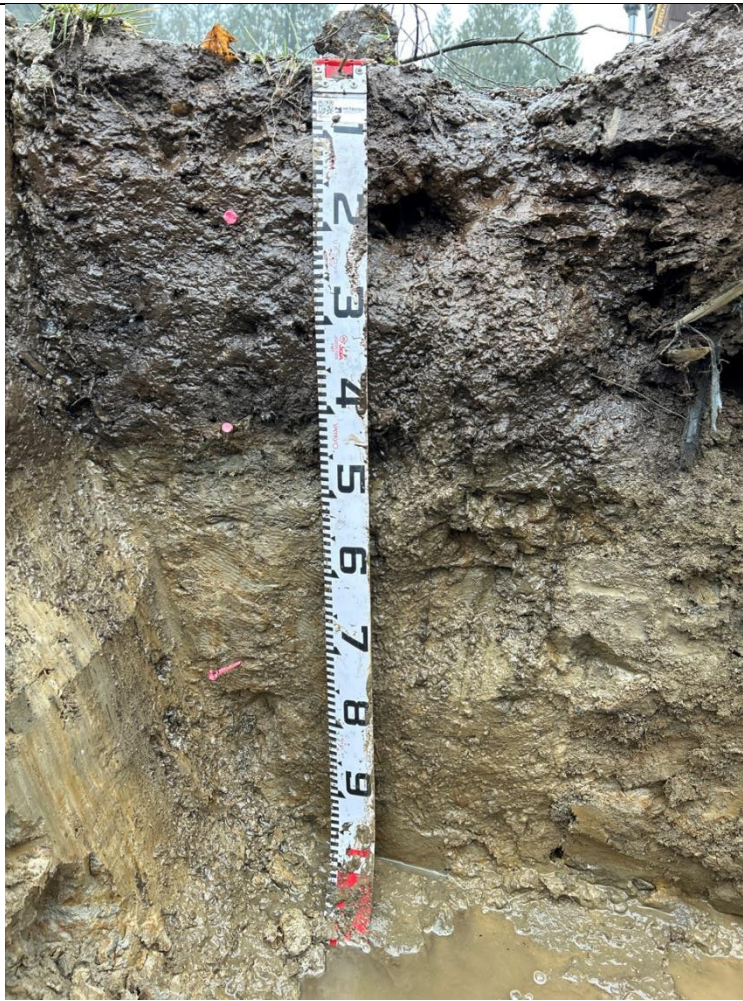
Class	Description
1	Land has little or no limitations, is level or nearly level, and is easily maintained for a wide range of field crops. Soils are deep, hold moisture well, and can be managed without difficulty.
2	Land has minor limitations that either require good ongoing management practices or may restrict the range of crops (or both). Soils are deep, hold moisture well, and can be managed with little difficulty.
3	Land has limitations that require moderately intensive management practices, or may moderately restrict the range of crops, or both. Limitations may restrict choice of crop, timing and ease of tillage, planting and harvesting, and methods of soil conservation.
4	Land may only be suitable for a few crops, or a wide range of crops with low yield. The risk of crop failure is high. Soil conditions are such that special development and management practices are required. Limitations may restrict choice of crop, timing and ease of tillage, planting and harvesting, and methods of soil conservation.
5	Land has limitations that make it suitable for perennial forage or other specially adapted crops. Crops such as cranberries may be appropriate, or fruit trees or grapes if area is climatically suitable (stoniness and/or topography are not significant limitations to these crops). Productivity of these suited crops may be high. Class 5 lands may be used to cultivate field crops, provided intensive management is employed. If adverse climate is the main limitation, cultivated crops may be grown, however crop failure is expected under average conditions.

Table App.2 Descriptions of relevant BC Land Capability Subclasses for Agriculture

Subclass	Description
D	Soil may be difficult to till, may pose problems for farm equipment operation and movement, and require special management for seedbed preparation. Land may have insufficient aeration, absorb, and distribute water slowly, have consolidated bedrock or permafrost, or have the depth of rooting zone restricted by conditions other than wetness such as a high-water table.

P	Applies to soils with sufficient coarse fragments to significantly hinder tillage, planting, and/or harvesting operations.
T	Topography may limit agricultural use of farm machinery, decreasing the uniformity of growth of mature crops, and increasing the potential for water erosion. Classification is based on percent slope (steepness) and the pattern or complexity of slopes, while micro-topography is not regarded as a limitation to agricultural use and is not considered in classification.
W	Soils may be limited by excess free water (other than flooding). Excess water occurs because of imperfect or poor drainage due to high water tables, seepage, or runoff from surrounding areas.

Appendix III. Soil Pit Descriptions and Soil Profile Pictures



Test Pit 1

Soil name: Durieu

Soil classification: Gleyed Ferro-Humic Podzol

Rooting depth: 47 cm

Water table: 110 cm

Drainage class: imperfect

Parent material: glaciomarine

Comments: native soil with topsoil stripped

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Bf	0-19	Silt loam	30	Gravel dominant	M ABK	Moist; firm	10YR 3/4	No
Bfh	19-43	Silt loam	25	Gravel dominant	M ABK	Moist; friable	10YR 2/2	No
Cg	43-76	Sandy loam	5	Fine gravel	M SBK	Moist; friable	10YR 5/4	Medium; common; 10YR 5/4
Cg2	76-110	Loamy sand	5	Fine gravel	C ABK	Moist; very friable	2.5Y 6/2	Medium; many; 10YR 5/4



Test Pit 2

Soil name: Durieu

Soil classification: Humo-Ferric Podzol

Rooting depth: 61 cm

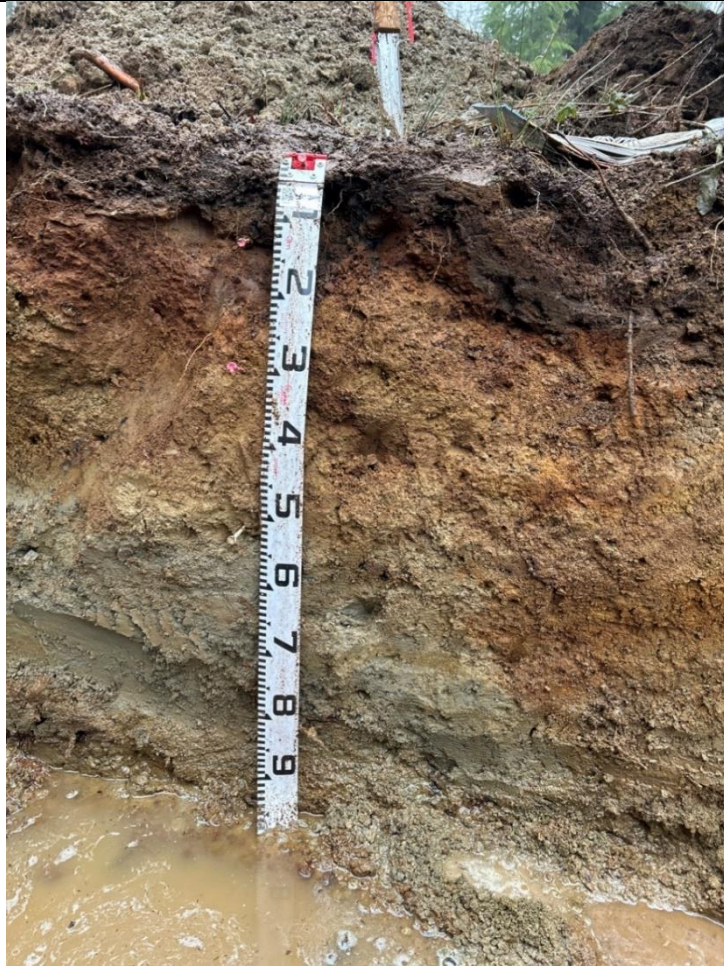
Water table: 100 cm

Drainage class: moderately well

Parent material: glaciomarine

Comments: Native soil

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Ah	0-14	Silt loam	10	Fine gravel	Granular	Moist; friable	10YR 2/2	No
Bf	14-32	Silt loam	15	Fine gravel	F SBK	Moist; friable	7.5YR 4/4	No
Bm	32-69	Loam	20	Gravels	M SBK	Moist; friable	2.5Y 5/3	No
C	69-101	Loamy sand	10	Fine gravel	C ABK	Moist; firm	2.5Y 5/1	No



Test Pit 3

Soil name: Durieu

Soil classification: Humo-Ferric Podzol

Rooting depth: 41 cm

Water table: 100 cm

Drainage class: moderately well

Parent material: glaciomarine

Comments: Native soil

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Ah	0-11	Silt Loam	5	Gravels	Medium Granular	Moist; friable	10YR 3/2	No
Bf	11-29	Silt loam	10	Fine gravels	M SBK	Moist; firm	7.5YR 3/4	No
Bm	29-52	Sandy loam	10	Gravels	C SBK	Moist; firm	2.5Y 5/3	No
Cg	52-100+	Sandy loam	0		M ABK	Moist; firm	2.5Y 5/1	Fine; few; 10YR 4/4



Test Pit 4

Soil name: N/A

Soil classification: fill

Rooting depth: N/A

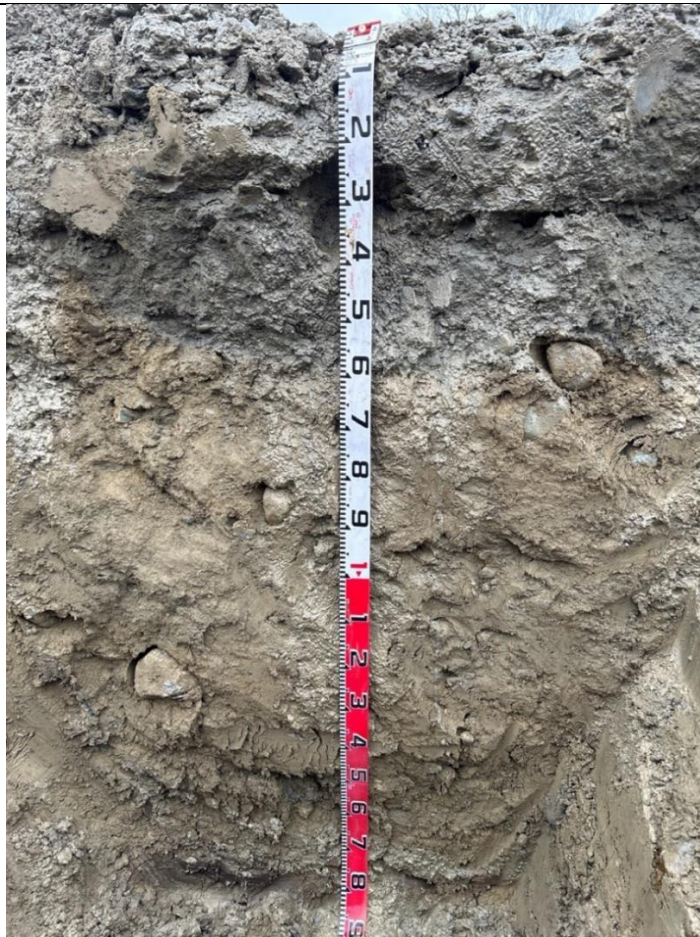
Water table: N/A

Drainage class: imperfect

Parent material: glaciomarine

Comments: Fill. Road base used for truck turn around. Admixed native soil and imported high coarse materials down to 190 cm.

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Fill 1	0-40	Silt loam	60	Mostly gravel. Some cobble.	M SBK	Moist; friable	2.5Y 6/3	
Fill 2	40-190	Sandy loam	45	Mostly gravel. Some cobble.	M SBK	Moist; firm	2.5Y 5/3	
Cg	190-220+	Sandy loam	10	Gravels	C ABK	Moist; firm	5Y 5/1	



Test Pit 5

Soil name: N/A

Soil classification: Fill

Rooting depth: N/A

Water table: N/A

Drainage class: poor

Parent material: N/A

Comments:

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Fill 1	0-55	Loam	75	Mixed gravels	C SBK	Wet; slightly sticky	2.5Y 4/1	
Fill 2	55-81	Sandy loam	20	Gravel and cobble	M SBK	Moist; firm	2.5Y 5/3	
Fill 3	81-180	Sandy loam	15	Gravel and cobble	M SBK	Moist; firm	10YR 5/1	Medium; common; 10YR 5/1
Bfh	180-190+	Silt loam	5	Gravels	M SBK	Wet; slightly sticky	10YR 2/2	



Test Pit 6

Soil name: N/A
Soil classification: FILL
Rooting depth: N/A
Water table: 250 cm
Drainage class: moderately well
Parent material: N/A
Comments:

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Fill	0-241	Loam	50	Gravel through boulders	C SBK	Moist; firm	2.5T 5/3	No
Cg	241-250+	Silt loam	5		M ABK	Moist; firm	2.5Y 5/1	Fine; common; 10YR 4/3



Test Pit 7

Soil name: N/A

Soil classification: Fill

Rooting depth: N/A

Water table: N/A

Drainage class: moderately well

Parent material: N/A

Comments: Fill to 141 cm and then bf to 169 cm. Top 50cm heavily packed. Woody debris from logging activity found at fill/native soil barrier.

Horizon	Depth (cm)	Texture	Coarse Fragment %	Coarse fragment notes	Structure	Consistence	Colour	Mottles
Fill	0-141	Loam	50	Mostly gravel and cobble. Occasional stones & boulders	C SBK	Moist; firm	2.5Y 5/3	No
Bfh	141-170+	Silt loam	5	Gravels	M SBK	Wet; non- sticky	7.5YR 4/4	No

Appendix IV: Site Photos



FIGURE 1 LOWER BENCH OF IMPORTED FILL LOOKING TOWARD PIT 5



FIGURE 2 TOPSOIL PILED ADJACENT TO TEMPORARY ROAD



FIGURE 3 PIT 3 IN NATIVE SOIL



FIGURE 4 PIT 2 IN NATIVE SOIL

Date & Time: Tue, Jan 23, 2024 at 10:28:27 PST
Position: +049.238978° / -122.243918° (± 15.5 ft)
Altitude: 419ft (± 11.2 ft)
Datum: WGS-84
Azimuth/Bearing: 292° N68W 5191mils True ($\pm 12^\circ$)
Elevation Angle: -05.3°
Horizon Angle: -00.7°
Zoom: 0.5X
2024/01/23 13028 Stave Lake Rd. looking west. fill area.



FIGURE 5 IMPORTED FILL (CENTER RIGHT) FROM THE TURNAROUND LOOKING WEST

Appendix V: Soil Lab Results for Pits 3, 5, 6, and 7



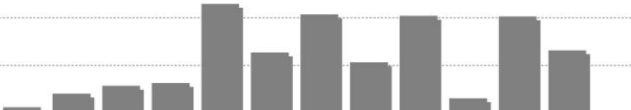
Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: info.vancouver@element.com
W: www.element.com

Page 1 of 1

Farm Soil Analysis

Bill To:	McTavish Resource &	Grower Name:	OT-115	Lot ID:	1708215
Address:	203-19292 60 Ave.	Site ID:	Pit 3 Ah	Report Number:	2965964
	Surrey, BC., Canada	Field Name:		Report Type:	Final Report
	V3S 3M2	Acres:		Date Received:	Jan 23, 2024
Agreement:	36394	Legal Location:		Date Reported:	Feb 01, 2024
		Previous Crop:	Crop not provided	Event Code:	

Nutrient analysis (ppm)														Soil Quality				
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #	
0" - 10"	2	<5	43	1	433	35	78.1	0.3	2	0.1	3.3	5.2	<30	5.4	0.09	15.1	21729	
Excess														Alkaline	Extreme	High		
Optimum														Neutral	Very High	Normal		
Marginal														Acidic	High	Low		
Deficient														Very Acidic	Good	Very Low		
Total lbs/acre	7	17	142	4	Texture <i>Sandy Loam</i>				Hand Texture <i>n/a</i>				BS	19.0 %	CEC 13.5 meq/100 g			
					Sand	52.7 %	Silt	35.0 %	Clay	12.2 %				Ca	16.1 %	Mg 2.2 %	Na <1.0 %	K 0.8 %
Estimated lbs/acre	9	12	85	5	Ammonium <i>n/a</i>								TEC	13.5 meq/100 g				
					Lime	<i>n/a</i>	Buffer pH	<i>n/a</i>	K/Mg Ratio <i>n/a</i>									

Nitrate-N

Sulfate-S

n/a = not analysed

*Nitrate-N **Sulfate-S *n/a* = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

Crop not provided					
Macro-nutrients	Yield	N	P ₂ O ₅	K ₂ O	S
Growing Condition					
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:


Element uses nutrient extraction and analytical methods specifically developed for western Canadian soils.

The modified Kelowna extractant used to analyze key nutrients in this Farm Soil Analysis report is the standard method used in soil fertility research in western Canada. It is used in developing crop response curves to fertilizer in the prairies. The Element "RECOMMENDATIONS FOR BALANCED CROP NUTRITION" are based on those research data. Element recommendations are accurate but should not replace responsible judgement.

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Farm Soil Analysis

Bill To:	McTavish Resource &	Grower Name:	OT-115	Lot ID:	1708215
Address:	203-19292 60 Ave.	Site ID:		Report Number:	2966747
	Surrey, BC., Canada	Field Name:	Pit 5 Fill	Report Type:	Final Report
	V3S 3M2	Acres:		Date Received:	Jan 23, 2024
Agreement:	36394	Legal Location:		Date Reported:	Feb 01, 2024
		Previous Crop:	Crop not provided	Event Code:	

Nutrient analysis (ppm)														Soil Quality			
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #
0" - 36"	2			18										7.7	0.28		21730
Excess														Alkaline	Extreme	High	
Optimum														Neutral	Very High	Normal	
Marginal														Acidic	High	Low	
Deficient														Very Acidic	Good	Very Low	
Total lbs/acre	29			217	Texture <u>Sandy Loam</u> Hand Texture <u>n/a</u>						BS <u>n/a</u> CEC <u>n/a</u>						
					Sand 57.6 % Silt 31.0 % Clay 10.8 %						Ca <u>n/a</u> Mg <u>n/a</u> Na <u>n/a</u> K <u>n/a</u>						
Estimated lbs/acre	29			211	Ammonium <u>n/a</u>						TEC <u>n/a</u>						
					Lime <u>n/a</u> Buffer pH <u>n/a</u> K/Mg Ratio <u>n/a</u>												

*Nitrate-N **Sulfate-S *n/a* = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

Crop not provided					
Macro-nutrients	Yield	N	P2O5	K2O	S
Growing Condition					
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:


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Farm Soil Analysis

Bill To:	McTavish Resource &	Grower Name:	OT-115	Lot ID:	1708215
Address:	203-19292 60 Ave.	Site ID:		Report Number:	2966748
	Surrey, BC., Canada	Field Name:	Pit 6 Fill	Report Type:	Final Report
	V3S 3M2	Acres:		Date Received:	Jan 23, 2024
Agreement:	36394	Legal Location:		Date Reported:	Feb 01, 2024
		Previous Crop:	Crop not provided	Event Code:	

Nutrient analysis (ppm)														Soil Quality			
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #
0" - 36"	3			11										7.2	0.2		21731
Excess														Alkaline	Extreme	High	
Optimum														Neutral	Very High	Normal	
Marginal														Acidic	High	Low	
Deficient														Very Acidic	Good	Very Low	
Total lbs/acre	31			130	Texture <u>Sandy Loam</u> Hand Texture <u>n/a</u>						BS n/a CEC n/a						
					Sand 53.0 %	Silt 32.0 %	Clay 15.5 %	Ca n/a Mg n/a Na n/a K n/a									
Estimated lbs/acre	30			126	Ammonium n/a						TEC n/a						
					Lime n/a Buffer pH n/a						K/Mg Ratio n/a						

*Nitrate-N **Sulfate-S *n/a* = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

Crop not provided					
Macro-nutrients	Yield	N	P2O5	K2O	S
Growing Condition					
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Element uses nutrient extraction and analytical methods specifically developed for western Canadian soils.

The modified Kelowna extractant used to analyze key nutrients in this Farm Soil Analysis report is the standard method used in soil fertility research in western Canada. It is used in developing crop response curves to fertilizer in the prairies. The Element "RECOMMENDATIONS FOR BALANCED CROP NUTRITION" are based on those research data. Element recommendations are accurate but should not replace responsible judgement.

Farm Soil Analysis

Bill To:	McTavish Resource &	Grower Name:	OT-115	Lot ID:	1708215
Address:	203-19292 60 Ave.	Site ID:		Report Number:	2966747
	Surrey, BC., Canada	Field Name:	Pit 5 Fill	Report Type:	Final Report
	V3S 3M2	Acres:		Date Received:	Jan 23, 2024
Agreement:	36394	Legal Location:		Date Reported:	Feb 01, 2024
		Previous Crop:	Crop not provided	Event Code:	

Nutrient analysis (ppm)														Soil Quality			
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #
0" - 36"	2			18										7.7	0.28		21730
Excess														Alkaline	Extreme	High	
Optimum														Neutral	Very High	Normal	
Marginal														Acidic	High	Low	
Deficient														Very Acidic	Good	Very Low	
Total lbs/acre	29			217	Texture <u>Sandy Loam</u> Hand Texture <u>n/a</u>						BS <u>n/a</u> CEC <u>n/a</u>						
					Sand 57.6 % Silt 31.0 % Clay 10.8 %						Ca <u>n/a</u> Mg <u>n/a</u> Na <u>n/a</u> K <u>n/a</u>						
Estimated lbs/acre	29			211	Ammonium <u>n/a</u>						TEC <u>n/a</u>						
					Lime <u>n/a</u> Buffer pH <u>n/a</u> K/Mg Ratio <u>n/a</u>												

*Nitrate-N **Sulfate-S *n/a* = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

Crop not provided					
Macro-nutrients	Yield	N	P2O5	K2O	S
Growing Condition					
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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