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LAND CAPABILTY AND SOIL ASSESSMENT

Land Capability and Soil Assessment for Three Parcels in the City of Powell River, BC

FOR:

The City of Powell River

BY:

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1 Summary

We conducted an agricultural land capability study of three land parcels in the Powell River area. The three parcels have a combined area of approximately 352-ha (880 acre). The northernmost is Area 1 (284-ha), located north of Powell River in the Wildwood area. The smallest is Area 2 (13-ha) in the downtown area along Cranberry Road and the BC Hydro power line. The southernmost, Area 3 (55-ha), is in the downtown area in the Westwood area. The parcels are all located within the Agricultural Land Reserve (ALR).

This agricultural land capability study was undertaken to evaluate the soils and their potential to support agriculture. It includes a general description of the soils with particular attention to characteristics that would limit their use for agriculture, such as stoniness, slope, aridity, wetness and presence of bedrock near the surface.

The soils are variable; in some areas they have few limitations, but in others, serious limitations were encountered. Accordingly, we mapped each of the parcels, showing the different soil types as they vary across the landscape. In addition, we assessed each soil types for their capability to support agriculture. From this assessment, we determined the existing (unimproved) capability and also evaluate the capability after improvement through conventional agricultural practices, such as drainage, stone-picking, irrigation and fertilization.

The lands in their current conditions consist of a mix of recently harvested forest land, maturing stands of Douglas-fir and Hybrid Poplar and scattered dense brush. Soils are generally coarse-textured, being derived from sandy parent materials. Aside from this one statement, however, they defy generalization.

Combined Area

Table A summarizes the land capability for all three areas combined. In the report we also present the capability for each soil type in each of the three land parcels.

Table A. Land Capability of Combined Area

Agricultural Land Capability	ha	per cent
Good (Class 2, improvable to Class 2 or 1)	24	7%
Fair (Class 4, improvable to Class 3 or 4)	108	30%
Poor (Class 4 to 6, improvable to Class 4 to 5)	190	54%
Very Poor (Class 5 to 7, not practically improvable)	31	9%
Total	352	100%

Soils with a **Very Poor** Agricultural Land Capability have severe limitations and are unsuitable for agriculture. These areas amount to just under 10% of the total land area.

Soils with a **Poor** Agricultural Land Capability are marginal for agriculture. They will be brought into production only with intense, costly and difficult improvements, which may not be practicable or economically feasible. Or, they may be suited for a small range of crops that require minimal cultivation or are tolerant of certain conditions that would preclude others crops. Such soils cover just over one-half of the combined area (54%).

Soils with a **Fair** Agricultural Land Capability are suitable, if not ideal, for agricultural production. They experience some limitations which may result in less than optimal management (e.g., restricted tillage, restricted crop choice, delayed planting, and harvesting). Or they may be suitable for a smaller range of crops. These lands cover just under one-third of the combined area (30%).

Less than one-tenth of the combined area (7%) has **Good** agricultural soil. All have mild limitations which can be improved to Class 1, or highly valuable soil.

Area 1

Of the 284-ha in Area 1, an estimated 45-ha (16%) of soils have serious (Class 7) topographic and depth-to-bedrock limitations that are not improvable. A further 75-ha (26%) have slightly less serious (Class 5 and 6) limitations (stoniness, and topography) which are not practically improvable. These are not suitable for agriculture.

In some areas, soils had significant limitations in their existing state but were improvable. For example, Soil Unit 7 (17-ha, 6%) consists of poorly-drained organic soils that could only be improved (with considerable expense and some difficulty) through drainage to Class 3 or 4, and even then would only be suitable for certain crops.

Nearly one-third of the area (85-ha, 30%) of the area has Class 4 limitations due to stoniness, excess water and topography. The stoniness and excess water limitations can be improved to Class 3 with intense stone removal, and implementing ditches, and drain tiles. These soils can be described as marginal for conventional agriculture, and will require substantial investment to make them productive land.

The remaining 80-ha of Area 1 (28%) have Class 3 limitations with respect to stoniness, excess water, and topography. Except where the limitation is topography, these areas can be improved to Class 2.

Area 2

Area 2 has only 13-ha. The majority of this area is covered by Soil Unit 11 (11-ha, 85%) in which the soils are marginal (Class 4 and 5) for agriculture due to their stoniness. Improvement through stone-picking would likely be of limited effectiveness and may not be feasible. The remaining area (2-ha, 15%) contains soils that have an excess wetness limitation (Class 3W) which can be improved through drainage.

Area 3

Area 3 covers 55-ha, with 10.5-ha (19%) having severe (Class 5 to 7) topographic and stoniness limitations rendering them unsuitable for agriculture. A further 23-ha (42%) have moderate (Class 4) limitations due to stoniness and aridity. These are now marginal for agriculture, but could be brought into production for a limited range of crops (e.g., tree fruits) or with stone-picking and irrigation. The remaining 21-ha (38%) are well-suited for agriculture; they have Class 2 and 3 level limitations for stoniness, excess water and topography. For the most part these are practically improvable.

2 Introduction

At the request of The City of Powell River (The City), we have completed a basic soils investigation and an assessment of the land capability of three properties located within the jurisdiction of the City of Powell River. The combined 352-ha of the three separate properties are located within the Agricultural Land Reserve. The city plans to submit an application to exclude these lands from the ALR, and therefore required a more detailed assessment of the land capability for the soils. The locations of the three areas are shown in Figure 1 in Appendix A.

The property owners are the PRSC Land Developments Ltd. and Catalyst Paper Corporation. PRSC has the following limited partners:

- Powell River Waterfront Development Corporation (wholly owned by the City of Powell River)
- Tees'kwat Land Holdings Ltd. (wholly owned by the Sliammon Development Corporation, and
- 0606890 B.C. Ltd., (wholly owned by the Catalyst Paper Corporation or its related companies)

The legal descriptions for the parcels are:

Area 1 (Northern Block Wildwood area - estimated 284-ha)

PID: 010-267-409 [owned by PRSC Land Developments Ltd.]; Block 56, D.L. 450 Group 1 New Westminster District, Plan 8096 except part in Plan 12767;

PID: 026-686-361 [owned by PRSC Land Developments Ltd.] Lot A, D.L. 450 Group 1. New Westminster District, Plan BCP23890;

PID 010-267-361 [owned by Catalyst Paper Corporation] Block 55, except portions in Plans 13475, 14965 and BCP23890.

Area 2 (Cranberry Road and Timberlane Avenue Area – 13-ha)

PID: 026-685-621 [owned by PRSC Land Developments Ltd.] Lot C, District Lot 450, Group 1 new Westminster District, Plan BC0P23887;

Area 3 (Southern Westwood area – estimated 55-ha)

PID: 026-685-591 [owned by PRSC Land Developments Ltd.] Lot A, District Lot 450, Group 1 New Westminster District, Plan BC0P23887;

This report includes the following maps:

- Two 1:5000 soils maps (Figures 2 and 3 in Appendix B) showing the location of the soil pits and the soil taxa grouped into soil unit.
- Two 1:5000-scale maps (Figures 4 and 5 in Appendix C) showing the agricultural capability units and their areas.
- Two 1:5000-scale maps (Figures 6 and 7 in Appendix D) specific agricultural land capabilities and improvability of the soil at each observation point.

2.1 Purpose and Scope

The purpose of the assessment is to provide a basic inventory of the soils, and to evaluate the capability of the land to support agriculture. The report and maps are based on the Ministry of Environment's manual *Land Capability Classification for Agriculture in British Columbia*,[1] with the respect to guidelines stated by the Provincial Agricultural Land Commission's website[2]:

"This classification takes into account the relative degree and type of limitation or hazard to agriculture; use and/or the range of possible crops. It also indicates the type and intensity of management practices required for good management of the soil resource to maintain sustained production. Productivity (i.e., yield per hectare) of any specific crop is not considered."

A thorough investigation of soil types within the property was conducted, and the site was segregated into soil subgroup polygons (Polygons A through G), and agricultural potential limitations (Units 1 though 17).

3 Methodology

3.1 Field Work

To properly identify, describe and analyze the agricultural land capabilities of the soils in the project area, we conducted detailed soil mapping at a scale of 1:5000. Field inspections were carried out throughout the study area by Gordon Butt, M.Sc., P.Ag., P.Geo., and Wanda Miller, B.Sc., G.I.T., A.Ag., from Madrone.

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[1] BC Ministry of Environment and Ministry of Agriculture and Food. 1983. *Land Capability Classification for Agriculture in British Columbia*, Ministry of Environment, Manual 1, Kelowna, BC.
[2] Provincial Agricultural Land Commission ("About the ALR" Link) website: http://www.alc.gov.bc.ca/index.htm Accessed August 29, 2006.

Soils and terrain information were collected from transects throughout the study area. A total of 85 soil pits were inspected, for an average spacing of about 2-ha per soil pit, or 0.5 soil pits/ha. Soil pits were dug to minimum depths required to properly identify the soil and its agricultural capability—generally, between 40 and 100 cm. Soil information including soil type, horizon, horizon depth, characteristic soil forming factors, colour, structure, texture, coarse fragment content and stoniness using 2 mm sieves, consistence, rooting abundance and depth, parent material, and drainage were collected at each site.

3.2 Soil Classification

Soils were classified using *The Canadian System of Soil Classification*,[3] as a first step in determining land capabilities and improvability. To our knowledge, there are no recent existing detailed soils maps of the Powel River area. Accordingly, we have used roughly corresponding soil series identified in the southern Sunshine Coast area as well as the Vancouver Island area. The names of the soils follow the report and maps included in the Ministry of Environment's 1980 RAB Bulletin 18, *Soils of the Langley-Vancouver Map Area*.[4]

3.3 Land Capability Classification

3.3.1 Land Capability Classification

The *Land Capability Classification for Agriculture in BC*[5] classification system determines the general suitability of the land for agricultural use.

The guidebook includes seven classes differentiated on the basis on inherent capability of soils and climate to support common agricultural crops. Land areas are grouped into classes based on similar, relative degrees of limitation for agricultural use.

The intensity of the limitation becomes progressively greater from Class 1 to Class 7, with agricultural capability decreasing from Class 1 to Class 7. Class 1 soils typically support the greatest range of crops and/or require the least amount of management to bring them into production. The lands have slight limitations that restrict its use for the production of common agricultural crops. Conversely, Class 7 soils support the narrowest range of crops (if any), and has no capability for soil bound agriculture or for arable or sustained natural grazing.

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[3] Soil Classification Working Group. 1998. *The Canadian System of Soil Classification*. Agric. and Agri-Food Can. Publ. 1646 (Revised). 187 pp.

[4] H.A. Luttmerding. 1980. Ministry of Environment RAB Bulletin 18, *Soils of the Langley-Vancouver Map Area*. Report No. 15, British Columbia Soil Survey. BC Ministry of Environment, Kelowna, BC.

[5] Kenk, E. and I. Cotic. April, 1983. Land Capability Classification for Agriculture in British Columbia. MOE Manual 1. Surveys and Resource Mapping Branch, Ministry of Envirnoment and Soils Branch, Ministry of Agriculture and Food. Kelowna, B.C. 68 pp. ISSN 0821-0640.

In general, the greater the number and/or severity of the limitation(s) to a certain land area, the lower the capability of the land to produce agricultural crops, and hence the higher the soil class. The soil limitations used to determine the class rating are shown with an alphabetic symbol (Table 1), which follows the land capability class; for example, a Class 4A soil is one that suffers moderate limitations due mainly to lack of sufficient soil moisture.

Table 1. Description of Land Capability Limitations

Symbol	Land Capability Subclasses for Mineral Soils	General Description
A	Soil Moisture Deficiency	Doughtiness due to poor soil moisture retention
C	Adverse Climate	Thermal limitations due to growing season frost or low temperatures
D	Adverse Soil Structure and/or Low Perviousness	Soils are difficult to cultivate due to firmness or poor trafficability
E	Erosion	Soils have been subject to past erosion
F	Fertility	Soils have high fertilizer requirement
I	Inundation	Soils are flooded part of the year
N	Salinity	Soils have high salt content
P	Stoniness	Soils have high stone content
R	Depth to Bedrock	Soils are shallow over bedrock
T	Topography	Land is sufficiently steep or complex to limit machine use
W	Excess Water	Soils are wet

The classification scheme also recognizes that management inputs may improve a soil, thus changing the capability class. Improved ratings of the land are based on the potential to upgrade the quality of the land, given the applicability of certain management practices. For example, stone removal may alleviate a stoniness limitation such that the land capability class is changed from a 4P to 3P. Where the limitation is aridity, irrigation water is assumed to be available. Other types of improvement techniques include; drainage, stone removal, fertilization, dyking, salinity alleviation, sub-soiling and the addition of soil amendments. As each site is unique, the extent to which these improvements can increase the land capability is determined from site specific evaluations, as well as past experience with improving comparable soils.

Other factors, including distance to market, available transportation facilities, location, farm size, type of ownership, cultural patterns, skill or resources of individual operators, and hazard of crop damage by storms, are not considered in this classification. Furthermore does not include capability of lands for trees, ornamental plants, recreation, wildlife or other resources.

4 Study Area Description

4.1 Location and Site Overview

The properties are located in southwestern British Columbia in the north-central region of the Sunshine Coast. The three study areas are a combined estimated 352-ha, and are located within the jurisdiction of the City of Powell River. Area 1 (approximately 284-ha) is located approximately 10 km north of downtown Powell River, and lies both southwest and northeast of the Sunshine Coast Highway, near the community of Wildwood Heights.

Area 2 is 13-ha and is situated between Cranberry Street, Timberlane Avenue, and Dieppe Avenue, and a BC Hydro right-of-way in the Westview area of town.

Area 3 is an estimated 55-ha and is also located in the Westwood area between Marine Avenue and the BC Hydro right-of-way (2 km southwest of Area 2). Refer to Figure 1 in Appendix A for an overview of the site locations.

4.2 Existing Land Use

The three study areas consist of a mix of recently harvested timber, second growth Douglas-fir and Hybrid Poplar stands, and scattered brush and shrubs. The study area includes the land which is situated in the ALR.

An estimated one fifth of Area 1 has been logged and converted to hybrid poplar plantations in the early to mid 1990's by MacMillan Bloedel Ltd. The poplar plantations are now 10 to 14 years old, but have not been harvested. Much of the remaining area of this block was logged more recently using ground-based systems. The land now is largely brushed over, and it appears that no or very minimal conifer replanting was undertaken. The northern boundary of Lot A and Block 56 is adjacent to I.R. 1 of the Sliammon First Nation, and the southern edge of the ALR boundary of Block 55 is situated against second growth Douglas-fir stands in non-ALR lands. The non-ALR portion of Area 1 consists of second-growth conifer forest on mainly south-sloping, rocky land. The northeastern boundary abuts residential properties in the community of Wildwood Heights, and the southwest boundary of this block lies along the shore of Malaspina Strait. Several lots to the north of Area 1 are being used for agricultural fields, but are not located within the ALR.
Area 2 has also been recently logged. Adjacent areas to the northeast are used for residential development and the offices and bus storage area of the school board. The land across Timberlane to the southeast has been logged but otherwise remains vacant. To the north lies industrial land used partly for gravel extraction. A small stand of second-growth conifer forest is present on the south side of the BC Hydro right-of-way to the southwest. Area 2 is not adjacent to any active farmland.

Area 3 is bounded on the northeast by the BC Hydro right-of-way and to the southwest by Marine Drive. An active haul road and a BC Hydro power line run roughly west-east through the property, and there area several old logging roads and trails throughout the site. School sports fields lie along the northern boundary. Second-growth timber stands are located along the southern boundary of the site (located in non-ALR lands), and a small gravel extraction operation is located long the southwestern corner of the land. The area itself has been patch-logged over the last decade with several openings of red alder and brush, as well as dense second-growth stands. We also noted new falling boundary ribbons indicating on-going planning for industrial logging. Area 3 is not adjacent to any active farmland.

4.3 Climate

The nearest established climate stations are Powell River (elevation 52 m) and Powell River Airport (elevation 121 m)[6]. Total precipitation normals are 1113 and 1244 mm, respectively. Snowfall normals are 39.4 and 65.2 cm, reflecting the substantially greater snowfall at the higher elevation (the airport receives about two-thirds more snow).

Growing season precipitation (May through September) for Powell River and the airport are 277 and 293 mm. Although this is less than one-third of the total precipitation, it is relatively high for comparable areas on eastern Vancouver Island, such as Comox (189 mm), Duncan (157 mm) and Saanichton (140 mm). The potential evapotranspiration is estimated at 375 mm (based on comparable data for other coastal stations)[7], resulting in Climatic Moisture Deficit of about 100 mm for Powell River, and somewhat less (roughly 80) for the airport. This corresponds to a Moisture Class of 2A, indicating a relatively mild growing season moisture deficit.

The average annual temperature for Powell River and its airport are 10.6 and 9.1°. At 10.6°, Powell River has one of the highest annual mean temperatures in Canada. The extreme low temperature encountered at Powell River was -14.4° for the period of record (on January 13, 1950). At Powell River Airport, the extreme low temperature was -16.7 on January 30, 1969. For both stations, temperatures below -10° have been experienced in all months from November through March, although they are rare.

[6] National Climate Data and Information Archive - Canadian Climate Normals or Averages 1971-2000. Environment Canada's Website: http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html Accessed April 24, 2007.

[7] Climatology Unit. 1981. Climate Capability Classification for Agriculture in British Columbia. APD Technical Paper 4. Air Studies Branch, British Columbia Ministry of Environment. Victoria, B.C. 23 pp From the Provincial Agricultural Land Commission Reports and Publications Website: http://www.alc.gov.bc.ca/publications/publications.htm. Accessed April 24, 2007.

Frosts have occurred at Powell River as late as May 6 (-6.7° in 1975) and as early as October 31 (-4° in 1984). At Powell River Airport, the comparable figures are May 1 (-4.4° in 1954) and September 27 (-1.1° in 1972). The freeze-free period is estimated at 170 for both Powell River and the airport.

Powell River experiences on average total degree-days (above 5) of 2217; the comparable figure for Powell River Airport is 1816.

In terms of Climatic Capability for Agriculture, Powell River is rated as a Class 1c climate. The range of crops that could be raised at lower elevations in the Powell River area includes: apricots, peaches, cherries, pears, plums, apples, strawberries, raspberries, grapes, cucumbers, melons, beans, peppers, asparagus, tomatoes, lettuce, potatoes, corn, carrots, beets, radishes, peas, onions, leeks, spinach, cauliflower, cabbage, broccoli, turnips, Brussels sprouts, Swiss chard, cereal grains, and forage crops.

At slightly higher elevations the climate is rated as Class 1b, reflecting lower growing degree days. The range of crops is narrower and certain crops, such as apricots, peaches, cherries, pears, plums, and grapes may not be suitable. This will apply to the upper two-thirds of Area 1, and all of Areas 2 and 3. Climate information for this site is used to determine the heat energy and moisture inputs required for agricultural production.

4.4 Surficial Geology and Landforms

The three areas lie in the Georgia Depression physiographic composite unit, along the western boundary of the Southern Fiord Ranges[8]. Elevations within Area 1 range from nearly sea level (along the western boundary) to about approximately 140 meters above sea level (along the eastern boundary). Areas 2 and 3 lie between 60 and 120 meters above sea level. For the most part, the three areas have east-southeast facing slopes and benchy terrain along the eastern property boundaries.

No recent, detailed surficial geology maps of the Powell River area were attained; however, a recent summary report by Bichler *et al* [9] describes the Quaternary history of the study area as well as an overview map of deposits in the study area. All three areas are located on thick glacial deposits laid down during a period of high sea level between 19 000 and 13 000 years ago. According to Bichler *et al*, Vashon drift material (silty sandy till and sandy, gravelly glaciofluvial and glaciolacustrine sediments) were initially deposited along margins of overriding ice lobes.

[8] Mathews, W.H. (compiler). 1986: Physiography of the Canadian Cordillera; Geologiccal Survey of Canada, Map 1701A, scale 1: 5000 000.

[9] Bichler, A., et al. Sunshine coast Aggregate Potential Mapping Project. Geological Fieldwork 2001, Paper 2002-1.

Also deposited with the advancing ice fronts were the Quadra sands, which are outwash sediments that are typically cross-stratified, well-sorted glaciofluvial sands that are now found up to 100 m asl. As the study area was ice free 13 000 years ago thick deposits of the Capilano Sediments, which mark the ice retreat phase, with glaciofluvial, glaciomarine, and marine sediments that were deposited on the seafloor, and are now seen as raised deltas and inter-tidal beach sediments. The Capilano Sediments can be found up to 180 m asl in the study area.

In our investigation, the parent material appeared to be glaciofluvial outwash sands and gravels, modified in places by marine reworking (likely Capilano Sediments and a mix of Quadra Sand). Certain areas contained silty deposits possibly associated with impounded lakes or locally protected marine embayments of the Vashon drift material.

The underlying bedrock for the study area is mapped as Early Cretaceous Unnamed dioritic intrusive rock.[10] We encountered very little bedrock at the surface in the field investigation. In certain parts of the southern portion of Area 1, bedrock is exposed as rounded outcrops of glacially smoothed granodioritic rock, elsewhere it is absent.

5 Soil Associations

5.1 Soils Overview

Observed soils correspond roughly to the Capilano, Sechelt, and Lumbum Soil Series mapped in the southern Sunshine Coast area. Capilano Soils have gentle to moderately steep gradients (raging from 5 to 50% in the study area) and elevations generally range between 30 and 200 m above sea level. The parent materials of Capilano soils are deep, coarse-textured stony, glaciofluvial and deltaic deposits with gravelly marine lag deposits. The soils have textures that are typically gravelly loamy sand, and are well drained. Strongly cemented (duric) layers can be present between 40 and100 cm depths, which can sometimes restrict permeability. Capilano soils are located along the lower and middle slopes of all three of the study areas. And include Polygons A, B, C, and D (refer to Figures 2 and 3 in Appendix B). Soils in these polygons display typical Capilano soil characteristics, with Polygons B and C being moderately well to poorly drained variants, and Polygon D consisting of shallow soils overlying bedrock. Soils in this polygon consist of generally high coarse fragment content and are likely associated with deltaic and outwash deposits.

[10] BCGS Geoscience Map – From the Government of British Columbia Ministry of Energy, Mines, and Petroleum Resources Website MapPlace.ca: http://www.empr.gov.bc.ca/Mining/Geolsurv/MapPlace/default.htm

Sechelt Soils typically located on gentle to steeply sloping terrain up to 400 m above sea level. Sechelt soils have developed from sandy, mainly stone-free alluvial fan or deltaic deposits. Textures are dominantly sand to loamy sand, are well drained, and have no root-restricting horizons. Polygons F and G (refer to Figure 3 in Appendix B) are correlated to Sechelt soils and are located along upper slopes in the southeastern section of Area 3. Polygon F consists of the imperfectly drained variant of the soil type.

Lumbum soils are typically located on level to very gently sloping terrain with slopes less than 2 percent, reaching from sea level to approximately 100 m. These soils have developed from partially decomposed organic deposits. The underlying mineral sediments are usually fine textured deltaic, floodplain, or glaciomarine deposits. The soils are typically very poorly drained have very high water holding capacity and slow surface runoff. The watertable is near the soil surface for most of the late fall, winter and early spring, resulting in localized surface ponding. Polygon E (refer to Figure 2 in Appendix B) corresponds to Lumbum Soils and is located in depressions within the central section of Area 1.

The soils within the study are have been grouped into seven polygons based on similar soil characteristics and taxa, and are summarized in Table 2 below. Figures 2 and 3 in Appendix B provide an overview of soil Polygons A through G over the three study areas.

Table 2. Soil Observation Polygons and Plot Descriptions

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [11]
Polygon A – Capilano Soils								
G1	Sand	Loose	65	55	50	1	Well	O.SB
G2	Sand	Loose	65	20	0	10	Well	O.DYB
G2-0[12]	-	-	-		-	15	-	
G3	Sand	Loose	75	35	25	10	Well	O.DYB
G5	Sand	Loose	85	35	15	8	Moderately well	O.DYB
G10	Sand	Loose	60	35	5	10	Well	O.HFP
G16	Sand	Loose	50	31	10	7	Well	O.DYB
G26	Sand	Loose	62	40	20	2	Moderately well	O.HFP
G30	Loamy Sand	Loose	48	30	10	9		O.HFP
G32	-	-	-	-	-	75	Well	-
G33	Sand	Loose	80	50	30	17	Well	O.HFP
G34	Sand	Loose	0	0	0	4	Well	DU.HFP
G43	Sand	Loose	60	40	10	21	Well	O.HFP
G43-0	-	-	-	-	-	20-25	-	-
G44	Loamy Sand	Loose	80	50	30	23	Well	O.DYB
W1	Sand	Loose	69	45	10	8	Well	O.DYB

[11] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

[12] - 0 refers to an observation point with only a very shallow pit was excavated and/or slope gradients were assessed

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [13]
W2	Sand	Loose	68	30	5	6	Well to moderately well	O.DYB
W2-0	-	-	-		-	13	-	
W3	Sand	Loose	75	45	2	7	Well to moderately well	O.DYB
W5	Loamy Sand	Friable, slightly loose	33	18	5	10	Well	O.DYB
W8	Sand	Loose	87	65	10	16	Well to moderately well	O.DYB
W8-0	-	-	-	-	-	75	-	-
W9	Sand	Loose	45	25	8	6	Well	O.DYB
W11	Loamy Sand	Friable, slightly loose	57	20	10	5	Well	O.HFP
W13	Sandy Loam	Friable	42	35	2	11	Well	O.DYB
W19	Sand	Loose	61	25	0	8	Well	O.DYB
W21	Sand	Loose	58	20	2	4	Moderately well to well	O.HFP
W21-0	Loamy Sand	Loose	-	-	-	3	well	O.HFP
W23	Loamy Sand	Loose	47	15	15	13	well	O.HFP
W24	Sand	Loose	93	45	10	10	Moderately well to well	O.HFP
W24-0	-	-	-	-	-	20	-	-

[13] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [14]
W25	Loamy Sand to Sand	Loose	62	25	12	6	Well	O.HFP
W25-0	Loamy Sand to Sand	Loose	-	-	-	5	Well	O.HFP
W26	Sand	Loose	52	15	10	3	Well	O.HFP
W27	Sandy Loam	Friable	23	10	0	7	Well to moderately well	O.DYB
W28	Sandy Loam	Friable	43	20	2	6	Moderately well to well	O.HFP
W29	Loamy Sand	Friable, slightly loose	58	15	8	10	Well to moderately well	O.HFP
W29-0						10		
W30	Loamy Sand	Friable	35	20	5	8	Well	O.HFP
W30-0	-	-	-	-	-	20-30	-	-
W32	Loamy Sand	Friable	55	20	5	10	Well	O.DYB
W33	Sandy Loam to Loamy Sand	Friable	49	16	2	3	Moderately well to well	SM.HFP
W34-0	-	-	-	-	-	15-20	-	-
W36	Sand	Loose	41	15	3	10	Well	O.HFP

[14] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [15]
W38	Loamy Sand	Friable slightly loose	59	20	6	7	Well to moderately well	O.DYB
Air photo	-	-	-	-	-	50 to 80	Well	-
Polygon B – Capilano Soils (moderately well to imperfectly drained variant)								
G6	Loamy Sand	Friable	65	40	25	3	Moderately well	GL.HFP
G8	Sandy Loam	Friable	40	20	5	9	Moderately well	GL.HFP
G12	Sand	Loose	46	25	10	15	Moderately well	GL.HFP
G14	Sandy Loam	Friable	60	30	10	21		GL.DYB
G15	Sand	Loose	50	20	5	2	Moderately Well	GL.DYB
G17	Sand	Loose	7	0	0	1	Imperfect	GL.HFP
G18	Loamy Sand	Friable	45	20	0	6	Imperfect	GL.DYB
G21	Sand	Loose	30	20	10	1	Imperfect	GL.DYB
G22	Sand	Loose	55	15	5	9	Moderately well	GL.HFP
G25	Sand	Loose	20	10	5	10	Moderately well	GL.HFP
G27	Loamy Sand	Loose	55	30	15	8	Moderately well	GL.HFP
G36	Sand	Loose	80	50	30	1	Moderately well	GL.DYB
W4	Sand	Loose	78	25	5	10	Moderately well	GL.DYB
W6	Sandy Loam	Friable	95	45	12	4	Imperfect to moderately well	GL.DYB

[15] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [16]
W7	Silt to Sandy Loam	Friable, firm with depth	23	10	5	25-35	Moderately well	GL.DYB
W7-0	-	-	-	-	-	20	-	-
W10-0	-	-	-	-	-	65	-	-
W11-0	-	-	-	-	-	20	-	-
W12	Sandy Loam	Friable	10	0	0	2	Imperfect	GL.HFP
W14	Sandy Loam	Friable	8	0	0	2-5	Imperfect	GL.HFP
W15-0	-	-	-	-	-	25	-	-
W16	Sandy Loam	Friable	15	5	0	4	Imperfect	GL.DYB
W22	Silty Sand	Friable	38	15	0	5	Moderately well	GL.HFP
Polygon C – Capilano Soils (poor to imperfectly drained variant)								
G19	Sand	Loose	80	40	10	3	Imperfect	O.G.
G20	Silty Loam	Friable	0	0	0	0	Poor	O.HG
G23	Silty Loam	Friable	0	0	0	1	Poor	O.HG
G24			5	0	0	0		
G29	Sand	Loose	62	30	10	8	Moderately well	O.G.
G45	Silty Loam	Friable	0	0	0	0	Poor	O.G
W10	Loamy Sand	Loose to Friable	40	20	2	3	Imperfect to poor	O.HG
W17	Loamy Sand	Friable	18	10	0	1	Imperfect to poor	O.HG

[16] Description of Soil Taxa:
O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [17]
W18	Sandy Loam	Friable	20	0	0	2	Imperfect to poor	O.HG
W18-0	Sandy Loam	Friable	20		0	2	Imperfect to poor	O.HG
W20	Sandy Loam	Friable	50	5	5	3	Imperfect to poor	
W-39	Loamy Sand	Friable	14	5	1	1	Imperfect to poor	O.HG
Polygon D – Capilano Soils (very shallow lithic phase)								
G4	-	-	-	-	-	10	Rapid	O.R.
G7	-	-	-	-	-	9	rapid	O.R.
G13	-	-	-	-	-	25	Rapid	O.R.
G14-0	-	-	-	-	-	55	Rapid	O.R.
G16-0	-	-	-	-	-	50	Very Rapid	O.R.
W14-0	-	-	-	-	-	55	Very Rapid	O.R.
Air photo	-	-	-	-	-	80 to 100	Very rapid	O.R
Polygon E – Lumbum Soils								
G9	-	-	-	-	-	3	Poor	TY.M
G11	-	-	-	-	-	4	Poor	TY.M
W15	-	-	-	-	-	0	Poor	TY.M

[17] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)	% coarse gravel, cobbles, and stones	% Cobbles and Stones	Topography (%)	Drainage	Soil Taxon [18]
Polygon F – Sechelt Soils (Imperfect to moderately well drained variant)								
G31	Loamy Sand	Friable	15	0	0	11	Imperfect	GL.DYB
G31-0	-	-	-	-	-	11	Imperfect	
G37	Sand	Loose	2	0	0	1	Moderately Well	GL.HFP
G38	Sand	Loose	5	0	0	4	Moderately Well	GL.HFP
G42	Sandy Loam	Friable	55	10	0	0	Moderately Well	GL.DYB
W31	Sandy Loam	Friable	40	15	1	3	Moderately Well	GL.HFP
W35	Sandy Loam	Friable	33	10	0	5	Moderately Well	GL.HFP
Polygon G – Sechelt Soils								
G28	Sandy	Loose	5	0	0	-	Well	O.HFP
G34	Sandy	Loose	0	0	0	4	Well	
G35	Sand	Loose	2	0	0	1	Moderately Well	O.HFP
G39	-	-	-	-	-	85	-	-
G40	-	-	-	-	-	85	-	-
G41	Sand	Loose	2	0	0	4	Well	O.HFP
W37	Sand	Loose	5	0	0	0	Well	O.HFP

[18] Description of Soil Taxa:

O.DYB = Orthic Dystric Brunisol; GL.DYB = Gleyed Dystric Brunisol; O.SB = Orthic Sombric Brunisol; O. HFP = Orthic Humo-Ferric Podzol; GL.HFP = Gleyed Humo-Ferric Podzol; DU.HFP = Duric Humo-Ferric Podzol; SM.HFP = Sombric Humo-Ferric Podzol; O.G. = Orthic Gleysol; O.HG = Orthic Humic Gleysol; TY.M = Typic Mesisol; O.R. = Orthic Regosol; RO = Rock outcrop

6 Results of Land Capability Assessment

The soils on the site were separated into 17 Units in the three areas: Units 1 to 9 in Area 1, Units 10 and 11 in Area 2, and Units 13 to 17 Units in Area 3. Each Unit contains similar land capability classes as well as similar soil types. Table 3 summarizes the site units, the soil attributes from each observation pit, as well as the limitations associated with each soil observation. Table 4 summarizes the existing and improvable limitations for each unit, and the area covered by each unit. Table 5 presents the proportions of each class rating found within each unit, and the percent of land cover that class rating has in each area. Figures 4 and 5 in Appendix C are maps of the land capability units for the three areas. Figures 6 and 7 in Appendix D are maps of the agricultural land capability improvements.

Table 3. Individual Soil Observation Characteristics for Land Capability Ratings

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[19]	% coarse gravel, cobbles, and stones [20]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
				AREA 1				
Unit 1								
G2-0	-	-	-		-	15	3T	3T
W2-0	-	-	-		-	13	4T	4T
W8	Sand	Loose	87	65	10	16	5P3T	4P3T
Unit 2								
G1	Sand	Loose	65	55	50	1	6P	6P
G2	Sand	Loose	65	20	0	10	3P	3P
G3	Sand	Loose	75	35	25	10	5P	5P
G5	Sand	Loose	85	35	15	8	4P	4P
G6	Loamy Sand	Friable	65	40	25	3	5P	5P
G8	Sandy Loam	Friable	40	20	5	9	3P	3P
G10	Sand	Loose	60	35	5	10	4P	4P
G12	Sand	Loose	46	25	10	15	4P	3P
G15	Sand	Loose	50	20	5	2	3P	3P
G16	Sand	Loose	50	31	10	7	4P	3P
G18	Loamy Sand	Friable	45	20	0	6	3P	3P
G19	Sand	Loose	80	40	10	3	4P	4P
G21	Sand	Loose	30	20	10	1	4P	3P
G22	Sand	Loose	55	15	5	9	3P	4P

[19] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[20] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[21]	% coarse gravel, cobbles, and stones [22]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
W1	Sand	Loose	69	45	10	8	5P	5P
W2	Sand	Loose	68	30	5	6	4P	4P
W3	Sand	Loose	75	45	2	7	5P	5P
W4	Sand	Loose	78	25	5	10	4P	3P
W5	Loamy Sand	Friable, slightly loose	33	18	5	10	3P	3P
W6	Sandy Loam	Friable	95	45	12	4	5P	5P
W9	Sand	Loose	45	25	8	6	4P	3P
W11	Loamy Sand	Friable, slightly loose	57	20	10	5	4P	4P
W13	Sandy Loam	Friable	42	35	2	11	4P	3P
W19	Sand	Loose	61	25	0	8	3P	4P
Unit 3								
G17	Sand	Loose	7	0	0	1	3W	2W
G20	Silty Loam	Friable	0	0	0	0	5W	4W
G23	Silty Loam	Friable	0	0	0	1	5W	4W
G24			5	0	0	0	3W	2W
G45	Silty Loam	Friable	0	0	0	0	5W	4W
W10	Loamy Sand	Loose to Friable	40	20	2	3	4W	3W
W12	Sandy Loam	Friable	10	0	0	2	4W	3W
W14	Sandy Loam	Friable	8	0	0	2-5	3W	2W

[21] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[22] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[23]	% coarse gravel, cobbles, and stones [24]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
W16	Sandy Loam	Friable	15	5	0	4	3W	2W
W17	Loamy Sand	Friable	18	10	0	1	4W	3W
W18	Sandy Loam	Friable	20	0	0	2	3W	2W
W18-0	Sandy Loam	Friable	20		0	2	3W	2W
W20	Sandy Loam	Friable	50	5	5	3	4W	3W
W39	Loamy Sand	Friable	14	5	1	1	3W	2W
Unit 4								
W7	Silt to Sandy Loam	Friable, firm with depth	23	10	5	25-35	6T	6T
W7-0	-	-	-	-	-	20	5T	5T
W8-0	-	-	-	-	-	75	7T	7T
W10-0	-	-	-	-	-	65	7T	7T
Unit 5								
G13	-	-	-	-	-	25	7R	7R
G14	Sandy Loam	Friable	60	30	10	21	4P	3P
W11-0	-	-	-	-	-	20	3T	3T
W15-0	-	-	-	-	-	25	3T	3T
Unit 6								
G4	-	-	-	-	-	10	7R	7R
G7	-	-	-	-	-	9	7R	7R
G14-0	-	-	-	-	-	55	7R	7R

[23] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[24] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations- Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[25]	% coarse gravel, cobbles, and stones [26]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
G16-0	-	-	-	-	-	50	7R	7R
W14-0	-	-	-	-	-	55	7R	7R
Unit 7								
G9	-	-	-	-	-	3	5 W	4W
G11	-	-	-	-	-	4	5W	4W
W15	-	-	-	-	-	0	5W	3W
Unit 8								
Air photo	-	-	-	-	-	80 to 100	7RT	7RT
Unit 9								
Air photo	-	-	-	-	-	50 to 80	5T TO 6T	5T TO 6T
					AREA 2			
Unit 10								
G25	Sand	Loose	20	10	5	10	3W	2W
W22	Silty Sand	Friable	38	15	0	5	3W	2W
Unit 11								
G26	Sand	Loose	62	40	20	2	5P	5P
G27	Loamy Sand	Loose	55	30	15	8	4P	4P
W21	Sand	Loose	58	20	2	4	4P	4P
W21-0	Loamy Sand	Loose	-	-	-	3	4P	3P
W23	Loamy Sand	Loose	47	15	15	13	4P	3P

[25] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[26] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[27]	% coarse gravel, cobbles, and stones [28]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
				AREA 3				
Unit 12								
G29	Sand	Loose	62	30	10	8	4P	4P
G30	Loamy Sand	Loose	48	30	10	9	4P	3P
G33	Sand	Loose	80	50	30	17	5P	5P
G36	Sand	Loose	80	50	30	1	5P	5P
G43	Sand	Loose	60	40	10	21	4P	4P
G44	Loamy Sand	Loose	80	50	30	23	5P	5P
W24	Sand	Loose	93	45	10	10	6P	6P
W25	Loamy Sand to Sand	Loose	62	25	12	6	4P	4P
W25-0	Loamy Sand to Sand	Loose	-	-	-	5	4P	3P
W26	Sand	Loose	52	15	10	3	4P	4P
W27	Sandy Loam	Friable	23	10	0	7	2P	2P
W28	Sandy Loam	Friable	43	20	2	6	3P	3P
W29	Loamy Sand	Friable, slightly loose	58	15	8	10	4P	4P
W29-0	-	-	-	-	-	10	4P	3P
W30	Loamy Sand	Friable	35	20	5	8	3P	3P
W30-0	-	-	-	-	-	20-30	3PT	3PT
W32	Loamy Sand	Friable	55	20	5	10	3P	3P

[27] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[28] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[29]	% coarse gravel, cobbles, and stones [30]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
W33	Sandy Loam to Loamy Sand	Friable	49	16	2	3	4P	3P
W36	Sand	Loose	41	15	3	10	4P	3P
W38	Loamy Sand	Friable slightly loose	59	20	6	7	4P	4P
Unit 13								
G43-0	-	-	-	-	-	20-25	3T	3T
W24-0	-	-	-	-	-	20	3T	3T
W30-0						20-30	3T	3T
W34-0	-	-	-	-	-	15-20	3T	3T
Unit 14								
G32	-	-	-	-	-	75	7T	7T
G39	-	-	-	-	-	85	7T	7T
G40	-	-	-	-	-	85	7T	7T
Unit 15								
G31	Loamy Sand	Friable	15	0	0	11	3W	2W
G31-0	-	-	-	-	-	11	3W	2W
Unit 16								
G28	Sandy	Loose	5	0	0	-	4A	2A
G34	Sandy	Loose	0	0	0	4	4A	2A
G35	Sand	Loose	2	0	0	1	4A	2A

[29] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[30] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Soil Observations-Soils Types	Texture	Consistency	Total Coarse Fragment Content (%)[31]	% coarse gravel, cobbles, and stones [32]	% Cobbles and Stones	Topography (%)	Unimproved Rating	Improved Rating
G37	Sand	Loose	2	0	0	1	4A	2A
G38	Sand	Loose	5	0	0	4	4A	2A
G41	Sand	Loose	2	0	0	4	4A	2A
Unit 17								
G42	Sandy Loam	Friable	55	10	0	0	2P	1
W31	Sandy Loam	Friable	40	15	1	3	2P	1
W35	Sandy Loam	Friable	33	10	0	5	2P	1

[31] Total Coarse Fragment Content for aridity limitation is based on the sieved proportion of fine gravels (0.002 m), coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 50 cm of the mineral soil

[32] Total Coarse Fragment Content for stoniness limitation is based on the sieved proportion of coarse gravels (2.5 to 7.5 cm diameter), cobbles (7.5 to 25 cm diameter) and stones (>25 cm diameter) of the total soil in upper 25 cm of the mineral soil

Table 4. Land Capability Classifications and Improved Ratings for Area Units

Soil Observations	Approximate Area (ha)	Percentage of Area Covered by Unit	Unimproved Land Capability Rating (Existing)	Improved Rating
Area 1 - Total Area ~ 284-ha				
Unit 1	16	5.5	4T	4T
Unit 2	150	53	4P3R	4P
Unit 3	62	22	4W	3W
Unit 4	16	5.5	7T	7T
Unit 5	11	3.7	7R4P3T	7R3PT*
Unit 6	8.6	3.0	7R	7R
Unit 7	17	6	5W02L	4W
Unit 8	2	0.7	7RT	7RT
Unit 9	1.7	0.6	6T	6T
Area 2 -Total Area ~ 13-ha				
Unit 10	2	17	3W	2W
Unit 11	11	83	4P	3P
Area 3 - Total Area ~ 5-ha				
Unit12	23	42	4P	4P
Unit 13	6	11	3T	3T
Unit 14	4	7	7T	7T
Unit 15	1.0	2	3W	2W
Unit 16	16	29	4A	2A
Unit 17	5	9	2P	1

*Limitations are not consistent over the entire Unit

Table 5. Proportions of Existing Land Capability Rating for Each Unit

Soil Observations	Existing Land Capability Rating	Proportion of Land Capability Rating in Each Unit					
		7	6	5	4	3	2
Area 1~284-ha							
Unit 1	4T				50%	50%	
Unit 2	4P		4%	22%	43%	30%	
Unit 3	4W			23	41	36	
Unit 4	7T	50%	25%	25%			
Unit 5	7R4P3T	25%			25%	50%	
Unit 6	7R	100%					
Unit 7	5W02L			100%			
Unit 8	7RT	100%					
Unit 9	6T		70%	30%			
Total area covered by each class rating in Area 1		44.8 ha	9.9 ha	64.7 ha	84.6 ha	79.8 ha	
Percent of Class Representation in Area 1		15.8	3.5	22.8	29.8	28.1	
Area 2~13-ha							
Unit 10	3W					100%	
Unit 11	4P			20	80		
Total area covered by each class rating in Area 2				1.9 ha	7.4 ha	3.64	
Percent of Class Representation in Area 2				14.3	57.1	28.6	
Area 3~55-ha							
Unit12	4P		5.5	17	50	22	5.5
Unit 13	3T					100%	
Unit 14	7T	100%					
Unit 15	3W					100%	
Unit 16	4A				100%		
Unit 17	2P						100%
Total area covered by each class rating in Area 3		4.5 ha	1.5 ha	4.5 ha	22.9 ha	15.3 ha	6.1 ha
Percent of Class Representation in Area 3		8.3	2.8	8.3	41.7	27.8	11.1

6.1 Land Capability Classification and Improvement Ratings of Mapped Soil Units

6.1.1 Area 1 Mapped Soil Units

Unit 1

Description and Capability Classification

This is located in Area 1along the lower western slopes, occupying an estimated 16-ha or roughly 5.6%. The soils generally well drained with simple slopes ranging from 10 to 30% (3T to 4T limitations). The soils are likely derived from similar parent materials as in Unit 2, and have a mix of Orthic Dystric Brunisols (derived from glaciofluvial materials) and Gleyed Humo-ferric Podzols (with underlying glaciomarine sediments). We found bedrock close to the surface in some places, and it may be present in other locations but it is probably not extensive. Stoniness limitations are likely present throughout the unit (as seen in W8), and likely vary in coarse fragment content similar to as seen in Unit 2.

Improvement Ratings and Feasibility

The slopes in this area pose difficulties for farm machinery access. In addition, the soil erosion potential is greater on steeper slopes. Topographic limitations cannot be improved. Accordingly, we conclude that a Class 3T to 4T limitation is likely the best possible improved rating with probable Class 5 to Class 3 stoniness limitations throughout.

Unit 2

Description and Capability Classification

This unit amounts to 150-ha or 53% of Area 1. It is located on gently sloping ground on the western side of the property that has been recently harvested. The area slopes to the northeast, generally at a gradient of 5% or lower, but in some places there is a simple slope of 5 to 10%. Unit 2 has Class 3P to 6P stoniness limitations, with a Unit "average" of 4P. The unit consists of predominantly sandy Orthic and Gleyed Dystric Brunisols and Humo-ferric Podzols, with high coarse fragment contents. A few areas likely experience seepage, presumably from the east, and accordingly are moderately wet in the winter (a few pits contained water).

Improvement Ratings and Feasibility

The soils in this unit have sufficient coarse fragment content that will hinder tillage, planting, and /or harvest operations. The 4P stoniness limitations could be improved by one class to 3P, with intense removal of the cobbles and stones. The coarse gravel content; however, is considered impractical to remove, and will likely remain after cobble and stone improvement. The remaining Class 5P and 6P stoniness limitations cover 27% of the unit and are considered to be unimproveable. Overall, the best improved rating is likely 4P for most of this unit.

Unit 3

Description and Capability Classification

The soils of Unit 3 are located in the northeastern and eastern upper slopes of Area 1, and occupy approximately 62-ha, or 22% of Area 1. The unit is very gently sloping or level, and is approximately at the same elevation as a small lake and stream located in the same area. Soils here are primarily loamy sands to sandy loams and silts, and are imperfectly to poorly drained. All pits filled almost immediately with water, and the soils were classified as Orthic Humic Gleysols, Gleyed Dystric Brunisols or Gleyed Humo-ferric Podzols. Their unimproved ratings range from 3W to 5W (with an average of 4W) reflecting the poor drainage. Most of this area has been recently harvested (with the exception of two hybrid poplar plantations at observations W20, W39, and G40), and the persistence of high water tables is reflected in the native vegetation (e.g.; abundant salmonberry) as well as in the soil profiles.

Improvement Ratings and Feasibility

Class 4 soils with excess water limitations have high water tables, seepage, or runoff during the growing season that cause moderate crop damage and occasional crop loss. The water level is near the soil surface during most of the winter and/or late spring, which may delay or prevent seeding in some years. The soils in this unit could likely be improved one class (5W to 4W, 4W to 3W, and 3W to 2W) since high winter water tables are generated by both subsurface and surface water. The improvements could be done by drainage via open ditches or drain tiles to the east; although the feasibility would require some investigation. Ditches would have to discharge into a stream in the centre of the unit; if this stream is fish-bearing, a drainage plan would require the cooperation of the Department of Fisheries and Oceans.

Unit 4

Description and Capability Classification

Unit 4 is the gully of a creek that runs from the western upper slopes to the ocean along the eastern property boundary. The gully covers approximately 16-ha (5.6%) of Area 1, and consists of steep sidewalls with sandy to silty gleyed soils leading to the creek bed. Slopes range from 40 to 80 %, with sidewall lengths ranging from 4 m to 10 m in length. Unit 4 has topography limitations ranging from 5T to 7T.

Improvement Ratings and Feasibility

The topographic limitations of this unit will limit use of farm machinery, and are not considered improvable. The best improved class is 5T to 7T.

Unit 5

Description and Capability Classification

Unit 5 is located on upper eastern slopes of Area 1, and is approximately 11-ha, covering 3.8% of the land in Area 1. This unit has 15 to 35% slopes (3T to 4T), scattered Class 4P stoniness limitations, and scattered exposed bedrock (7R). The soils here have sandy loam to loamy sand textures and are located on the side of a bedrock knob.

Improvement Ratings and Feasibility

The Class 4P limitation, which may not extend throughout the entire unit, could likely be improved to Class 3P with stone removal; however, the bedrock and topographic limitations are not improvable. The probability of rock close to the surface, (especially with the exposed bedrock outcrop immediately upslope and along the road) is likely high given the topography. Given these limitations, we rate the best improved capability class as 7R, depending on bedrock locations.

Unit 6

Description and Capability Classification

This unit includes area where bedrock is either exposed as outcroppings, or was observed at the surface. The unit includes three areas that are a total of 8.6-ha, or 3% of Area 1. These observed rock exposures are unsuitable for agriculture and has a capability rating of 7R.

Improvement Ratings and Feasibility

The presence of bedrock near the surface restricts rooting depth and tillage, and restricts agricultural use. Improvement of this limitation is impractical. The best rating is 7R.

Unit 7

Description and Capability Classification

Unit 7 covers approximately 17-ha (6%) in Area 1, and is located in depressional areas in the eastern section of Area 1. The unit consists of recently logged land that is now occupied by various grasses, sedges, and rushes. These organic soils are poorly drained with a thick blanket of moderately to well decomposed organic matter overlying compact glaciomarine silts and fine sands. The soils have Class 5W excess water limitations, reflecting the persistently high fall, winter and spring water tables. The Mesic soils observed in this is unit also have likely have occurrences of cumulo (layers of mineral soil), which can lead to the formation of aquatic muck, which may lead to late-lying wetness in spring and (probably) early saturation in fall.

Improvement Ratings and Feasibility

Due to the nature of these soils, the 5W limitation could likely be improved to 4W (possibly 3W in places) with implementation of drainage (ditches and/or subsurface drain tiles). Drainage will likely result in accelerated decomposition of the organic blanket which will then be subject to subsidence and changes in soil properties. Ditches would have to discharge into a stream to the southwest of the unit; if this stream is fish-bearing, a drainage plan would require the cooperation of the Department of Fisheries and Oceans.

Unit 8

Description and Capability Classification

Unit 8 is located along southeastern slopes in Area 1, and is approximately 2-ha (0.7% of the land in Area 1). This unit was assessed via air photos and consists of very steep bedrock bluffs with 7TR topographic and depth to bedrock limitations.

Improvement Ratings and Feasibility

This unit is wholly unsuitable for agriculture and has a capability rating of 7TR, which is unimproveable.

Unit 9

Description and Capability Classification

This unit amounts to 1.7-ha or (0.6%) of Area 1 and was delineated with the help of air photos interpretation. It is located on moderately steep sloping ground on the eastern side of the property immediately below the steep bedrock bluffs. The area slopes to the east, and have Class 5 T and 6T limitations with respect to topography. The soils here are likely derived from a mix of glaciofluvial and glaciomarine sediments similar parent materials as in Unit 1 and 2.

Improvement Ratings and Feasibility

The best improved rating is Class 5T to 6T. Note that despite this limitation, there may be some areas that are suitable for growing fruit trees, but only on a small-scale.

6.1.2 Area 2 Mapped Soil Units

Unit 10

These soils of Unit 10 are located in the northwestern corner, and southern boundary area of Area 2. They occupy 2-ha (17% of Area 2), and have gentle slopes situated in minor depressions. The sandy loam-textured, gleyed soils are imperfectly to moderately well drained (pits filling with water). There was abundant salmonberry and elderberry, suggesting wetter soil conditions. The unimproved ratings are 3W, reflecting excess water during the growing period that may cause minor crop damage during the growing period, and adverse affects of deep-rooted perennial crops during the winter months. The soils here are derived from similar parent materials as in Unit 11, but have substantially lower amounts of gravel.

Improvement Ratings and Feasibility

The Class 3W soils will likely be improved to Class 2 with drainage. This unit is suitable for agriculture.

Unit 11

Description and Capability Classification

Unit 11 covers 11-ha, 83% of Area 2, and has soils with Class 4P stoniness limitations. This undulating unit has been recently harvested and supports dense brush (bramble) and is not stocked with conifer seedlings. The soils are loamy sands and are predominantly classified as Orthic Humo-Ferric Podzols.

Improvement Ratings and Feasibility

The Class 4P stoniness limitation is a handicap to cultivation; however, the unit could be improved to Class 3P by removal cobbles and stones. The economic feasibility of this operation is questionable.

6.1.3 Area 3 Mapped Soil Units

Unit 12

Description and Capability Classification

This unit is located in the northern and southwestern parts of Area 2, and covers 23-ha or 42%. It has gently sloping, undulating terrain under second-growth forests. Soils are derived from coarse deltaic deposits overlying deeper glaciofluvial sediments. The soils have predominantly sandy to loamy sand textures and are classified as Orthic Humo-Ferric Podzols or Orthic Dystric Brunisols. Soils are variable in the level of stoniness limitation ranging form Class 3P to 6P, with an average 4P Classification (44% of the Unit).

Improvement Ratings and Feasibility

The soils in this unit have levels of coarse fragments that will hinder tillage, planting, and/or harvest operations. The 4P stoniness limitations could be improved by one class to 3P, with intense removal of the cobbles and stones.

The coarse gravel content, however, is considered impractical to remove, and will likely remain after cobble and stone improvement. The remaining Class 5P and 6P stoniness limitations cover 31% of the unit. This land is marginally suitable for agriculture.

Unit 13

Description and Capability Classification

Unit 13 occupies an estimated 6-ha or roughly 11% of Area 3 and is located on west facing slopes in the eastern part of the area. The soils are generally well drained with simple slopes ranging from 10 to 30% (3T to 4T limitations). The soils are likely derived from the glaciofluvial delta described in Unit 12.

Improvement Ratings and Feasibility

Soils with steeper gradients have limitations for farm machinery access, and increased potential for water erosion. Improvements of topographic limitations are impractical. The best improved rating is 3T.

Unit 14

Description and Capability Classification

Two gullies are located within Unit 14, and is 4-ha, covering 7% of Area 3. The gullies run roughly east-west, and are located in the northern and southern areas of the property.

The sidewall slopes are 85% and have Class 7T topographic limitations.

Improvement Ratings and Feasibility

The land in its present condition is not useable for arable agriculture or sustained natural grazing by domestic livestock. These limitations are not improvable.

Unit 15

Description and Capability Classification

Unit 15 is located in the northeastern area, and occupies 1-ha, which is 2% of Area 3. The unit consists of a minor depression that is dominated by salmon berry.

The Gleyed soils have loamy sand textures and are imperfectly drained. The unit has Class 3W excess water limitations during the growing period that can cause minor crop damage and winter water levels that can adversely affect perennial crops. The soils here are derived from similar parent materials as in Unit 12 and 16, but have substantially lower amounts of gravel.

Improvement Ratings and Feasibility

The Class 3 soils will likely be improved to Class 2 with water control methods such as ditching or tiling. Soils have higher moisture and nutrient retention compared to the soils in Unit 16. These soils are well-suited to agriculture.

Unit 16

Description and Capability Classification

The soils in Unit 16 are located in the southeastern property area, and cover approximately 16-ha and 29%. The soils are generally well drained with sand to loamy sand textures and gentle slopes. Unit 16 soils have Class 4A aridity limitations and have low moisture retention. Crops on these soils will suffer significant drought in the absence of irrigation.

Improvement Ratings and Feasibility

These soils can be improved through irrigation to Class 2A, although they must be carefully managed.

Unit 17

Description and Capability Classification

Unit 17 covers approximately 5-ha, 9%, of Area 3, and is located in the south central property area. The land is gently undulating with moderately well drained soils with sandy loam textures with gleyed Podzols and Brunisols. Soils in this unit have a mix of Class 2 stoniness, aridity, and excess water limitations.

Improvement Ratings and Feasibility

For the most part, the Class 2 limitations will not likely pose any hindrance to a wide range of agricultural practices.

7 Conclusions

We assessed a total of approximately 352-ha for land capability for agriculture. The main limitations include stoniness, topography, excess water, and aridity (soil moisture deficit). The properties have Class 7 to Class 2 ratings with respect to those limitations.

Of the total 352-ha assessed (all three study areas combined), approximately 139-ha or 39% have Class 5 to 7 limitations with respect to stoniness, topography, or excess water, and are not considered to be improvable. With a substantial investment in stone removal, subsoil drainage, or irrigation, only 213-ha or 60%, of the land could be improved to Class 3 to Class 1 ratings.

Areas 1 covers an estimated 284-ha, with 120-ha (42%) having Class 5 to Class 7 ratings that are not reasonably improvable. The remaining 165-ha (58%) have Class 3 to Class 4 ratings that may be marginally improved.

Area 2 is 13-ha with 2-ha (15%) having Class 5 stoniness limitations that is not likely improvable. 7.4-ha (57%) has Class 4 stoniness limitations that can likely be improved to Class 3 with stone removal, and the remaining 3.6-ha (28.6%) has Class 3 excess water limitations that can likely be improved to Class 2.

Area 3 covers approximately 55-h and has 10.5-ha (19.4%) that has Class 5 to 7 topographic and stoniness limitations that are not improvable. 23-ha (42%) have Class 4 stoniness and aridity limitations. The stoniness limitations will not likely be improvable, but the aridity limitations can be improved to Class 2 with irrigation. The remaining 21.4-ha (39%) has Class 3 excess water and stoniness limitations that can likely be improved to Class 2 soils.

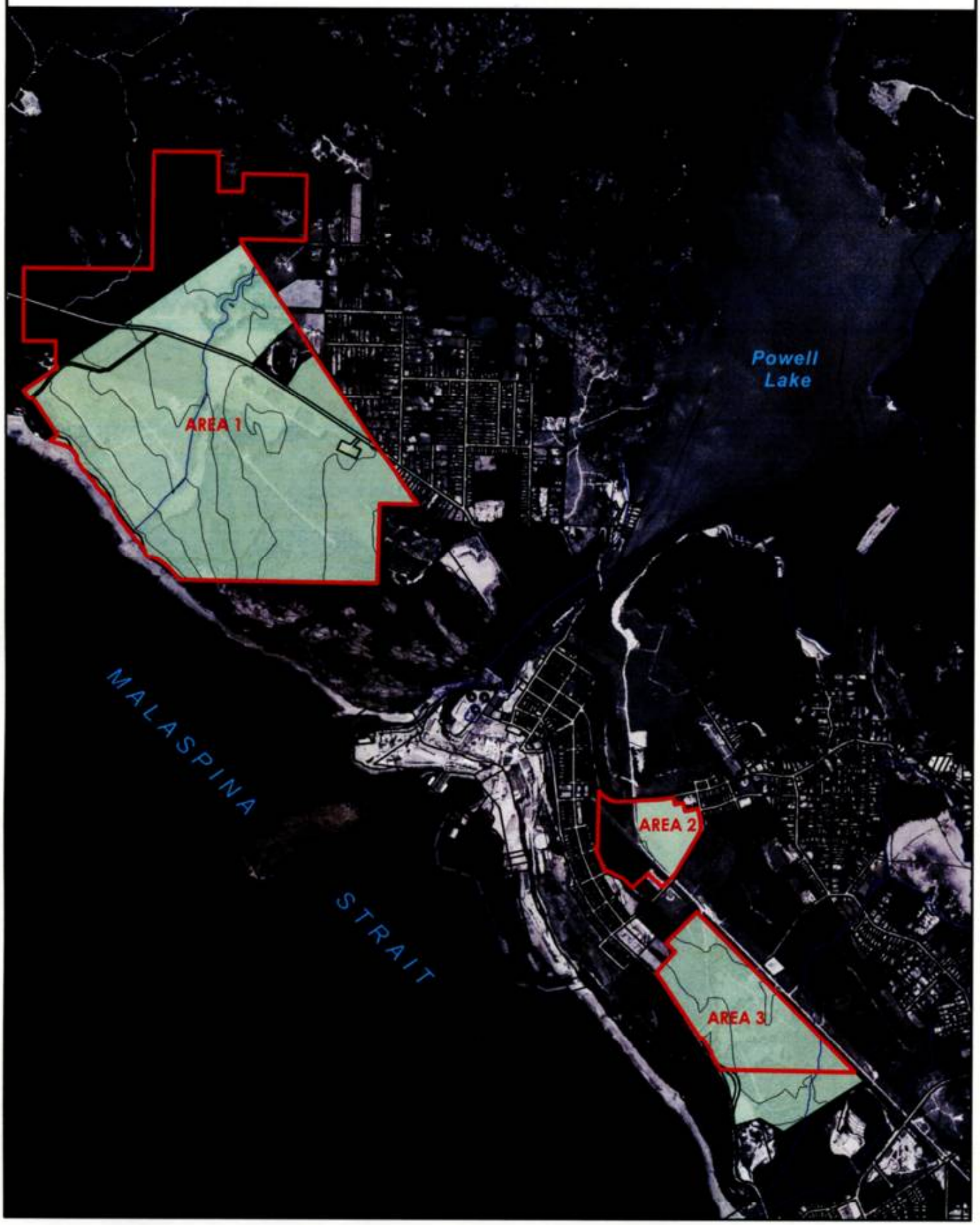
The feasibility of such improvement varies across the study areas; in some places it may make economic sense, in others, clearly not. Complications arise when several limitations are present together. Many soils had both stoniness and aridity limitations for examples, and stone-removal alone would barely affect the droughtiness of these soils. Improvement in one limitation would induce limitations in other factors, such as fertility.

Given the existing soil and climatic conditions, 60% of the land can be improved to Class 3. Class 3 lands will require moderately intensive management practices, and the range of crops that can be grown on the land is moderately restricted. For both classes, the given limitations may seriously affect one or more of the following practices: timing and ease of tillage, planting and harvesting, and methods of soil conservation. Also, frost in the area can limit the production of certain sensitive crops such as kiwi, grapes, cherries, peaches, and apricots.

APPENDIX A

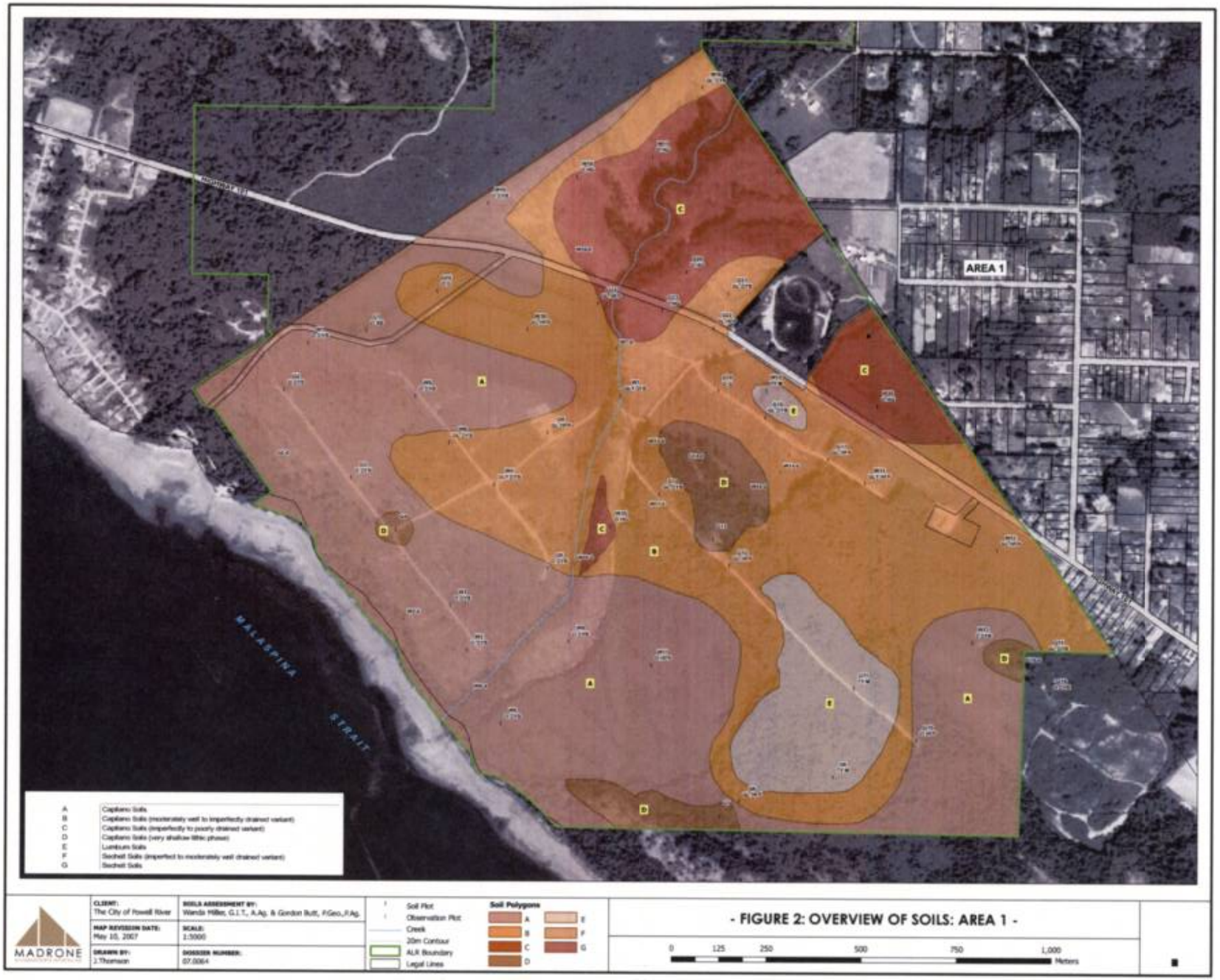
Study Area Location Overview

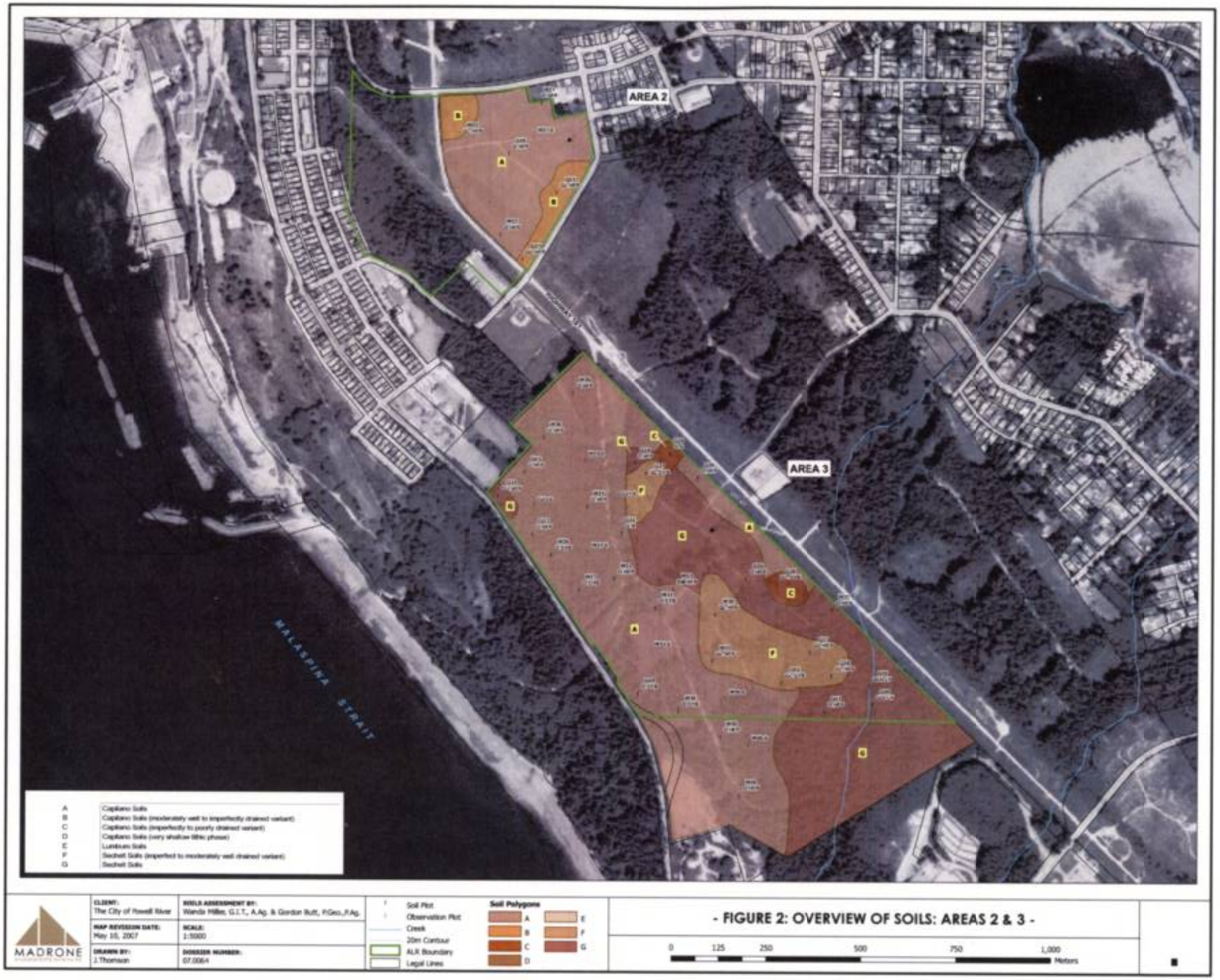
- FIGURE 1: OVERVIEW OF STUDY AND PROPERTY AREAS -



APPENDIX B

Overview Maps of Soil Associations


AREA 1
STRAIT
A Capilano Soils
B Capilano Soils (moderately well to imperfectly drained variant)
C Capilano Soils (imperfectly to poorly drained variant)
D Capilano Soils (very shallow lithic phase)
E Lumbum Soils
F Sechelt Soils (imperfect to moderately well drained variant)
G Sechelt Soils
MADRONE
CLIENT: The City of Powell River
SOILS ASSESSMENT BY: Wanda Miller, G.I.T., A.Ag. & Gordon Butt, P.Geo.,P.Ag.
MAP REVISION DATE: May 10, 2007
SCALE: 1:5000
DRAWN BY: J.Thomson
DOSSIER NUMBER: 07.0064
Soil Plot
Observation Plot
Creek
20m Contour
ALR Boundary
Legal Lines
Soil Polygons
A
B
C
D
E
F
G
- FIGURE 2: OVERVIEW OF SOILS: AREA 1 -
0 125 250 500 750 1,000
Meters


AREA 2
AREA 3
MALASPINA STRAIT
A Capilano Soils
B Capilano Soils (moderately well to imperfectly drained variant)
C Capilano Soils (imperfectly to poorly drained variant)
D Capilano Soils (very shallow lithic phase)
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F Sechelt Soils (imperfect to moderately well drained variant)
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Observation Plot
Creek
20m Contour
ALR Boundary
Legal Lines
Soil Polygons
A
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C
D
E
F
G
MADRONE
CLIENT: The City of Powell River
SOILS ASSESSMENT BY: Wanda Miller, G.I.T., A.Ag. & Gordon Butt, P.Geo.,P.Ag.
MAP REVISION DATE: May 10, 2007
SCALE: 1:5000
DRAWN BY: J. Thomson
DOSSIER NUMBER: 07.0064
- FIGURE 2: OVERVIEW OF SOILS: AREAS 2 & 3 -
0 125 250 500 750 1,000 Meters

APPENDIX C

Overview Maps of Land Capability Units

Area	Soil Unit	Area (ha)
1	U1	16.2
	U2	148.7
	U3	62.4
	U4	15.5
	U5	10.8
	U6	8.6
	U7	17.4
	U8	2.0
	U9	1.8
Total		**283.4**
2	U10	2.2
	U11	10.6
Total		**12.8**
3	U12	23.3
	U13	5.9
	U14	3.7
	U15	1.0
	U16	16.3
	U17	5.0
Total		**55.2**

MADRONE

CLIENT: The City of Powell River

SOILS ASSESSMENT BY: Wanda Miller, G.I.T., A.Ag. & Gordon Butt, P.Geo.,P.Ag.

MAP REVISION DATE: May 10, 2007

SCALE: 1:5000

DRAWN BY: J.Thomson

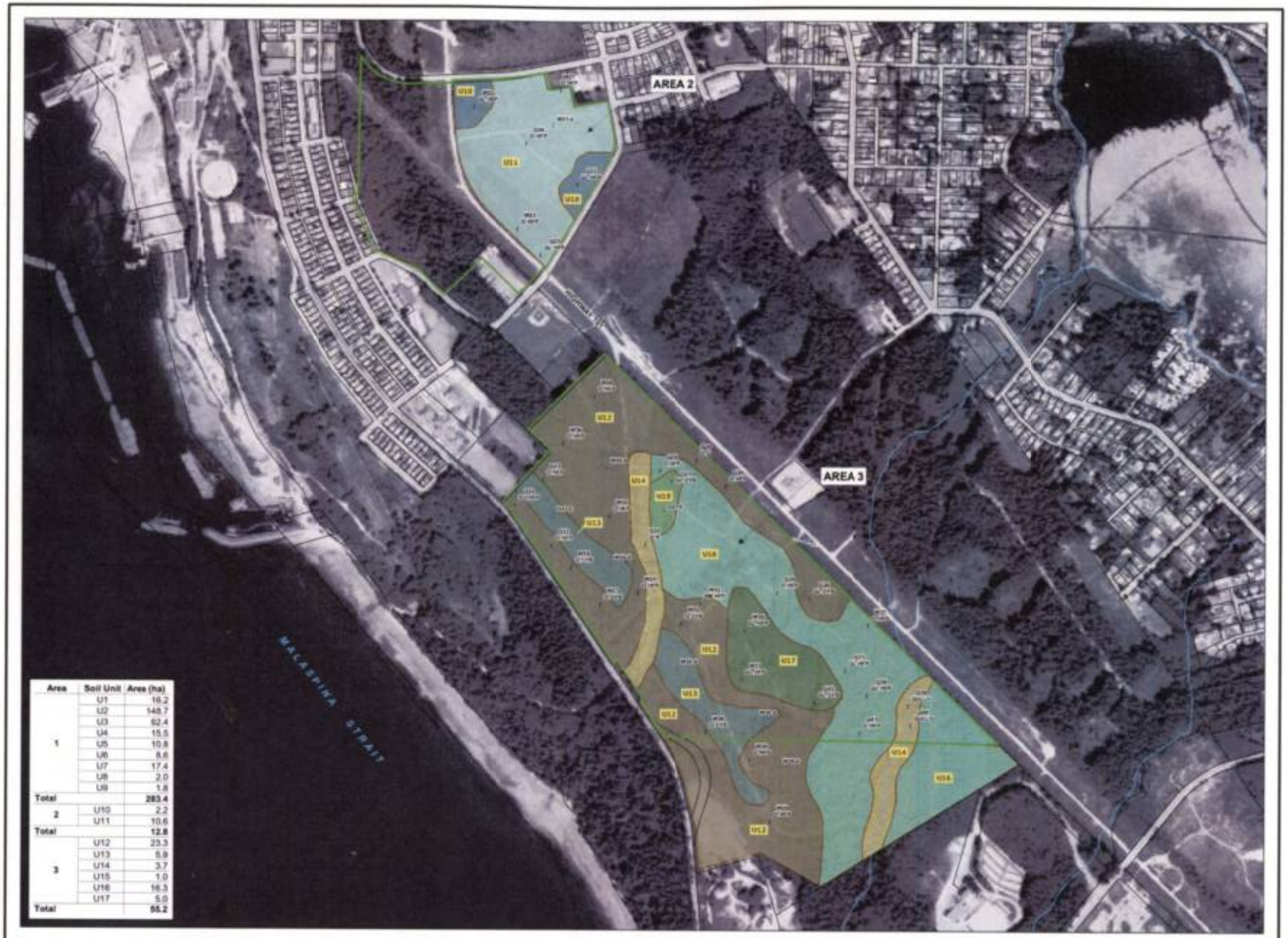
DOSSIER NUMBER: 07.0084

Soil Plot
Observation Plot
Creek
20m Contour
Land Capability Unit Boundary
ALR Boundary
Legal Lines

*State Projection: UTM NAD 83, Zone 10

- FIGURE 4: OVERVIEW OF AGRICULTURAL CAPABILITY UNITS: AREA 1 -

0 125 250 500 750 1,000 Meters



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	U13	5.9
	U14	3.7
	U15	1.0
	U16	16.3
	U17	5.0
Total		**55.2**

MADRONE

CLIENT: The City of Powell River	**SOILS ASSESSMENT BY:** Wanda Hiller, G.I.T., A.Ag. & Gordon Butt, P.Geo.,P.Ag.
MAP REVISION DATE: May 10, 2007	**SCALE:** 1:5000
DRAWN BY: J.Thomson	**DOSSIER NUMBER:** 07.0004

Soil Plot
Observation Plot
Creek
20m Contour
Land Capability Unit Boundary
ALR Boundary
Legal Lines

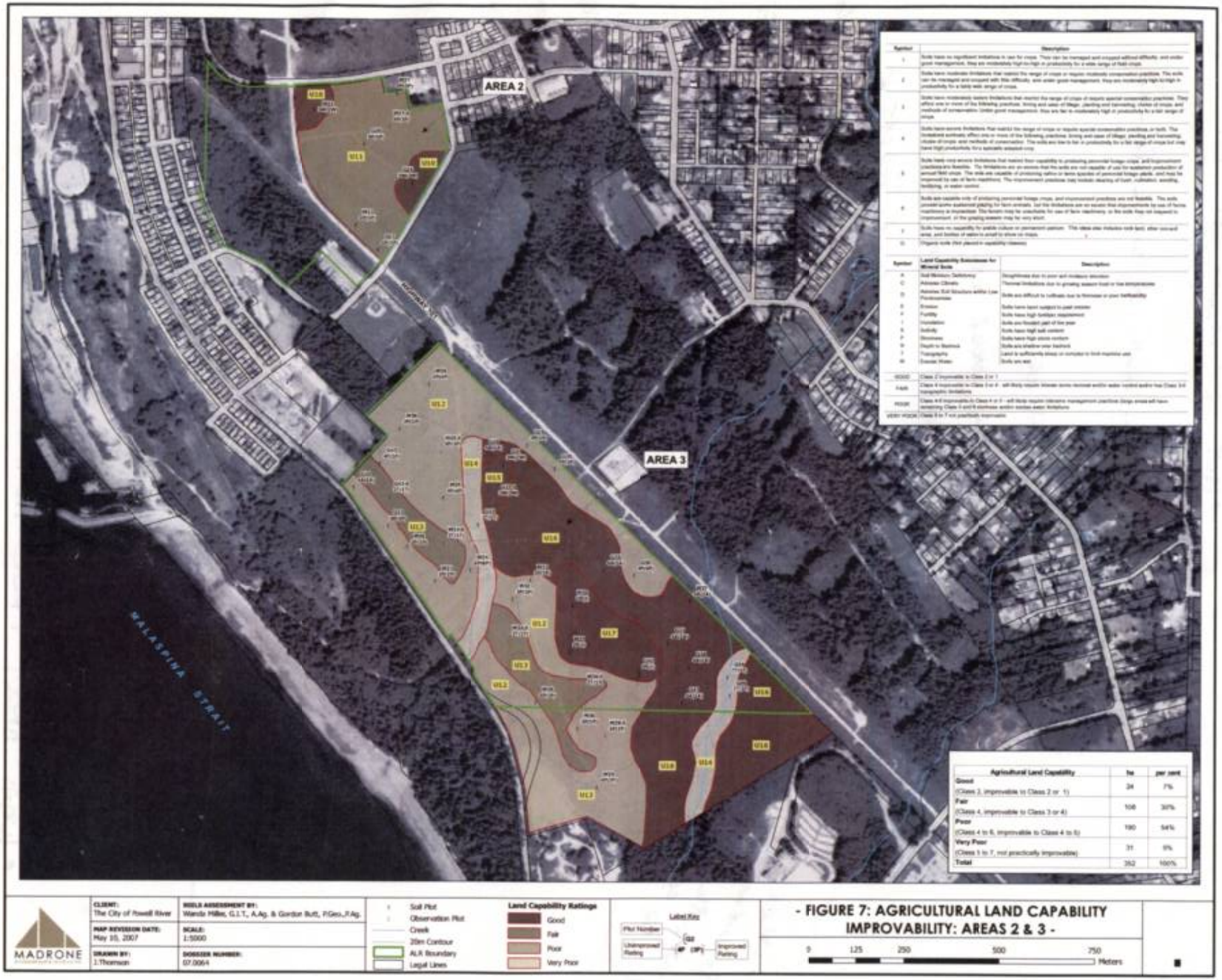
*State Projection: UTM Nad 83, Zone 10

- FIGURE 5: OVERVIEW OF AGRICULTURAL CAPABILITY UNITS: AREAS 2 & 3 -

0 125 250 500 750 1,000 Meters

APPENDIX D

Overview Maps of Agricultural Potential Ratings


AREA 2
AREA 3
MALASPINA STRAIT
Agricultural Land Capability | ha | per cent
Good (Class 2, improvable to Class 2 or 1) | 24 | 7%
Fair (Class 4, improvable to Class 3 or 4) | 108 | 30%
Poor (Class 4 to 6, improvable to Class 4 to 5) | 190 | 54%
Very Poor (Class 5 to 7, not practically improvable) | 31 | 9%
Total | 352 | 100%
CLIENT: The City of Powell River
YIELD ASSESSMENT BY: Wanda Miller, G.I.T., A.Ag. & Gordon Butt, P.Geo.,P.Ag.
MAP REVISION DATE: May 10, 2007
SCALE: 1:5000
DRAWN BY: J.Thomson
DOSSIER NUMBER: 07.0064
Soil Plot
Observation Plot
Creek
20m Contour
ALR Boundary
Legal Lines
Land Capability Ratings
Good
Fair
Poor
Very Poor
Label Key
Plot Number
Unimproved Rating
Improved Rating
- FIGURE 7: AGRICULTURAL LAND CAPABILITY IMPROVABILITY: AREAS 2 & 3 -
0 125 250 500 750 Meters