



# Ursus Environmental

Wildlife & Environmental Resource Consulting

600 Castle Way, Parksville, B.C. V9P 2R1

Ph./Fax: 250 - 248 - 1918 E-mail: ursusnanaimo@shaw.ca



## Level 1 & 2 Environmental Site Assessment for the Moorecroft Camp Property, Nanoose Bay

Prepared by:  
Joe Materi, R.P.Bio.  
January 17<sup>th</sup>, 2011

Prepared for:  
Regional District of Nanaimo - Recreation & Parks  
Oceanside Place  
830 West Island Highway  
Parksville, B.C. V9P 2X4

## **Level 1 & 2 Environmental Site Assessment for the Moorecroft Camp Property, Nanoose Bay**

### **EXECUTIVE SUMMARY**

The subject property is located at the northern terminus of Stewart Road, approximately 8 km east of the City of Parksville. The site has the civic address of 1563 Stewart Road, in Nanoose Bay. It is comprised of two parcels:

- Lot A, District Lot 110, Nanoose District, Plan 1777 (PID 006-884-849); and
- Lot 1 of District Lots 52 and 110, Nanoose District, Plan 31217 (PID 001-170-228).

The site is approximately 34.4 ha (85 acres) in total area, with elevations ranging from sea level to approximately 40 m above sea level. The property is predominantly forested, with development concentrated near the waterfront. The site includes a numerous residential and maintenance-related structures, a playing field, and an excavated water feature known locally as Skipsey Lake.

This study was authorized by Regional District of Nanaimo (RDN) staff. It is designed to satisfy the RDN's concerns regarding the environmental integrity of the site prior to purchase from the British Columbia Conference Property Development Council of the United Church of Canada. It was understood that environmental investigations of site building materials are being conducted by RDN personnel and are beyond the scope of this assessment.

The primary objectives of this assessment were to:

- 1) Conduct an historical review of the site including all reasonably ascertainable information related to the property;
- 2) Describe existing conditions at the site through field reconnaissance and interviews with personnel familiar with the site;
- 3) Investigate the potential for soil or groundwater contamination through a focused field program involving sample collection and analyses; and
- 4) Outline feasible remedial measures for any parts of the site possessing a high potential for contamination.

Based on the information gathered for this study, it was concluded that there is a low potential for significant soil or groundwater contamination at Moorecroft Camp. Historical maps and air photos indicate that the site and adjacent properties have remained largely forested since at least the late 1950's. Registered title holders dating back to the E & N Land Grant have included farmers, recreation-based organizations, and church groups as opposed to corporations involved in heavy industry.

Personal interviews indicated that development of the site has involved some small-scale forestry and commercial recreational development. Operation of Moorecroft Camp over the past 40 years has involved a modest degree of maintenance and environmental management. No suspicious trash or fill piles were noted during site inspections.

The potential for groundwater contamination through failing septic fields was assessed as low, given their service history and the absence of sewer-type odours during wet periods. Creek and surface runoff samples from December of 2010 did not point to any problems with high fecal coliform counts.

The six aging above-ground furnace oil tanks present on the property are in relatively good condition externally. Soils sampled near the tanks did not indicate any leakage problems with them. Soils near the flammable liquids storage shed had no detectable volatile hydrocarbons (BTEXS), of particular environmental concern due to their high solubility, but did possess elevated levels for the gross parameter Oil and Grease. While the Oil and Grease level of 3,990 mg/kg exceeds federal remediation guidelines for parkland, it is not considered Hazardous Waste as described under provincial statute. Based on its building footprint and shallow soils in the area, the volume of hydrocarbon contaminated soil around the flammable liquids storage shed was estimated to be less than 15 m<sup>3</sup>.

Given the hydrocarbon contaminated area's proximity to a sensitive intertidal area, and the fact that the RDN is contemplating other work on the site, it was recommended that remediation efforts be undertaken. Following removal of the flammable liquids storage shed, it was recommended that on-site bioremediation be carried out on the underlying soils. A bioremediation cell of 25 m<sup>2</sup> should be constructed in a level area with good machinery access. The total cost of installing and maintaining the bioremediation cell was estimated to be \$2,570.00 (plus HST), including confirmation sampling prior to reuse of the soil.

Although none of the existing furnace oil tanks at the site are leaking, it was recommended that any retained buildings on the site be converted to systems representing a lower risk to the environment (e.g. electrical, propane, solar).

---

**Level 1 & 2 Environmental Site Assessment for the  
Moorecroft Camp Property, Nanoose Bay**

<b><u>Table of Contents</u></b>		<b><u>Page</u></b>
<b>EXECUTIVE SUMMARY.....</b>		<b><i>i</i></b>
<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
	1.1 General.....	1
	1.2 Scope & Objectives .....	4
	1.3 Acknowledgements.....	4
<b>2.0</b>	<b>METHODS AND INFORMATION SOURCES.....</b>	<b>5</b>
	2.1 General.....	5
	2.2 Historical Information.....	5
	2.3 Current Information .....	5
	2.4 Soil and Water Sampling .....	6
<b>3.0</b>	<b>INVESTIGATION RESULTS .....</b>	<b>8</b>
	3.1 Historical Information from Existing Information Sources.....	8
	3.2 Historical and Current Site Information from Interviews.....	9
	3.3 Site reconnaissance .....	11
	3.4 Soil and Water Sampling .....	11
<b>4.0</b>	<b>DISCUSSION .....</b>	<b>16</b>
	4.1 General .....	16
	4.2 Potential Environmental Concerns .....	16
	4.3 Recommendations .....	17
<b>5.0</b>	<b>CONCLUSIONS &amp; RECOMMENDATIONS .....</b>	<b>19</b>
	5.1 Summary of Conclusions.....	19
	5.2 Summary of Recommendations.....	20
<b>6.0</b>	<b>LITERATURE CITED.....</b>	<b>21</b>

**List of Figures**

1. Moorecroft Camp location plan.....	2
2. Moorecroft Camp site plan .....	3
3. Location of soil sampling sites (red labels) and water sampling sites (blue labels) at Moorecroft Camp in December of 2010 .....	7
4. No large areas of stained soil or distressed vegetation were seen around the flammable liquids storage shed, located between Splash 1 and Cabin 2.....	12
5. Flaking paint was noted on the furnace oil tank for Fern Cottage .....	13
6. No stains or questionable storage was observed within the paint storage area in the rear of the maintenance shed .....	13
7. Water quality appeared good in the small creek flowing from Skipsey Lake. The latter supported breeding by pollution-sensitive amphibians in 2007..	14

**List of Tables**

1. Summary of soil sample analyses at Moorecroft Camp, Dec. 2010.....	15
2. Summary of water sample analysis at Moorecroft Camp, Dec. 2010 .....	15
3. Estimated bioremediation costs for hydrocarbon contaminated soil near the flammable liquids storage shed.....	18

**Appendices**

- A. Map of “Old Nanoose” from M. Williams Nicholls (1958)  
Aerial Photographs of the site from 2009 and 2002.
- B. Current title documents  
Chain of Title Report prepared by Conservation West Property Services.
- C. Photographs taken of the Site in December of 2010.
- D. Laboratory Analysis Certificates.

## **Level 1 & 2 Environmental Site Assessment for the Moorecroft Camp Property, Nanoose Bay**

### **1.0 INTRODUCTION**

#### **1.1 General**

The subject property is located at the northern terminus of Stewart Road, approximately 8 km east of the City of Parksville (Fig.1). The site has the civic address of 1563 Stewart Road, in Nanoose Bay. It is comprised of two parcels, with the following legal descriptions:

- Lot A, District Lot 110, Nanoose District, Plan 1777 (PID 006-884-849); and
- Lot 1 of District Lots 52 and 110, Nanoose District, Plan 31217 (PID 001-170-228)

In addition to the above parcels, there is a foreshore lease held by the current owner, the B.C. Conference Property Development Council of the United Church of Canada. This Crown lease, which expires in 2016, permits certain uses related to commercial recreation activities including: swimming, boat launching, and community recreation.

Moorecroft Camp is approximately 34.4 ha (85 acres) in total area, with elevations ranging from sea level to approximately 40 m above sea level (ASL). The property is predominantly forested, with development concentrated near the waterfront. Natural features associated with the site include approximately 900 m of marine shoreline, coastal bluff plant communities, and a tidal lagoon. The site includes a numerous residential and maintenance-related structures, a playing field, and an excavated wetland referred to as Skipsey Lake (Fig. 2).

This study was authorized by Regional District of Nanaimo (RDN) staff. It is designed to satisfy the RDN's concerns regarding the environmental integrity of the site prior to purchase from the British Columbia Conference Property Development Council of the United Church of Canada. Written authorization to proceed with the study was received on December 9<sup>th</sup>, 2010.



**Figure 1. Moorecroft Camp location plan.**

(Scale approximately 1: 100,000)

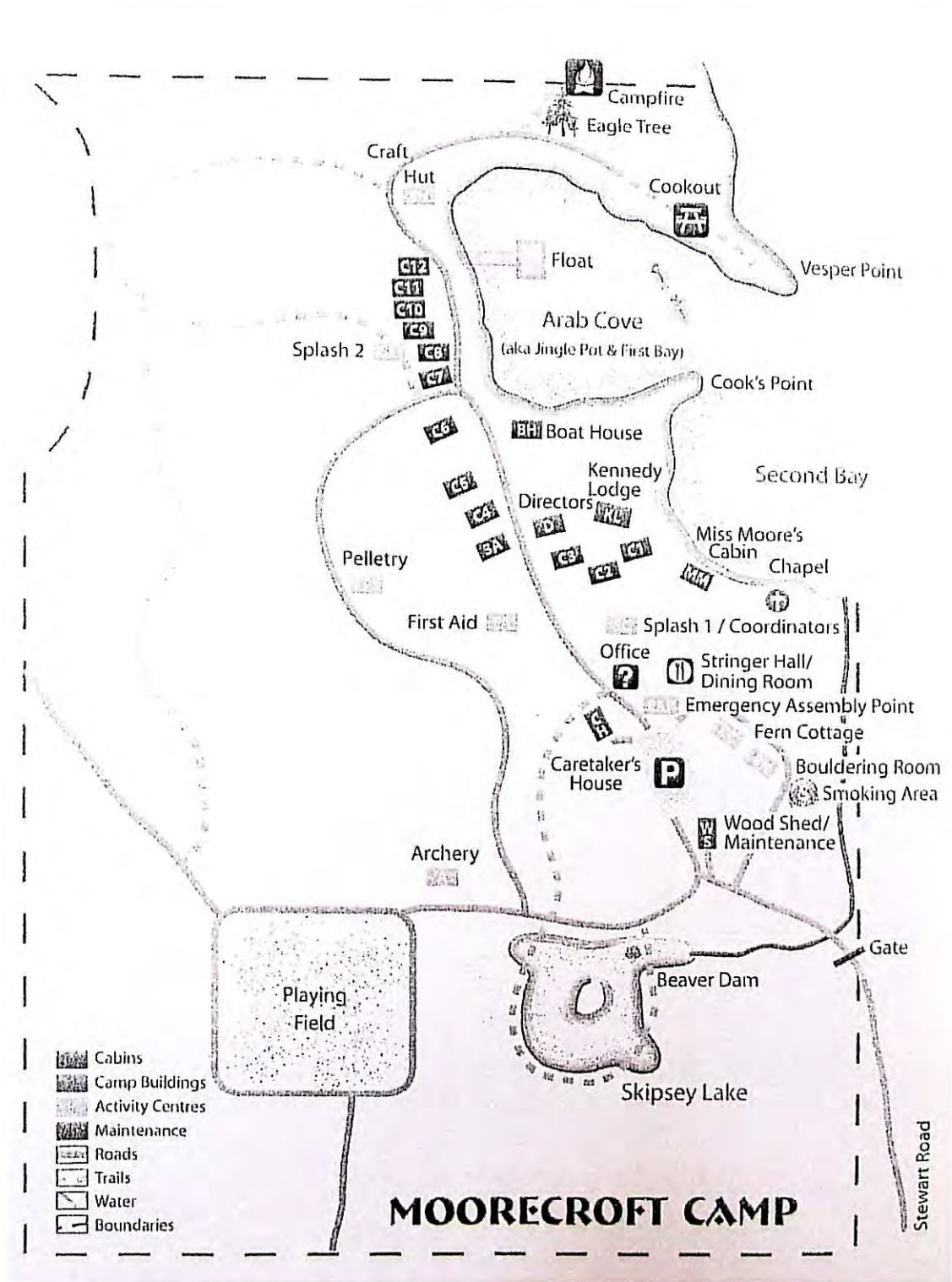


Figure 2. Moorecroft Camp site plan.

(Scale approximately 1: 4,000)



## **1.2 Scope & Objectives**

The twin goals of this assessment are to provide the Regional District of Nanaimo (RDN) with a clear understanding of environmental risks associated with the site and to give an indication of any costs related to site clean-up. It should be noted that, at the request of the RDN, the environmental assessment was limited to soil and groundwater conditions. It is understood that environmental investigations of site building materials are being conducted by RDN personnel and are beyond the scope of this assessment.

The primary objectives of this assessment were as follows:

- 1) To conduct an historical review of the site including all reasonably ascertainable information related to the property;
- 2) To describe existing conditions at the site through field reconnaissance and interviews with personnel familiar with the site;
- 3) To investigate the potential for soil or groundwater contamination through a focused field program involving sample collection and analyses; and
- 4) To outline feasible remedial measures for any parts of the site possessing a high potential for contamination.

## **1.3 Acknowledgements**

Thanks to Regional District of Nanaimo staff for providing a copy of the recently completed Building Condition Report for the site. Thanks also to Bob Walker of Conservation West Land Services for performing the chain of title and Contaminated Sites Registry searches. Pete Vanderbeek, current caretaker of Moorecroft Camp, and long-time resident Joe Skipsey kindly provided background information on site facilities and activities. Ms. Paddy Cardwell at the Craig Heritage Museum in Parksville provided invaluable assistance in searching for historical air photos and maps of the study area.

## **2.0 METHODS AND INFORMATION SOURCES**

### **2.1 General**

The assessment consisted of an historical and site investigation. The historical review was used to identify the potential for contamination based on previous activities taking place on the site and/or neighbouring properties. Sampling and analysis of soils at strategic locations was a key element of the site investigation. The methodology employed for this study has been designed to meet the standards of normal practice for conducting Phase 1 and 2 environmental site assessments. Guiding documents for this study included the Canadian Council of Ministers of the Environment publication *Subsurface Assessment Handbook for Contaminated Sites* (CCME 1994) and Canadian Standards Z768 and Z769 (CSA 2001).

### **2.2 Historical Information**

It should be noted that the Provincial Air Photo Library in Victoria was contacted to provide historic photos, but was out of service at the time of writing. A current and chain of title search was conducted by Conservation West Property Services of Victoria to establish a chronology of ownership and provide some evidence of past land uses. Other historical information and interviews were employed to identify potential areas of the site that were used for storage, production, or disposal of potentially hazardous materials. Some of the resources consulted for the review included:

- B.C. Ministry of Environment Soil Map;
- B.C. Ministry of Energy and Mines Bedrock Geology Map;
- 1980 and 2002 historical air photos;
- Craig Heritage Museum archives;
- B.C. Ministry of Environment Contaminated Sites Registry; and
- Interviews with Nanoose Bay Fire Department personnel and a long-time Nanoose Bay resident.

### **2.3 Current Information**

A site reconnaissance was carried out in December of 2010 to inspect the site for signs of potential contamination and to assess overall environmental conditions. The visual inspection provided information about site topography/drainage, surface staining and soil conditions, vegetation vigour, chemical/fuel storage areas, and general housekeeping. Adjacent properties were assessed for their potential to affect the subject property.

A consultation with the current caretaker, Mr. Pete Vanderbeek, was conducted in December of 2010, to discuss issues associated with septic fields and water wells. A copy of the RDN's recently completed Building Condition Report for Moorecroft Camp was also reviewed to provide a better understanding of existing conditions at the site.

A site information sheet produced by the Unique Properties real estate company was reviewed online to provide background on surrounding land usage.

## **2.4 Soil and Water Sampling**

Given the thin soils, undulating terrain, and spatial restrictions around furnace oil tanks, it was decided that all soil sampling pits would be hand-dug. A total of seven soil samples were collected, six near furnace oil tanks and one near the flammable liquids storage shed in late December of 2010 (Fig. 3). Soil was packed into 1L sterilized, darkened glass bottles with Teflon lids provided by the analytical laboratory. Soil samples were analysed for the presence of volatile hydrocarbons including: Benzene, Toluene, Ethylbenzene, Xylenes, Styrene and Methyl t-Butyl Ether. They were also tested for higher molecular weight hydrocarbons associated with lubricants using the gross parameter Oil and Grease.

To assess the potential for failing septic systems at the site, surface runoff samples were collected from two locations following a heavy rainfall event in December of 2010 and analysed for the presence of fecal coliforms. As samples were relatively turbid, the Most Probable Number (MPN) method of analysis was requested. One sampling station was located down-gradient of Stringer Hall, while the other was located down-gradient of the Caretaker's House, Splash 1, and Cabins # 1 through #5 (Fig. 3). In addition to these areas, a sample drawn from the small unnamed stream running adjacent to Fern Cottage and the Boulderling Room was also submitted for fecal coliform testing.

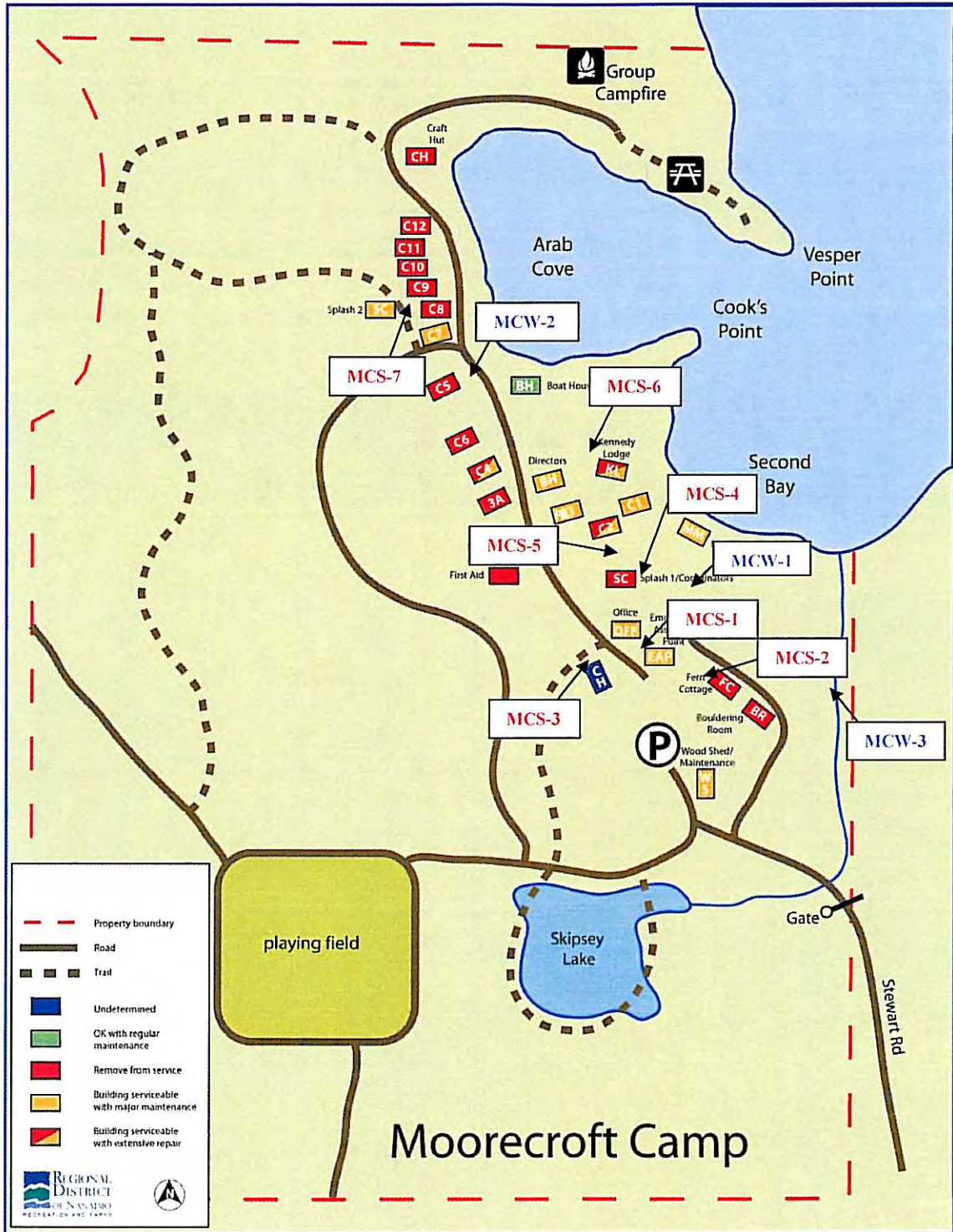


Figure 3. Location of soil sampling sites (red labels) and water sampling sites (blue labels) at Moorecroft Camp in December of 2010.

(Scale approximately 1: 4,000)

### 3.0 INVESTIGATION RESULTS

#### 3.1 Historical Information from Existing Information Sources

The bedrock geology of the region is comprised of undivided sedimentary rocks of the Nanoose Complex from the Buttle Lake Group. Bedrock here was formed over the Mississippian to Lower Permian Period, roughly 250 to 350 million years ago. At least four minor fault lines run through the Nanoose Peninsula, the nearest paralleling the marine shoreline (Massey *et al.* 2003). Major thrust faults in the region are located approximately 30 km to the west of the site.

Ministry of Environment Soil Map 92 F/G (Port Alberni) indicates that the soils in and around the site are part of the Hiller Formation, which composed predominantly of shallow stony Brunisols, a soil type which has only undergone slight soil development from the parent material of sandstone or conglomerate. The shallow soils covering most of the site are typically rapidly-draining, with the most common soil texture being gravelly loamy sand.

A map of "Old Nanoose" obtained from the Craig Heritage Museum in Parksville, shows land use in the area dating from the 1940's or 1950's. During that period, the area was sparsely settled and largely forested. The intertidal lagoon at Moorecroft was then referred to as Jingle Pot Cove. According to the map shown in *A History of Nanoose Bay* (Williams Nicholls 1958), the forested area comprising the southern part of the site was Lot 52, owned by R. Westmoreland. No owner was attached to Lot 110, which included land extending from the subject property northward to Dorcas Point. No industrial activity is indicated in proximity to the site in the 1940's and 1950's. On-line research found there was an explosives plant (Giant Powder Works) located about 5 km to the southeast of the site that operated from 1912 to 1925 (Paterson and Basque 1989).

Williams Nicholls (1958) notes that the original Moorecroft Camp was founded by Gertrude E. Moore in the mid-1930's, naming it after her family's homestead in Ontario. Miss Moore operated the camp for almost two decades before selling it to the current owner, the United Church, due to her failing health. The United Church purchased an additional 14 acres for the campground from the Clayton family in 1976.

The 1980 and 2002 air photos covering the region (Appendix A) do not indicate any significant changes to land use at the site. The 1980 air photo mosaic (Ref. # A993.03-1a) shows a narrow clearing connecting Arab/Jingle Pot Cove to Nuttal Bay in a more or less straight line running east-west. The clearing for the playing field is present in the southern part of the site, but adjacent areas appear largely forested. Some partial clearing is evident on adjacent parcels to the west and south in 1980. The 2002 air photo shows four new residences on the eastern side of Dorcas Point Road, due west of the northern subject parcel. It also shows residential subdivisions along Clayton Crescent and Nuttal Drive to the west of the southern subject parcel. The 2002 orthophoto shows a primitive road extending almost to the site's western property boundary, where the present day La Selva Place exists.

The chain of title search conducted by Conservation West Property Services is summarized in Appendix B. Changes in ownership of the northern parcel, which includes the original Moorecroft Camp was traced from 1913 to the present. This parcel was purchased from the Esquimalt and Nanaimo Railway Company by L. Allin in 1913, then repurchased the same year by the Yorkshire Guarantee and Securities Corporation, who facilitated many land purchases in B.C. by foreigners. Between 1914 and 1930, the property was held by seven different individuals, some or all of which may have been related. Robert Proctor bought the property in 1914. It then switched hands several times before an Arthur Proctor acquired the property in 1930. Gertude Moore and Lett Sherwood purchased the northern parcel in 1934. Title was transferred to the Moorecroft Girls Camp Ltd. in 1941. Title reverted back to Miss Moore between 1956 and 1960. In 1960, the United Church took over the property and has owned it to the present day.

The chain of title followed changes in ownership of the southern parcel from 1893 to the present. This parcel was originally purchased from the Esquimalt and Nanaimo Railway Company by J. McKibben in 1893. The following year John Stewart's name was added to the title. The latter took sole ownership of the property in 1901. In 1913, the southern parcel was purchased by the same L. Allin who acquired the northern parcel that year. Between 1919 and 1934 the property was owned by local farmers John Stewart and Fredrick Gaudet. In 1938, the southern property was acquired by the Moorecroft Girls Camp Ltd. Like the northern parcel, the southern parcel reverted back to Miss Moore in 1956 before being acquired by the United Church in 1960. The title for the southern parcel remained in Miss Moore's name between 1956 and 1960. From 1960 to the present, the United Church has held the title to the southern parcel of the subject site.

A search of the Ministry of Environment's Contaminated Sites Registry in December of 2010 found no listings of concern for either of the parcel identifiers associated with the subject property.

### **3.2 Historical and Current Site Information from Personal Interviews**

Mr. Joe Skipsey, a longtime Nanoose Bay resident closely associated with the operation of Moorecroft Camp, was contacted by telephone on January 6<sup>th</sup>, 2011, to discuss various aspects of the subject property. Regarding fuel storage devices, he recollected that all of the 275 gallon furnace oil tanks at Moorecroft Camp have been replaced at least once since his first involvement with the site in 1968. He mentioned that the large (800 gallon) furnace oil tank used for Stringer Hall was apparently installed around 1957, after being salvaged from a pulp mill operation in Port Alberni. He noted that, although this large tank has not been replaced, it was designed for heavy duty, being constructed of 3/8" steel plating.

With regard to waste management at Moorecroft Camp, Mr. Skipsey recalled that all paper waste was burned on-site from at least the late 1960's onward. In that era, he believed all non-paper waste was routinely collected and taken to the regional landfill for disposal. He had heard of a small dumpsite used in the 1950's for domestic refuse, reportedly located near the archery range in the south-central part of the site. However,

the area has largely grown over now, and he was not certain of the precise location of the dump site.

Issues relating to water quality were also discussed with Mr. Skipsey. He noted that the neither of site's two wells have been used since the 1950's. Both wells were relatively shallow (i.e. < 5 m depth). The RDN had an old water main running roughly east-west through the southern parcel comprising Moorecroft Camp. However, the current water main, part of the RDN's domestic water system, occurs along a road allowance located in the southern part of the southern parcel. According to Mr. Skipsey, water line improvements were undertaken around the same time as the Beachcomber Marina was under construction.

Mr. Skipsey described the waste water system at Moorecroft Camp as being comprised of five septic fields. One field services Stringer Hall and the caretaker's house, another is for grey water from Stringer Hall, and yet another is for the Nurse's Cabin and Directors' Cain. There are also separate septic fields for each of the washroom buildings, Splash 1 and Splash 2. Four of the fields were installed at intervals spanning each decade since the 1970's. The oldest field, used for the Splash One building, is of unknown age. All five septic fields were last serviced in 2007. No odours associated with septic field break-out have been noted by Mr. Skipsey during his time at Moorecroft Camp.

According to Mr. Skipsey, in addition to the youth camp, some selective logging was carried out on the Moorecroft Camp grounds in the 1990's. A total of 1,500 m<sup>3</sup> of wood was harvested from the site at that time. The timber was processed on-site using a portable sawmill. A second harvest planned for the site a few years later was cancelled.

The current caretaker for the site, Mr. Pete Vanderbeek, was contacted for additional information regarding the location of the abandoned water wells. He related that one well is located near the playing field, about 30 m north of a standpipe visible in the field. The other is located near the Craft Hut, near the bend in the road to Vesper Point (about 15 m to the northeast). Like Mr. Skipsey, Mr. Vanderbeek has not observed any sign of septic field break-out during his time at Moorecroft Camp.

Mr. Doug Penny was contacted to discuss any fires that the Nanoose Bay Volunteer Fire Department may have attended at Moorecroft Camp in recent memory. He could not recall any incidences of structural fires at the site, but did recall there were three brush fires there in the summer of 2003. The fires occurred in forested west-central part of the site. They were extinguished using foaming agents. Mr. Penny knew of no instances of garbage fires occurring on the site, noting that the camp had used dumpsters for several decades.

The RDN's most recent orthophoto of the area (2009) does not indicate any industrial land uses occurring in proximity to the site. The Unique Properties listing for Moorecroft Camp notes that the surrounding area currently includes smaller residential or recreational waterfront properties, typically ranging from one to five acres in size. It states that many homes in the area function as summer or second homes.

### **3.3 Site Reconnaissance**

Field reconnaissance was carried out at the site on December 16<sup>th</sup> of 2010. It involved walking all passable roads and trails, with a focus on developed parts of the site. A standard Level 1 Audit checklist was completed during the tour and photographs were taken of the site (Appendix C).

The site is mostly forested, predominantly by mature Douglas-fir trees. Within the matrix of older conifer stands, there are small areas of mature mixed forest, young mixed forest, riparian forest, and wetland habitat. A small clearing was noted about 40 m east of the archery range. No suspicious fill piles were observed within in this clearing or elsewhere across the subject property.

During the inspection, no large areas of stained soil or distressed vegetation were detected near areas associated with the storage of paints, chemicals, or hydrocarbons. Areas inspected included the six above-ground fuel storage tanks, the flammable liquids storage shed (Fig. 4), the wood shed/maintenance building, and the boat house. No unusual odours were detected in the above areas.

Almost all of the furnace oil storage tanks have some light surface rust on their exteriors, but only the tanks for Fern Cottage and Kennedy Lodge had flaking paint on their exteriors (Fig. 5). The large furnace oil storage tank for Stringer Hall, likely the oldest tank on the property, was assessed as being in good condition. Paint storage at the back of the wood shed/maintenance building appeared neat and tidy, with no stains observed on the shop floor (Fig. 6).

No unusual sheens or odours were detected on surface waters across the site including: wetted ditches beside the boat shed access road, Skipsey Lake, or the unnamed creek flowing from it (Fig. 7).

A fair amount of trash was observed in and around the abandoned craft hut. Most of it consisted of glass and wood. No sign of rusted metal barrels or abandoned refrigerators was detected outside this building or elsewhere across the site.

### **3.4 Soil and Water Sampling**

Laboratory Analysis Certificates have been included in Appendix D of this report. A total of seven soil samples were collected at the site, all a short distance down-gradient of hydrocarbon storage areas. Owing to the rolling topography and the presence of obstacles such as buildings, trees and roads, the sampling distance was quite variable, ranging from 0.3 m to 12 m from hydrocarbon storage areas. The samples were obtained from the maximum depth achievable by hand digging, generally in the range of 15 cm to 30 cm. Soil samples were analysed for the presence of volatile hydrocarbons (BTEXS) associated with gasoline and diesel fuels. They were also submitted for the gross parameter Oil and Grease (O&G), to test for the presence of non-volatile hydrocarbons occurring in diesel fuel, furnace oil, and crankcase lubricants.



It should be noted that O&G analysis will not discriminate between petroleum-based hydrocarbons and those originating from animal- and plant-based fats. However, the latter are considered unlikely to contribute much to the areas sampled. As indicated in Table 1, all seven of the soil samples tested below the limits of detection for the various types of volatile hydrocarbons (BTEXS). Oil and Grease test results for the submitted samples ranged from <100 mg/kg to 3,990 mg/kg (Table 1).

Fecal coliform testing of surface runoff, shown in Table 2, ranged from 2 to 5 Colony Forming Units. The background level of fecal coliforms in the small stream flowing north past Fern Cottage and Boulderling Room was 13 Colony Forming Units.



**Figure 4. No large areas of stained soil or distressed vegetation were seen around the flammable liquids storage shed, located between Splash 1 and Cabin 2.**



**Figure 5. Flaking paint was noted on the furnace oil tank for Fern Cottage.**



**Figure 6. No stains or questionable storage was observed within the paint storage area in the rear of the maintenance shed.**



**Figure 7. Water quality appeared good in the small creek flowing from Skipsey Lake. The latter supported breeding by pollution-sensitive amphibians in 2007.**

**Table 1. Summary of soil sample analyses at Moorecroft Camp, December 2010.**

<b>Sample ID</b>	<b>Sampling Location</b>	<b>Max. Sample Depth (cm)</b>	<b>BTEXS Constituents</b>	<b>Oil &amp; Grease (mg/kg)</b>
MCS-1	Stringer Hall: 6 m down-gradient from tank.	15	< Detection Limits	148
MCS-2	Fern Cottage: 0.5 m down-gradient from tank.	25	< Detection Limits	369
MCS-3	Caretaker's House: 2.5 m down-gradient from tank.	15	< Detection Limits	284
MCS-4	Splash 1: 0.3 m down-gradient from tank.	25	< Detection Limits	379
MCS-5	Flammable Liquids Storage Shed: 1.5 m down-gradient from tank.	30	< Detection Limits	3,990
MCS-6	Kennedy Lodge: 12 m down-gradient from tank.	27	< Detection Limits	186
MCS-7	Splash 2: 10 m down-gradient from tank.	25	< Detection Limits	< 100 (Detection Limit)

**Table 2. Summary of water sample analysis at Moorecroft Camp, December 2010.**

<b>Sample ID</b>	<b>Sampling Location</b>	<b>Fecal Coliforms (Most Probable # of Colony Forming Units)</b>	<b>Comments</b>
MCW-1	Surface runoff from ephemeral drainage below Stringer Hall.	2	Located down-gradient of two septic fields at Stringer Hall.
MCW-2	Surface runoff from ditch across from the Boat House.	5	Located down-gradient of septic fields for Splash 1 and Nurse's and Directors' Cabins.
MCW-3	Small unnamed creek flowing from Skipsey Lake.	13	Levels < 50 considered high quality trout streams in Pacific Northwest.

## **4.0 DISCUSSION**

### **4.1 General**

The historical review of the property found little to suggest a potential for significant soil and/or groundwater contamination resulting from past uses of the site. For many decades, the site and adjacent properties have remained largely forested. Registered title holders have been individual farmers, recreation-based organizations, or church groups as opposed to corporations involved in heavy industry. Development of the site, when it has occurred, has been of a small scale and has not involved any processes associated with heavy industry.

Interviews with personnel familiar with the site suggest that a modest degree of environmental management has been maintained there over the past 40 years or so. For example:

- non-paper waste was routinely taken to the regional landfill;
- furnace oil tanks were apparently replaced before they became problems;
- paint and fuel products were stored in dedicated locations ; and
- spill clean-up materials were kept in the refueling area.

The site includes septic fields of varying ages, some of which have the potential to result in break-out due to historical damage and/or lack of servicing. However, all septic fields on the site have been pumped-out within the past three years. Samples of surface runoff following a major rain event in late December of 2010 did not indicate any problems with high fecal coliform counts, and no sewer-type odours have been noted by personnel who frequent the site.

Although there are six aging above-ground furnace oil tanks present on the property, most appeared to be in relatively good condition externally. No large soil stains were observed underneath them, although some hydrocarbon releases have probably occurred historically during fuel filter changes. Soil sample analyses did not reveal potential leakage problems with any of the furnace oil tanks. All soil samples collected near furnace oil tanks had undetectable levels of highly-soluble hydrocarbons (i.e. BTEXS). The presence of less-soluble hydrocarbons was detected near five of the six tanks as Oil and Grease. The Oil and Grease levels near the tanks were all below published Remediation Guidelines established by Environment Canada (EC) for soil in the Parkland context. Oil and Grease levels near tanks ranged from <100 mg/kg to 379 mg/kg, below the EC Remediation Guideline of 500 mg/kg.

### **4.2 Potential Environmental Concerns**

While a basic level of site management has prevented serious environmental degradation of the site, there is nevertheless one area of concern. Soil sample results from the flammable liquids storage shed found no detectable volatile hydrocarbons, but it did reveal elevated levels of the gross parameter Oil and Grease (O&G).

The reported level for O&G was 3,990 mg/kg, which exceeds the Environment Canada Remediation Guideline of 500 mg/kg by a fairly large margin. The level of O&G in the soil in this area appears consistent with the accumulation of small releases over a long period of time. Environmentally friendly fuelling practices near water have been promoted in recent years, and practices at Moorecroft Camp likely improved since the camp first opened over 50 years ago.

While the level of Oil and Grease in soil near the flammable liquids storage shed is elevated, it would not be designated as Hazardous Waste under the B.C. Hazardous Waste Regulation (HWR). The O&G threshold for designation as Hazardous Waste is 10 % dry weight, or 100,000 mg/kg. As a result, remediation of this area is not considered mandatory under the HWR. Nevertheless, given the contamination's proximity to a sensitive intertidal area, and the fact that the RDN is contemplating other work on the site (e.g. removal of substandard structures) remediation efforts would be advisable. Given the small footprint of the flammable liquids storage shed, the total volume of hydrocarbon contaminated soil is estimated to be less than 15 m<sup>3</sup>.

### **4.3 Recommendations**

Based on the RDN's building Condition Report for Moorecroft Camp, it is likely that a number of the existing structures will be removed from the site. Buildings that might be torn down include several where hydrocarbon-based products were stored, namely: the flammable liquid storage shed, Splash 1, Fern Cottage, and Kennedy Lodge. Although none of the existing furnace oil tanks at the site are leaking, it is recommended that any heated buildings retained on the site be converted to systems representing a lower risk to the environment (e.g. electrical, propane, solar).

Subsequent to the removal of the flammable liquids storage shed, it is recommended that on-site bioremediation be carried out on underlying soils. Bioremediation has been employed as a cost-effective technique for cleaning hydrocarbon contaminated soils since the early 1990's. It takes advantage of native soil microbes that have adapted to using hydrocarbons as a carbon source. Bioremediation is usually feasible at sites where there is enough space to construct a bioremediation cell and enough time to allow significant biodegradation of the contaminants to occur (Vance 1991). At Moorecroft Camp, there is abundant open space for the anticipated volume of material and, with RDN ownership of the site, adequate time (i.e. one or two summers).

It is recommended that a bioremediation cell measuring approximately 25 m<sup>2</sup> be constructed in a level area with good machinery access. The cell should be lined with heavy poly sheeting and have a 30 cm high berm of clean material formed around its perimeter. The bottom of the cell should include an array of PVC drain pipes exposed to the open air at one end, to ensure the lower layers of the contaminated material are well-oxygenated. Heavy equipment could be used to excavate the material from the contamination plume and load it into a dump truck. The dump truck would transport the contaminated material to the remediation cell. Once in the cell, the material could be hand-raked to an even thickness of between 30 cm and 50 cm.

To encourage soil microbes, the cell should be established by mid-spring and periodically watered, tilled and fertilized during the warm season. Costs associated with remediation have been estimated in Table 3 below.

**Table 3 Estimated Bioremediation Costs for Hydrocarbon-contaminated Soil near the Flammable Liquids Storage Shed**

<b>Item</b>	<b>Unit Cost (excluding HST)</b>	<b>Estimated Cost</b>
20' x 20' Poly Tarp	1 @ \$ 60.00	\$ 60.00
Perforated PVC pipe 3" x 10' long	12 @ \$15.00	180.00
Excavator time – soil removal and remediation cell preparation	4 hrs @ 250.00	1000.00
Dump truck – soil transport	4 hrs @ 150.00	600.00
Sample Testing – late spring & late summer for O&G	4 @ \$40.00	160.00
Lawn Starter Fertilizer 7 kg bag	1 @ \$20.00	20.00
Consultant – remediation cell set-up & maintenance; monitoring (10 hrs).	10 @ 55.00	<u>550.00</u>
<b>Total Estimated Cost Excluding HST</b>		<b><u>\$2,570.00</u></b>

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary of Conclusions

Based on the information gathered in the course of this study, the following conclusions have been drawn about the potential for soil or groundwater contamination at Moorecroft Camp:

1. An historical review of the site suggests a low potential for significant soil and/or groundwater contamination resulting from past uses.
2. Historical maps and air photos indicate that the site and adjacent properties have remained largely forested since at least the late 1950's. Registered title holders dating back to the E & N Land Grant have included farmers, recreation-based organizations, and church groups as opposed to corporations involved in heavy industry.
3. Interviews indicate that development of the site has involved some small- scale forestry and commercial recreational development.
4. Operation of Moorecroft Camp over the past 40 years has involved a modest degree of maintenance and environmental management. No suspicious trash or fill piles were noted during site inspections.
5. The potential for groundwater contamination through failing septic fields was assessed as low, given their service history and the absence of sewer-type odours during wet periods. Creek and surface runoff samples from December of 2010 did not indicate any problems with high fecal coliform counts.
6. The six aging above-ground furnace oil tanks present on the property are in relatively good condition externally. Soils sampled near the tanks did not indicate any leakage problems with them.
7. Soils near the flammable liquids storage shed had no detectable volatile hydrocarbons (BTEXS), of particular environmental concern due to their high solubility.
8. Soils near the flammable liquids storage shed had elevated levels of the gross parameter Oil and Grease (O&G). While the level of 3,990 mg/kg exceeds federal remediation guidelines for parkland, it is not considered Hazardous Waste as described under provincial statute.
9. Based on its building footprint and shallow soils in the area, the volume of hydrocarbon contaminated soil around the flammable liquids storage shed is estimated to be less than 15 m<sup>3</sup>.

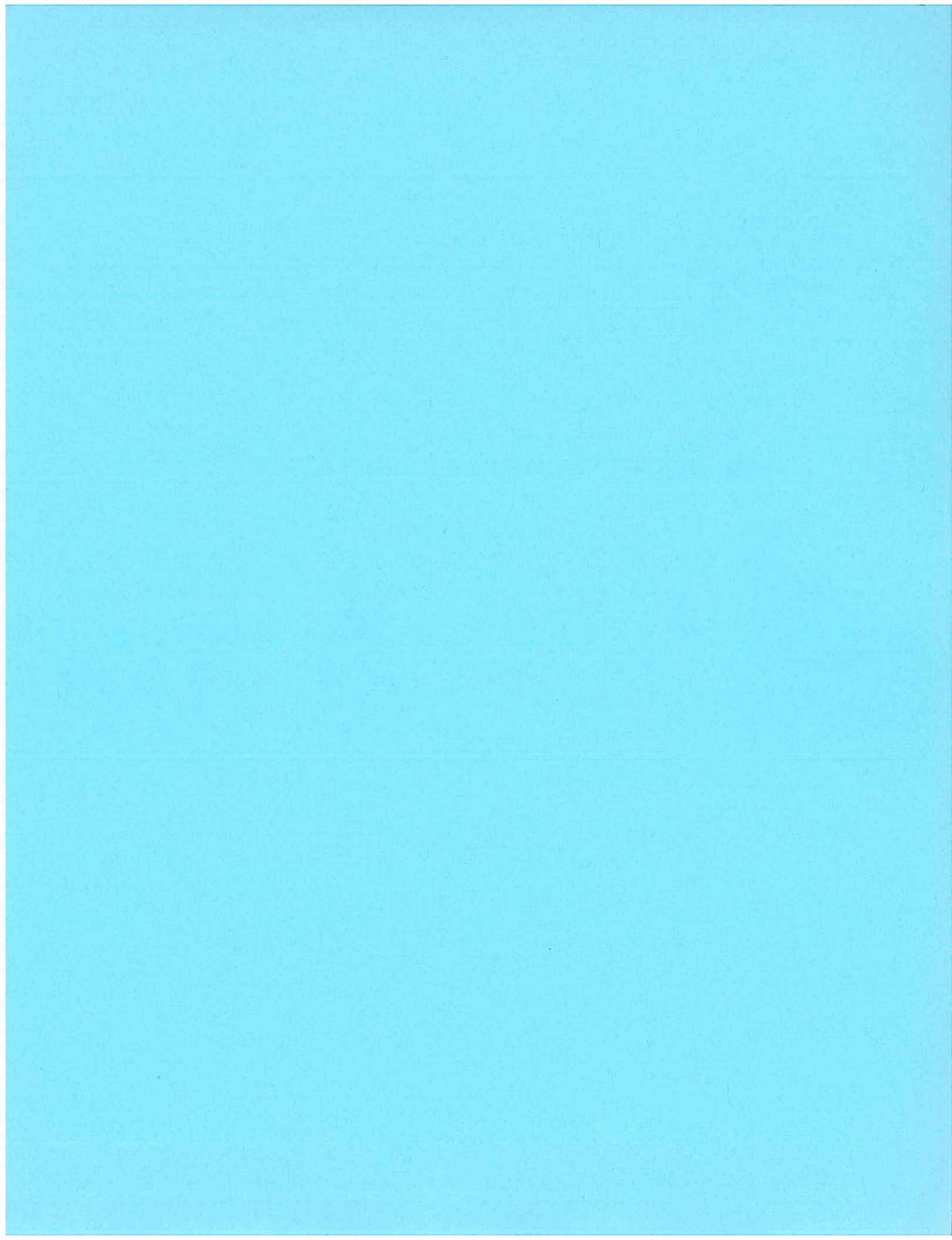


## **5.2 Summary of Recommendations**

1. Given the hydrocarbon contaminated area's proximity to a sensitive intertidal area, and the fact that the RDN is contemplating other work on the site, remediation efforts should be undertaken.
2. Following removal of the flammable liquids storage shed, it is recommended that on-site bioremediation be carried out on the underlying soils.
3. A bioremediation cell of 25 m<sup>2</sup> should be constructed in a level area with good machinery access. The total cost of installing and maintaining a bioremediation cell was estimated to be \$2,570.00.
4. Although none of the existing furnace oil tanks at the site are leaking, it is recommended that any retained buildings on the site be converted to systems representing a lower risk to the environment (e.g. electrical, propane, solar).

## 6.0 LITERATURE CITED

- Canadian Council of Ministers of the Environment (CCME). 1994. *Subsurface Assessment Handbook for Contaminated Sites*. Minister of Supply and Services, Ottawa, Ontario. 293 p.
- Canadian Standards Association (CSA). 2001. *Phase I Environmental Site Assessment (CSA Z768-01)*. Ottawa, Ontario. 22 p.
- Canadian Standards Association (CSA). 2001. *Phase II Environmental Site Assessment (CSA Z769-00)*. Ottawa, Ontario. 22 p.
- Massey, N.W.D., D.G. MacIntyre, and P.J. Desjardins. 2003. *Digital Map of British Columbia: Tile Nm10 Southwest BC*, British Columbia Ministry of Energy and Mines, Geofile 2003-04.
- Paterson, T. W., and G. Basque. 1989. *Ghost Towns and Mining Camps of Vancouver Island*. Sunfire Publishing Ltd., Langely, B.C.
- Vance, D.B. 1991. *On-site Bioremediation of Oil and Grease Contaminated Soils*. The National Environmental Journal Sept./Oct. 1991 Vol.1, No. 1, pp. 26-30.
- Williams Nicholls, M. 1958. *A History of Nanoose Bay*. First Edition. Craig Heritage Museum Archives, Parksville, B.C.



## APPENDIX A

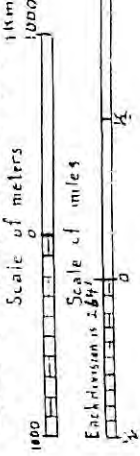
**Map of “Old Nanoose” from  
M. Williams Nicholls (1958)**

**&**

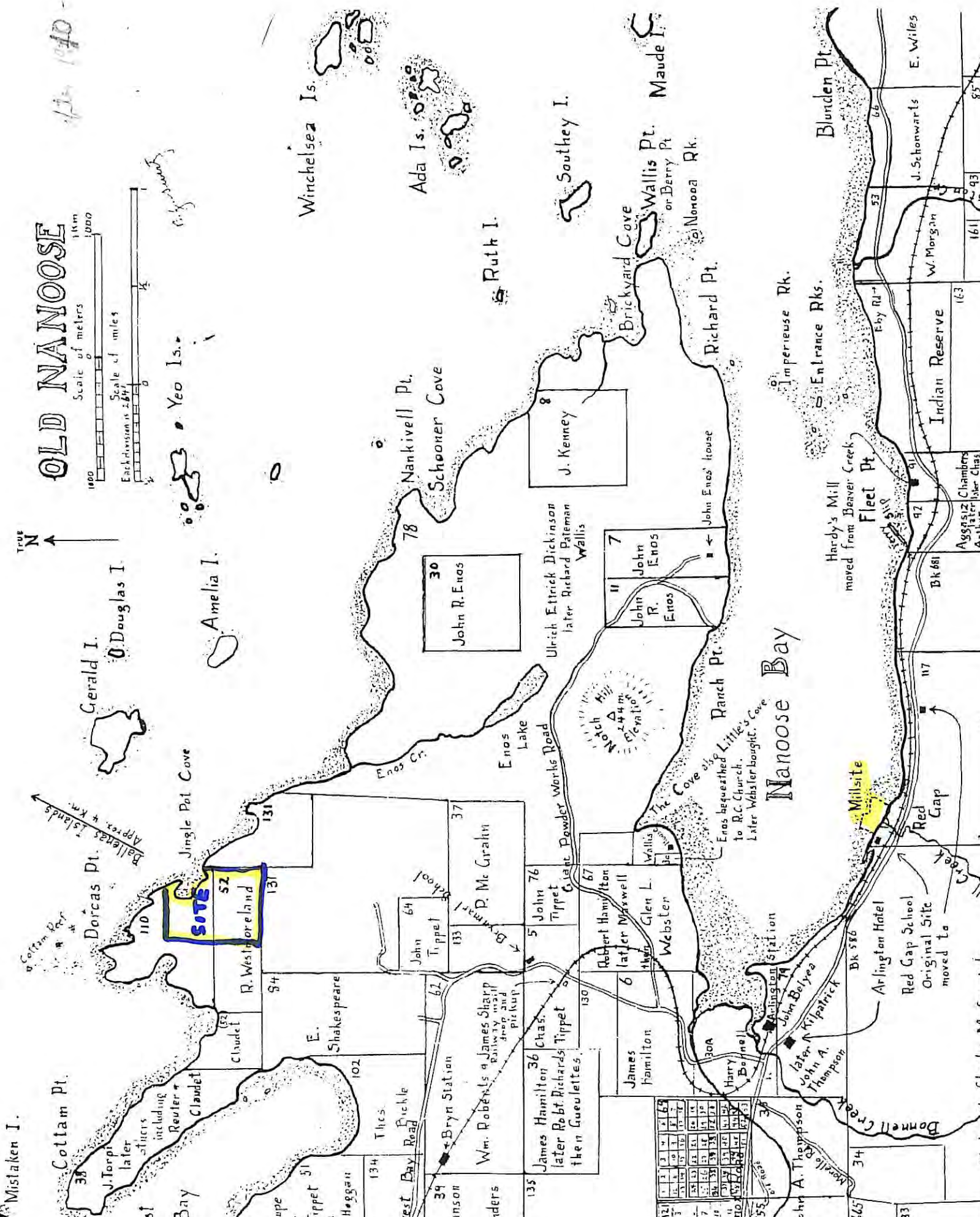
**Aerial Photographs of the Site  
from 2002 and 2009.**

11-1940-11

# OLD NANOOSE



True N





Properties

Land Use Regulations

Utilities and Services

Environment Atlas

Tools



Accuracy not Guaranteed



Scale 1: 15,000.00

GO OnPoint™

2002



Properties | Land Use Regulations | Utilities and Services | Environment Atlas

Tools

A toolbar containing various icons for map navigation and utility functions, including zoom in (+), zoom out (-), pan (hand), home, previous view, next view, globe, XY coordinates, layers, print, help (lightbulb), and a search icon.

Accuracy not Guaranteed



Scale 1: 15,000.00

GO OnPoint™

2009

**APPENDIX B**

**Current Title Documents  
&  
Chain of Title Report  
Prepared by Conservation West  
Property Services**



Date: 20-Dec-2010 TITLE SEARCH PRINT  
Requestor: (SC38998) MINISTRY OF ENVIRONMENT  
Folio: TITLE - L23985

Time: 16:15:53  
Page 001 of 001

VICTORIA LAND TITLE OFFICE TITLE NO: L23985  
FROM TITLE NO: E75969

APPLICATION FOR REGISTRATION RECEIVED ON: 08 APRIL, 1982  
ENTERED: 22 APRIL, 1982

REGISTERED OWNER IN FEE SIMPLE:

BRITISH COLUMBIA CONFERENCE PROPERTY DEVELOPMENT COUNCIL OF THE UNITED  
CHURCH OF CANADA,  
(SOCIETY NO. 6928),  
200-1955 W. 4TH AVENUE,  
VANCOUVER, B.C.  
V6J 1M7

TAXATION AUTHORITY:

PORT ALBERNI ASSESSMENT AREA

DESCRIPTION OF LAND:

PARCEL IDENTIFIER: 006-884-849  
LOT A, DISTRICT LOT 110, NANOOSE DISTRICT, PLAN 1777

LEGAL NOTATIONS: NONE

CHARGES, LIENS AND INTERESTS:

NATURE OF CHARGE  
CHARGE NUMBER DATE TIME

EXCEPTIONS AND RESERVATIONS

M76300

REGISTERED OWNER OF CHARGE:

ESQUIMALT AND NANAIMO RAILWAY COMPANY  
M76300

REMARKS: A.F.B. 9.693.7434A

81278G; SECTION 172(3)  
FOR ACTUAL DATE AND TIME OF REGISTRATION  
SEE ORIGINAL GRANT FROM E & N RAILWAY COMPANY  
FOR ACTUAL DATE AND TIME OF REGISTRATION SEE  
ORIGINAL GRANT FROM E & N RAILWAY COMPANY

"CAUTION - CHARGES MAY NOT APPEAR IN ORDER OF PRIORITY. SEE SECTION 28, L.T.A."

DUPLICATE INDEFEASIBLE TITLE: NONE OUTSTANDING

TRANSFERS: NONE

PENDING APPLICATIONS: NONE

\*\*\* CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN \*\*\*

Date: 20-Dec-2010  
Requestor: (SC38998)  
Folio:

TITLE SEARCH PRINT  
MINISTRY OF ENVIRONMENT  
TITLE - L23984

Time: 16:16:42  
Page 001 of 002

VICTORIA LAND TITLE OFFICE TITLE NO: L23984  
FROM TITLE NO: F96311

APPLICATION FOR REGISTRATION RECEIVED ON: 08 APRIL, 1982  
ENTERED: 22 APRIL, 1982

REGISTERED OWNER IN FEE SIMPLE:

BRITISH COLUMBIA CONFERENCE PROPERTY DEVELOPMENT COUNCIL OF THE  
UNITED CHURCH OF CANADA (SOCIETY NO. 6928)  
200 - 1955 WEST 4TH AVENUE,  
VANCOUVER, B.C.  
V6J 1M7

TAXATION AUTHORITY:

PORT ALBERNI ASSESSMENT AREA

DESCRIPTION OF LAND:

PARCEL IDENTIFIER: 001-170-228  
LOT 1 OF DISTRICT LOTS 52 AND 110, NANOOSE DISTRICT, PLAN 31217

LEGAL NOTATIONS: NONE

CHARGES, LIENS AND INTERESTS:

NATURE OF CHARGE

CHARGE NUMBER	DATE	TIME
---------------	------	------

EXCEPTIONS AND RESERVATIONS

M76300

REGISTERED OWNER OF CHARGE:

ESQUIMALT AND NANAIMO RAILWAY COMPANY  
M76300

REMARKS: A.F.B. 9.693.7434A

SECTION 172(3)

FOR ACTUAL DATE AND TIME OF REGISTRATION SEE

ORIGINAL GRANT FROM E & N RAILWAY COMPANY

RIGHT OF WAY

F97328 1977-11-29 09:16

REGISTERED OWNER OF CHARGE:

REGIONAL DISTRICT OF NANAIMO  
F97328

REMARKS: INTER ALIA, PART IN PLAN 936 RW,  
ASSIGNMENT OF 211427G

RIGHT OF WAY

H64825 1979-08-08 09:06

REGISTERED OWNER OF CHARGE:

REGIONAL DISTRICT OF NANAIMO  
H64825

REMARKS: PART IN PLAN 942 RW  
ASSIGNMENT OF 209853G

"CAUTION - CHARGES MAY NOT APPEAR IN ORDER OF PRIORITY. SEE SECTION 28, L.T.A."

DUPLICATE INDEFEASIBLE TITLE: NONE OUTSTANDING

Date: 20-Dec-2010  
Requestor: (SC38998)  
Folio:

TITLE SEARCH PRINT  
MINISTRY OF ENVIRONMENT  
TITLE - L23984

Time: 16:16:42  
Page 002 of 002

TRANSFERS: NONE

PENDING APPLICATIONS: NONE

\*\*\* CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN \*\*\*



*CONSERVATION WEST PROPERTY SERVICES*

4683 Lochwood Crescent

Victoria, BC, V8Y 1A9

(250) 658-8801

Ursus Environmental  
600 Castle Way  
Parksville, BC  
V9P 2R1

December 16, 2010

Attention: Joe Materi, RP Bio.

Dear Joe:

Re: Moorecroft Bible Camp Chain of Title Search:

In accordance with your verbal request and based on the information you provided to me on December 9<sup>th</sup>, the following shows the ownership history of the foreshore lot and the chain of titles associated with the upland parcels.

- 1) Lot A, District Lot 110, Nanoose District, Plan 1777 (PID 006-884-849).  
L23985 (April 1982) British Columbia Conference Property Development Council of the United Church of Canada, Society No. 6928, Vancouver BC.  
E75969 (August 1976) British Columbia Conference Council for Church Extension of the United Church of Canada, Vancouver, BC.  
94141-N (December 1960) United Church(BC Conference) Camping Society, Vancouver, BC.  
77138-N (October 1956) Gertrude E. Moore, Toronto, Ontario.  
27672-N (October 1941) Moorecroft 'Girls' Camp Ltd, Vancouver, BC.  
17465-N (May 1934) Lett Sherwood, Nanoose, BC.  
17272-N (February 1934) Lett Sherwood, Nanoose, BC.  
17271-N (February 1934) Gertrude E. Moore.  
13843-N (March 1930) Arthur Proctor.  
11051-N (December 1927) William Mitchell, Nanaimo, BC.  
11023-N (December 1927) George Lilyington.  
10030-N (March 1927) John Storey, Nanaimo, BC.  
3926-N (May 1922) Phyllis Forester Nash, Vancouver, BC.  
21263-I (--- ----) Sydney Taylor.  
15280-I (February 1914) Robert Proctor), Vancouver, BC.  
11689-I (July 1913) Yorkshire Guarantee and Securities Corporation Ltd.  
10943-I (June 1913) Lacon Allin, Victoria, BC.  
AFB Vol 30, Fol 266-4026F (June 1913) Lacon Allin, Victoria, BC.

AFB Vol 9, Fol 693-7434a Esquimalt and Nanaimo Railway Co.

2) Lot 1, District Lots 52 and 110, Nanoose District, Plan 31217 (PID 001-170-228).  
L23984 (April 1982) British Columbia Conference Property Development Council of  
the United Church of Canada, Society No. 6928, Vancouver BC.  
F96311 (November 1977) British Columbia Conference Council for Church  
Extension of the United Church of Canada, Vancouver, BC.  
F96310 (November 1977) British Columbia Conference Council for Church  
Extension of the United Church of Canada, Vancouver, BC.  
E75968 (August 1976) British Columbia Conference Council for Church Extension  
of the United Church of Canada, Vancouver, BC.  
94142-N (December 1960) United Church(BC Conference) Camping Society,  
Vancouver, BC.  
77139-N (October 1956) Gertrude E. Moore, Toronto, Ontario.  
21866-N (February 1938) Moorecroft Girls Camp Ltd.  
17281-N (March 1934) Frederick Claudet, Nanoose Bay, BC.  
13156-N (August 1922) John Stewart, Nanoose, BC.  
32074-I (March 1919) John Stweart, Nanoose, BC.  
10943-I (June 1913) Lacon Allin, Victoria, BC  
AFB Vol 20, Fol 225-6862 (May 1901) John Stewart  
AFB Vol 16, Fol 347-18165/67 (May 1894) John McKibben and John Stewart  
AFB Vol 15, Fol 397-16894 (August 1893)John McKibben  
AFB Vol 9, Fol 693-7434a Esquimalt and Nanaimo Railway Co.

3) Block A, District Lot 249, Nanaimo District. This foreshore parcel is currently held by  
the British Columbia Conference Property Development Council of the United Church of  
Canada under a standard lease from the Province for commercial recreation purposes  
(community outdoor recreation). The lease current was from September 27, 1986 until  
September 27, 2016. Lot 249 was first surveyed in 1951 and held under a 10 year lease  
by the Moorecroft Girl's Camp Ltd. The lease was assigned to the United Church in  
1955. The Church has held leases on Block A specifically since 1966 for dyke,  
swimming, boat launching and community recreation purposes (PIN 358801).

Current titles for (1) (and 2) above are attached. There were no records for any of these  
properties in the Contaminated Site Registry.

I trust you will find the foregoing suitable for your purposes. If you require anything  
further please let me know.

Yours truly



R. J. Walker  
Property Consultant, Conservation West Property Services

**APPENDIX C**

**Photographs Taken of the Site in December of  
2010**



1. Despite its age, the furnace oil tank by Stringer Hall is in good condition.



2. Fern Cottage with typical older 275 gallon furnace oil tank.



3. Heating oil tank located behind Caretaker's Residence.



4. Heating oil tank on east side of Splash 1 building.





5. Front view of Maintenance / Wood Storage building.



6. Interior view of flammable liquids storage shed.



7. View to North down beach access road.



8. View to east from beach access road.



9. West entrance to abandoned Craft Hut building.



10. Boat House building viewed from beach.

## APPENDIX D

### Laboratory Analysis Certificates



# North Island Laboratories

• 2755 B Moray Avenue, Courtenay, B.C. V9N 8M9 Tel: (250) 338-7786 Fax: (250) 338-7553

## Certificate of Analysis

Report To: Ursus Environmental  
Joe Materi  
600 Castle Way  
Parksville, BC  
V9P 2R1

Lab Number: 85084  
Date Reported: 6 Jan 11  
Date Completed: 6 Jan 11  
Date Received: 21 Dec 10 11:42

Sampled By: Joe Materi  
Sampling Date: 20 Dec 10 0:00

Test	Result	Units	Detection Limit
<b>85084-01</b> <b>MCS-1</b>	<b>Soil</b>		
Benzene	<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease	148	mg/kg	100 mg/kg
<b>85084-02</b> <b>MCS-2</b>	<b>Soil</b>		
Benzene	<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease	369	mg/kg	100 mg/kg
<b>85084-03</b> <b>MCS-3</b>	<b>Soil</b>		
Benzene	<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether	<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease	284	mg/kg	100 mg/kg

Results relate only to samples as submitted. This certificate must not be reproduced, except in its entirety, without written consent from the laboratory.

06/01/2011

Page 1 of 3



# North Island Laboratories

• 2755 B Moray Avenue, Courtenay, B.C. V9N 8M9 Tel: (250) 338-7786 Fax: (250) 338-7553

85084-04	MCS-4	Soil		
Benzene		<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease		379	mg/kg	100 mg/kg

85084-05	MCS-5	Soil		
Benzene		<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease		3990	mg/kg	100 mg/kg

85084-06	MCS-6	Soil		
Benzene		<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease		186	mg/kg	100 mg/kg

85084-07	MCS-7	Soil		
Benzene		<0.02	ug/g dry weight	0.02 ug/g dry weigh
Toluene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Ethylbenzene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Total Xylenes (m,p,o)		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Styrene		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Methyl t-Butyl Ether		<0.05	ug/g dry weight	0.05 ug/g dry weigh
Oil and Grease		<100	mg/kg	100 mg/kg

85084-08	MCW-1	Fresh Water		
Fecal Coliforms (A1)		2	MPN/100mL	2 MPN/100mL

Results relate only to samples as submitted. This certificate must not be reproduced, except in its entirety, without written consent from the laboratory.

06/01/2011

Page 2 of 3



# North Island Laboratories

• 2755 B Moray Avenue, Courtenay, B.C. V9N 8M9 Tel: (250) 338-7786 Fax: (250) 338-7553

85084-08	MCW-1	Fresh Water		
85084-09	MCW-2	Fresh Water		
Fecal Coliforms (A1)		5	MPN/100mL	2 MPN/100mL
85084-10	MCW-3	Fresh Water		
Fecal Coliforms (A1)		13	MPN/100mL	2 MPN/100mL
85084-01				

Test	Method	Analyst	Date
Benzene	Exova Subcontract Exova Subcontract	EXL	
Ethylbenzene	Exova Subcontract Exova Subcontract	EXL	
Fecal Coliforms (A1)	MPN APHA 9221	NIsL	21/12/2010
Methyl t-Butyl Ether	Exova Subcontract Exova Subcontract	EXL	
Oil and Grease	Ext. Grav.-Exova Subcontract	EXL	23/12/2011
Styrene	Exova Subcontract Exova Subcontract	EXL	
Toluene	Exova Subcontract Exova Subcontract	EXL	
Total Xylenes (m,p,o)	Exova Subcontract Exova Subcontract	EXL	

Approved By:

Catherine Black, Owner/Operator