Starfield Resources Inc.

Ferguson Lake Project

Nunavut, Canada

STARFIELD RESOURCES INC.

Assessment of Soil Hydrocarbon Contamination at Ferguson Lake

Prepared by:

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Vancouver/Yellowknife

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EXECUTIVE SUMMARY

Executive Summary

The Ferguson Lake Project is a copper, nickel, cobalt, platinum, and palladium property currently being explored by Starfield Resources Inc. It is located on the western shores of Ferguson Lake, 240 kilometres west of Rankin Inlet and 180 kilometres south of Baker Lake, between Yathkyed and Kaminuriak lakes. The old camp is located primarily on bedrock with shallow soils in depressions.

The types of fuel and lubricants that are stored on the camp site consist of JET-B, P-50 diesel motive, gasoline, propane, and an assortment of hydraulic and motor oils. JET-B is used for the purposes of helicopter refuelling and heating purposes. All JET-B products are contained in 205 L drums. P-50 diesel motive is used for heating purposes and the powering of generators, pumps, and other related heavy equipment. It is stored in pre-inspected barrels that previously contained sealed JET-B. Gasoline is for fuelling the ski-doos. Propane is used for heating and cooking purposes. Oils and lubricants are used on the heavy equipment.

A preliminary hydrocarbon assessment was done at Ferguson Lake Old Camp in the summer of 2006. Results from this assessment indicated that some areas were contaminated with hydrocarbons from previous exploration activity. Using standards and sampling techniques adopted by the Canadian Council of Ministers of the Environment (CCME) (2007) a detailed second assessment was carried out in the summer of 2007 at Ferguson Lake Old Camp, at the New Camp, and at the Inco Camp. The objective of the second trip was to determine how extensive the hydrocarbon contamination was at sites sampled in 2006 and to identify and delineate other areas that may also have contaminated soils.

Results suggest that soil contamination has occurred at various locations at Ferguson Lake Old Camp, New Camp, and Inco Camp. It is recommended that additional sampling be carried out to identify the remainder of the contamination but not before all structures, equipment, *etc*., have been removed from the site and excavation of the contaminated soils has been conducted.

ABBREVIATIONS

Abbreviations

petroleum hydrocarbons	PHC
equivalent carbon number	ECN
extractable petroleum hydrocarbon	EPH
Canadian Council of Ministers of the Environment	CCME
Canada Wide Standards	CWS
CWS Fraction 1	F1
CWS Fraction 2	F2
CWS Fraction 3	F3
CWS Fraction 4	F4

ACKNOWLEDGEMENTS

Acknowledgements

This report was prepared for Starfield Resources Inc. by Rescan Environmental Services Ltd. (Rescan). The report was written by Rachelle Lalonde (M.Sc., A.Ag.). Dr. Susan Ames (Ph.D. P.Ag.) reviewed the report. François Landry (M.Sc., R.P.Bio) also reviewed the report in addition to providing overall project management.

The initial field program was conducted in the summer of 2006 by Rescan scientist Dr. Susan Ames. Soils field work in 2007 was conducted by Rescan scientist Rachelle Lalonde and two field assistants, Najuk Kusugak and Jerome Misheralak. Field work was conducted out of Ferguson Camp with logistical support provided by Ian Mitchell of Starfield Resources Inc.

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1. INTRODUCTION

1. Introduction

Contaminated sites pose a threat to human health and the environment. Management practices that allow for quick identification, assessment, and remediation are important in containing the contaminant(s) and rehabilitating the site.

A preliminary hydrocarbon assessment was done at Ferguson Lake Old Camp in the summer of 2006. Results from this assessment indicated that some areas were contaminated with hydrocarbons from previous exploration activity. Using standards and sampling techniques adopted by the Canadian Council of Ministers of the Environment (CCME) (2007) a detailed second assessment was carried out in the summer of 2007 at Ferguson Lake Old Camp, New Camp, and Inco Camp. The objective of the second trip was to determine how extensive the hydrocarbon contamination was at sites sampled in 2006 and to identify other areas that may also have contaminated soils.

1.1 Location

The Ferguson Lake Project is a copper, nickel, cobalt, platinum, and palladium property currently being explored by Starfield Resources Inc. It is located on the western shores of Ferguson Lake, 240 kilometres west of Rankin Inlet and 180 kilometres south of Baker Lake, between Yathkyed and Kaminuriak lakes.

Ferguson Lake camps (old and new) and airstrip are located on bedrock outcropping with soils in depressional areas (Plate 1.1-1). Vegetation consists of mosses, lichens, dwarf birch, alder, Labrador tea, and an assortment of low groundcover. Migratory wildlife such as caribou, Arctic

Plate 1.1-1. Old Ferguson Camp location on bedrock outcropping.

fox, Arctic hare, ptarmigan, and an assortment of wild birds are also found in the area between May and October.

Access to the property is via fixed-wing aircraft or helicopter out of Rankin Inlet and/or Baker Lake.

1.2 Fuel and Lubricants on Site

The types of fuel and lubricants stored on the camp site consist of JET-B, P-50 diesel motive, gasoline, propane, and an assortment of hydraulic and motor oils. JET-B is helicopter fuel and is also used for heating purposes. All JET-B products are contained in 205 litre drums. P-50 diesel motive is also used for heating purposes and powering generators, pumps, and other related heavy equipment. It is stored in pre-inspected barrels that previously contained sealed JET-B fuel. Gasoline is used for the ski-doos and propane is used for heating and cooking purposes. Oils and lubricants are used on the heavy equipment.

1.3 Petroleum Hydrocarbons

Petroleum hydrocarbons (PHCs) are a mixture of organic compounds found in and derived from geological substances such as oil, bitumen, and coal. Petroleum products released into the environment, such as crude oil and jet fuel, typically contain thousands of compounds in varying proportions. They are composed predominantly of carbon and hydrogen with minor amounts of nitrogen, sulphur, and oxygen. Petroleum hydrocarbon contamination in soils varies with the petroleum source, soil type, composition, degree of processing (crude, blended, or refined), and the extent of weathering caused by exposure to the environment.

Identifying specific hydrocarbons is based on the number of carbon atoms each substance contains, for a maximum of 50 carbon atoms. Natural gas contains between two and six carbon atoms, diesel and furnace oil contain between nine and 21, and grease may contain anywhere between 18 and 34 carbon atoms. Based on the Canadian Council of Ministers of the Environment's (CCME) Canada Wide Standards (CWS), analysis of petroleum products using the F1 parameter (equivalent carbon number [ECN]: C6-C10) captures the majority of most unweathered gasolines, mineral spirits, and paint thinners. Petroleum products that are predominantly captured with the F2 parameter (ECN: C10-C16) include most diesel oils, furnace oils, kerosenes, jet fuel, and some weathered gasolines. Many petroleum products contain components within both the F1 and F2 variable ranges (*e.g.*, weathered gasolines, jet fuels, and diesel oil). The F3 parameter (ECN: 16-34) includes diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts. Similar to F3, the F4 parameter (ECN: C34-C50) contains the same petroleum products except for diesel and furnace oils (Appendix 1).

2. METHODS

2. Methods

2.1 Sampling

Soils were sampled in three different areas adjacent to Ferguson Lake: the Old Camp, the New Camp, and Inco Camp. Samples were collected at 10 cm depth intervals until bedrock was hit. If soils extended deeper than 50 cm, samples were collected at random intervals. Spacing of the samples was also dependent on the site and obvious signs of contamination. When sampling around a facility or known spill, a grid design was used with the centre point being the facility or spill and any additional samples were collected along transects which extended out from the centre in north, east, south, and westerly directions. Random grab samples were taken where there was stained soil.

After the sample was collected, the hole was filled in and marked with a stake. A GPS waypoint was also taken.

To avoid cross contamination, a clean plastic scoop was used for each sample collected (Plate 2.1-1). Samples were placed into glass jars and sent to ALS Environmental Services in Vancouver, British Columbia. Samples were analysed for soil texture and hydrocarbon content. Samples were analyzed within the 14 day holding time limit required for hydrocarbon analysis. All analytical methodologies and certificates of analysis are provided in Appendix 2.

Plate 2.1-1. Sampling Equipment.

2.1.1 Old Camp

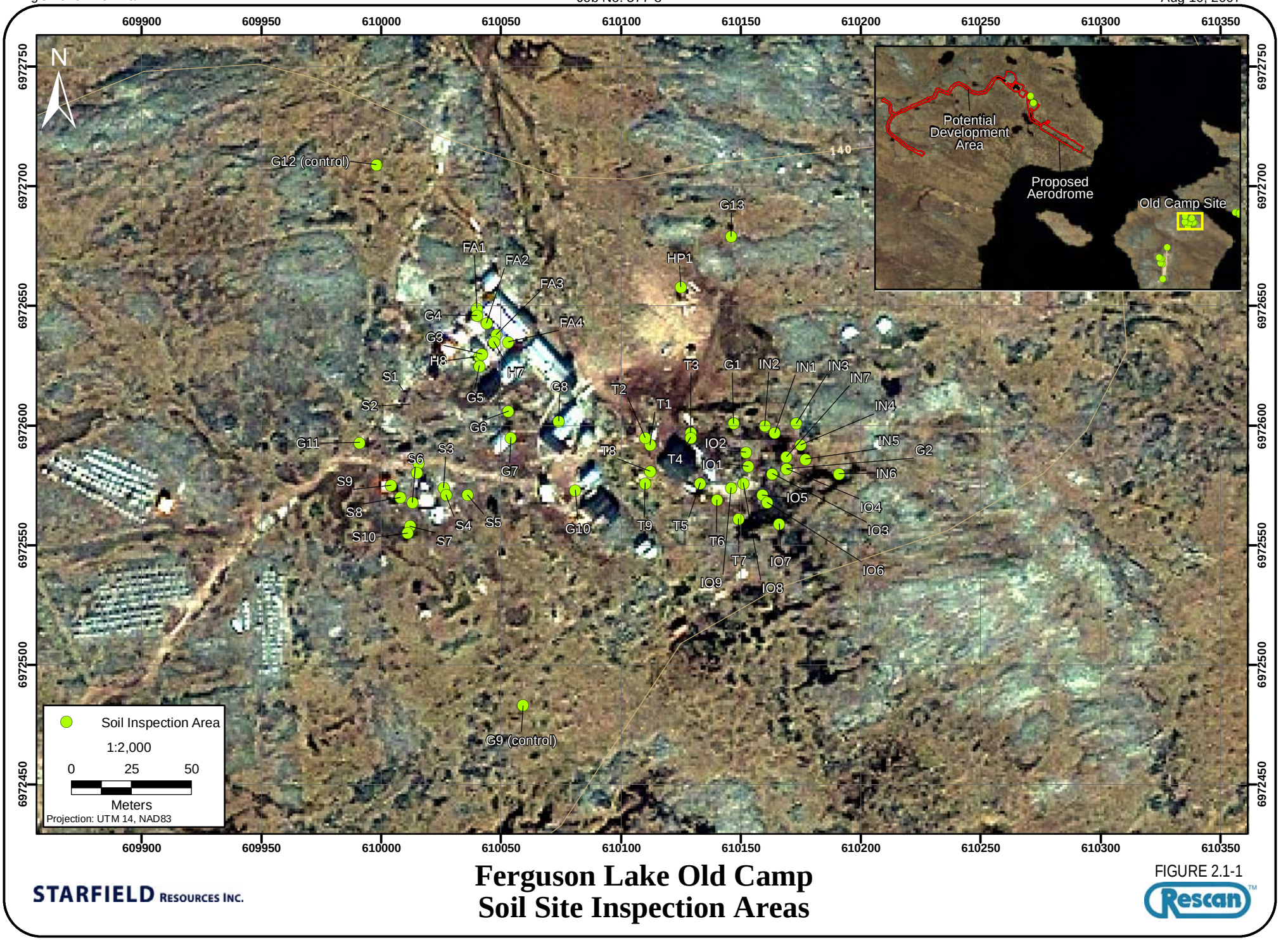
Based on the findings of the 2006 sampling program, sample site locations were selected to determine the extent of hydrocarbon contamination. Sample locations that were revisited included: the tractor shed, the machine shop, the new and old incinerators, hut 7, the fuel storage area, and the airstrip. In addition to these sites, the helipad, the first aid building, hut 8, another fuel storage area, random grab samples of stained soils, and two sites used as controls for quality assurance were assessed (Figures 2.1-1 and 2.1-2 and Table 2.1-1).

2.1.2 New Camp

At the new camp, a fuel spill may have occurred over the winter at a fuel storage area. Twelve samples (NC1 – NC12) were taken where this spill may have occurred, as well as the area adjacent to it. Two samples (NC13 and 14) were taken further away, in an area that had a small stain of oil on the vegetation (Figure 2.1-3 and Table 2.1-2).

2.1.3 Inco Camp

Samples at Inco Camp were taken randomly around the site (Figure 2.1-4 and Table 2.1-3). Several abandoned fuel barrels and other old camp supplies (*i.e.*, machinery and tools) still exist on site. Soils with surface staining or adjacent to barrels and old supplies, which have the potential to contaminate the soil, were sampled.



Ferguson Lake Old Camp Soil Site Inspection Areas

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FIGURE 2.1-1

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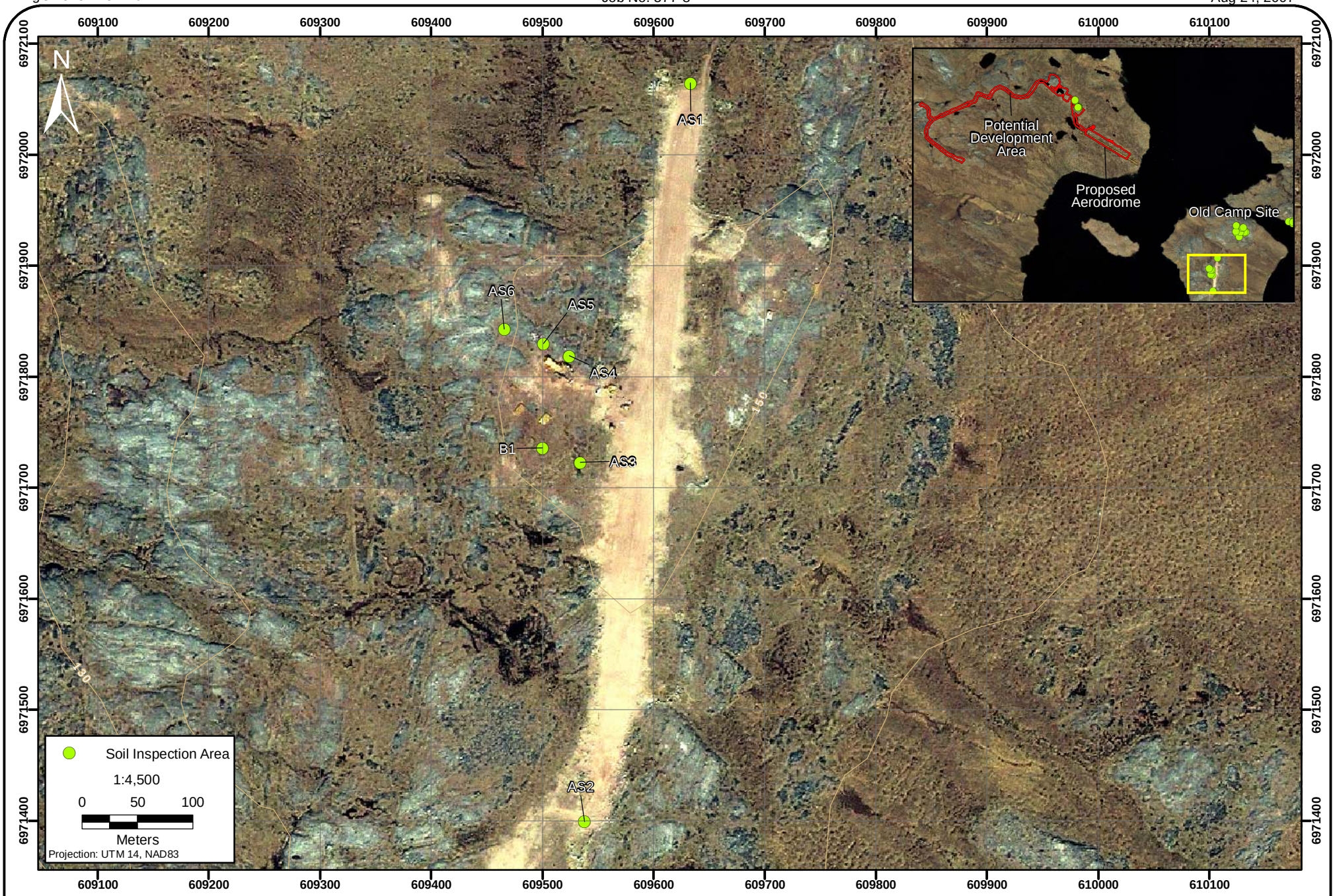

Ferguson Lake Old Camp Airstrip
Soil Site Inspection Areas

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FIGURE 2.1-2

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Table 2.1-1
Soil Samples Taken at Old Camp

Facility	Site Number	Distance (m) from Facility or Grab Sample[1]	Sample(s) Taken		Total
			Surface (0-10 cm)	Subsurface[2]	
Tractor Shed	T1	5	1	0	1
	T2	9	1	0	1
	T3	5	1	1a	2
	T4	9	1	0	1
	T5	10	1	0	1
	T6	20	1	1a	2
	T7	30	1	0	1
	T8	5	1	1a	2
	T9	10	1	1a	2
Incinerator Old	IO1	5	1	0	1
	IO2	10	1	0	1
	IO3	5	1	0	1
	IO4	10	1	0	1
	IO5	5	1	0	1
	IO6	10	1	1a	2
	IO7	20	1	1a	2
	IO8	5	1	0	1
	IO9	10	1	0	1
Incinerator New	IN1	5	1	0	1
	IN2	10	1	0	1
	IN3	5	1	0	1
	IN4	5	1	0	1
	IN5	10	1	0	1
	IN6	20	1	1a	2
	IN7	5	1	1a	2
Shop	S8	1	1	0	1
	S9	3	1	0	1
	S1	1	1	0	1
	S2	3	1	0	1
	S3	5	1	0	1
	S4	10	1	0	1
	S5	20	1	0	1
	S6	1	1	0	1
	S7	10	1	0	1
	S10	20	1	2 a,b	3

(continued)

Table 2.1-1
Soil Samples Taken at Old Camp (completed)

Facility	Site Number	Distance (m) from Facility or Grab Sample[1]	Sample(s) Taken		Total
			Surface (0-10 cm)	Subsurface[2]	
First Aid	FA1	3	1	0	1
	FA2	3	1	0	1
	FA3	3	1	0	1
	FA4	3	1	0	1
Huts	H8	1	1	0	1
	H7	1	1	0	1
Helipad	HP1	Grab	1	0	1
	G1	Grab	1	0	1
	G2	Grab	1	0	1
	G3	Grab	1	0	1
	G4	Grab	1	0	1
	G5	Grab	1	0	1
	G6	Grab	1	0	1
	G7	Grab	1	0	1
	G8	Grab	1	0	1
	G9 (control)	Grab	1	1a	2
	G10	Grab	1	0	1
	G11	Grab	1	0	1
	G12 (control)	Grab	1	0	1
	G13	Grab	1	0	1
Airstrip	AS1	Grab	1	0	1
	AS2	Grab	1	0	1
	AS3	Grab	1	0	1
	AS4	Grab	1	0	1
	AS5	Grab	1	0	1
	AS6	Grab	1	0	1
Fuel Barrels	B1	Grab	1	1c	2
Total Samples Collected					**74**

Notes:
[1] Grab samples were taken in areas that had obvious stains on soils.
[2] Subsurface sample depths: a = 10-20 cm, b=20-30 cm, c= 30-40 cm, d= 60-70 cm.

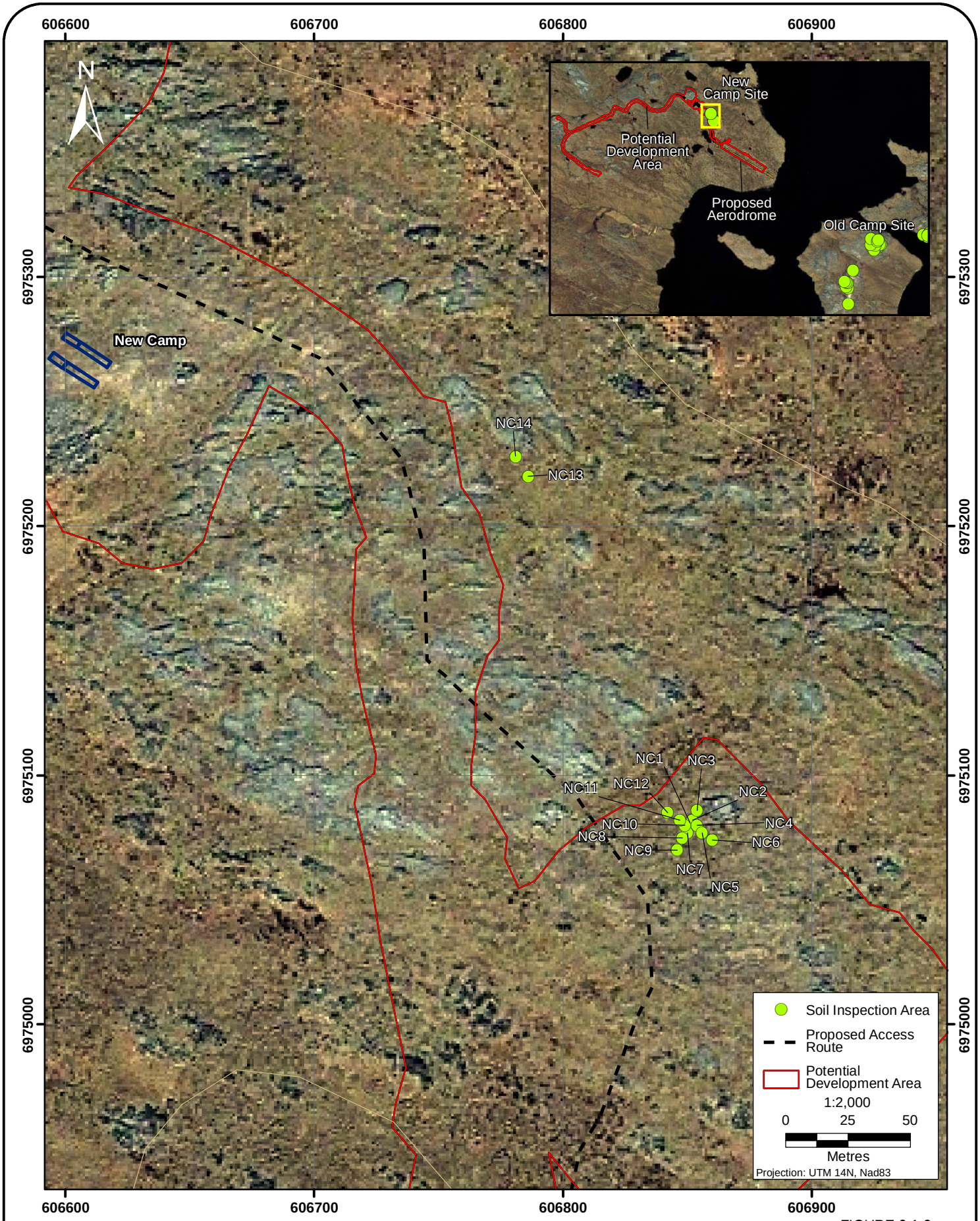

FIGURE 2.1-3

Ferguson Lake New Camp and Airstrip
Soil Site Inspection Areas

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Table 2.1-2
Soil Samples Taken at New Camp

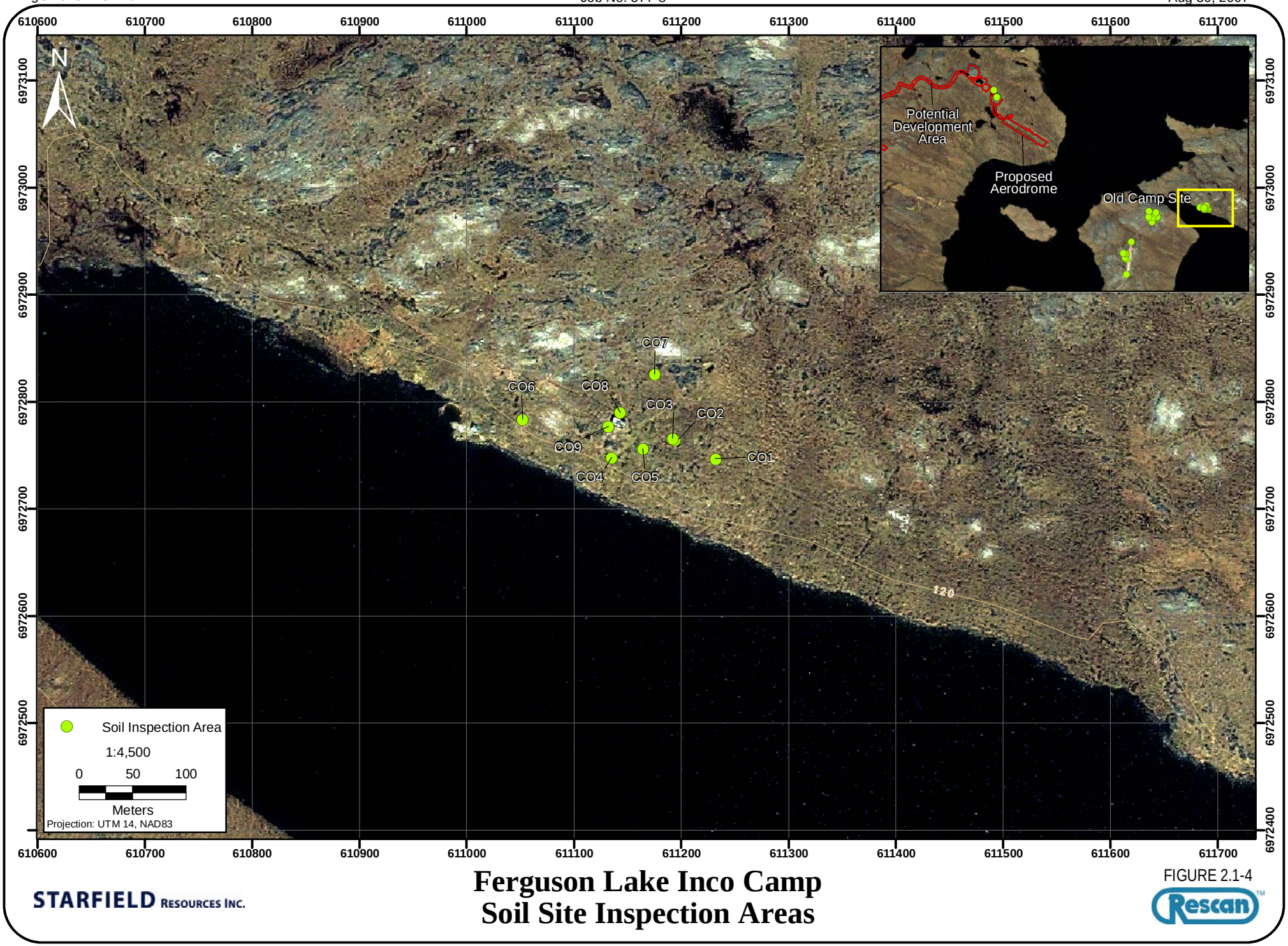
Site Number	Distance (m) from Potential Fuel Spill	Sample(s) Taken		Total
		Surface (0-10 cm)	Subsurface[1]	
NC1	0	1	2 b,c	3
NC2	2	1	1c	2
NC3	5	1	1c	2
NC4	2	1	1c	2
NC5	5	1	1c	2
NC6	10	1	1c	2
NC7	2	1	1c	2
NC8	5	1	1c	2
NC9	10	1	0	1
NC10	2	1	1c	2
NC11	5	1	0	1
NC12	10	1	1c	2
NC13	Grab	1	1c	2
NC14	Grab	1	2 c,d	3
Total Samples Collected				**28**

Note:
[1] Subsurface sample depths: a = 10-20 cm, b=20-30 cm, c= 30-40 cm, d= 60-70 cm.

Table 2.1-3
Soil Samples Taken at Inco Camp

Site Number	Distance (m) from Facility or Grab Sample[1]	Sample(s) Taken		Total
		Surface (0-10 cm)	Subsurface[2]	
CO1	Grab	1	1c	2
CO2	Grab	1	1c	2
CO3	Grab	1	1c	2
CO5	Grab	1	1c	2
CO4	Grab	1	1c	2
CO6	Grab	1	0	1
CO7	Grab	1	0	1
CO8	Grab	1	1c	2
CO9	Grab	1	1c	2
Total Samples Collected				**16**

Notes:
[1] Grab samples were taken in areas that had obvious stains on soils.
[2] Subsurface sample depths: a = 10-20 cm, b=20-30 cm, c= 30-40 cm, d= 60-70 cm.



Ferguson Lake Inco Camp
Soil Site Inspection Areas

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FIGURE 2.1-4

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3. RESULTS AND DISCUSSION

3. Results and Discussion

CCME standards for hydrocarbons vary depending on soil texture. Coarse textured (>75 µm) soils have lower standards since they have larger pore spaces between soil particles which allows for greater contaminant mobility than with finer textured soils (<75 µm). The tractor shed soils at the Old Camp were the only soils that were fine textured and were assessed as such. All other areas were assessed using CCME standards for coarse textured soils.

Chromatograms created by ALS environmental services illustrate the petroleum hydrocarbons associated with each sample location (Appendix 2).

3.1 Old Camp

3.1.1 Tractor Shed

Seven out of nine samples collected at the tractor shed were contaminated with hydrocarbons (Figure 3.1-1). These fine textured soils did not exceed CCME standards for F1 and F2 products (Table 3.1-1) but did exceed them for F3 and F4. These results suggest that the hydrocarbons in this area are predominantly diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts. Although the depth of contamination was determined (0-20 cm), the spatial extent was not since the most distant samples exceeded CCME standards. Additional sampling should be carried out until the extent of contamination is determined.

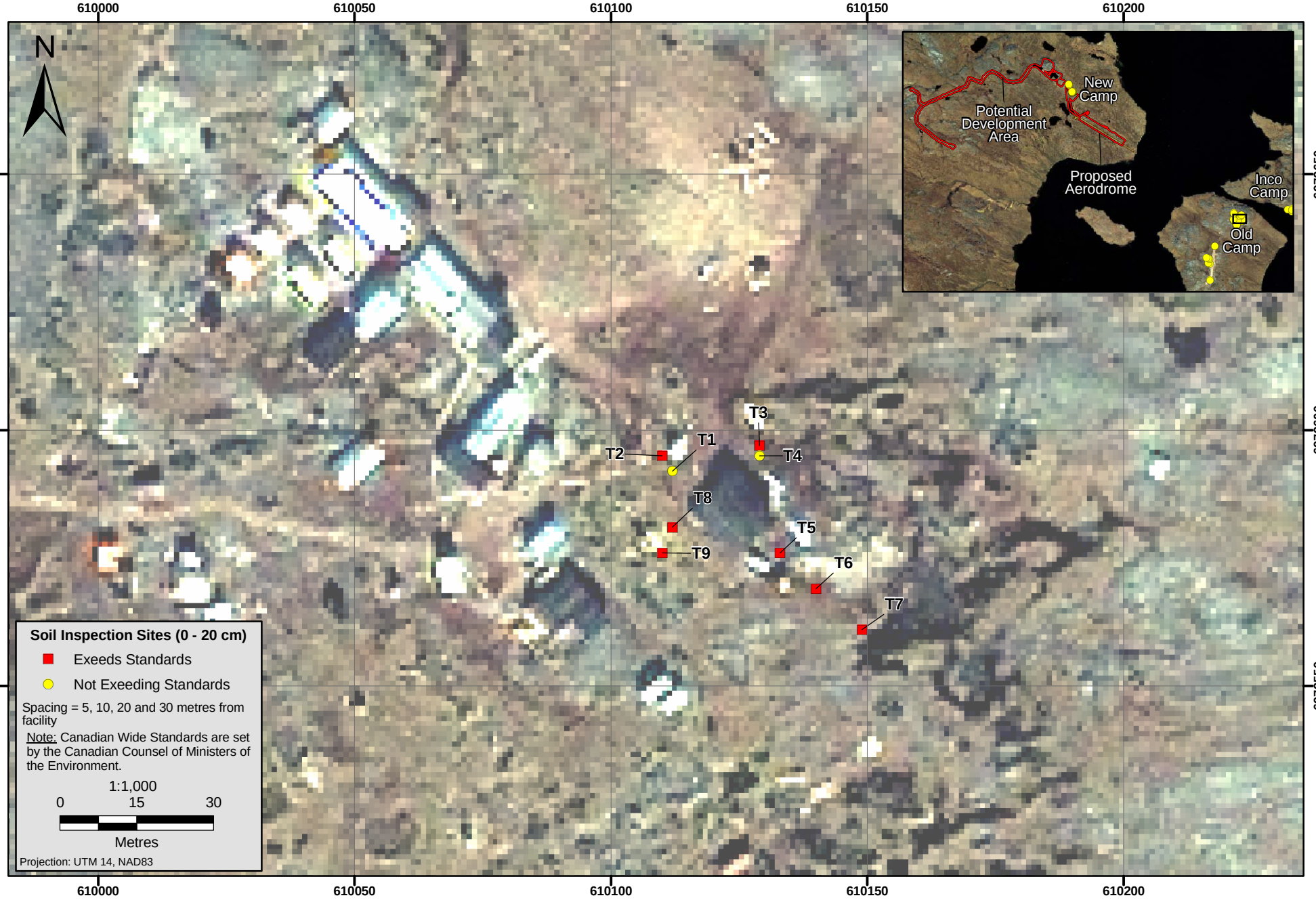
The sample collected at T9 had soils that were contaminated at depth (10-20 cm) but not at surface (0-10 cm). The fine textured soils adjacent to the tractor shed were assumed to limit the mobility of the contaminants, however, these results suggest that the soil has properties similar to coarser textured soils which allows for greater mobility of contaminants.

3.1.2 Incinerator Old

The old incinerator exceeded CCME standards for F2, F3, and F4 products (Table 3.1-2). This suggests that soils are contaminated with one or more of the following: diesel, furnace, and lubricating oils, kerosene, jet fuel, weathered gasoline, greases, waxes, heavy fuels, and asphalts. Samples taken in an easterly direction away from the old incinerator were in close proximity to the new incinerator soil samples (Figure 3.1-2). The westerly extent of the old incinerator's contamination was determined, however, additional samples are required north and south of the old incinerator.

3.1.3 Incinerator New

Similar to the tractor shed, only F3 and F4 products were exceeded for the new incinerator (Table 3.1-3). All samples indicated that there was contamination. The contaminants may be from diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and/or asphalts. Although bedrock outcropping limited the number of samples that could be collected along transects in each direction, additional samples should be colleted in soil pockets in the vicinity to determine the extent of contaminants (Figure 3.1-2).



Ferguson Lake Old Camp: Potential Contamination around the Tractor Shed (T)

FIGURE 3-1.1

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Table 3.1-1
Hydrocarbon Assessment for the Tractor Shed

Fraction	Soil Depth	Standard[1] (mg/kg)	T1	T2	T3	T4	T5	T6	T7	T8	T9
F1 (C6-C10)	0-10 cm	660	<10	<12	<30	<10	<10	<12	<10	<15	<20
F1 (C6-C10)	10-20 cm		NA	NA	<10	NA	NA	<10	NA	<10	<20
F2 (C10-C16)	0-10 cm	1,500	11	33	45	20	39	65	23	75	47
F2 (C10-C16)	10-20 cm		NA	NA	14	NA	NA	23	NA	17	71
F3 (C16-C34)	0-10 cm	2,500	720	5,000	7,300	1,900	5,400	9,300	6,600	8,000	3,700
F3 (C16-C34)	10-20 cm		NA	NA	1,400	NA	NA	6,000	NA	4,500	8,900
F4 (C34-C50)	0-10 cm	6,600	650	4,500	7,300	1,400	5,700	8,300	5,700	8,700	5,600
F4 (C34-C50)	10-20 cm		NA	NA	1,600	NA	NA	5,400	NA	4,500	8,700

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Table 3.1-2
Hydrocarbon Assessment for the Old Incinerator

Fraction	Soil Depth	Standard[1] (mg/kg)	I01	I02	I03	I04	I05	I06	I07	I08	I09
F1 (C6-C10)	0-10 cm	330	<10	<20	<10	<12	23.0	<10	<12	<10	<10
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA	NA	<10	<10	NA	NA
F2 (C10-C16)	0-10 cm	760	3,200	260	730	61	1,900	<5	2,000	<5	17
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA	NA	9	7,700	NA	NA
F3 (C16-C34)	0-10 cm	1,700	6,400	6,700	12,000	6,600	13,000	790	11,000	2,700	1,100
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA	NA	140	89,000	NA	NA
F4 (C34-C50)	0-10 cm	3,300	5,200	6,300	5,300	6,700	3,600	490	4,700	1,600	980
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA	NA	150	46,000	NA	NA

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence

3.1.4 Shop

Eight out of ten samples exceeded CCME standards for F3 and F4 products (Table 3.1-4). Sample S9 was the only sample to exceed F2 products. This suggests that this area, which is adjacent to the road, may have been affected by other hydrocarbons in addition to diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts. Most soil inspection sites in this area had very shallow soils (>20 cm). Additional sampling will be required to determine the extent of soil contamination at the Shop; the most distant sampling sites were contaminated (Figure 3.1-3).

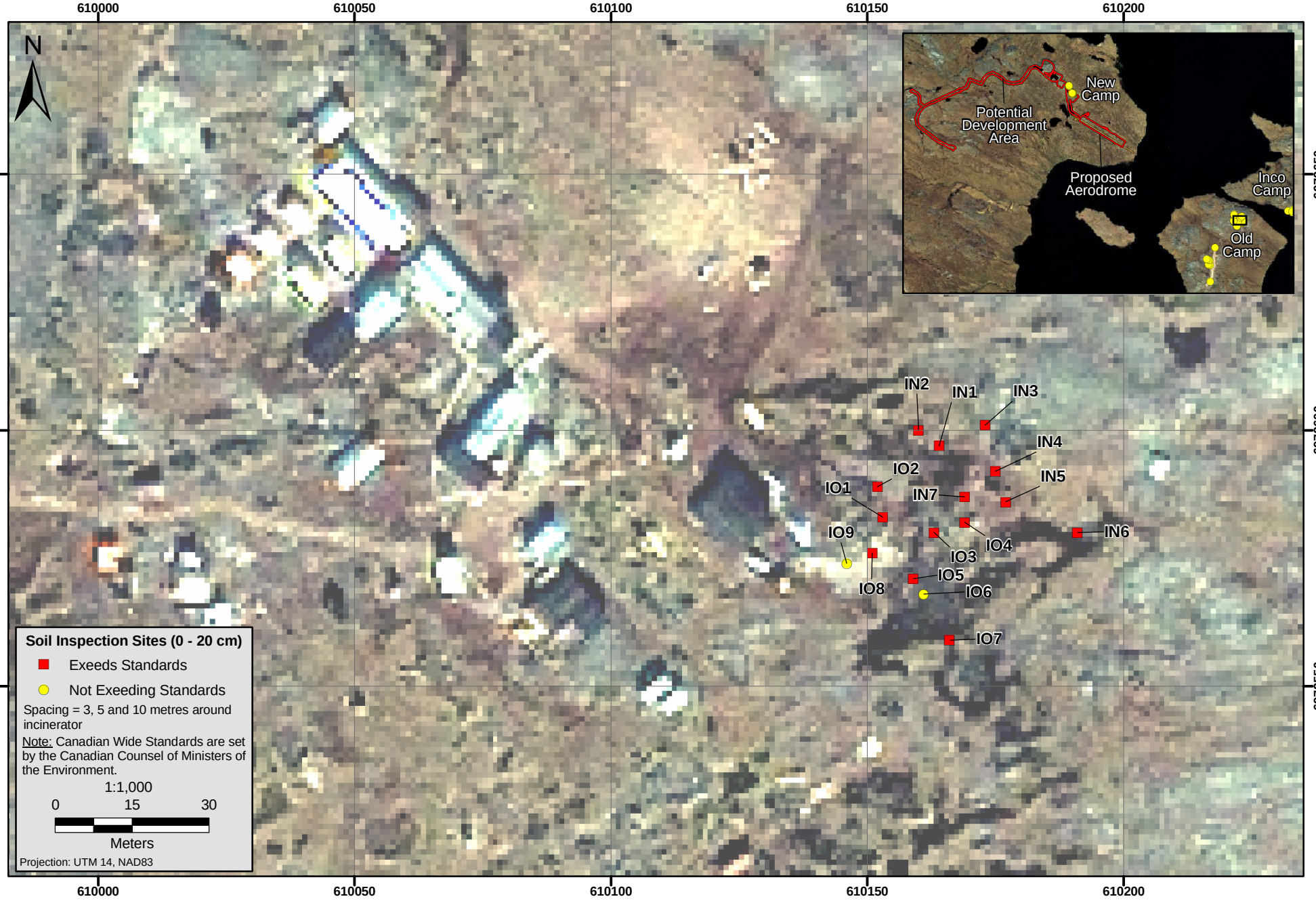

FIGURE 3-1.2

Ferguson Lake Old Camp: Potential Contamination around the Old (IO) and New (IN) Incinerators

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Table 3.1-3
Hydrocarbon Assessment for the New Incinerator

Fraction	Soil Depth	Standard[1] (mg/kg)	IN1	IN2	IN3	IN4	IN5	IN6	IN7
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	<10	<15	<10	<12
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA	NA	<10	<12
F2 (C10-C16)	0-10 cm	760	36	31	41	44	68	<5	74
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA	NA	6	19
F3 (C16-C34)	0-10 cm	1,700	3,800	3,500	3,300	3,700	6,700	310	5,000
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA	NA	3,500	7,500
F4 (C34-C50)	0-10 cm	3,300	4,400	1,900	3,700	2,800	3,500	270	5,100
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA	NA	2,900	6,500

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

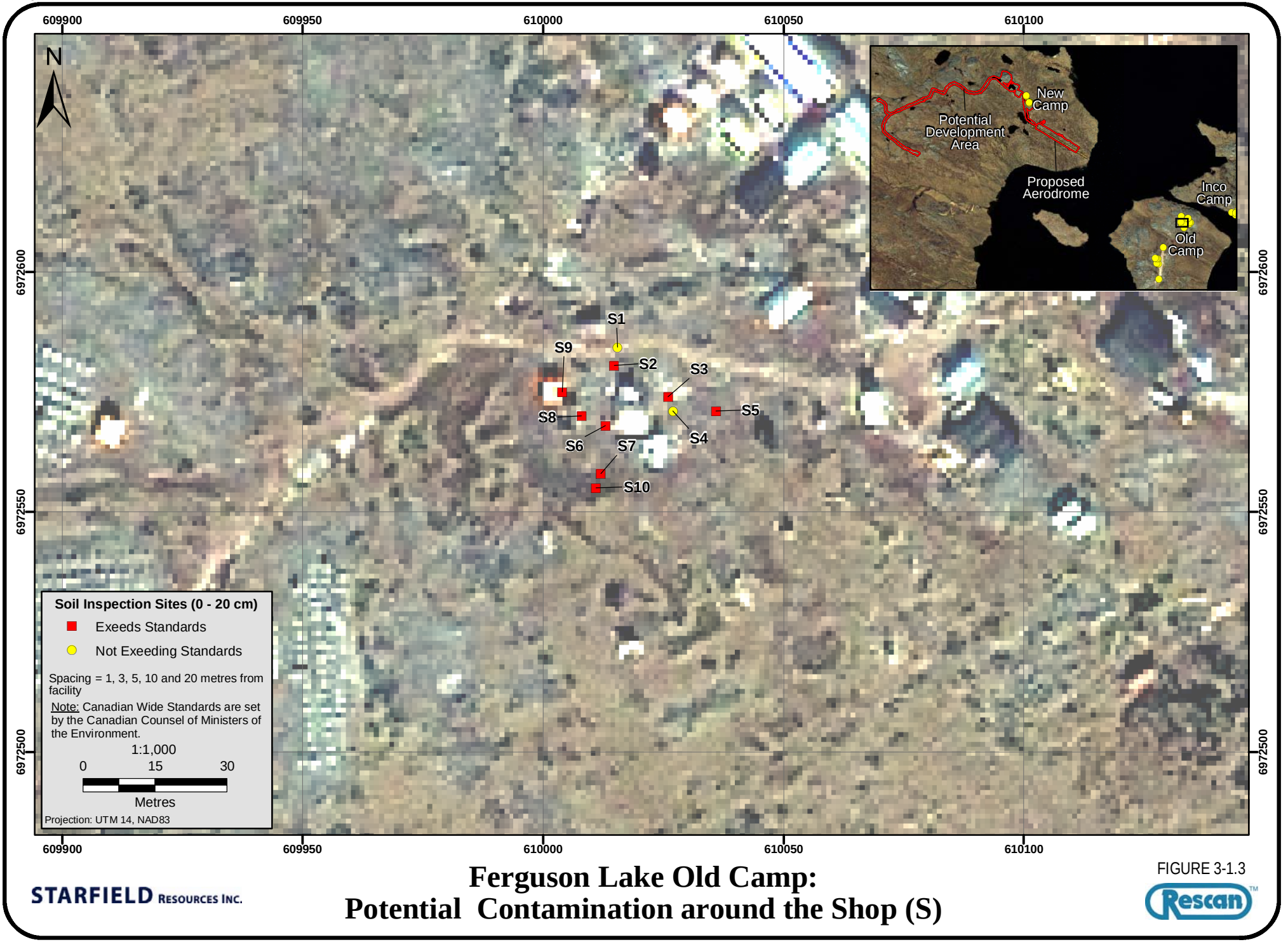
Table 3.1-4
Hydrocarbon Assessment for the Shop

Fraction	Soil Depth	Standard[1] (mg/kg)	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	<10	<10	<10	<20	<10	<10	<10
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	<10
F1 (C6-C10)	20-30 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	<10
F2 (C10-C16)	0-10 cm	760	<5	11	<5	<5	8	14	21	110	2,000	12
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	<5
F2 (C10-C16)	20-30 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	<5
F3 (C16-C34)	0-10 cm	1,700	630	3,000	4,100	540	2,400	3,300	5,200	6,700	5,700	10,000
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	6,600
F3 (C16-C34)	20-30 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	400
F4 (C34-C50)	0-10 cm	3,300	430	2,700	3,900	490	2,900	4,600	6,000	6,600	5,500	8,400
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	6,000
F4 (C34-C50)	20-30 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	240

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

3.1.5 Grab Samples

Grab samples were collected where the soil was darkly stained. Four samples (G1, G7, G12, and G13) were not contaminated with hydrocarbons (Figure 3.1-4 and Table 3.1-5). All samples were coarse textured. Although no samples exceeded F1 standards, F2, F3, and F4 standards



Ferguson Lake Old Camp: Potential Contamination around the Shop (S)

FIGURE 3-1.3

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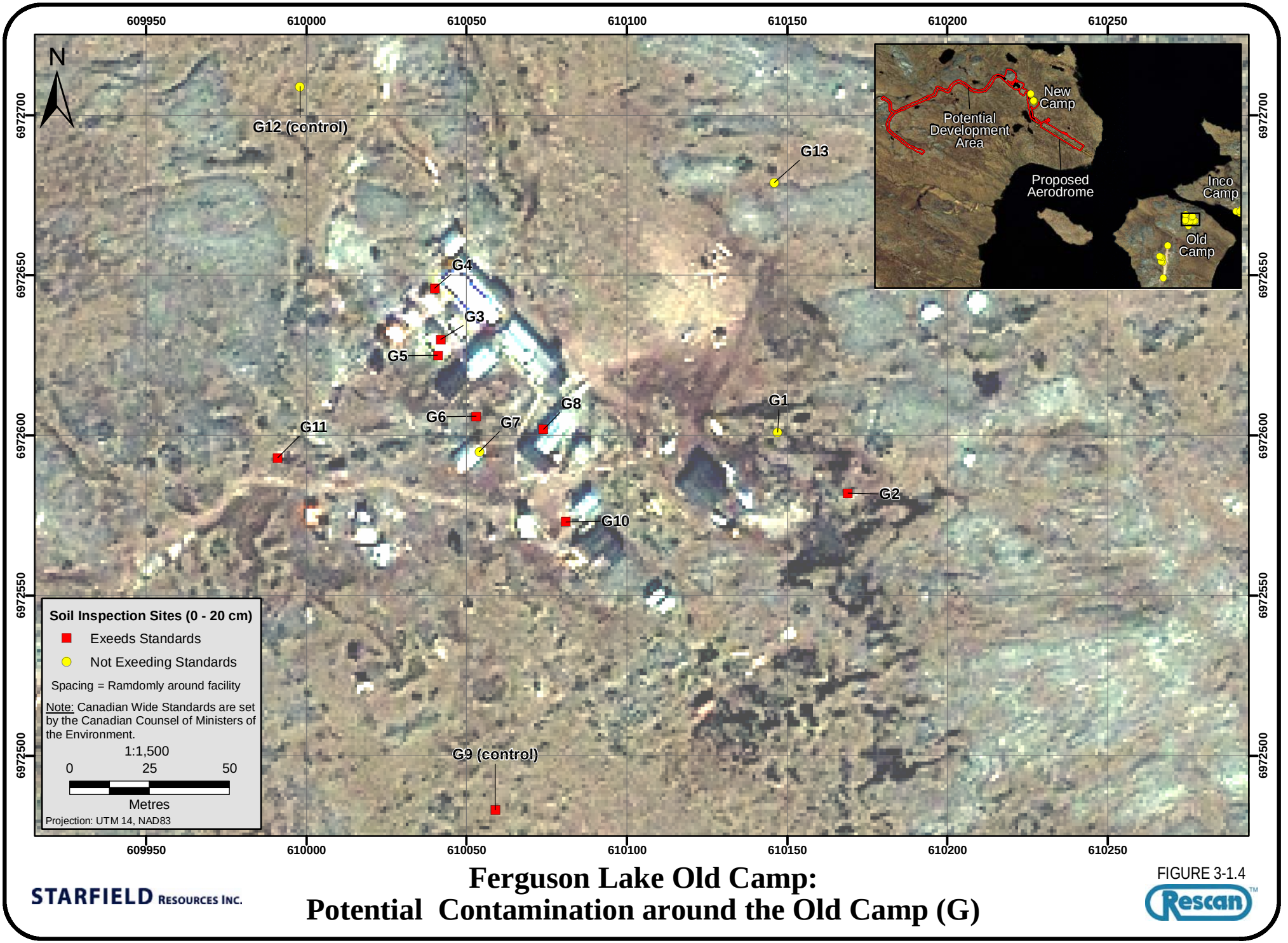

Ferguson Lake Old Camp: Potential Contamination around the Old Camp (G)

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FIGURE 3-1.4

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Table 3.1-5
Hydrocarbon Assessment for Grab Samples

Fraction	Soil Depth	Standard[1] (mg/kg)	G1	G2	G3	G4	G5	G6	G7	G8	G9 (control)	G10	G11	G12 (control)	G13
F1 (C6-C10)	0-10 cm	330	<10	<15	<10	<10	<10	<20	<20	<10	<10	23.0	<10	<10	<10
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	<10	NA	NA	NA	NA
F2 (C10-C16)	0-10 cm	760	<5	8	160	45	190	250	8	890	<5	1,300	150	50	110
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	120	NA	NA	NA	NA
F3 (C16-C34)	0-10 cm	1,700	1,300	2,300	1,700	4,400	1,700	5,000	550	2,900	14	110	4,300	230	1,500
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	5,300	NA	NA	NA	NA
F4 (C34-C50)	0-10 cm	3,300	1,000	2,900	1,800	3,600	1,900	4,500	570	2,200	62	85	4,900	470	1,800
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA	NA	NA	NA	NA	3,900	NA	NA	NA	NA

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

were exceeded. Thus, soils may be contaminated with kerosenes, jet fuel, weathered gasolines, diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts.

The sample collected at G9 had soils that were contaminated at depth (10-20 cm) but not at surface (0-10 cm). This may reflect the mobility of the contaminants within these coarse textured soils.

Samples G9 and G12 were collected as representative control samples. G12 did not exceed any of the CCME standards; however, G9 did exceed the standards. Since both samples were taken in areas that were distant from existing facilities, this may indicate that there were other facilities or fuel barrel storage site which have since been relocated or removed from the Old Camp. The soils collected at G9 exceeded the standards for F3 and F4 products which suggest that this may have been an old fuel storage site.

3.1.6 Huts

Both samples collected at Hut 7 and Hut 8 exceeded CCME standards for F3, and F4 products (Figure 3.1-5). F1 and F2 standards were also exceeded by soils collected from Hut 7 (Table 3.1-6) which suggest that additional contaminants (gasolines, mineral spirits, paint thinners, kerosenes, and/or jet fuels) were present at this site. Contaminants that may be present at both locations include: diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts.

FIGURE 3-1.5

Ferguson Lake Old Camp: Potential Contamination around the Huts (H)

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Table 3.1-6
Hydrocarbon Assessment for Hut Samples

Fraction	Soil Depth	Standard[1] (mg/kg)	H7	H8
F1 (C6-C10)	0-10 cm	330	395	<10
F1 (C6-C10)	10-20 cm		NA	NA
F2 (C10-C16)	0-10 cm	760	34,000	<5
F2 (C10-C16)	10-20 cm		NA	NA
F3 (C16-C34)	0-10 cm	1,700	14,000	8,200
F3 (C16-C34)	10-20 cm		NA	NA
F4 (C34-C50)	0-10 cm	3,300	3,800	7,700
F4 (C34-C50)	10-20 cm		NA	NA

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Additional sampling will be required adjacent to these huts to determine the spatial extent of soil contamination.

3.1.7 First Aid Building

All four samples collected around the First Aid Building were contaminated with hydrocarbons, although FA3 is less affected then the others (Table 3.1-7). The F3 standard was exceeded for all samples, indicating diesel, furnace, and lubricating oils, greases, waxes, heavy fuels, and asphalts.

Table 3.1-7
Hydrocarbon Assessment for the First Aid Building

Fraction	Soil Depth	Standard[1] (mg/kg)	FA1	FA2	FA3	FA4
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	<10
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA
F2 (C10-C16)	0-10 cm	760	42	5,800	590	1,400
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA
F3 (C16-C34)	0-10 cm	1,700	2,900	2,800	1,700	3,200
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA
F4 (C34-C50)	0-10 cm	3,300	3,500	2,000	510	710
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Since these samples were taken in close proximity (3 m) to the First Aid Building, additional samples should be collected below and at a distance from this building (Figure 3.1-6).

3.1.8 Helicopter Pad

Soils sampled on the helicopter pad did not exceed CCME standards (Table 3.1-8, Figure 3.1-6). No additional soil sampling is required within this area.

3.1.9 Airstrip

Only one soil sample collected adjacent to the airstrip had hydrocarbon contamination (Table 3.1-9). Sample number AS4 exceeded F2, F3, and F4 standards which indicates it may contain diesel, furnace, and lubricating oils, kerosenes, jet fuel, gasolines, greases, waxes, heavy fuels, and asphalts.

Spatial distribution of the hydrocarbons found in sample AS4 will require further assessment to the north, east, and south. The sample collected at AS5 did not exceed standards which suggest that west of sample AS4 the soil may be clean (Figure 3.1-7).

3.1.10 Fuel Barrel Storage Area

Soil sample B1 was collected adjacent to a barrel located within a fuel storage area. This sample did not exceed CCME standards (Table 3.1-10, Figure 3.1-7). No additional soil sampling is required within this area.

3.2 New Camp

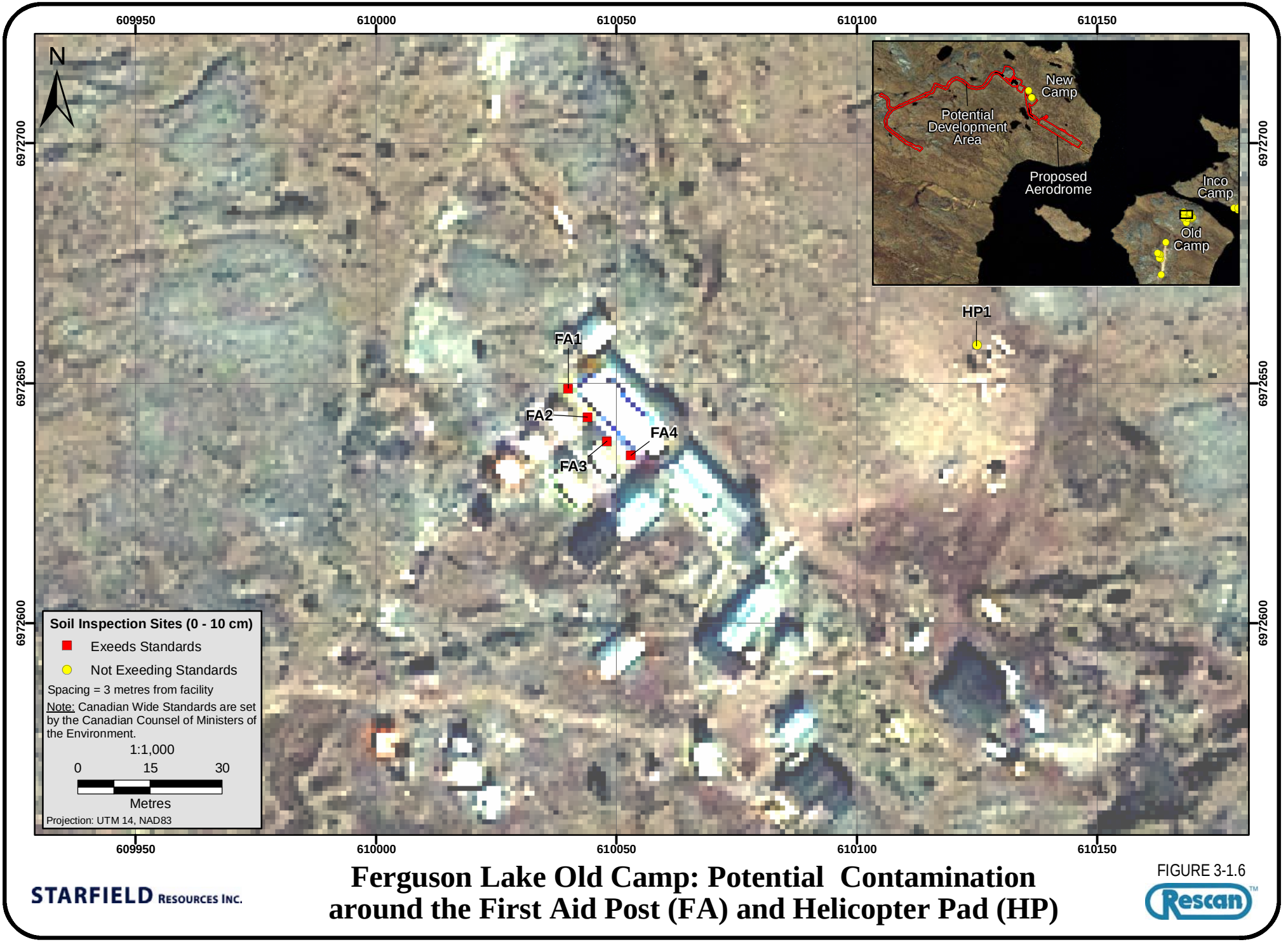
One out of 14 samples exceeded CCME standards, but only one fraction (F2) was exceeded by the sample collected at NC13 (Table 3.2-1). Since this sample was taken where the soil was stained by a fuel barrel that had leaked (Plate 3.2-1), the soil is most likely contaminated with diesel oil.

All soil samples (NC1 to NC12) collected from the area where a spill had potentially occurred in the winter of 2006 did not exceed CCME guidelines (Figure 3.2-1). No additional soil sampling is required in this area.

3.3 Inco Camp

Inco Camp samples were randomly collected adjacent to areas with various materials (storage shed, empty barrels, and tools) that are still located in this area (Figure 3.3-1). The results indicate that three out of nine samples exceeded CCME guidelines (Table 3.3-1). The sample collected at CO5 had the most contamination; it exceeded all four fractions. The samples collected at CO9 and CO3 were less contaminated.

Additional sampling adjacent to these three sites should be done to identify the spatial and soil depth extent of the contaminants. These contaminants may consist of gasolines, mineral spirits, paint thinners, diesel, furnace, and lubricating oils, kerosenes, jet fuel, greases, waxes, heavy fuels, and asphalts.



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Ferguson Lake Old Camp: Potential Contamination around the First Aid Post (FA) and Helicopter Pad (HP)

FIGURE 3-1.6

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Table 3.1-8
Hydrocarbon Assessment for the Helicopter Pad

Fraction	Soil Depth	Standard[1] (mg/kg)	HP1
F1 (C6-C10)	0-10 cm	330	<10
F1 (C6-C10)	10-20 cm		NA
F2 (C10-C16)	0-10 cm	760	10
F2 (C10-C16)	10-20 cm		NA
F3 (C16-C34)	0-10 cm	1,700	34
F3 (C16-C34)	10-20 cm		NA
F4 (C34-C50)	0-10 cm	3,300	99
F4 (C34-C50)	10-20 cm		NA

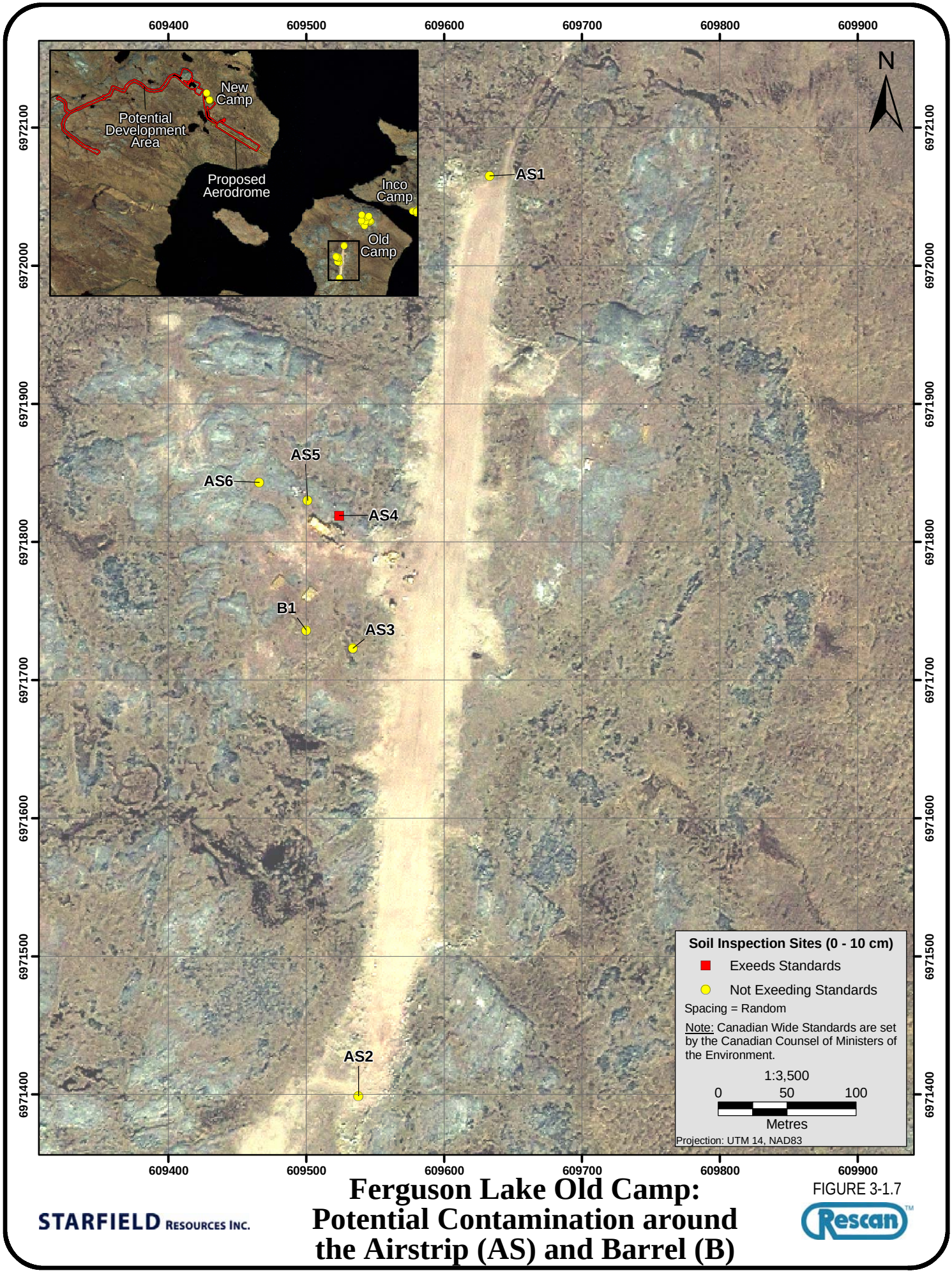
Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Table 3.1-9
Hydrocarbon Assessment for the Airstrip

Fraction	Soil Depth	Standard[1] (mg/kg)	AS1	AS2	AS3	AS4	AS5	AS6
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	55	<10	<10
F1 (C6-C10)	10-20 cm		NA	NA	NA	NA	NA	NA
F2 (C10-C16)	0-10 cm	760	<5	14	6	15,000	5	<5
F2 (C10-C16)	10-20 cm		NA	NA	NA	NA	NA	NA
F3 (C16-C34)	0-10 cm	1,700	130	49	12	2,500	340	140
F3 (C16-C34)	10-20 cm		NA	NA	NA	NA	NA	NA
F4 (C34-C50)	0-10 cm	3,300	85	38	<5	1,300	360	150
F4 (C34-C50)	10-20 cm		NA	NA	NA	NA	NA	NA

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

The sample collected at CO3 had soils that were contaminated at depth (10-20 cm) but not at surface (0-10 cm). This may reflect the mobility of the contaminants within these coarse textured soils.



Ferguson Lake Old Camp: Potential Contamination around the Airstrip (AS) and Barrel (B)

FIGURE 3-1.7

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Table 3.1-10
Hydrocarbon Assessment for the Fuel Barrel Storage Area

Fraction	Soil Depth	Standard[1] (mg/kg)	B1
F1 (C6-C10)	0-10 cm	330	<10
F1 (C6-C10)	10-20 cm		<10
F2 (C10-C16)	0-10 cm	760	<5
F2 (C10-C16)	10-20 cm		<5
F3 (C16-C34)	0-10 cm	1,700	14
F3 (C16-C34)	10-20 cm		<5
F4 (C34-C50)	0-10 cm	3,300	11
F4 (C34-C50)	10-20 cm		<5

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Table 3.2-1
Hydrocarbon Assessment for the New Camp

Fraction	Soil Depth	Standard[1] (mg/kg)	NC1	NC2	NC3	NC5	NC4	NC6	NC7	NC8	NC9	NC10	NC11	NC12	NC13	NC14
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	184	<10
F1 (C6-C10)	30-40 cm		<10	<10	<10	<10	<10	<10	<10	<10	NA	<10	NA	<10	45.0	<10
F1 (C6-C10)	60-70 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10
F2 (C10-C16)	0-10 cm	760	<5	<5	<5	<5	<5	<5	<5	<5	<5	150	<5	<5	2,700	7
F2 (C10-C16)	30-40 cm		<5	<5	<5	<5	<5	<5	<5	<5	NA	<5	NA	7	630	14
F2 (C10-C16)	60-70 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5
F3 (C16-C34)	0-10 cm	1,700	6	<5	<5	30	51	5	50	<5	<5	40	<5	54	1,300	41
F3 (C16-C34)	30-40 cm		6	6	<5	50	<5	7	<5	8	NA	<5	NA	60	340	10
F3 (C16-C34)	60-70 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5
F4 (C34-C50)	0-10 cm	3,300	<5	<5	<5	28	39	8	43	<5	<5	<5	<5	62	200	32
F4 (C34-C50)	30-40 cm		<5	<5	<5	46	<5	<5	<5	<5	NA	<5	NA	41	66	<5
F4 (C34-C50)	60-70 cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5

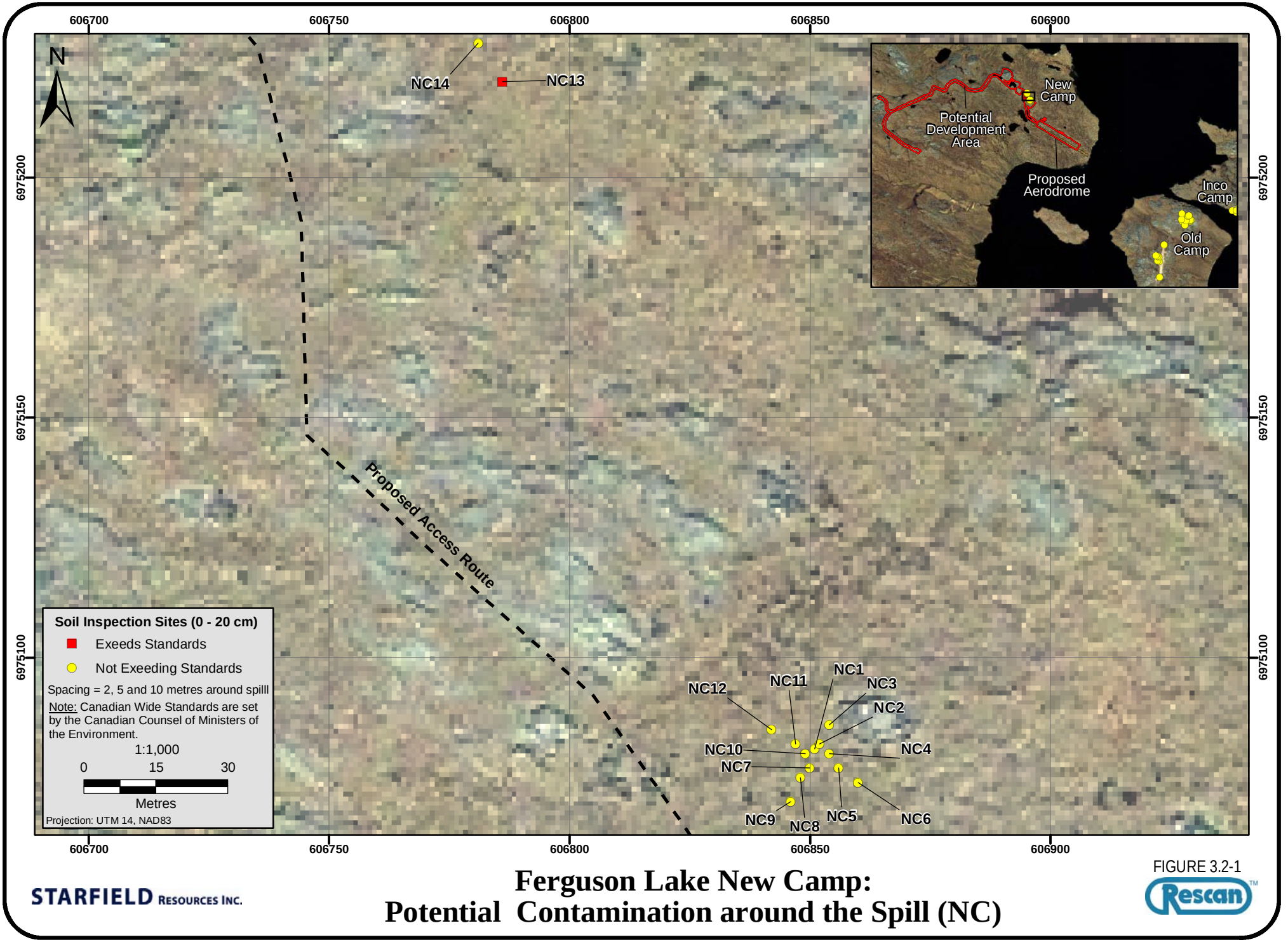
Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.

Plate 3.2-1. Soil stained by a barrel that was leaking.

Table 3.3-1
Hydrocarbon Assessment for Inco Camp

Fraction	Soil Depth	Standard[1] (mg/kg)	C01	C02	C03	C05	C04	C06	C07	C08	C09
F1 (C6-C10)	0-10 cm	330	<10	<10	<10	129	<10	<10	<10	<10	<10
F1 (C6-C10)	10-20 cm		<10	<10	29.0	489	<10	<10	NA	NA	<10
F2 (C10-C16)	0-10 cm	760	<5	210	11	6,800	20	<5	<5	<5	2,400
F2 (C10-C16)	10-20 cm		<5	<5	2,800	4,500	<5	<5	NA	NA	<5
F3 (C16-C34)	0-10 cm	1,700	13	110	22	6,500	20	41	64	<5	27,000
F3 (C16-C34)	10-20 cm		6	13	900	2,200	14	<5	NA	NA	16
F4 (C34-C50)	0-10 cm	3,300	32	42	25	4,400	<5	10	41	<5	13,000
F4 (C34-C50)	10-20 cm		9	25	240	1,500	11	<5	NA	NA	6

Notes:
[1] Canadian Wide Standards for Industrial Ecological Soil Contact criteria were used.
NA: sample not taken because of bedrock presence.



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Ferguson Lake New Camp: Potential Contamination around the Spill (NC)

FIGURE 3.2-1

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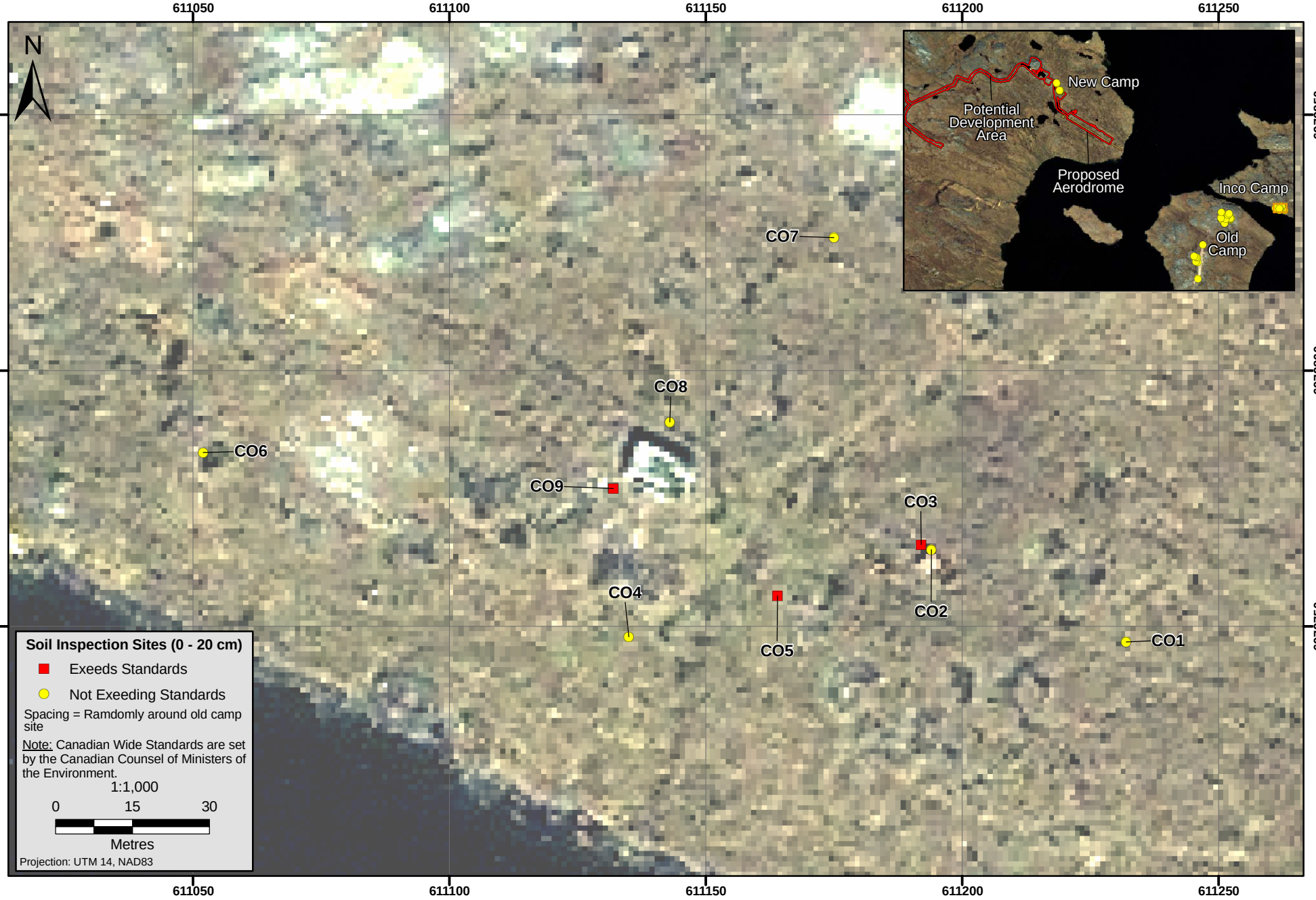

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Ferguson Lake: Potential Contamination around Inco Camp (CO)

FIGURE 3.3-1

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4. CONCLUSION

4. Conclusion

This assessment suggests that soil contamination has occurred at various locations at Ferguson Lake Old Camp, New Camp, and at Inco Camp. The New Camp area was the cleanest of all three locations, with only one soil inspection site being contaminated with hydrocarbons. The other two areas will require additional soil sampling to isolate the spatial distribution of the contamination.

Although bedrock outcropping limited the number of samples that could be collected along transects in most directions, additional samples should be collected in soil pockets in the vicinity to determine the extent of contaminants around bedrock.

At all locations sampled, soil contamination generally extended from the surface to bedrock, however, at some sites (*i.e.*, T9, IN6, G9) the surface samples were not contaminated but the subsurface samples were contaminated. This may reflect the mobility of the hydrocarbon product within these coarse textured soils. As a result, all areas that are contaminated will have to have soils removed to bedrock.

It is recommended that additional sampling not be carried out until all structures, equipment, *etc*., are removed from the site and some preliminary excavation is conducted.

REFERENCES

References

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