APPENDIX E
AMEC 2010 and 2014 Ecological Surveys

Black Point Quarry Project
Guysborough County, NS
SLR Project No.: 210.05913.00000

BLACK POINT
BASELINE ECOLOGICAL SURVEYS
SUMMARY REPORT
(2010 Surveys with Updates from 2014)

Prepared for:

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September 2014

Project No.: TV144003

TABLE OF CONTENTS

PAGE

List of Figures

List of Tables

List of Appendices

1.0 INTRODUCTION AND BACKGROUND

Vulcan Materials Company and Morien Resources Corp. (the Proponent) proposes the development, operation, decommissioning and abandonment of a granite quarry and marine terminal at Black Point in Guysborough County, Nova Scotia. The Black Point Quarry Project consists of aggregate production (drilling, blasting, processing and stockpiling) on a 354.5 ha property, along with the construction and operation of a 200 m long marine terminal adjacent to the quarry in Chedabucto Bay. The aggregate will be loaded into bulk carriers up to 70,000 DWT and transported to ports along the US eastern and Gulf coasts and potentially to markets in Canada and the Caribbean.

The Black Point Quarry Project (the Project) is located on the south shore of Chedabucto Bay in the District of Guysborough, Nova Scotia. The proposed Project Site is approximately 2 and 2.5 km from the communities of Half Island Cove in the west, and Fox Island Main in the east, respectively. The Project is situated between Highway 16 and the Atlantic coast in an area dominated by coniferous forests, coastal barrens, as well as various types of wetlands, including bog, fen, swamp and marsh. A power transmission line corridor runs along the south end of the property and with the exception of a few ATV trails, skidder tracks and property cut lines, the area is relatively undisturbed. The Project Site is depicted in Figure 1-1.

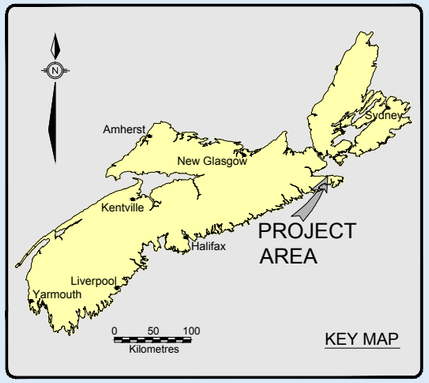
This summary report presents the results of ecological field survey conducted in 2010 and in 2014. The 2010 surveys were completed by AMEC Earth & Environmental (AMEC) and presented in report format in February 2011 (Black Point Baseline Ecological Surveys Summary Report). The AMEC work was conducted for Erdene Resource Development Corp. (Erdene), the initial proponent of the Project. Subsequently, the Project was taken over by Vulcan Materials Company and Morien Resources Corp. who retained AMEC to update the ecological information through field surveys in 2014. This report builds on the 2011 Summary Report in that additional and new field information is simply added or inserted where applicable. The updated information is identified as 2014 survey results. It is of note that the status information provided for species recorded in 2010 and reported in 2011 has not been updated.

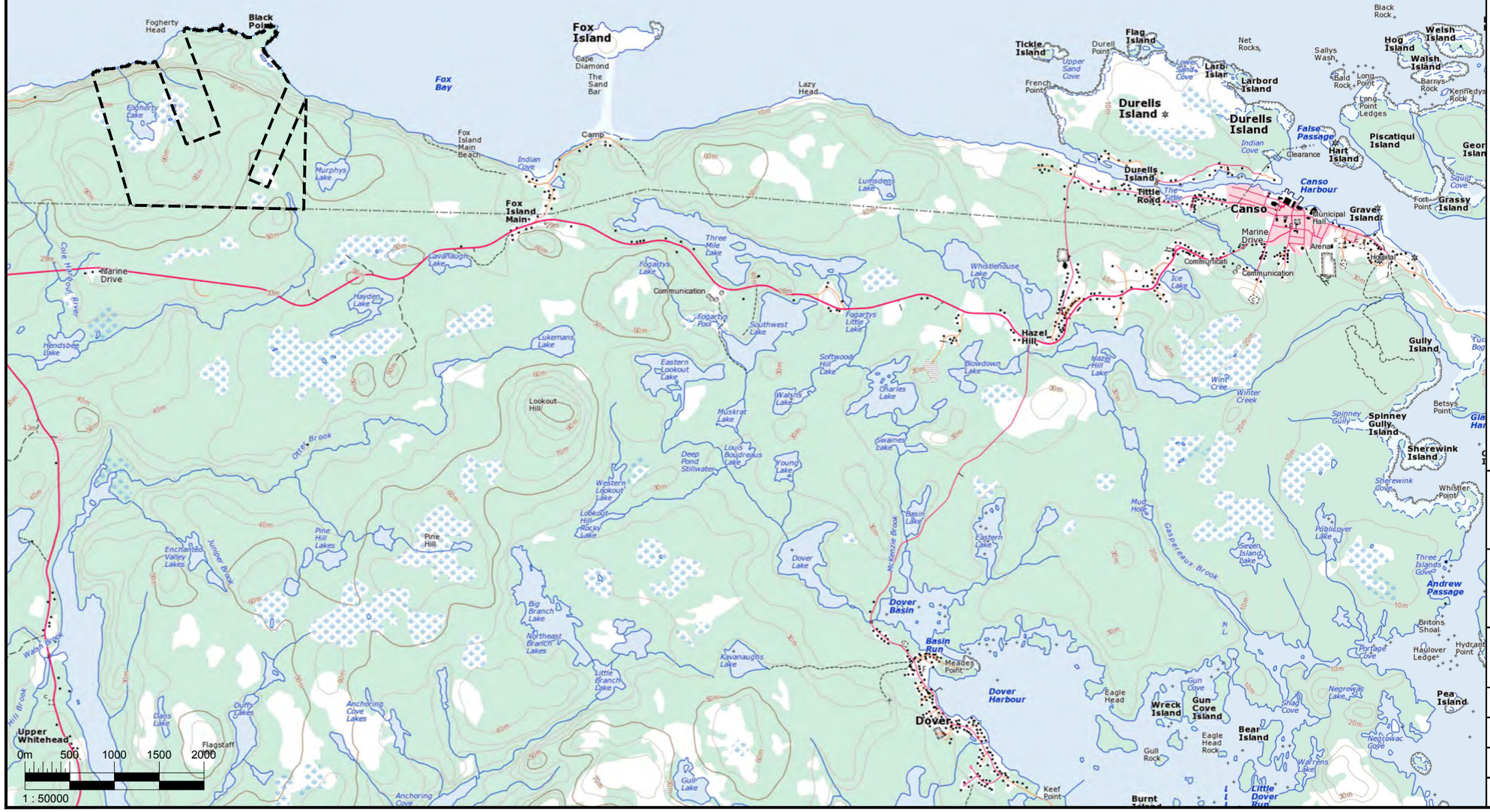
The results presented in this report derive from on-site surveys for:

- Vascular Plants;
- Cyanolichens;
- Birds, including
    - Owls and early breeders;
    - Migrating and early breeding passerines
    - Breeding passerines;
    - Shorebirds and coastal birds;
- Mammals;
- Herpetiles (reptiles and amphibians);

- Odonates (dragonflies and damselflies);
- Wetlands;
- Freshwater habitat and fish communities;
- Marine habitat and benthic invertebrate communities.

The full wetland delineations were beyond the scope of the AMEC surveys conducted in 2010. They were conducted in the 2011 and 2014, following the finalization of the Project design, and are reported in a separate document.





LEGEND:

Site Boundary

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CLIENT
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PROJECT
Black Point Quarry Project

TITLE
Study Area with Project Site

DWN BY:	PROJECTION:	DATE:
DS	UTM Zone 20	February 2011
CHK'D BY:	DATUM:	PROJECT NO:
BC	NAD83	TV01017
REV. NO.:	SCALE:	FIGURE No.
N/A	1:50,000	1-1

2.0 FLORA

2.1 VASCULAR PLANTS

Field surveys were carried out in order to describe the existing plant communities and habitats within the Project Site, identify wetlands, and to confirm presence or absence of rare plants. These surveys were also supplemented during the 2014 wetland and vegetation surveys.

2.1.1 Approach and Methodology

In preparation for the vascular plant field surveys, maps of existing habitat were assembled, indicating streams, wetlands and habitats including forest types. Map sources included available mapping from provincial and federal governments, such as aerial photography, the NSDNR Wetlands Database (NSDNR 2000), Forest Inventory Mapping (NSDNR 2010), and 1:50,000 topographic maps (11F/06) (NRCan 1998).

A priority species list was prepared prior to conducting field work in order to help guide the plant surveys by identifying plant species at risk /conservation concern potentially present on the site. In order to prepare this priority list an ACCDC data search was obtained in April 2010 (ACCDC 2010) to identify any plant species at risk/conservation concern previously identified within 100 km radius of the site.

For the purpose of the vascular plant surveys, the survey area consisted of all land encompassed within the property boundary provided by Erdene (Figure 1-1). Surveys within the Project Site focused on habitats suitable for potential vascular plant species at risk. Habitats with high potential for species at risk include freshwater and marine wetlands, as well as floodplains of streams and rivers. Forest habitats, except forests in flood plains, are estimated to have medium to low potential for rare vascular plants. Surveys for rare vascular plants were timed to cover both early and late phenology. Field surveys in the Project Area were carried out between June 22 and June 25, 2010 (early summer); and between August 31 and September 8, 2010 (late summer). A third round of surveys was conducted between August 18 and August 22, 2014 to update and supplement the 2010 surveys.

The surveys were carried out by senior botanist Dr. Marion Sensen and biologist Scott Burley. All habitat types in the Project Site were surveyed. Streams visible on the topographic maps as well as streams identified during the field surveys were investigated. Floodplains and aquatic flora of streams and lakes were also surveyed. All wetlands within the Project Area were investigated, including any wetlands which were field identified during the surveys, but which are not included in the provincial Wetlands Inventory Database (NSDNR 2000).

An inventory of plant species present on the Project Site was established in order to describe the existing habitat. Samples of species which were difficult to identify in the field were collected and later identified in the laboratory using a microscope and applicable identification guides. Photographs were taken of all major habitat types encountered during the survey.

2.1.2 Baseline Inventory

Five main habitat types were encountered within the Project Site. Most of the Project Site is covered by a mosaic of barren vegetation and coniferous forest. There are also patches of mixed forest, and wetlands such as treed bog, open bog, fen, and swamp scattered throughout the Project Area.

Coniferous Forest

Patches of coniferous forest dominated by balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*) are present throughout the Project Site. The understory of this habitat type varies in dominant species but can include lambkill (*Kalmia angustifolia*), late low blueberry (*Vaccinium angustifolium*), twinflower (*Linnaea borealis*), bunchberry (*Cornus canadensis*), starflower (*Trientalis borealis*), and wild sarsaparilla (*Aralia nudicaulis*).

Photo 2-1. Coniferous Forest Patch

Photo 2-2. Balsam Fir Dominated Coniferous Forest

Barren

Much of the Project Site is dominated by low barren vegetation. This habitat type can either be dominated by shrub species such as huckleberry (*Gaylussacia baccata*), late low blueberry and common juniper (*Juniperus communis*) growing to heights of less than one metre. Other forms of this habitat type are dominated by black crowberry mats growing over rocks. This type of barren is typically located closer to the coast (on headlands), but can occur inland over bedrock outcrops.

Photo 2-3. Low Barren/Shrub Barren Transition Area

Photo 2-4. Coastal Headland Barren

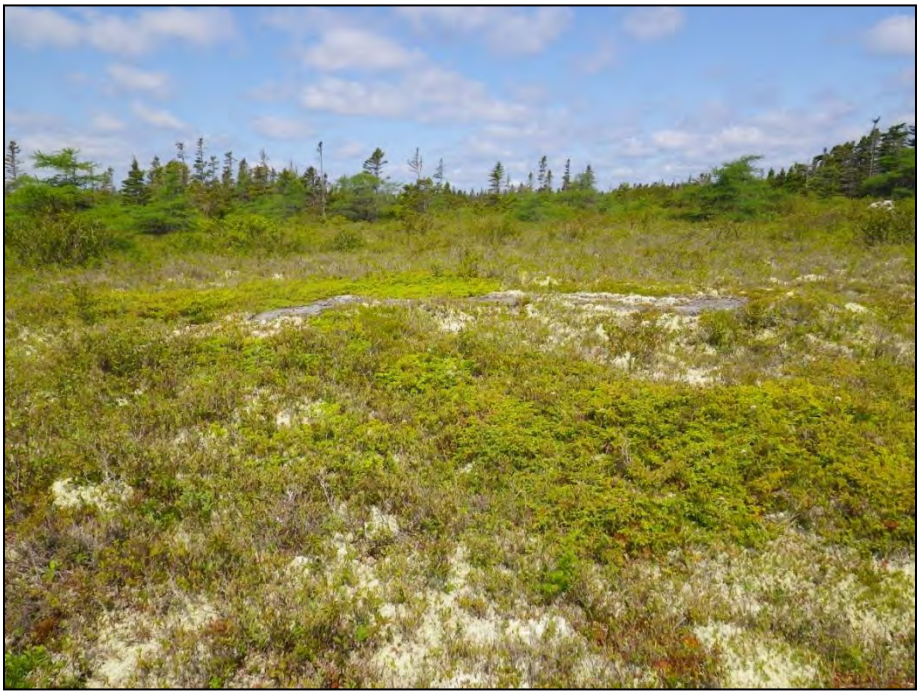

Photo 2-5. Low Barren

Tall Shrub Barren

A number of tall shrub barren vegetation patches are located throughout the Project Site. Dominant vegetation in these areas include Pin Cherry (*Prunus pensylvanica*), Alder (*Alnus incana*), and Mountain Holly (*Nemopanthes mucronatus*). In many instances, this habitat type acts as a transition zone between coniferous forest and barren habitat (described above).

Photo 2-6. Tall Shrub Barren

Mixed Forest

Mixed forest patches are scattered throughout the Project Site. These areas are dominated by canopy species such as red maple (*Acer rubrum*), heart-leaved paper birch (*Betula papyrifera var. cordifolia*), balsam fir, and understorey species including lambkill, late low blueberry, twinflower, bunchberry, starflower and wild sarsaparilla (*Aralia nudicaulis*). This habitat type is generally located in the southern end of the Project Site but does occur in patches closer to the coast.

Photo 2-7. Mixed Forest along Stream

Wetlands

A number of wetlands were identified within the Project Site. Wetland types encountered within the Project Site include open/treed bogs, fens, and treed/shrub swamps. Wetlands surveyed within the Project Area are described in more detail below in Section 4 and in the 2014 Wetland Baseline Survey Report.

Other habitat types

A number of other habitat types were also encountered within the Project Site including beaches, coastal barren headlands, coastal cliffs, regenerating forests, and lakes. Three mapped streams, as well as a number of intermittent/seasonal drainage channels, are also located on the property. Freshwater habitats on the site are discussed in Section 5.

A complete inventory of the vascular plant species observed during the surveys is provided in Table A.1-1 in Appendix A.1.

Photo 2-8. Beach at Northeast End of Property

2.1.3 Species of Conservation Concern

One vascular plant species of conservation concern was detected on the Project Site during the June 2010 surveys. Southern twayblade (*Listera australis)* has an ACCDC rarity rank of S2. This species was encountered along two streams located within the Project Area. Figure 2-1 illustrates the locations where this species was encountered. One location contained over 40 individuals within a relatively small area whereas only one individual was found at the second location. This species is shown in Photo 2-9, while its habitat is depicted in Photo 2-10.

An additional plant species of conservation concern, Northern Comandra (*Geocaulon lividum* – ACCDC rank S3) was detected during the August 2014 field survey. This species was noted in Wetland 18 (WL18) in the open bog portion of this wetland. Numerous individuals were reported throughout this wetland. Figure 2-1 illustrates the locations where this species was encountered. This species is shown in 11, while its habitat is depicted in Photo 2-101.

amec

LEGEND:

- Site Boundary

Lichens:

- *Peltigera leucophlebia*
- *Ramalina thrausta*
- *Cladonia stygia*
- *Nephroma bellum*
- *Usnea flammea*

Vascular Plants:

- *Listera australis*
- *Geocaulon lividum*

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PROJECT

Black Point Quarry Project

TITLE

Rare Vascular Plants and Lichens

DWN BY: DS	PROJECTION: UTM Zone 20	DATE: September 2014
CHK'D BY: SB	DATUM: NAD83	PROJECT NO: TV144003
REV. NO.: N/A	SCALE: N.T.S.	FIGURE No. 2-1

Photo 2-9. *Listera australis* in *Sphagnum* moss along stream

Photo 2-10. *Listera australis* habitat

Photo 2-11. *Geocaulon lividum* in open bog

Photo 2-12. *Geocaulon lividum* habitat

No plant species at risk listed by *SARA*/COSEWIC or in the *Nova Scotia Endangered Species Act* (*NSESA*) were identified in the field during the two vegetation surveys (June 2010 and August/September 2010).

2.2 LICHENS

2.2.1 Approach and Methodology

Field survey for lichens focused on cyanolichens. These lichens contain a blue-green algae (cyanobacterium) instead of (or in addition to) a green alga, as the photosynthetic component. Cyanolichens are very sensitive to air quality (Richardson, 1988), and are the only group of lichens which have been given status rankings by the Nova Scotia Department of Natural Resources (NSDNR General Status Ranks of Wild Species, 2010). Field surveys for cyanolichens were conducted by traversing through and around the proposed Project Site, visiting all habitat types. An AMEC lichenologist examined all potential substrates, such as tree trunks, branches, soil, and rock and recorded all cyanolichen species observed. Particular attention was paid to potential suitable habitat for cyanolichen species of concern, such as shaded, humid locations and mature red maples (*Acer rubrum*) growing in and around wetlands.

Mature balsam fir (*Abies balsamea*) trees on north-facing slopes were also examined, as such trees may support the boreal felt lichen (*Erioderma pedicellatum*). This species is an epiphytic cyanolichen listed as endangered under both the *SARA* and the *NSESA*. It is red-listed by NSDNR. The boreal felt lichen predictive habitat mapping maintained by Nova Scotia

Environment (Robert Cameron, NSE, pers. comm. April, 2010) was consulted to determine if there was any potential boreal felt lichen habitat on the site which would warrant further investigation. The mapping indicated there are no areas of potential habitat for this species on the site.

Examples of additional lichen (non-cyanolichen) species detected during field surveys for other taxa in 2010 were also recorded.

2.2.2 Baseline Inventory

A total of 9 species of cyanolichen were detected during the field survey. Table 2.1 lists the cyanolichen species observed on the Project Site during field surveys in 2010.

Table 2.1 Cyanolichen Species Identified on the Proposed Black Point Project Site in 2010

Binomial	Common Name	ACCDC Subnational Rank	NSDNR General Status
Lobaria pulmonaria	--	S4S5	Green
Lobaria quercizans	--	*S4S5*	Green
Lobaria scrobiculata	--	S4S5	Green
Peltigera canina	Dog Lichen	S4S5	Green
Peltigera leucophlebia	Dog's Tooth Lichen	S4S5	Yellow
Pseudocyphellaria perpetua	---	S4S5	Green
Collema sp.	--	--	--
Leptogium sp.	--	--	--
Nephroma sp.	--	--	--

Several additional non-cyanolichen species were observed during the cyanolichen and other taxa surveys in 2010, these are listed in Table 2.2 None of these species have been assigned status ranks by NSDNR.

Table 2.2. Other Lichen Species Identified on the Proposed Black Point Project Site in 2010.

Binomial	Common Name	ACCDC Subnational Rank
Cladonia arbuscula	Bering Reindeer Lichen	S4S5
Cladonia multiformis	--	S4S5
Cladonia rangiferina	Reindeer Lichen	S4S5
Cladonia maxima	Reindeer Lichen	S4S5
Cladonia sp.	---	--
Arctoparmelia centrifuga	Concentric-ring Lichen	S4S5
Parmelia squarrosa	--	S4S5
Ramalina thrausta	--	S2S3
Platismatia glauca	--	S4S5
Xanthoria parietina	Maritime sunburst lichen	S4S5
Usnea spp. *	Old Man's Beard Lichen	-

*Note that *Usnea* species are notoriously difficult to identify to species, often requiring the use of thin-layer chromatography.

2.2.3 Species of Conservation Concern

A single cyanolichen species of concern was detected on the Site during the surveys in 2010. A specimen of *Peltigera leucophlebia* was detected at the location depicted on Figure 2-1. This

species was yellow-listed by NSDNR, indicating it is vulnerable to natural or anthropogenic events. ACCDC ranks this species as S4S5. According to the updated General Status ranks (2010), this species is now ranked as 4 and is no longer considered rare.

No boreal felt lichen was detected on the Site, nor was any habitat deemed to be particularly suitable.

A second uncommon lichen (though not a cyanolichen), *Ramalina thrausta*, was found on the Site. The approximate location is depicted on Figure 2-1. ACCDC ranks this species as S2S3.

2.2.4 Species of Conservation Concern (2014)

Due to changes in species ranks and legislative requirements, an additional round of rare lichen surveys was carried out in August 2014. During these field surveys three additional lichen species of conservation concern were recorded on the Site. *Ramalina thrausta (*Angelhair Ramalina Lichen), detected in 2010, is still considered a species of conservation concern, with General Status rank 3. Table 2.3 provides a summary of the additional lichen species of conservation concern recorded in the Black Point Study Area. It should be noted that in weltands with suitable habitat, *Cladonia stygia* occurred frequently enough that only examples of *C. stygia* patches were marked with GPS locations.

Table 2.3. Lichen SOCC Identified on the Proposed Black Point Project Site in 2014.

Binomial	Common Name	ACCDC Rank	General Status Rank*	Location	Habitat
Cladonia stygia	Black-footed Reindeer Lichen	S2S3	3	WL 9, WL11, WL18, WL19, WL20	Open Bog
Nephroma bellum	Naked Kidney Lichen	S3?	3	WL10, WL17	Forested Wetland
Usnea flammea	Coastal Bushy Beard Lichen	S2S3	3	WL8, WL12, WL17	

*General Status Ranks accurate as of 22 September, 2014

3.0 FAUNA

3.1 BIRDS

3.1.1 Approach and Methodology

Bird surveys were carried out at those times of the year when birds make the most intensive use of the area. Survey times were chosen based on known breeding and migration periods, and all habitats used by the targeted birds were surveyed at appropriate times of the year to maximize the quality and quantity of data obtained. Surveys were conducted at the time of day with the highest likelihood of detecting the target species (e.g., early morning for breeding passerines, and during the appropriate parts of the tidal cycle for shorebirds), and in favourable conditions to maximize detection probability (low winds, no precipitation).
Survey dates and primary targets were as follows:

April 14th, 2010: year-round residents and early breeders, including owls;

May 18th and 19th, 2010: main passerine migration and early breeders;

June 22nd and 23rd, 2010: main passerine breeding;

August 25th, 2010: early shorebird migration; and

September 23rd, 2010: late shorebird migration.

Bird species, abundance and geographical location were recorded during each of the site visits. The location of each survey point was recorded using a handheld GPS unit. The early breeding bird survey in April included a night-time survey for owls which used the playback method employed by the Atlantic Canada Nocturnal Owl Survey (BSC, 2011). At each survey location, a series of owl calls interspersed with listening periods was played, for a total listening time of 15 minutes. Locations are depicted on Figure 3-1. For the day-time surveys in April, formal point counts were not conducted (as most birds were not yet present and/or vocalizing); instead, a list of observed species was recorded as the surveyors traversed the Project Site.

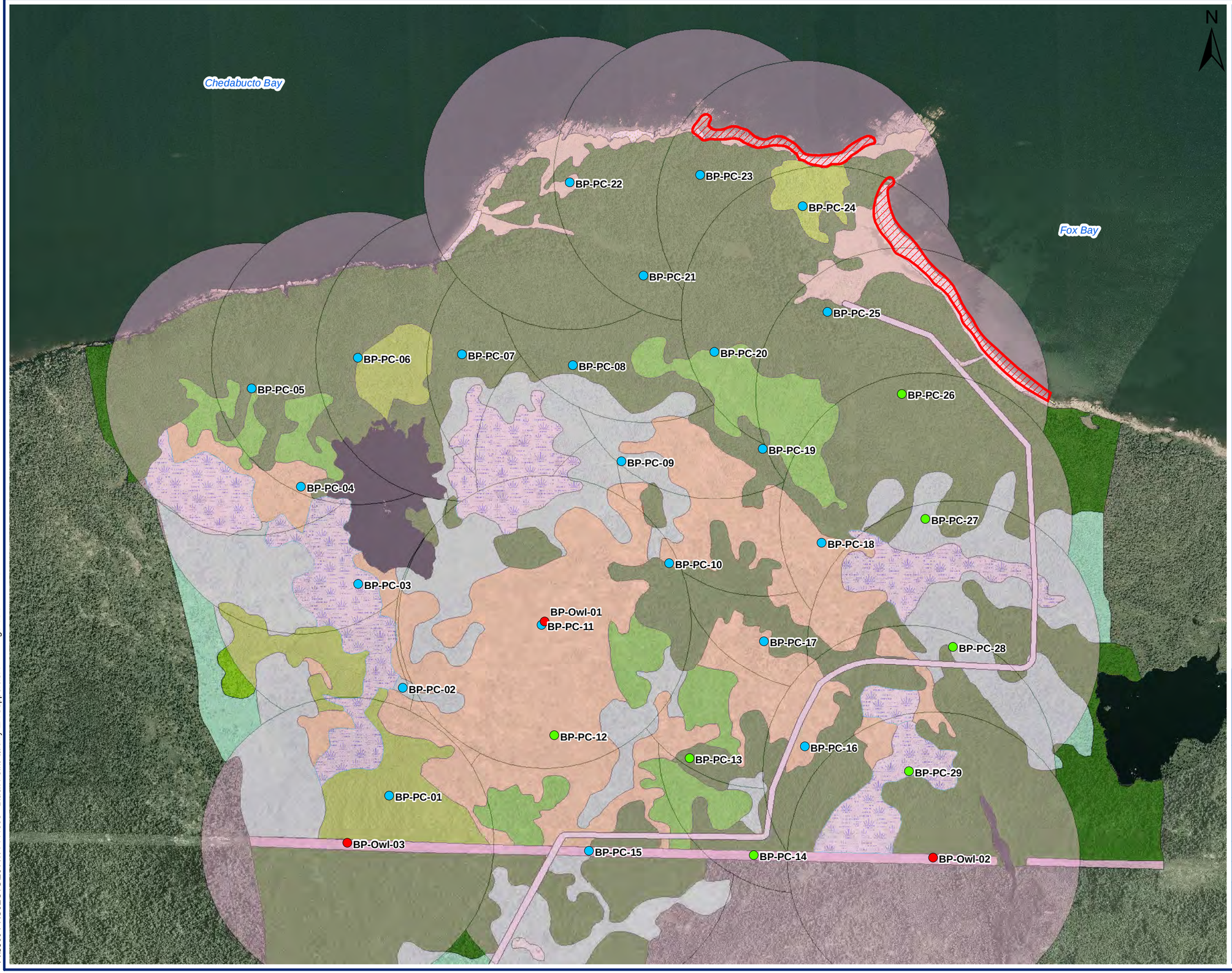
For the May and June surveys, ten-minute Maritimes Breeding Bird Atlas (MBBA)-style point counts were conducted at 29 fixed locations within the Project Site including each of the available habitat types on the Site. Points were selected in a systematic manner, with point counts spaced approximately 300 m apart in an effort to cover the entire project footprint; after the habitat classification had been completed, point count locations were plotted on a habitat figure (Figure 3-1) to ensure that all habitat types were represented in the surveys.

Surveys began at approximately 0600 hrs, and although efforts were made to complete the point counts by 1000 hrs, i.e., within four hours of dawn, because of time constraints the surveys often continued until late morning or very early afternoon in order to obtain data from each of the point count locations. It is very important to note that the point counts conducted after 1000 hrs are likely to miss many species that are present in the area but that do not tend to sing beyond the early morning hours; for that reason, the data from the late morning/early afternoon point counts are presented separately in the summary tables and are considered qualified. The point count surveys employed silent listening only; no playback was used. During each point count, species were identified visually or by their characteristic songs and call

notes, and the observer recorded numbers of each species observed as well as breeding evidence using Bird Studies Canada and Maritimes Breeding Bird Atlas criteria. Surveys were conducted only during suitable weather conditions, with no precipitation or winds that would interfere with listening conditions.

In addition to the point counts, Fogherty Lake was viewed from the bank (near PC-03 and PC-04) to look for shorebirds and waterfowl, and the waters off the coast were scanned for the presence of marine-associated bird species (seabirds, waterfowl and shorebirds). Any incidental observations of birds or other fauna made while traversing the site between point count locations were noted.

Shorebird data were collected in August and September according to the Atlantic Canada Shorebird Survey protocol (CWS, 2003). Surveyors walked back and forth along suitable areas of coastline within the Project Site (Figure 3-1) several times throughout the tidal cycle, recording numbers and species of shorebirds seen on each pass. In addition, a list of observed species was recorded as the surveyors traversed the Project Site, and the waters off the coast were scanned for the presence of seabirds and waterfowl.



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LEGEND

2010 Bird Survey Locations

- Early Morning Point Count
- Late Morning/Mid Afternoon Point Count
- Owl Survey
- Shorebird Survey Area
- 400m Buffer (2010 Bird Survey Locations)

Terrestrial Habitats

- Wetland
- Coniferous Forest
- Open Coniferous Forest
- Open Mixed Forest
- Regenerating Coniferous Forest
- Regenerating Forest
- Bog
- Coastal Barren
- Open Barren
- Shrub Barren
- Sand Gravel Beach
- Powerline Transmission Corridor

DRAFT

0 125 250 500 Meters

SCALE: 1:10,000
WHEN PLOTTED CORRECTLY AT 11 x 17
NAD 1983 UTM Zone 20N

NOTES

This map is for conceptual purposes only and should not be used for navigational purposes.

Basedata: Nova Scotia Natural Resources, downloaded, June 2014; Orthoimagery from GeoNOVA, 2007.

MORIEN RESOURCES CORP.

BLACK POINT QUARRY
ENVIRONMENTAL ASSESSMENT

2010 BIRD SURVEY LOCATIONS

September 23, 2014	Rev 1.0	Figure No. 3.1
Project No. 210.05913.00000		

SLR Consulting (Canada) Ltd.

3.1.2 Baseline Inventory

Owls and Early Migrants

During the nocturnal survey on April 14, 2010, three owl survey locations were established (Figure 3-1). At Survey Location PC03, near the southwest corner of the Site, two owls were heard: Northern Saw-whet Owl (*Aegolius acadicus*) and Barred Owl (*Strix varia*). No owls were heard at the other two owl survey locations.

A total of nineteen species were encountered during the day-time bird surveys in April. Table 3.1 lists these species, along with their NSDNR status and ACCDC ranks, respectively.

Table 3.1. Bird Species Identified During Daytime Surveys on Black Point Project Site, April 2010.

Common Name	Binomial	NSDNR Status	ACCDC rank
American Black Duck	*Anas rubripes*	Green	S5
American Crow	*Corvus brachyrhynchos*	Green	S5
Bald Eagle	*Haliaeetus leucocephalus*	Green	S4
Black-capped Chickadee	*Poecile atricapilla*	Green	S5
Boreal Chickadee	*Poecile hudsonica*	Yellow	S3
Brown Creeper	*Certhia americana*	Green	S5
Common Loon	*Gavia immer*	Yellow	S3B,S4N
Common Raven	*Corvus corax*	Green	S5
Dark-eyed Junco	*Junco hyemalis*	Green	S4S5
Golden-crowned Kinglet	*Regulus satrapa*	Green	S4
Great Black-backed Gull	*Larus marinus*	Green	S4
Hairy Woodpecker	*Picoides villosus*	Green	S5
Herring Gull	*Larus argentatus*	Green	S4S5
Merlin	*Falco columbarius*	Green	S5B
Northern Flicker	*Colaptes auratus*	Green	S5B
Pileated Woodpecker	*Dryocopus pileatus*	Green	S5
Red-breasted Merganser	*Mergus serrator*	Green	S3B,S5N
Ruffed Grouse	*Bonasa umbellus*	Green	S4S5
Song Sparrow	*Melospiza melodia*	Green	S5B

May and June Point Count Surveys

Twenty-nine point counts were conducted during the May and June surveys using the methodology described in Section 3.1.1; of those, 22 were surveyed in the early morning (between dawn and 1000 hrs), while seven were conducted after 1000 hrs. The locations of the point count surveys are depicted on Figure 3-1, and the habitat type(s) within an approximately 100m radius of each point count are described in Table 3.2. Tables B.1-1 and B.1-2 (Appendix B) summarize the observations at each point count location. The seven point counts conducted after 1000 hrs, in both May and June, had a lower number of species detected per point count than did the early morning point counts, with a notable drop in numbers of many early morning singers (e.g. most sparrow and warbler species), and an overrepresentation of species that are frequently observed and/or vocal throughout the day (e.g. Black-capped and Boreal

Chickadees, Ruby-crowned Kinglet, Blue-headed Vireo, Winter Wren). It is of note that **all habitat types were surveyed with at least one point count before 10:00 am** (Table 3-2).

Table 3.2. Habitat Types of Point Count Locations on Black Point Project Site, May and June 2010.

Habitat Type(s)	Point Count ID(s)[1]
Coniferous Forest	5,7,13,14,19,20,21,23,26
Barrens	9,11,12
Wetland (bog, fen, treed swamp)	3,29
Regenerating Forest	1,24
Mixed (Barrens and Wetland)	18,2
Mixed (Coniferous Forest and Barrens)	8,10,15,16,17,22,25,27,28
Mixed (Coniferous Forest and Regenerating Forest)	6

Note: Point counts 12, 13, 14, 26, 27, 28 and 29 were surveyed after 1000 hrs

May Migrant and Early Breeding Bird Survey

Point counts were conducted over two days (May 18 and 19) by AMEC ornithologists. A total of 407 birds, representing forty-one species were observed or heard during the May migration and early breeding surveys (Table B.1-1 in Appendix B). An average of 15.1 ± 4.0 (standard deviation) individual birds were recorded per point count, excluding the counts conducted after 1000 hrs; in the late morning/early afternoon point counts, 10.7 ± 3.9 individuals were recorded. Bird species of concern are discussed in Section 3.1.2.

June Breeding Birds

On June 22 and 23 2010, point count surveys were conducted by AMEC ornithologists at the same twenty-nine locations as in May (Figure 3-1). A total of 240 birds, representing forty-six species, were detected during the June breeding bird surveys (Table B.1-2 in Appendix B). An average of 13.4 ± 3.9 individual birds were recorded per point count, excluding the counts conducted after 1000 hrs; in the late morning/early afternoon point counts, 10.3 ± 4.9 individuals were recorded. Bird species of concern are discussed in Section 3.1.2.

Shorebirds

During the August 25 and September 23 surveys, five shorebird species were observed in small numbers feeding on the shores of the study area (Table 3.3).

Table 3.3. Shorebird Species Observed on Shoreline of Black Point Project Site in 2010.

Species	Binomial	NSDNR Status	ACCDC Rank	Number Observed	
				Aug. 25	Sept. 23
Greater Yellowlegs	*Tringa melanoleuca*	Green	S3B,S5M	3	0
Semipalmated Sandpiper	*Calidris pusilla*	Green	S3M	4	0
Spotted Sandpiper	*Actitis macularius*	Green	S3S4B	4	0
Least Sandpiper	*Calidris minutilla*	Green	S1B,S5M	9	0
Semipalmated Plover	*Charadrius semipalmatus*	Green	S1S2B,S5M	10	4

Four seabird species, Northern Gannet (*Morus bassanus*), Herring Gull (*Larus argentatus*), Great Black-backed Gull (*L. marinus*) and Double-crested Cormorant (*Phalacrocorax auritus*) were observed feeding, flying, and/or resting on the water during the surveys. In addition, 20 landbird species were also observed on the Project Site during the fall surveys (Table 3.4).

Table 3.4. Additional Bird Species Identified During Fall Shorebird Surveys on Black Point Project Site in 2010.

Common Name	Binomial	NSDNR Status	ACCDC Rank
American Crow	*Corvus brachyrhynchos*	Green	S5
American Kestrel	*Falco sparverius*	Green	S5B
Bald Eagle	*Haliaeetus leucocephalus*	Green	S4
Belted Kingfisher	*Megaceryle alcyon*	Green	S5B
Black-capped Chickadee	*Poecile atricapilla*	Green	S5
Blue Jay	*Cyanocitta cristata*	Green	S5
Boreal Chickadee	*Poecile hudsonica*	Yellow	S3
Cedar Waxwing	*Bombycilla cedrorum*	Green	S5B
Common Raven	*Corvus corax*	Green	S5
Common Yellowthroat	*Geothlypis trichas*	Green	S5B
Dark-eyed Junco	*Junco hyemalis*	Green	S4S5
Golden-crowned Kinglet	*Regulus satrapa*	Green	S4
Hairy Woodpecker	*Picoides villosus*	Green	S5
Northern Flicker	*Colaptes auratus*	Green	S5B
Northern Harrier	*Circus cyaneus*	Green	S5B
Red-breasted Nuthatch	*Sitta canadensis*	Green	S4S5
Red-eyed Vireo	*Vireo olivaceus*	Green	S5B
Red-tailed Hawk	*Buteo jamaicensis*	Green	S5
Sharp-shinned Hawk	*Accipiter striatus*	Green	S4S5B
White-throated Sparrow	*Zonotrichia albicollis*	Green	S5B

3.1.3 Incidental Observations

Three additional species were observed on the Project Site or just offshore by AMEC staff in 2010, outside of the targeted bird surveys. These are listed in Table 3.5.

Table 3.5 Incidental Bird Observations on the Black Point Site, 2010.

Common Name	Binomial	NSDNR Status	ACCDC Rank
Common Eider	*Somateria mollisima*	Green	S4
Ruby–throated Hummingbird	*Archilochus colubris*	Green	S5B
Spruce Grouse	*Falcipennis canadensis*	Green	S5

A complete list of all bird species observed on the Black Point site or just offshore during the 2010 field season is provided in Table B.1-3 in Appendix B.

3.1.4 Bird Species of Conservation Concern

Bird Species at Risk are those listed under federal or provincial endangered species legislation, such as *SARA* or the *NSESA*. No bird species listed as rare or endangered under *SARA* or the *NSESA* were observed on the proposed Black Point Project Site.

Species of concern are those listed as Yellow (sensitive) or Red (at-risk) by NSDNR, or as S3 or lower (S2, S1) by ACCDC. Ten species of concern were documented on the Black Point Site by AMEC staff in 2010.

Four species listed by NSDNR as Yellow or sensitive to anthropogenic or natural events were found on the site (Table 3.6). Another six were listed as S3 or lower for some part of the population or life history (*i.e.* migration or breeding).

Table 3.6. Bird Species of Concern Identified on the Black Point Project Site in Fall 2010.

Common Name	Binomial	NSDNR Status	ACCDC Rank
Boreal Chickadee	*Poecile hudsonica*	Yellow	S3
Common Loon	*Gavia immer*	Yellow	S3B,S4N
Gray Jay	*Perisoreus canadensis*	Yellow	S3S4
Rusty Blackbird	*Euphagus carolinus*	Yellow	S2S3B
Greater Yellowlegs	*Tringa melanoleuca*	Green	S3B,S5M
Red-breasted Merganser	*Mergus serrator*	Green	S3B,S5N
Semipalmated Sandpiper	*Calidris pusilla*	Green	S3M
Spotted Sandpiper	*Actitis macularius*	Green	S3S4B
Least Sandpiper	*Calidris minutilla*	Green	S1B,S5M
Semipalmated Plover	*Charadrius semipalmatus*	Green	S1S2B,S5M

3.2 MAMMALS

3.2.1 Approach and Methodology

Mammal surveys were conducted simultaneously with surveys for other taxonomic groups and wetlands on the site throughout the 2010 (for specific dates, refer to Sections 2.1, 3.1, 4.1, 5.1, and 6.1). Any evidence of mammal species such as sightings, tracks, vocalizations, tufts of hair, scat, and skeletal remains was recorded.

3.2.2 Baseline Inventory

A list of terrestrial mammals determined to be utilizing habitats on the proposed Black Point project site is provided in Table 3.7.

Table 3.7. Mammal Species Identified on the Black Point Project Site in 2010.

Common Name	Binomial	NSDNR Status	ACCDC Rank	Evidence
Red Squirrel	*Tamiasciurus hudsonicus*	Green	S5	Sighting, vocalizations
Eastern Chipmunk	*Tamias striatus*	Green	S5	vocalizations

American Beaver	*Castor canadensis*	Green	S5	Dams, lodges
North American Porcupine	*Erethizon dorsatum*	Green	S5	Sighting
Eastern Coyote	*Canis latrans*	Green	S5	Scat, tracks
Black Bear	*Ursus americanus*	Green	S5	Sighting, scat
Short-tailed Weasel	*Mustela erminea*	Green	S5	Sighting
Varying Hare	*Lepus americanus*	Green	S5	Scat
White-tailed Deer	*Odocoileus virginianus*	Green	S5	Tracks, scat

Other mammals such as Bobcat (*Lynx rufus*), Raccoon (*Procycon lotor*), and Red Fox (*Vulpes vulpes*) may also be present. Small mammal species such as shrews, voles, and mice are assumed to be present.

Two species of marine mammals were observed off the site during field surveys in 2010, these were northern minke whale (*Balaenoptera acutorostrata*) and gray seal (*Halichoerus grypus*). Many other species of marine mammals are expected to occur in the vicinity of the study area.

3.3 HERPETILES

3.3.1 Approach and Methodology

During terrestrial and freshwater field surveys conducted on the Project site in 2010 (for specific dates, refer to Sections 2.1, 3.1, 4.1, 5.1, and 6.1), reptile and amphibian observations were recorded during surveys for other taxonomic groups. Any evidence of herpetile species, including sightings, vocalizations, cast skins (snakes), skeletal remains, egg masses or presence of larvae, was recorded. Ponds and watercourses and their banks were scanned using binoculars during the day to detect presence of turtles, either in the water or basking, night-time field work included listening for vocalizations of frogs and toads, and coarse woody debris such as fallen logs and branches was overturned to look for salamanders and newts.

3.3.2 Baseline Inventory

A list of herpetile species determined to be utilizing habitats on the proposed Black Point project site is provided in Table 3.8

Table 3.8 Herpetile Species Identified on the Black Point Project Site in 2010.

Common Name	Binomial	NSDNR Status	ACCDC Rank	Evidence
Yellow Spotted Salamander	*Ambystoma maculatum*	Green	S5	Sighting of larvae
American Toad	*Bufo americanus americanus*	Green	S5	Sighting of adults, vocalizations
Spring Peeper	*Pseudacaris crucifer crucifer*	Green	S5	Sighting of adults, vocalizations
Green Frog	*Rana clamitans melanota*	Green	S5	Sighting of adults, vocalizations
Maritime Garter Snake	*Thamnophis sirtalis*	Green	S5	Sighting
Northern Leopard Frog	*Rana pipiens*	Green	S5	Sighting
Bullfrog	*Rana catesbieana*	Green	S5	Sighting of adults and larvae

3.4 ODONATES

Odonate (dragonflies and damselflies) were surveyed on the site in June and July 2010 by local odonate expert Paul Brunelle, assisted by AMEC staff. Additional specimens were collected during August and September 2010 by AMEC staff, and added to Brunelle's report. The complete odonate report, including details on the approach and methodology, is provided in Appendix B.2.

3.4.1 Odonate Species of Conservation Concern

A single odonate species of concern was observed during the 2010 field surveys.

The spot-winged glider (*Pantala hymenaea*) is a large dragonfly species which is migratory in northeastern North America (Brunelle, 2010). It is listed as Yellow by NSDNR Meaning it is sensitive to anthropogenic or natural impacts. Globally, the spot-winged glider is listed as G5, and sub-nationally as S5B. A specimen was observed near shallow bog pools in Wetland 12 (Figure 1 in Appendix B.2), engaging in mating behaviour. However, it is not known if such bog pools are suitable for larval development of the fast-growing larvae of this genus (Paul Brunelle, pers. comm 2010.) See the Odonate report in Appendix B.2 for further details.

4.0 WETLANDS

4.1 APPROACH AND METHODOLOGY

Prior to conducting on-site wetland surveys, AMEC conducted a desktop study to identify potential wetland locations within the Project Site, using available information such as the Nova Scotia Wetland Database (NSDNR 2000), Nova Scotia Wet Areas Mapping (NSDNR 2009), and topographic mapping (NRCAN 1998). Field surveys consisted of visiting all areas identified during the desktop study as known wetland locations as well as areas having the potential to contain wetlands. Areas identified as “dry” during the desktop study were also verified in the field to ensure there were no wetlands located in these areas.

Wetland field surveys were conducted between August 31 and September 8, 2010 in conjunction with the August/September 2010 vascular plant surveys by AMEC senior botanist Marion Sensen and AMEC wetland biologist Scott Burley. The investigated sites were field-referenced using Global Positioning System (GPS) and recent aerial photography.

4.1.1 Wetland Determination/Identification

AMEC staff utilized standard wetland criteria to identify wetlands. To be determined a wetland, a site must meet the following three criteria:

- A majority of dominant vegetation species are wetland associated species;
- Hydrologic conditions exist that result in periods of flooding, ponding, or saturation during the growing season; and
- Hydric soils are present.

These criteria are briefly discussed in the following paragraphs.

Vegetation

Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987). The definition of wetlands includes the phrase "sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions." Hydrophytic vegetation should be the dominant plant type and is characterized by the dominant plant species comprising the plant community (Environmental Laboratory, 1987). Accordingly, AMEC assessed dominance of hydrophytic vegetation in each wetland on the Project Site.

Soils

A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA-NRCS, 2007). Indicators that a hydric soil is present include soil color (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regime, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese

concretions, organic soils (histosols), histic epipedon, high organic content in surface layer in sandy soils, and organic streaking in sandy soils.

To determine soil characteristics in some wetlands, the AMEC team excavated a soil pit to a minimum depth of 30 cm or refusal within each wetland. The soil was then examined for hydric soil indicators. The matrix color and mottle color (if present) of the soil was determined using the Munsell Soil Color Chart.

Hydrology

Wetlands, by definition, either periodically or permanently have a water table at, near or above the land's surface or are saturated with water. To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology. Primary indicators of wetland hydrology may include, but are not limited to: water marks, drift lines, sediment deposition, drainage patterns, visual observation of saturated soils, and visual observation of inundation. In addition to the primary indicators, there is a variety of secondary wetland hydrology indicators. Secondary indicators include, but are not limited to: oxidized root channels in the upper 12 inches, water-stained leaves, and local soil survey data. When no primary indicators of wetland hydrology are observed at a data point, two or more secondary indicators are required to confirm wetland hydrology. In accordance with this definition, the AMEC team recorded primary and/or secondary indicators within each wetland.

Although complete wetland delineations were beyond the scope of the current survey, in preparation of anticipated future wetland delineations, wetland determination sheets were completed for a portion (seven) of the 20 wetlands surveyed within the Project Area. Determination sheets for the remaining wetlands were planned to be completed during the wetland delineation component of the project. Completed wetland determination sheets for the seven wetlands are provided in Appendix C.1.

4.1.2 Biophysical Habitat Assessment

AMEC selected the methodology of the Canadian Wetland Classification System to identify wetland classes, forms and types (National Wetland Working Group, 1997). Wetland vegetation is the primary biological indicator of major ecological processes, their vitality, and its ability to support wildlife. Wetland vegetative abundance and diversity depend upon a range of factors including soil types and topography, but are most closely linked to the nature of the hydrologic regime (Glooschenko and Grondin, 1988). Plants most clearly illustrate the biological capability of the wetland. The nature and dynamics of the vegetative community ultimately define wetland habitat type and subsequent functional values of the site.

The field assessments were conducted during the August 2010 survey by a crew of two people, both with experience in wetland ecology, habitat identification, and functional assessment. Biophysical field investigations were conducted according to methods best defined in Dickinson (1994). Standardized wetland field data sheets were used to document the wetland information collected in the field, which includes information on vegetation assemblages, inundation, wildlife and disturbance.

4.1.3 Detailed Habitat Sketches

Detailed habitat sketches were prepared in the field for each wetland to document the wetland components (i.e., inflow, outflow, standing water, vegetation communities, *etc.*) (Appendix C.2).

4.2 BASELINE INVENTORY

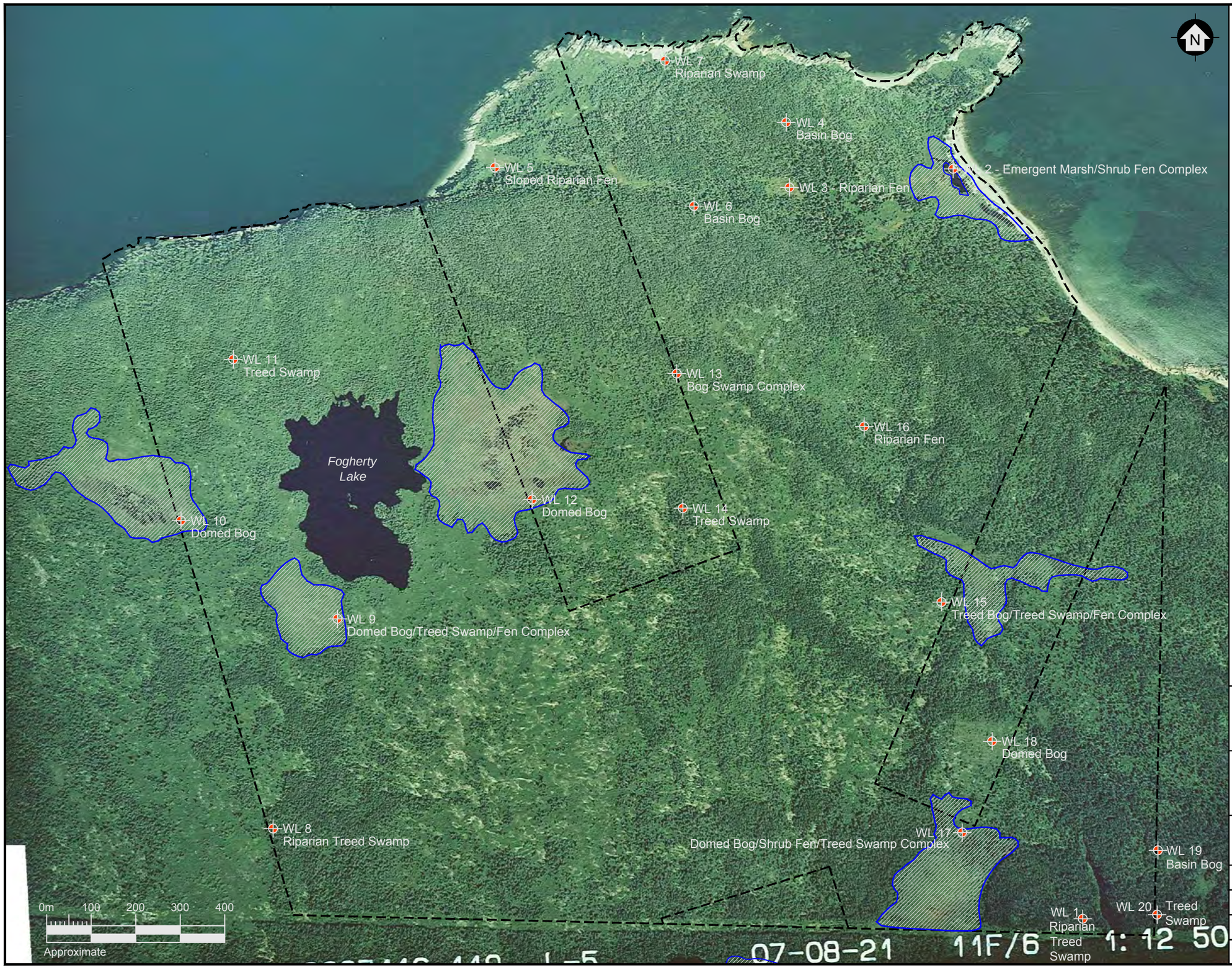
A total of 20 wetlands were surveyed within the Project Site (Table 4.1). This includes the six wetlands previously identified in the NSDNR Wetland Database as well as 14 additional field identified wetlands (Figure 4-1). Table 4.1 provides a summary of wetland types along with corresponding UTM coordinates and approximate areas for each wetland encountered within the Project Site. Wetland sizes reported are only estimates based on preliminary field observations and air photo interpretation, as complete wetland delineations were not conducted. A representative photo of each wetland is provided in Appendix C.3.

Table 4.1 Wetland Types and Locations Identified on the Black Point Project Site in 2010.

Wetland #	Wetland Type	Easting	Northing	Approximate Size (ha)
WL 1	Riparian Treed Swamp	645767	5022425	0.21
WL 2	Emergent Marsh/Shrub Fen Complex	645476	5024110	*5.79
WL 3	Riparian Fen	645108	5024068	0.56
WL 4	Basin Bog	645101	5024214	0.09
WL 5	Sloped Riparian Fen	644447	5024113	0.98
WL 6	Basin Bog	644894	5024026	0.72
WL 7	Riparian Swamp	644829	5024353	0.04
WL 8	Riparian Treed Swamp	643949	5022628	1.23
WL 9	Domed Bog/Treed Swamp/Fen Complex	644093	5023099	*7.21
WL 10	Domed Bog	643742	5023320	5.36
WL 11	Treed Swamp	643859	5023682	0.12
WL 12	Domed Bog	644530	5023367	10.13
WL 13	Bog/Swamp Complex	644855	5023650	0.51
WL 14	Treed Swamp	644869	5023348	0.53
WL 15	Treed Bog/Treed Swamp/Fen Complex	645450	5023137	*7.60
WL 16	Riparian Fen	645276	5023531	0.13
WL 17	Domed Bog/Treed Swamp/Shrub Fen Complex	645496	5022619	*7.33
WL 18	Domed Bog	645563	5022824	2.28
WL 19	Basin Bog	645935	5022579	0.56
WL 20	Treed Swamp	645934	5022435	0.09

* Actual wetland area is larger than what is reported in the NSDNR Wetlands Database and covers a larger area than what is depicted in Figure 4-1 .

Vascular plant species recorded for each wetland are presented in Appendix C.4. The wetland assessment data sheets are provided in Appendix C.1 Photographs of each wetland are provided in Appendix C.4.



LEGEND:

- Site Boundary
- NSDNR Wetlands
  Nova Scotia Wetlands and Coastal Habitats Inventory (2000)
- Field Identified Wetlands

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Metropolitan Place
99 Wyse Road, Suite 1480
Dartmouth, NS B3A 4S5

PROJECT
Black Point Quarry Project

TITLE
Wetland Locations

DWN BY:	PROJECTION:	DATE:
DS	UTM Zone 20	February 2011
CHK'D BY:	DATUM:	PROJECT NO:
SB	NAD83	TV01017
REV. NO.:	SCALE:	FIGURE No.
N/A	N.T.S.	4-1

5.0 FRESHWATER HABITAT

5.1 APPROACH AND METHODOLOGY

Habitat assessment and fish community surveys were conducted on Fogherty Lake and three unnamed watercourses which were identified by field personnel with experience in fish habitat assessment methods. These freshwater habitats were identified using topographic mapping and aerial photography. Field work was conducted during two site visits, on August 24th to 26th and September 20th to 22nd, 2010. Locations of surveys are depicted on Figure 5-1.

Habitat Assessment

Physical dimensions and field-measured water quality parameters (pH, conductivity, water temperature and dissolved oxygen) of the lake and watercourses were noted. For each distinct habitat segment of the three watercourses, channel type, bank composition and stability, substrate composition and embeddedness, in-stream cover and overhanging vegetation was recorded. Locations were recorded using a hand-held Garmin GPS unit, and photographs were taken at representative sections of each water body. For the three watercourses, physical habitat characteristics along the surveyed sections of each watercourse were recorded on standard DNR&E/DFO New Brunswick Stream Survey and Habitat Assessment forms.

Water samples from each water body were collected in laboratory-supplied bottles and placed in a cooler with ice for shipping to AGAT Laboratories in Dartmouth, NS for analysis of general chemistry, total metals (including mercury), total suspended solids, and low-level phosphorous.

Fish Community Surveys

Fish sampling was conducted in Fogherty Lake and the three unnamed watercourses under a scientific permit (License # 323774) in accordance with the conditions outlined in Section 52 of the Fishery (General) Regulations (SOR/93-53) under the *Fisheries Act* (Government of Canada, 1985).

Five-minute spot checks were conducted on the watercourses with a backpack electrofishing unit, to determine presence or absence of fish species. Two multi-panel gillnets, with mesh sizes ranging from 2.5 cm to 10 cm, were deployed on Fogherty Lake for two hours on August 27, 2010. In addition, four minnow traps were baited with dry cat food and placed in shallow water near the shore of the lake for a total of four hours.

amec

LEGEND:
- Site Boundary
- Not Surveyed
- Stream Unit 1
- Stream Unit 2
- Stream Unit 3
- Stream Unit 4
- Gillnetting and Electrofishing Locations

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PROJECT
Black Point Quarry Project

TITLE
Gillnetting and Electrofishing Locations

DWN BY: DS	PROJECTION: UTM Zone 20	DATE: February 2011
CHK'D BY: SB	DATUM: NAD83	PROJECT NO: TV01017
REV. NO.: N/A	SCALE: N.T.S.	FIGURE No. 5-1

5.2 BASELINE INVENTORY

Habitat Assessment

A brief description of each of the water bodies assessed is provided below. The completed watercourse habitat assessment forms and Site photographs are provided in Appendices D.1 and D.2, respectively. Water quality data, including analytical results and field-measured parameters, are presented in Table D.3-1 in Appendix D.3. Surface water on the Project Site tended to be very acidic (pH<4).

Fogherty Lake

Fogherty Lake is a shallow lake surrounded by trees, barrens and exposed rock. The water is clear but darkly tea-coloured, and visibility is nil at approximately one metre depth. The lake substrate is exposed bedrock and large boulders. There is some woody organic debris on the lake bed, which has a strong sulfurous smell. Vegetation surrounding the lake includes leatherleaf (*Chaemodaphne calyculata)*, sheep laurel (*Kalmia angustifolia*), possum-haw viburnum (*Viburnum nudum)*, rhodora (*Rhododendron canadense*), chokeberry (*Photina* sp.) Labrador tea (*Ledum groenlandicum*), bunchberry (*Cornus canadensis*), black spruce (*Picea mariana*) and tamarack *(Larix laricina*). Yellow water lily (*Nuphar lutea*) was observed growing in the lake. Water in this lake was found to be very acidic (pH in field=2.94) and dark tea-coloured (Table D.3-1 in Appendix D.3).

Unnamed Watercourses

Unnamed Watercourse 1 is the outflow of Fogherty Lake to the north. A beaver dam is located near the upstream end of the watercourse. Upstream of the dam, the channel is deep and wide and the substrate largely fines; downstream, the channel is a relatively narrow and shallow run with one area of natural deadwater. The northernmost 150m of this watercourse was not surveyed, as it flows down a steep dropoff; however, the dimensions and substrate of the downstream reaches appeared to be similar to the run portions of the channel.

Unnamed Watercourse 2 originates in a steep valley at the north of the Project Site, and flows in a northwesterly direction. There was a great deal of deadfall in the channel valley. The upstream reaches were dry at the time of the survey, and further downstream the stream was very shallow; this watercourse is probably ephemeral. The last 220 m of this watercourse was inaccessible, as it flows down a steep slope to the ocean, as does Unnamed Watercourse 1. However, the dimensions and substrate of the downstream reaches appeared to be similar to the rest of the channel.

Unnamed Watercourse 3 originates in the southeast portion of the Project Site, flows through softwood forest and fen habitat, and ultimately discharges into Hendsbee Lake, south of the Project Site. The downstream portion of the assessed section is a large pool resulting from a beaver dam on the watercourse just south of the Site property line.

Fish Community Surveys

No fish were seen in Fogherty Lake, although a few insect species were found in and around the minnow traps, namely dragonflies, damselfies, mayflies, whirligig beetles, caddisfly larvae, and giant water bugs.

Five minute electrofishing spot-checks were conducted on Unnamed Watercourses 1 and 3, Unnamed Watercourse 2 was too shallow to fish. No fish were observed in either watercourse during the electrofishing and habitat assessments. Other AMEC field personnel reported seeing a small unidentified fish approximately 2 cm in length in Unnamed Watercourse 3. Based on habitat limitations, it is unlikely that this was a juvenile salmonid; the pH values measured at the Site range from 2.9 to 3.5, and fish passage to the ocean is impossible due to the steep terrain at the north of the Site.

A fourth ephemeral watercourse was identified on the Project Site near the western property boundary. This watercourse appears to drain Wetlands 8 and 9 when water levels are high. It was not surveyed, as it was well away from the proposed Project footprint. A spot check showed the water pH to be 2.65, too acidic to support fish.

In summary, neither Fogherty Lake nor any of the unnamed watercourses represent fish habitat due to acidic conditions.

6.0 MARINE HABITAT

Three types of marine surveys were conducted on the proposed marine footprint of the Project. This includes a benthic habitat survey, a marine invertebrate community survey, and a marine sediment survey.

6.1 UNDERWATER BENTHIC HABITAT SURVEY

6.1.1 Approach and Methodology

Between August 31 and September 3, 2010, video survey techniques were used to map substrate types and document macrofaunal and macrofloral species presence and abundance in the footprint of the proposed marine infrastructure. AMEC contracted Connors Diving Services to perform the diving and video surveillance activities. An AMEC representative was on-site to guide the dive crew in the event that any issues arose.

A total of 1,200 metres (m) of video surveillance divided into six transects (T1, T2, T3, T4, T5, and T6) was conducted in and around the marine portion of the Project Site, as depicted in Figure 6-1. T1, T2, and T3 each measured 250m and were oriented parallel to the shoreline while T4, T5, and T6 each measured 150m in length and extended perpendicular from the shoreline. The transect locations were visually referenced in the field and coordinates were derived using a handheld Global Positioning System (GPS) to mark the start and end points of the transects. These coordinates are also provided in Figure 6-1.

The underwater surveillance of the transects required the use of an underwater video camera, operated by a Canadian Standards Association (CSA)-certified diver using SCUBA. As much as was practical, the underwater video surveillance encompassed a span of approximately 1m on either side of the transect line. Seabed characterization involved field observations made by the field crew and a review of the video surveillance tape. Observations along the video transect were made for every 5m segment.

6.1.2 Baseline Inventory

The results of the transect surveys for the proposed Project Site are presented in Appendix E.1 (Tables E1-1 to E.1-6). The following information is provided for each 5m increment of transect line:

- Visual estimate of substrate grain size distribution (in order of dominance);
- Identification and abundance of macrofaunal species; and
- Identification and percent coverage of macrofloral species.

A summary of the information provided in Tables E.1-1 to E.1-6 (Appendix E.1) is described in the following paragraphs. A species list has been included in Table E.1-7 in Appendix E.1.

For the purposes of the video survey review and species assessment, four categories were developed to characterize the observed abundances. The categories are as follows:

A = Abundant
Numerous (not quantifiable) observations made throughout the entire 5m segment.

C = Common
Numerous (not quantifiable) observations made intermittently along the 5m segment.

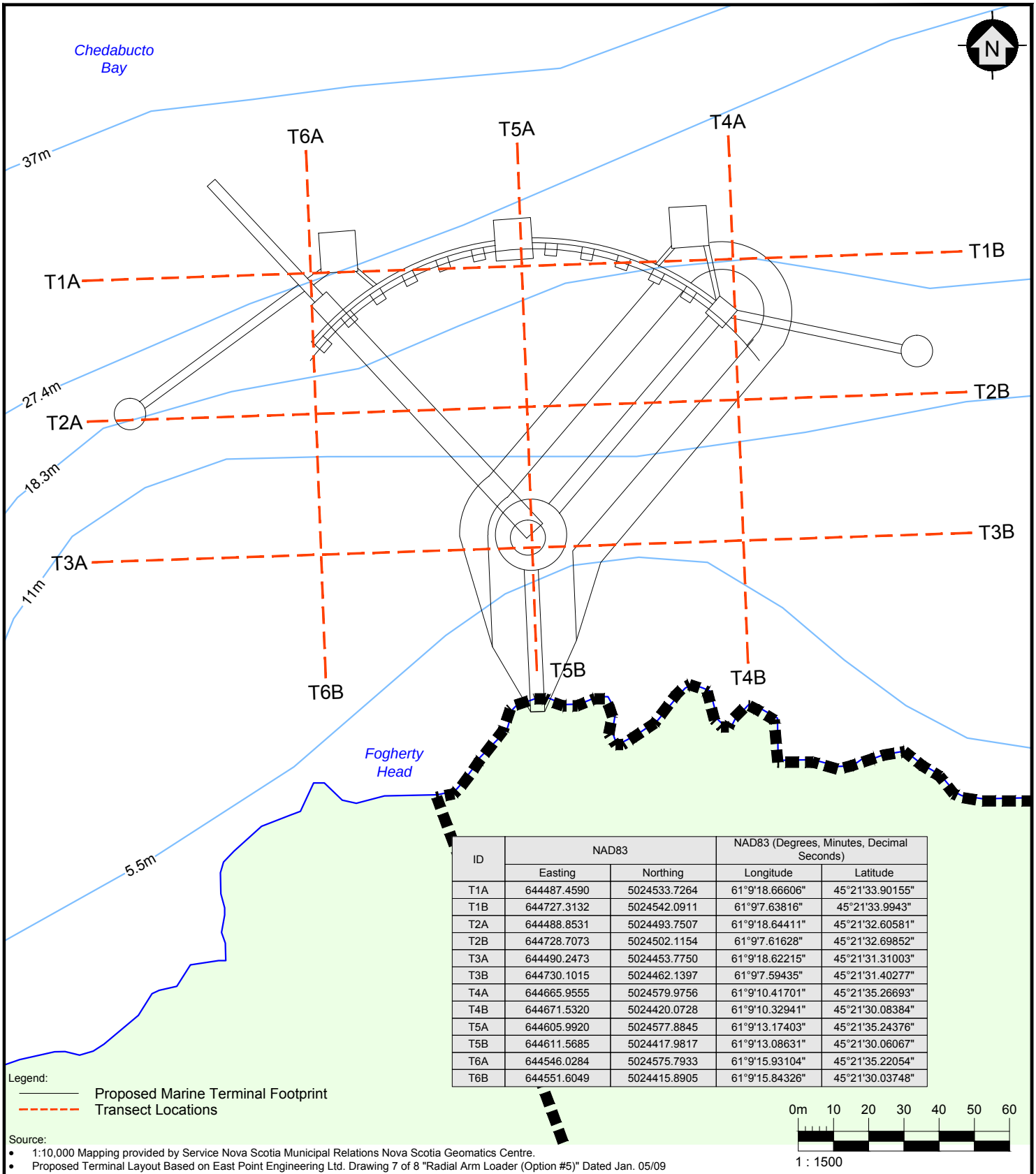
O = Occasional
Quantifiable observations made intermittently along the 5m segment.

U = Uncommon
Quantifiable observations made infrequently along the 5m segment.

The marine substrate within the characterized area consisted primarily of cobble, rock, and large boulders. Lesser amounts of sand and silt were observed throughout the transects. The high degree hard bottom supports a high diversity of both floral and faunal species.

Algal cover is sparse (0-10%) in deeper waters but increases markedly (50-90%) as the transects approached the near shore areas. The algal canopy is dominated by the brown algal species black whip weed (*Chordaria flagelliformis*), bladderwrack (*Fucus* sp.), and sea colander (*Agarum clathratum*). Other species present in lesser amounts included sugar kelp (*Laminaria saccharina*), tube weed (*Polysiphonia lanosa*), an encrusting red alga (*Leptophyllum* sp.), Irish moss (*Chondrus crispus*), a brown alga (*Pilayella littoralis*), a green alga (*Acrosiphonia arcta*), and a red alga (*Plumaria plumosa*). Of note, green fleece (*Codium fragile*), an invasive species in Nova Scotia (Invasive Species Alliance of Nova Scotia, 2011), was noted along T2. This species has been previously reported from around the Canso area (Watanabe *et al*. 2010).

The hard bottom and algal cover provides habitat for many species. The most common species noted included deep sea scallop (*Placopecten magellanicus*), blue mussel (*Mytilus edulis*), green sea urchin (*Strongylocentrotus droebachiensis*), and American lobster (*Homarus americanus*). Fish species noted along the transects were cunner (*Tautogolabrus adspersus*) and shorthorn sculpin (*Myoxocephalus scorpius*). Other invertebrate species observed along the transects included American oyster (*Crassostrea virginica*), northern rock barnacle (*Semibalanus balanoides*), Bowerbank's halichonidria (*Halichondria bowerbanki*), frilled anemone (*Metridium senile*), periwinkle (*Littorina* sp.), sea cucumber (*Cucumaria frondosa*), sea peach (*Holacynthia pyriformis*), sea star (*Asterias* sp.), and waved whelk (*Buccinum undatum*). Due to the depths of the surveyed areas divers had to move at speed greater than optimal for characterization. The combination of the speed of the diver's movement and a cobble bottom resulted in difficulty discerning the presence of small invertebrates such as periwinkles.



ID	NAD83		NAD83 (Degrees, Minutes, Decimal Seconds)	
	Easting	Northing	Longitude	Latitude
T1A	644487.4590	5024533.7264	61°9'18.66606"	45°21'33.90155"
T1B	644727.3132	5024542.0911	61°9'7.63816"	45°21'33.9943"
T2A	644488.8531	5024493.7507	61°9'18.64411"	45°21'32.60581"
T2B	644728.7073	5024502.1154	61°9'7.61628"	45°21'32.69852"
T3A	644490.2473	5024453.7750	61°9'18.62215"	45°21'31.31003"
T3B	644730.1015	5024462.1397	61°9'7.59435"	45°21'31.40277"
T4A	644665.9555	5024579.9756	61°9'10.41701"	45°21'35.26693"
T4B	644671.5320	5024420.0728	61°9'10.32941"	45°21'30.08384"
T5A	644605.9920	5024577.8845	61°9'13.17403"	45°21'35.24376"
T5B	644611.5685	5024417.9817	61°9'13.08631"	45°21'30.06067"
T6A	644546.0284	5024575.7933	61°9'15.93104"	45°21'35.22054"
T6B	644551.6049	5024415.8905	61°9'15.84326"	45°21'30.03748"

Legend:
- Proposed Marine Terminal Footprint
- Transect Locations

0m 10 20 30 40 50 60

1 : 1500

Source:
- 1:10,000 Mapping provided by Service Nova Scotia Municipal Relations Nova Scotia Geomatics Centre.
- Proposed Terminal Layout Based on East Point Engineering Ltd. Drawing 7 of 8 "Radial Arm Loader (Option #5)" Dated Jan. 05/09

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PROJECT	DWN BY:	DATUM:	DATE:
Black Point Quarry Project	DS	NAD83	February 2011
	CHK'D BY: CK	REV. NO.: N/A	PROJECT NO: TV01017
TITLE	PROJECTION:	SCALE:	FIGURE No.
Benthic Habitat Video Survey Transect Locations	UTM Zone 20	1:1500	6-1

6.2 MARINE INVERTEBRATE COMMUNITY SURVEY

6.2.1 Approach and Methodology

Prior to field surveys, a grid was plotted over a map of the footprint of the proposed marine infrastructure, containing at least five times as many squares as the number of required sampling stations. A random number generator software program was then used to derive the sampling locations (squares) within the footprint, which are depicted on Figure 6-2.

Six benthic invertebrate samples were collected at the Project Site on September 1, 2010. Connors Diving Services was contracted by AMEC to perform the sample collection.

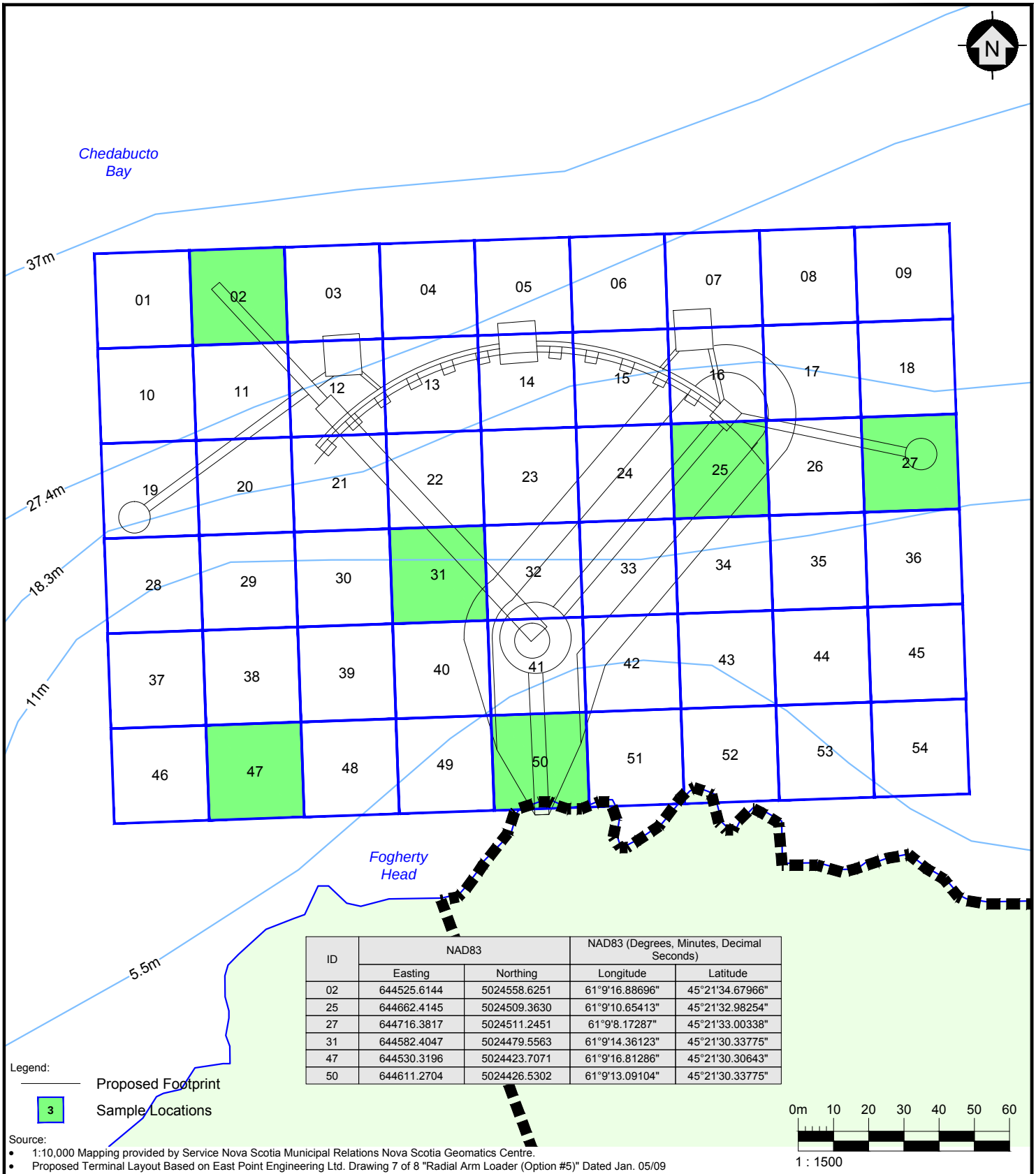
Once on station, the diver placed a 0.25 m^2 quadrat on the substrate surface and used a small container to penetrate the substrate, as much as was practical, to a depth greater than 5 cm. Several litres of sediment were collected at each of the benthic invertebrate sampling locations. This sediment was placed in a clean 20 L bucket and brought to the support vessel at the surface, where it was thoroughly mixed and 4 L were measured out for the benthic invertebrate sample.

Each sample was sieved through a 1.0 millimetre screen using filtered seawater to remove the risk of osmotic shock to any organisms present. The samples were preserved with 70% isopropanol in one or more 1 L glass Mason jars. Each jar was inverted several times to ensure proper mixing of the contents.

Samples were then shipped to BioTech Inc. (Smithtown, NB), for benthic invertebrate identification and enumeration.

Benthic invertebrate statistical indices compiled for this program consisted of the following:

- Benthic invertebrate identification and enumeration for each station;
- Number of species and number of individuals per species for each station;
- Number of species per station by major taxonomic group; and
- Density (number of organisms/m^2) and biomass (g/m^2 wet weight) for each station.



ID	NAD83		NAD83 (Degrees, Minutes, Decimal Seconds)	
	Easting	Northing	Longitude	Latitude
02	644525.6144	5024558.6251	61°9'16.88696"	45°21'34.67966"
25	644662.4145	5024509.3630	61°9'10.65413"	45°21'32.98254"
27	644716.3817	5024511.2451	61°9'8.17287"	45°21'33.00338"
31	644582.4047	5024479.5563	61°9'14.36123"	45°21'30.33775"
47	644530.3196	5024423.7071	61°9'16.81286"	45°21'30.30643"
50	644611.2704	5024426.5302	61°9'13.09104"	45°21'30.33775"

Source:
- 1:10,000 Mapping provided by Service Nova Scotia Municipal Relations Nova Scotia Geomatics Centre.
- Proposed Terminal Layout Based on East Point Engineering Ltd. Drawing 7 of 8 "Radial Arm Loader (Option #5)" Dated Jan. 05/09

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PROJECT	DWN BY:	DATUM:	DATE:
Black Point Quarry Project	DS	NAD83	February 2011
	CHK'D BY: MCM	REV. NO.: N/A	PROJECT NO: TV01017
TITLE	PROJECTION:	SCALE:	FIGURE No.
Benthic Invertebrate Sampling Locations	UTM Zone 20	1:1500	6-2

6.2.2 Baseline Inventory

The total number of organisms collected at each sample station (density) ranged from 109 organisms (436 organisms/m^2) at Station 4 to 318 organisms (1,272 organisms/m^2) at Station 2. The number of major taxonomic groups represented ranged from 17 at Station 4 to 47 at Station 1. Biomass calculations ranged from 3.24 g/m^2 at Station 4 to 79.28 g/m^2 at Station 5.

Three phyla and twelve classes were identified within the collected samples. The most prevalent taxa were the annelid worms (Polychaetes) and molluscs (Gastropods). The most common polychaetes indentified include the worm *Aricidea (*syn.*Acmira) catherinae*, sinistral spiral tubeworm *(Spirobis borealis)* and cirratulids (*Tharyx* spp.). The most prevalent bivalve species included the common tortoiseshell limpet (*Tectura testudinalis*) and interrupted turbonille *(Turbonilla interrupta)*.

A complete list of the species identified is included in Table E.2 1. of Appendix E.2. It should be noted that some bottles were broken during transport. Sample GQ 02 and GQ 47 had two of the three bottles damaged and GQ 27 had one of five bottles broken. Approximately 80% of the spilled sample from each bottle was recovered.

6.3 MARINE SEDIMENT SAMPLING PROGRAM

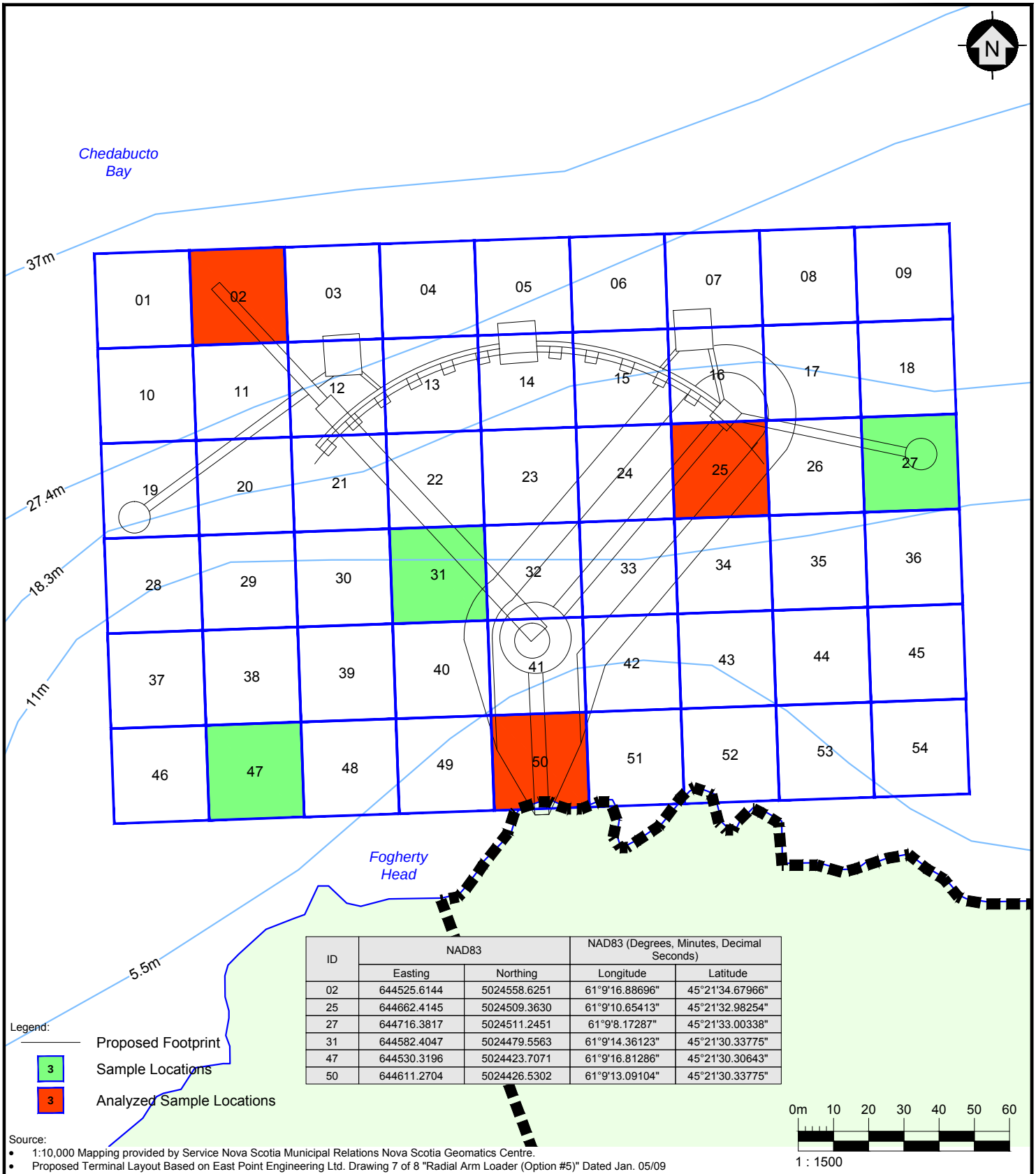
6.3.1 Approach and Methodology

The sample collection, preparation, and analyses were conducted in accordance with Environment Canada's publication *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing, December 1994.* Connors Diving Service was retained to collect the sediment samples.

A total of six marine sediment samples were collected on September 1, 2010 from within the footprint of the proposed marine infrastructure. A handheld Garmin Global Positioning System (GPS) was used to locate the sampling locations selected by AMEC prior to field program initiation. The coordinates of the sampling locations are listed on Figure 6-3 as UTM (Universal Transverse Mercator) and latitude and longitude (dd mm ss.sss) (Datum: NAD 83).

The sediment sample was obtained from the same well-mixed sample of substrate as the benthic invertebrate sample (outlined previously).

As per laboratory protocol, two 250 millilitre (ml) jars of sediment were collected per station. An additional 250 ml jar of sediment was collected at each of the sampling locations to safeguard against loss or damage during transport.



ID	NAD83		NAD83 (Degrees, Minutes, Decimal Seconds)	
	Easting	Northing	Longitude	Latitude
02	644525.6144	5024558.6251	61°9'16.88696"	45°21'34.67966"
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Source:
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- Proposed Terminal Layout Based on East Point Engineering Ltd. Drawing 7 of 8 "Radial Arm Loader (Option #5)" Dated Jan. 05/09

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Black Point Quarry Project	DS	NAD83	February 2011
	CHK'D BY: MCM	REV. NO.: N/A	PROJECT NO: TV01017
TITLE	PROJECTION:	SCALE:	FIGURE No.
Marine Sediment Sampling Locations	UTM Zone 20	1:1500	6-3

Following sample collection, all samples were placed in a cooler on ice and delivered to Maxxam Analytics Inc. (Maxxam), in Bedford, NS for the required chemical analyses. Maxxam is accredited with the Standards Council of Canada (SCC).

Three of the six samples (GQ 02, GQ 25, and GQ 50; Figure 6-3) were analyzed for metals including mercury, hexavalent chromium, and low level selenium and tin; low level polycyclic aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); low level benzene, toluene, ethylbenzene, and xylene (BTEX) including an assessment for presence/absence of creosote; total petroleum hydrocarbons (TPHs); total inorganic and total organic carbon (TIC/TOC); total dichloro-diphenyl-trichloroethane (DDT) (including 2,4'- and 4,4'-dichloro-diphenyldichloroethylene (DDE), 2,4'- and 4,4'-dichlorodiphenyldichloroethane (DDD), and 2,4'- and 4,4'-DDT); and grain size.

In order to facilitate the determination of all disposal options for sediment potentially removed during the construction of the proposed Project, the analytical sample results were compared to the following:

- *Canadian Environmental Protection Act* (CEPA) Disposal at Sea Regulations (formerly the *Ocean Dumping Control Act*);
- Canadian Council of Ministers of the Environment (CCME) Probable Effects Levels (PELs) for marine/estuarine sediment;
- CCME Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health in agricultural, residential/parkland, and commercial/industrial applications; and
- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 2.0 Risk-Based Screening Levels (RBSLs).

6.3.2 Baseline Inventory

The analytical results of the three marine sediment samples analyzed are summarized in Tables E.3-1 to E.3-4 (Appendix E.3). The complete set of analytical results, including laboratory Quality Assurance/Quality Control and Certificates of Analyses for all parameters tested, are provided in Appendix E.4.

There were no exceedances noted for any of the abovementioned guidelines.

Two samples (GQ 25 and GQ 50) were predominantly gravel (76-82%) with lesser amounts of sand (16-19%), silt (1-3%), and clay (<1-1%). Sample GQ 02 was a mix of gravel (51%) and sand (42%) with lesser amounts of silt (5%) and clay (3%) (Table E.3-5 in Appendix E.3). The three samples collected and analyzed had total carbon contents ranging from 0.6 to 1.62 grams per kilogram (g/kg) (Table E.3-5 in Appendix E.3).

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Personal Communications

Robert Cameron, Nova Scotia Environment, pers. comm. April 2010.

Appendix A.1

Vascular Plants

Table A-1-1. Vascular Plant Species Inventory on the Black Point Project Site, 2010 and 2014

Species	Common Name	General Status 2010 Rank*	NSDNR 2010	ACCDC 2010	2010 survey
Abies balsamea	Balsam Fir	4	Green	S5	X
Acer rubrum	Red Maple	4	Green	S5	X
Achillea millefolium	Yarrow	4	Green	S5	X
Agrostis scabra	Rough Bentgrass	4	Green	S5	X
Alnus incana	Speckled Alder	4	Green	S5	X
Alnus viridis ssp.crispa	Green Alder, Mountain Alder	4	Green	S5	
Amelanchier sp.	A Service Berry	NA	NA	NA	X
Ammophila breviligulata	Beachgrass	4	Green	S5	X
Andromeda polifolia	Bog- Rosemary	4	Green	S5	X
Aralia hispida	Bristly Sarsaparilla	4	Green	S5	X
Aralia nudicaulis	Wild Sarsaparilla	4	Green	S5	X
Arctostaphylos uva-ursi	Bearberry	4	Green	S4	X
Arethusa bulbosa	Arethusa, Swamp- Pink	4	Green	S4	X
Argentina (Potentilla) anserina	Silverweed	4	Green	S5	X
Artemisia stelleriana	Dusty Miller	7	Exotic	SNA	X
Athyrium filix-femina	Northern Lady Fern	4	Green	S5	X
Atriplex glabriuscula	Northeastern Saltbush	4	Green	S4S5	X
Betula papyrifera var. cordifolia	Heart-leaved paper Birch	4	Green	S5	X
Cakile edentula	American Searocket	4	Green	S5	X
Calamagrostis canadensis	Blue Joint	4	Green	S5	X
Calystegia sepium	Hedge Bindweed	4	Green	S5	X
Carex aquatilis var. aquatilis	Leafy Tussock Sedge	4	Green	S5	X
Carex canescens	Hoary Sedge	4	Green	S5	X
Carex echinata	Little Prickley Sedge	4	Green	S5	X
Carex exilis	Coast Sedge	4	Green	S4	X
Carex folliculata	Long Sedge	4	Green	S5	X
Carex gynandra	Nodding Sedge	4	Green	S5	X
Carex intumescens	Bladder Sedge	4	Green	S5	X
Carex lenticularis	Shore Sedge	4	Green	S4	X
Carex magellanica var. irrigua	Stunted Sedge	4	Green	S5	X
Carex nigra	Smooth Black Sedge	4	4	S5	X
Carex paleacea	Chaffy Sedge	4	Green	S5	X
Carex pauciflora	Few-flowered Sedge	4	Green	S4S5	
Carex projecta	Necklace Sedge	4	Green	S4S5	X
Carex recta	Erect Sedge, Estuary Sedge	4	Green	S4?	
Carex retrorsa	Retrorse Sedge	4	Green	S4	X
Carex scoparia	Broom Sedge	4	Green	S5	X
Carex sp.	a Sedge	NA	NA	NA	X
Carex stipata	Stalk-grain sedge	4	Green	S5	X
Carex trisperma	Three-seeded Sedge	4	Green	S5	X
Cerastium sp.(none rare)	A chickweed	NA	NA	NA	X
Chamaedaphne calyculata	Leatherleaf	4	Green	S5	X
Chamerion (Epilobium) angustifolium	Fireweed	4	Green	S5	X
Clintonia borealis	Clintonia Lily	4	Green	S5	X
Coptis trifolia	Goldthread	4	Green	S5	X
Corema conradii	Broom Crowberry	4	Green	S4	X
Cornus canadensis	Bunchberry	4	Green	S5	X
Cypripedium acaule	Pink Lady's Slipper	4	Green	S5	X
Danthonia spicata	Poverty Oat-grass	4	Green	S5	X
Dennstaedtia punctilobula	Hay-Scented Fern	4	Green	S5	X
Deschampsia flexuosa	Wavy Hairgrass	4	Green	S5	X
Doellingeria (syn.Aster) umbellata	Tall White Aster	4	Green	S5	X
Drosera intermedia	Spoon-leaved Sundew	4	Green	S5	X
Drosera rotundifolia	Round-leaved Sundew	4	Green	S5	X
Dryopteris campyloptera	Mountain Woodfern	4	Green	S5	X
Dryopteris carthusiana	Spinulose Woodfern	4	Green	S5	X
Dryopteris cristata	Crested Shield-fern	4	Green	S5	X
Dryopteris sp.	a woodfern (seedling)	NA	NA	NA	X
Eleocharis sp.	Spike Rush	NA	NA	NA	X
Empetrum nigrum	Black Crowberry	4	Green	S5	X
Epigaea repens	Trailing Arbutis	4	Green	S5	X
Epilobium ciliatum	Hairy Willowherb	4	Green	S5	X
Epilobium palustre	Swamp willow-herb	4	Green	S5	
Equisetum arvense	Field Horsetail	4	Green	S5	X
Equisetum sylvaticum	Woodland Horsetail	4	Green	S5	X
Eriophorum tenellum	Rough Cotton-grass	4	Green	S4S5	X
Eriophorum vaginatum	Tussock cotton-grass	4	Green	S5	X
Eriophorum virginicum	Tawny Cotton-grass	4	Green	S5	X
Eurybia (syn. Aster) radula	Rough Wood-aster	4	Green	S5	X
Galium palustre	Marsh Bedstraw	4	Green	S5	X
Gaultheria hispidula	Snowberry	4	Green	S5	X
Gaultheria procumbens	Teaberry	4	Green	S5	X
Gaylussacia baccata	Black Huckleberry	4	Green	S5	X
Geocaulon lividum	Northern Comandra	3	Yellow	S3	
Glyceria canadensis	Rattlesnake Grass	4	Green	S5	X
Hieracium x floribundum	Yellow Hawkweed	Exotic	Exotic	SNA	X
Hypericum boreale	Northern St. John's Wort	4	Green	S5	
Hypericum canadense	Canadian St. John's Wort	4	Green	S5	X
Ilex verticillata	Black Holly	4	Green	S5	X
Iris hookeri (syn. I. setosa)	Hooker's Iris (Beach-head Iris)	4	Green	S4	X
Iris sp.	An Iris	7	NA	NA	X
Iris versicolor	Blueflag Iris	4	Green	S5	X
Juncus balticus (syn. J. arcticus)	Arctic rush (syn. baltic rush)	4	Green	S5	
Juncus brevicaudatus	Narrow-Panicled Rush	4	Green	S5	X
Juncus bufonius	Toad Rush	4	Green	S5	X
Juncus canadensis	Canada Rush	4	Green	S5	X
Juncus effusus	Soft Rush	4	Green	S5	X

Table A-1-1. Vascular Plant Species Inventory on the Black Point Project Site, 2010 and 2014

Species	Common Name	General Status 2010 Rank*	NSDNR 2010	ACCDC 2010	2010 survey
Juncus pelocarpus	Brown-Fruited Rush	4	Green	S5	X
Juniperus communis	Common Juniper	4	Green	S5	X
Juniperus horizontalis	Creeping Juniper	4	Green	S4	X
Kalmia angustifolia	Lambkill, Sheep-laurel	4	Green	S5	X
Kalmia polifolia	Bog Laurel, Pale Laurel	4	Green	S5	X
Larix laricina	Larch	4	Green	S5	X
Lathyrus japonicus (syn. L. maritimus)	Beach Pea	4	Green	S5	X
Ledum groenlandicum	Labrador-tea	4	Green	S5	X
Leontodon autumnalis	Fall Dandelion	7	Exotic	SNA	X
Leymus mollis	Wild Rye	4	Green	S5	X
Ligusticum scoticum	Scotch Lovage	4	Green	S5	X
Linnaea borealis	Twinflower	4	Green	S5	X
Listera australis	Southern Twayblade	2	Red	S2	X
Lonicera canadensis	American Fly Honeysuckle	4	Green	S5	X
Lycopodium annotinum	Stiff Clubmoss	4	Green	S5	X
Lycopodium obscurum	Tree Clubmoss	4	Green	S5	X
Lycopus americanus	Cut-leafed Water-horehound	4	Green	S5	
Lycopus uniflorus	Northern Bugleweed	4	Green	S5	X
Lysimachia terrestris	Swamp Loosestrife	4	Green	S5	X
Maianthemum (Smilacina) trifolia	Three-leaved False Solomon's Seal	4	Green	S5	X
Maianthemum canadense	Wild Lily-of-the-valley	4	Green	S5	X
Mertensia maritima	Sea Bluebells	4	Green	S5	X
Mitchella repens	Partridge Berry	4	Green	S5	X
Moehringia lateriflora	Grove Sandwort	4	Green	S5	X
Moneses uniflora	One-flowered Shinleaf	4	Green	S5	X
Monotropa uniflora	Indian-pipe	4	Green	S5	X
Myrica gale	Sweet Gale	4	Green	S5	X
Myrica pensylvanica	Bayberry	4	Green	S5	X
Nemopanthus mucronatus	False Mountain Holly	4	Green	S5	X
Nuphar sp.	Yellow pond-lily	NA	NA	NA	
Nymphaea sp.	Water Lily	NA	NA	NA	X
Oclemena (syn. Aster) acuminata	Whorled Wood Aster	4	Green	S5	X
Oclemena (syn.) Aster X blakei	Hybrid White Panicled American-Aste	NA	Green	SNR	X
Oclenema (Aster) nemoralis	Bog Aster	4	Green	S5	X
Osmunda cinnamomea	Cinnamon Fern	4	Green	S5	X
Osmunda claytoniana	Interrupted Fern	4	Green	S5	X
Oxalis montana	Wood-sorrel	4	Green	S5	X
Persicaria (Polygonum) sagittata	Arrow-leafed Tearthumb	4	Green	S5	X
Phegopteris connectilis	Northern Beech Fern	4	Green	S5	X
Photinia melanocarpa	Black Chokeberry	4	Green	S5	X
Picea glauca	White Spruce	4	Green	S5	X
Picea mariana	Black Spruce	4	Green	S5	X
Plantago maritima	Seashore-plantain	4	Green	S5	X
Platanthera blephariglottis	White Fringed orchid	4	Green	S4	
Platanthera clavellata	Club-spur Orchid	4	Green	S5	
Platanthera sp.	Rein orchid, Fringed Orchid	NA	NA	NA	
Platanthera sp. (aquilonis or dilatata)	Northern Bog Orchid	4	4	S4S5	X
Poa sp	Grass	NA	NA	NA	X
Potentilla simplex	Cinquefoil	4	Green	S5	X
Prenanthes trifoliolata	Lion's Paw	4	Green	S5	X
Prunus pensylvanica	Fire Cherry / Pin Cherry	4	Green	S5	X
Pteridium aquilinum	Bracken	4	Green	S5	X
Ranunculus acris	Tall Buttercup	7	Exotic	SNA	X
Rhodiola rosea (Sedum roseum)	Roseroot Stonecrop	4	Green	S4	X
Rhododendron canadense	Rhodora	4	Green	S5	X
Rhynchospora alba	White Beak-rush	4	Green	S5	X
Rosa nitida	Swamp Rose	4	Green	S4	X
Rosa rugosa	Rugose Rose	7	Exotic	SNA	X
Rosa sp.	A Rose	NA	NA	NA	
Rosa virginiana	Virginia Rose	4	Green	S5	X
Rubus allegheniensis	Common Blackberry	4	Green	S5	X
Rubus chamaemorus	Cloudberry, Bakeapple	4	Green	S4	X
Rubus hispidus	Bristly Dewberry	4	Green	S5	X
Rubus idaeus	Red Raspberry	4	Green	S5	X
Rubus pubescens	Dwarf Raspberry	4	Green	S5	X
Rubus sp.	a bramble	NA	NA	NA	X
Rumex acetosella	Sheep Sorrel	7	Exotic	SNA	X
Sagina procumbens or nodosa	Pearlwort	4	Green	S5	X
Salix sp	Willow	NA	NA	NA	X
Sarracenia purpurea	Pitcher-plant	4	Green	S5	X
Schoenoplectus subterminalis	Water- Bulrush	4	Green	S5	
Scirpus atrocinctus	Black-girdle Bullrush	4	Green	S5	X
Scirpus cyperinus	Cottongrass Bullrush	4	Green	S5	X
Sibbaldiopsis tridentata	Three- toothed- cinquefoil	4	Green	S5	X
Sisyrinchium montanum	Strict Blue-eyed-grass	4	Green	S5	X
Solidago macrophylla	Large-leaf Goldenrod	4	Green	S4	X
Solidago rugosa	Rough Goldenrod	4	Green	S5	X
Solidago sempervirens	Seaside Goldenrod	4	Green	S5	X
Solidago sp.	A Goldenrod	NA	NA	NA	
Solidago uliginosa	Bog Goldenrod	4	Green	S5	X
Sorbus americana	Mountain-ash	4	Green	S5	X
Sparganium sp.	Bur-reed	NA	NA	NA	X
Spiraea alba	Meadowsweet	4	Green	S5	X
Symphiotrichum (Aster) novi-belgii	New york Aster/ New Belgium Aster	4	Green	S5	X
Symphiotrichum (Aster) puniceum	Rough Aster	4	Green	S5	X
Thalictrum pubescens	Tall Meadow- Rue	4	Green	S5	X
Thelypteris noveboracensis	New York fern	4	Green	S5	

Table A-1-1. Vascular Plant Species Inventory on the Black Point Project Site, 2010 and 2014

Species	**Common Name**	**General Status 2010 Rank***	**NSDNR 2010**	**ACCDC 2010**	**2010 survey**
Thelypteris palustris	Marsh Fern	4		S5	X
Triadenum fraseri	Marsh St. John's Wort	4	Green	S5	
Trichophorum (Scirpus) caespitosum	Tufted Leafless-Bullrush	4	Green	S5	X
Trientalis borealis	Starflower	4	Green	S5	X
Typha latifolia	Broadleaf cattail	4	Green	S5	X
Utricularia cornuta	Horned Bladderwort	4	Green	S5	X
Utricularia intermedia	Flatleaf Bladderwort	4	Green	S5	X
Utricularia minor	Lesser Bladderwort	4	Green	S4	X
Vaccinium angustifolium	Lowbush Blueberry	4	Green	S5	X
Vaccinium macrocarpon	Large Cranberry	4	Green	S5	X
Vaccinium myrtilloides	Velvetleaf Blueberry	4	Green	S5	X
Vaccinium oxycoccos	Small Cranberry	4	Green	S5	X
Vaccinium vitis-idaea	Mountain Cranberry	4	Green	S5	X
Viburnum nudum	Wild Raisin	4	Green	S5	X
Viola sp	Violet ---not a species at risk	NA	NA	NA	X

** General Status Ranks accurate as of September 22, 2014*

Appendix B. Fauna

Appendix B.1: Results of Migrant and Breeding Bird Surveys

Appendix B.2: Odonata Report

Appendix B.1

Results of Migrant and Breeding Bird Surveys

Table B.1-1. Results of Migrant & Early Breeding Bird Survey on Black Point Site in May 2010.

Common Name	Binomial	NSDNR Status	Early Morning Point Count Station																					Late Point Count Station						
			1	2	3	4	5	6	7	8	9	10	11	15	16	17	18	19	20	21	22	23	24	25	12	13	14	26	27	28	29
American Crow	*Corvus brachyrhynchos*	Green		2			3	1															1								
American Goldfinch	*Carduelis tristis*	Green					1				1	1	1							2			1								
American Redstart	*Setophaga ruticilla*	Green																						2							
American Robin	*Turdus migratorius*	Green													1																
Bald Eagle	*Haliaeetus leucocephalus*	Green																		1											
Bay-breasted Warbler	*Dendroica castanea*	Green					1																								
Black-and-white Warbler	*Mniotilta varia*	Green	1	1	1		1		1		1	1						2	2	1			1	2		1	1				
Black-backed Woodpecker	*Picoides arcticus*	Green	1																												
Black-capped Chickadee	*Poecile atricapilla*	Green	1					1							1			1					1				2				
Blackpoll Warbler	*Dendroica striata*	Green	1	1	1	1				1	1																				
Black-throated Green Warbler	*Dendroica virens*	Green					1													2	2			2				3			
Blue Jay	*Cyanocitta cristata*	Green					1	1	1												1										
Blue-headed Vireo	*Vireo solitarius*	Green				1									1					1	1	1	2			2					1
Boreal Chickadee	*Poecile hudsonica*	Yellow	1			4			2			1				2	1			1	3		1			1	1	1			
Brown Creeper	*Certhia americana*	Green																		1											
Common Loon	*Gavia immer*	Yellow							1																						
Common Raven	*Corvus corax*	Green																						1					1		
Common Yellowthroat	*Geothlypis trichas*	Green		3	1	2	2	2	3	1	1		2		2		3	2	3		1		1	1	2	1			1	1	2
Dark-eyed Junco	*Junco hyemalis*	Green	1	3	2	3	1	1	2	1	2	1		1		1	1		1		1				1		1	2	1	1	1
Downy Woodpecker	*Picoides pubescens*	Green																													1
Fox Sparrow	*Passerella iliaca*	Green	1																												
Golden-crowned Kinglet	*Regulus satrapa*	Green						1	1				1					1		1	1	2	1	1		1	1	2	1		
Grey Jay	*Perisoreus canadensis*	Yellow							1				1			1					1										
Hermit Thrush	*Catharus guttatus*	Green		1	1	1	1			1		2	1	1	1	1	2				1	1	1			1	1				
Herring Gull	*Larus argentatus*	Green																						1							
Lincoln's Sparrow	*Melospiza lincolnii*	Green			1																										
Magnolia Warbler	*Dendroica magnolia*	Green	1												1				1		1	1	1						1		
Merlin	*Falco columbarius*	Green																					1								
Nashville Warbler	*Vermivora ruficapilla*	Green												1											1	1					
Northern Flicker	*Colaptes auratus*	Green													2	1								1							
Northern Parula	*Parula americana*	Green																		1				2				1			
Palm Warbler	*Dendroica palmarum*	Green		3	3	1		1			2	2	2	1	1	1	2	2	2							2	1				1
Red-breasted Nuthatch	*Sitta canadensis*	Green													2												1				
Red-winged Blackbird	*Agelaius phoeniceus*	Green																						1							
Ruby-crowned Kinglet	*Regulus calendula*	Green	2	1	3	1	2	2	1	1	3	2	1		1	3	3	1	1	1	1	2		2			1	1	1	1	2
Rusty Blackbird	*Euphagus carolinus*	Yellow								1																					
Song Sparrow	*Melospiza melodia*	Green																									1	1			
Swainson's Thrush	*Catharus ustulatus*	Green																								1					
White-throated Sparrow	*Zonotrichia albicollis*	Green	2	1	3	2	3		1	1	1	2	1	1	4	2	3	1	2	1		1	2	2	2	1	2		1	2	
Winter Wren	*Troglodytes troglodytes*	Green	1												1				1		1		1	1			1				2
Yellow-rumped Warbler	*Dendroica coronata*	Green	1	2	1	4	4	2	2	1	3	2		2	2	4	3	2	2	2	2	1	3	1	2	2	3	1		2	

Table B.1-2. Results of Breeding Bird Survey on Black Point Site in June 2010.

Common Name	Binomial	NSDNR Status	Early Morning Point Count Station																					Late Point Count Station						
			1	2	3	4	5	6	7	8	9	10	11	15	16	17	18	19	20	21	22	23	24	25	12	13	14	26	27	28	29
Alder Flycatcher	*Empidonax alnorum*	Green	1	1	2						1	1	2		1																
American Crow	*Corvus brachyrhynchos*	Green			1	1	1	1												2	6	1	1		1					1	
American Goldfinch	*Carduelis tristis*	Green																1				1		1							
American Redstart	*Setophaga ruticilla*	Green			1												1				1			1							
American Robin	*Turdus migratorius*	Green	1		1																	1									
Bald Eagle	*Haliaeetus leucocephalus*	Green																		1											
Bay-breasted Warbler	*Dendroica castanea*	Green																					1								
Black-and-white Warbler	*Mniotilta varia*	Green	1	1	2	1	1	1	1		1	1		1			1	1	1	1	2		1	1			1	1			
Black-backed Woodpecker	*Picoides arcticus*	Green	1																												
Black-capped Chickadee	*Poecile atricapilla*	Green																					1				1				
Blackpoll Warbler	*Dendroica striata*	Green	1																												
Black-throated Green Warbler	*Dendroica virens*	Green	1				1	1												2	2		1	1				1			
Blue-headed Vireo	*Vireo solitarius*	Green							1											2			1	1		1		1			
Boreal Chickadee	*Poecile hudsonica*	Yellow								1		1			2	1	1									1	1	1			
Chipping Sparrow	*Spizella passerina*	Green																					1								
Common Raven	*Corvus corax*	Green					1																								
Common Yellowthroat	*Geothlypis trichas*	Green	2	3	3	3	1	1	1		2		1	1	3	2		2	1	2	1	1	1		3		2				2
Dark-eyed Junco	*Junco hyemalis*	Green	1	1	1	1		1	1		1	1	1	3		2	1	1	1	1				1	1	2	1	1	1	1	1
Golden-crowned Kinglet	*Regulus satrapa*	Green		1						1		1			1					1	1	1				2				
Grey Jay	*Perisoreus canadensis*	Yellow			2				1																			1			
Hairy Woodpecker	*Picoides villosus*	Green								2														1							
Hermit Thrush	*Catharus guttatus*	Green								1	1	2	1	1	1		2	3	4	1	1	1	2	1	1		1	2	1		2
Herring Gull	*Larus argentatus*	Green			1		1																								
Lincoln's Sparrow	*Melospiza lincolnii*	Green												1																	1
Magnolia Warbler	*Dendroica magnolia*	Green	1	1	1		1			2	2		1			1	1		1				1	1		1		1	1	1	
Mourning Warbler	*Oporornis philadelphia*	Green								1											1										
Nashville Warbler	*Vermivora ruficapilla*	Green					1				1	1											1				1			1	
Northern Flicker	*Colaptes auratus*	Green																1													
Northern Parula	*Parula americana*	Green																		1											
Palm Warbler	*Dendroica palmarum*	Green	1	2	2	2			1		2					1	1	2	1	1		1					2	1	1		2
Ruby-crowned Kinglet	*Regulus calendula*	Green	3	1	2	2	1	1	1				1		2									1			1	1		1	1
Song Sparrow	*Melospiza melodia*	Green			1																										
Swainson's Thrush	*Catharus ustulatus*	Green	1					1															1								
Swamp Sparrow	*Melospiza georgiana*	Green											1																		
White-throated Sparrow	*Zonotrichia albicollis*	Green	2	3	2	2	1	1	2	1	1	1	2	1	1	3	3	4	2	1	2		1	4	3	1	2			2	1
White-winged Crossbill	*Loxia leucoptera*	Undetermined				1															1						2				
Winter Wren	*Troglodytes troglodytes*	Green	1						1		1			1					1	1	2	1	1	1				1			2
Yellow Warbler	*Dendroica petechia*	Green																					1								
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Green												1	1		1	1									1				
Yellow-rumped Warbler	*Dendroica coronata*	Green	1			1	1				1	1		1	1		1	1	1					1		1	1	1		1	

Table B.1-3. List of all Bird Species Identified on or Offshore of the Black Point Site in 2010.

Common Name	Binomial	NSDNR Status	ACCDC SRANK
Alder Flycatcher	*Empidonax alnorum*	Green	S5B
American Black Duck	*Anas rubripes*	Green	S5
American Crow	*Corvus brachyrhynchos*	Green	S5
American Goldfinch	*Carduelis tristis*	Green	S5
American Kestrel	*Falco sparverius*	Green	S5B
American Redstart	*Setophaga ruticilla*	Green	S5B
American Robin	*Turdus migratorius*	Green	S5B
Bald Eagle	*Haliaeetus leucocephalus*	Green	S4
Bay-breasted Warbler	*Dendroica castanea*	Green	S3S4B
Belted Kingfisher	*Megaceryle alcyon*	Green	S5B
Black-and-white Warbler	*Mniotilta varia*	Green	S4S5B
Black-backed Woodpecker	*Picoides arcticus*	Green	S3S4
Black-capped Chickadee	*Poecile atricapilla*	Green	S5
Blackpoll Warbler	*Dendroica striata*	Green	S3S4B
Black-throated Green Warbler	*Dendroica virens*	Green	S4S5B
Blue Jay	*Cyanocitta cristata*	Green	S5
Blue-headed Vireo	*Vireo solitarius*	Green	S5B
Boreal Chickadee	*Poecile hudsonica*	Yellow	S3
Brown Creeper	*Certhia americana*	Green	S5
Cedar Waxwing	*Bombycilla cedrorum*	Green	S5B
Common Eider	*Somateria mollisima*	Green	S4
Common Loon	*Gavia immer*	Yellow	S3B,S4N
Common Raven	*Corvus corax*	Green	S5
Common Yellowthroat	*Geothlypis trichas*	Green	S5B
Dark-eyed Junco	*Junco hyemalis*	Green	S4S5
Double-crested Cormorant	*Phalacrocorax auritus*	Green	S5B
Downy Woodpecker	*Picoides pubescens*	Green	S5
Fox Sparrow	*Passerella iliaca*	Green	S3S4B
Golden-crowned Kinglet	*Regulus satrapa*	Green	S4
Gray Jay	*Perisoreus canadensis*	Yellow	S3S4
Great Black-backed Gull	*Larus marinus*	Green	S4
Greater Yellowlegs	*Tringa melanoleuca*	Green	S3B,S5M
Hairy Woodpecker	*Picoides villosus*	Green	S5
Hermit Thrush	*Catharus guttatus*	Green	S5B
Herring Gull	*Larus argentatus*	Green	S4S5
Least Sandpiper	*Calidris minutilla*	Green	S1B,S5M
Lincoln's Sparrow	*Melospiza lincolnii*	Green	S4B
Magnolia Warbler	*Dendroica magnolia*	Green	S5B
Merlin	*Falco columbarius*	Green	S5B
Mourning Warbler	*Oporornis philadelphia*	Green	S4B
Nashville Warbler	*Vermivora ruficapilla*	Green	S5B

Table B.1-3. List of all Bird Species Identified on or Offshore of the Black Point Site in 2010.

Common Name	Binomial	NSDNR Status	ACCDC SRANK
Northern Flicker	*Colaptes auratus*	Green	S5B
Northern Gannet	*Morus bassanus*	Green	SHB,S5M
Northern Harrier	*Circus cyaneus*	Green	S5B
Northern Parula	*Parula americana*	Green	S5B
Palm Warbler	*Dendroica palmarum*	Green	S5B
Pileated Woodpecker	*Dryocopus pileatus*	Green	S5
Red-breasted Merganser	*Mergus serrator*	Green	S3B,S5N
Red-breasted Nuthatch	*Sitta canadensis*	Green	S3B,S5N
Red-eyed Vireo	*Vireo olivaceus*	Green	S5B
Red-tailed Hawk	*Buteo jamaicensis*	Green	S5
Red-winged Blackbird	*Agelaius phoeniceus*	Green	SNA
Ruby-crowned Kinglet	*Regulus calendula*	Green	SNA
Ruffed Grouse	*Bonasa umbellus*	Green	S4S5
Rusty Blackbird	*Euphagus carolinus*	Yellow	SNA
Semipalmated Plover	*Charadrius semipalmatus*	Green	S1S2B,S5M
Semipalmated Sandpiper	*Calidris pusilla*	Green	S3M
Sharp-shinned Hawk	*Accipiter striatus*	Green	S4S5B
Song Sparrow	*Melospiza melodia*	Green	S1?B,S4S5M
Spotted Sandpiper	*Actitis macularius*	Green	S3S4B
Spruce Grouse	*Falcipennis canadensis*	Green	S5
Swainson's Thrush	*Catharus ustulatus*	Green	S4S5B
Swamp Sparrow	*Melospiza georgiana*	Green	S5B
White-throated Sparrow	*Zonotrichia albicollis*	Green	S5B
White-winged Crossbill	*Loxia leucoptera*	Undetermined	S4S5
Winter Wren	*Troglodytes troglodytes*	Green	S5B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Green	S3S4B
Yellow-rumped Warbler	*Dendroica coronata*	Green	S5B

Appendix B.2

Odonata Report

Odonata Survey 2010 (Damselflies and Dragonflies)

Black Point Quarry

Prepared for:
AMEC Earth and Environmental

Paul M. Brunelle
January 26 2011

Paul Brunelle and Beth Cameron spent five field days, over the periods June 9th to 11th and July 14th to 16th, surveying for adult Odonata in the proposed Black Point Quarry locale, near Black Point, Guysborough County, Nova Scotia. All types of freshwater aquatic habitats identified on the property were sampled.

The 2010 season was an unusually early one for odonate flight, and emergence in the Black Point area was just beginning during the first visit – the flight period at this locale is apparently heavily influenced (delayed)by the moderation from coastal weather, as it is adjacent to the ocean to the north, and only about 14km from it to the south.

There is no known prior survey for Odonata in the project area, and Guysborough County itself has been rather lightly surveyed to date.

Results

A modest diversity of Odonata species was encountered – 25 species (22%) of the 115 recorded in Mainland Nova Scotia. A further 41 species are considered possible for the habitat types known on the property, and at these latitudes, consequently 38% of the potential list was taken in 2010.

Forty-seven records (species/site/date) were recorded.

The greatest number of species taken at any one site was twelve; at Wetland 12 (site NS1690, a true bog), with nine at Wetland 2, Ponds 1 and 2 (site NS1697) being second. Most habitats proved to be sparse in species during the visits.

One species of conservation interest in Nova Scotia was encountered, at Wetland 12 (NS1690, a true bog). A male *Pantala hymenaea* (Say 1839, Spot-winged Glider), ranked as Yellow by NSDNR, was observed several times at a secondary pond, at times apparently guarding an ovipositing *P. flavescens* (Fabricius 1798, Wandering Glider). Although *Pantala* species have been observed ovipositing in bog ponds before, it is not known whether that is a viable habitat for the extremely rapid growth of their larvae, a characteristic of this migratory genus. Extra-specific guarding, possibly indicating hybridization, has not been observed in the region in this genus before.

Following Brunelle's involvement AMEC staff took a number of further specimens which were determined by Brunelle; the results given in Appendix 3.

On the cover:
Fogherty Head Shoreline, site NS1698, Guysborough County, Nova Scotia, June 11, 2010.
Left side (top down):
Leucorrhinia glacialis Hagen 1890, Crimson-ringed Whiteface, teneral male, site NS1694, Wetland 17, June 11, 2010.
Enallagma boreale (Sélys 1875), Boreal Bluet.
Dorocordulia lepida (Hagen in Sélys 1871), Petite Emerald, female.

Survey Tactics

Methodology for survey, curation and documentation followed the ADIP (Atlantic Dragonfly Inventory Program) protocols, which have evolved over the last twenty years, and which reflect current practice in the study of odonates.

Habitat Location

After discussions with the client, airphotos of the project region were reviewed and a target aquatic habitat list prepared. This list was confirmed and amended during the field trips.

Each site was given an ADIP identification code beginning with 'NS'.

Field Survey

Personnel

All survey was done by Paul M. Brunelle and Beth H. Cameron.

Lifestage

Principal survey was for flying adults and tenerals (the latter are recently-emerged adults), however exuviae (the abandoned skins of the emerged insects) were also collected when found. Exuviae collection may present the most effective means of inventory for these habitats, and firmly establishes residence status (see Appendix 1), however field survey must be scheduled carefully to collect this material, and tends to be protracted.

Larval survey can yield excellent information on the residence status of species, however it is decidedly protracted in the field and in the lab.

Adults were captured by net and retained in field envelopes until preserved.

Frequency of Survey

One visit to a water body per year is insufficient to acquire a reasonably complete species list, due to the diverse flight periods of species, however the results of even one trip per year can be suggestive as to the health of the aquatic habitat.

For this project all sites were visited at least twice.

Diel

Survey was done during the peak periods of adult odonate activity, roughly 10:00 to 17:00.

Weather

Field days were chosen which had weather suitable for surveying for adults – sunny and hot, with no more than moderate winds. However, extensive overcast developed during some survey days and rain ended a few days early.

Voucher Specimens

Specimens were taken *pro forma* in many cases, and in all cases where field determination of particular species was considered untrustworthy.

The specimens were force-dried in acetone (adults and tenerals) or air-dried (exuviae) and are stored in clear mylar envelopes with a label giving all identification and accession information.

Each specimen was given a 6-digit ADIP accession number, unique among specimens of odonates taken in Atlantic Canada and northern New England and catalogued in the ADIP databases. The accession number has an alphabetical suffix which indicates the provenance on which the record is based;

v vouchered specimen,
o observed on the wing or perched,
h determined in the hand then released,
p photographed, and,
c indicating that the determination of vouchers has been confirmed by another worker.

The specimens have been deposited at the Nova Scotia Museum of Natural History, Halifax.

Documentation

Photography

General habitat photos were taken during each visit, converted to jpg format, catalogued, and will be tendered to the client for project use if requested.

Data

Field notes, species observations and specimen details were entered into a Filemaker Pro 8.5 relational database structure, which will be translated into Excel 11.3.5 database form for deposit with the client.

Sites are listed by aquatic type, then by name (some are generic names). The wetland 'names' are the identifiers used by AMEC Earth and Environmental, which pertain to studies of a broader taxonomic base.

A map of sites is given in Appendix 4.

In the accounts the ADIP (Atlantic Dragonfly Inventory Program) site code is given first, followed by the field code in brackets.

The Nova Scotia mapbook grid is given next, followed by the grid for the previous series of mapbooks, which were on a different grid and are still employed by some authorities. The National Topographic Information System (NTIS) 1/50,000 map reference is then provided.

Coordinates are given in decimal notation, followed by them formatted in a manner which facilitates their lookup in the Google Earth web software.

Visits were all made in 2010. The month and day are given first, followed by the time on site and minutes used, the amount of sky coverage (averaged, the amount of cloud will generally have varied during the visit), and the strength of the wind.

P.M. Brunelle and B.H. Cameron were present during all visits.

Species encountered are listed in taxonomic order to family, in alphabetical order by genus and species. The scientific name is first given, followed by the attribution and description date, then the accepted English name and family.

The ranking by various authorities is then given (see Appendix 1 for details);

NTSV G = NatureServe Global Rank,
NGSCDA = National General Status Canadian Rank,
NSDNR = NS Dept. of Natural Resources Colour Rank,
NGSNS = National General Status Nova Scotia Rank,
NTSV S = NatureServe Nova Scotia Rank.

Records of the species encountered are first given by their ADIP record number, with an alphabetical suffix indicating the provenance of the record. The month and day of the date are next, followed by the surveyor of record (COLL.), if only one individual.

Lifestage(s) encountered are then given (see Appendix 2 for definitions), followed by the ADIP Residence Status code (RSTAT), which indicates the degree to which we know or infer that the species is present in the aquatic habitat through the full development of individuals (see Appendix 2), and hence whether the record has conservation significance. A brief explanation of the code is also given.

Code Site: NS1689 (aka FoL).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.3489°N, -61.1589°W [45.348904N, 61.158904W].

Visits:
June 9 – 14:30 to 15:10 (40 min), cloudy 90%, light to moderate.
June 10 – 10:25 to 15:15 (95 min), sunny 95%, light to moderate.
July 16 – 11:45 to 12:30 (45 min), sunny 100%, none to light.

All Species Recorded – 5.

Enallagma boreale (Sélys 1875)
Boreal Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313060v, July 16, COLL. Beth H. Cameron.
Adult, Teneral, RSTAT 1 (emergence proven).

Basiaeschna janata (Say 1839)
Springtime Darner, Aeshnidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313048o, June 10, Adult,
RSTAT 8 (males at appropriate habitat).

Somatochlora cingulata Sélys 1871
Lake Emerald, Corduliidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S2.
Record 313079o, July 16, Adult,
RSTAT 8 (males at appropriate habitat).

Ladona julia (Uhler 1857)
Chalk-fronted Corporal, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313029v, June 9, Teneral,
RSTAT 1 (emergence proven).

Pantala flavescens (Fabricius 1798)
Wandering Glider, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV SA.
Record 313078o, July 16, Adult,
RSTAT 10 (not at water).

Comments: This lake appears to have an unusually short odonate list.

Code Site: **NS1697** (aka FBBP).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.35508°N, -61.14255°W [45.355083N, 61.142546W].

Visits:
June 11 – 14:10 to 14:45 (35 min), sunny 100%, none to light.
July 15 – 10:25 to 12:40 (125 min), sunny 100%, none to light.

All Species Recorded – 9.

Lestes disjunctus Sélys 1862
Common Spreadwing, Lestidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313071v, July 15, COLL. Paul M. Brunelle, Beth H. Cameron. Teneral, RSTAT 1 (emergence proven).

Enallagma boreale (Sélys 1875)
Boreal Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313074v, July 15, COLL. Beth H. Cameron. Adult, RSTAT 8 (males at appropriate habitat).

Enallagma ebrium (Hagen 1861)
Marsh Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313075v, July 15, Adult, RSTAT 8 (males at appropriate habitat).

Enallagma hageni (Walsh 1863)
Hagen's Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313073v, July 15, COLL. Beth H. Cameron. Adult, RSTAT 8 (males at appropriate habitat).

Ischnura posita (Hagen 1861)
Fragile Forktail, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313076v, July 15, Adult, RSTAT 8 (males at appropriate habitat).

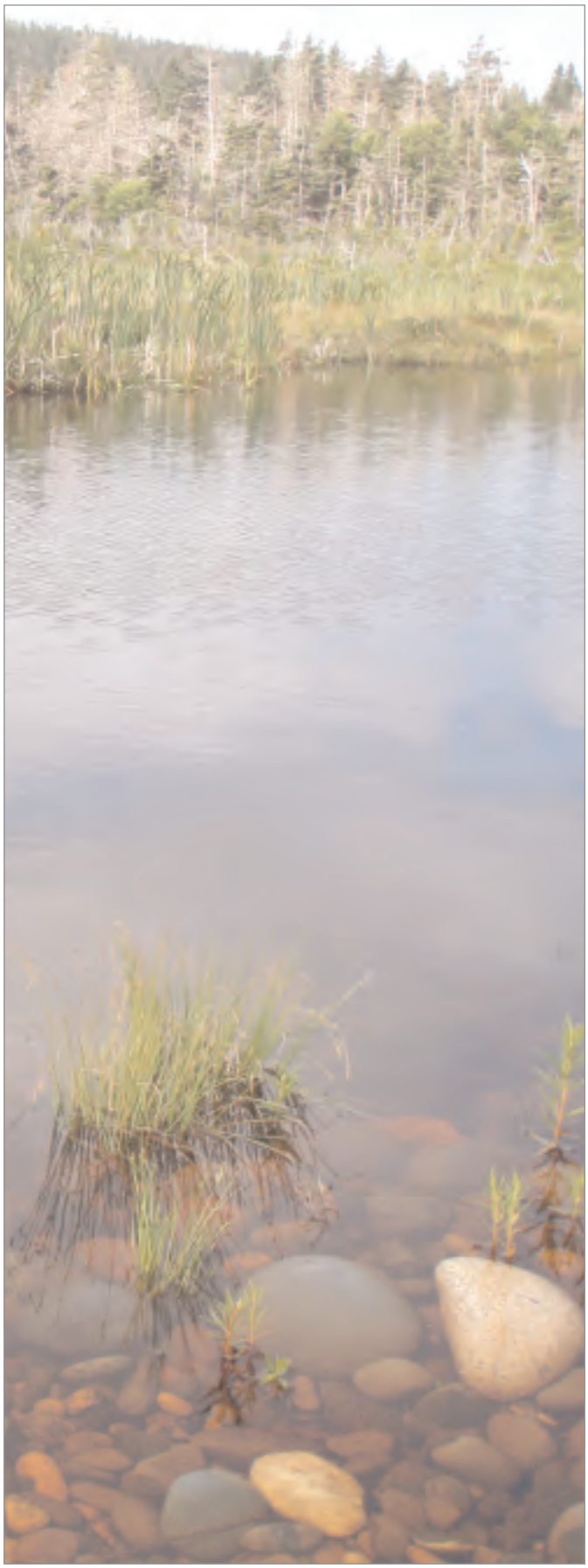
Ischnura verticalis (Say 1839)
Eastern Forktail, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313070v, July 15, COLL. Beth H. Cameron. Adult, Teneral, RSTAT 1 (emergence proven).

Aeshna interrupta interrupta Walker 1908
Variable Darner, Aeshnidae.
NTSV G5T5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313072v, July 15, Exuvia, RSTAT 1 (emergence proven).

Libellula quadrimaculata Linnaeus 1758
Four-spotted Skimmer, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313077v, July 15, Adult, RSTAT 8 (males at appropriate habitat).

Sympetrum internum Montgomery 1943
Cherry-faced Meadowhawk, Libellulidae,
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313081v, July 15, Teneral, RSTAT 1 (emergence proven).

Comments: Barrachois ponds bordered by both bog and *Typha latifolia* marsh. They are likely inundated by seawater periodically, but nevertheless house a comparatively large odonate list.



Code Site: **NS1695** (aka LMSW).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6. CHECK
45.33996°N, -61.138757°w [45.33996N, 61.138757W]. CHECK

Visits:
June 11 – 11:10 to 11:30 (20 min), sunny 100%, none to light.
July 14 – 13:35 to 14:25 (50 min), light overcast, none to light.

All Species Recorded – 0.

Comments: A stillwater formed by a beaver dam. Although some *Aeshna* species (determination to species was not possible) were seen flying over the ponds on July 14th, they otherwise showed no odonate species, however weather was not ideal for odonates during the second visit.

Code Site: **NS1702** (aka FBBB).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.35502°N, -61.14306°W [45.35502N, 61.143055W].

Visits:
July 15 – 13:15 to 14:20 (65 min), sunny 100%, none to light

All Species Recorded – 3.

Enallagma boreale (Sélys 1875)
Boreal Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313084o, July 15,
Adult, RSTAT 8 (males at appropriate habitat).

Aeshna eremita Scudder 1866
Lake Darner, Aeshnidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313086v, July 15, Adult,
RSTAT 9 (inappropriate habitat).

Libellula quadrimaculata Linnaeus 1758
Four-spotted Skimmer, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313085o, July 15,
Adult, RSTAT 8 (males at appropriate habitat).

Comments: Diverse bogs in a series inland from the Fox Bay pond's shorelines. Those which are nearest to the ponds may be subject to periodic inundation by seawater.

Code Site: **NS1700** (aka FHSF).
Mapbook: 43y03 (old 35e02), NTIS Map: 11F6.
45.35582°N, -61.15614°W [45.355823N, 61.156136W].

Visits:
June 11 – 15:40 to 16:05 (25 min), sunny 100%, none to light.
July 15 – 16:00 to 17:15 (75 min), sunny 100%, none to light.

All Species Recorded – 2.

Aeshna eremita Scudder 1866
Lake Darner, Aeshnidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313082o, July 15, Adult,
RSTAT 9 (inappropriate habitat).

Pantala flavescens (Fabricius 1798)
Wandering Glider, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV SA.
Record 313083v, July 15, Adult,
RSTAT 9 (inappropriate habitat).

Comments: An abruptly sloped fen with some open water. The only species seen at this site were not behaving as residents – apparently only foraging.

Code Site: **NS1692** (aka FSWB).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.347094°N, -61.161008°W [45.347094N, 61.161008W].

Visits:
June 9 – 16:45 to 17:00 (15 min), cloudy 90%, light to moderate.
June 10 – 09:55 to 10:15 (20 min), sunny 95%, light to moderate.

All Species Recorded – 0.

Comments: This is a comparatively dry domed bog – only one small pot-hole was observed to have surface water.

Code Site: **NS1690** (aka FEBc).
43y04 (old 35e02), 11F6.
45.34989°N, -61.1555°W [45.34989N, 61.1555W].

Visits:
June 9 – 15:25 to 16:30 (50 min), cloudy 90%, light to moderate.
June 10 – 11:30 to 14:25 (20 min), sunny 95%, light to moderate.
June 11 – 18:10 to 18:35 (25 min), sunny 100%, none to light.
July 16 – 12:35 to 16:05 (210 min), light overcast, moderate to strong.

All Species Recorded – 12.

Lestes disjunctus Sélys 1862
Common Spreadwing, Lestidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313090v, July 16, COLL. Beth H. Cameron.
Teneral, RSTAT 1 (emergence proven).

Enallagma annexum Hagen 1861
Northern Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313051v, June 10,
Teneral, Exuvia, RSTAT 1 (emergence proven).

Enallagma boreale (Sélys 1875)
Boreal Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313080v, July 16, COLL. Beth H. Cameron.
Adult, Teneral, RSTAT 1 (emergence proven).

Ischnura verticalis (Say 1839)
Eastern Forktail, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313065o, July 16, Adult,
RSTAT 8 (males at appropriate habitat).

Nehalennia gracilis Morse 1895
Sphagnum Sprite, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S2.
Record 313067v, July 16, COLL. Beth H. Cameron.
Adult, RSTAT 7 (females at appropriate habitat).

Aeshna subarctica Walker 1908
Subarctic Darner, Aeshnidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313057v, June 10, COLL. Beth H. Cameron.
Larva, Molt, RSTAT 2 (larvae collected).
Record 313091v, July 16, COLL. Beth H. Cameron.
Exuvia, RSTAT 1 (emergence proven).

Cordulia shurtleffii Scudder 1866
American Emerald, Corduliidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313031v, June 10,
Teneral, RSTAT 1 (emergence proven).

Ladona julia (Uhler 1857)
Chalk-fronted Corporal, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313056v, June 10, Teneral, Exuvia (assoc.),
RSTAT 1 (emergence proven).
Record 313061o, July 16, Adult,
RSTAT 8 (males at appropriate habitat).

Leucorrhinia glacialis Hagen 1890
Crimson-ringed Whiteface, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313055v, June 10,
Teneral, Exuvia (assoc.), RSTAT 1 (emergence proven).
Record 313062v, July 16, COLL. Beth H. Cameron.
Adult, RSTAT 3 (ovipositing observed).

Pantala flavescens (Fabricius 1798)
Wandering Glider, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV SA.
Record 313063o, July 16, Adult,
RSTAT 3 (ovipositing observed).

Pantala hymenaea (Say 1839)
Spot-winged Glider, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Yellow, NGSNS 3, NTSV SA.
Record 313064o, July 16, Adult,
RSTAT 8 (males at appropriate habitat).

Sympetrum internum Montgomery 1943
Cherry-faced Meadowhawk, Libellulidae,
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S5.
Record 313066v, July 16,
COLL. Paul M. Brunelle. Teneral, RSTAT 1 (emergence proven).

Comments: A true domed bog, with secondary ponds and peripheral fens. The odonate list is extensive, but probably not complete.

Code Site: **NS1694** (aka SEPF).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.34038°N, -61.14361°W [45.340379N, 61.143614W].

Visits:
June 11 – 10:15 to 10:50 (35 min), sunny 100%, none to light.
July 14 – 12:20 to 13:15 (55 min), sunny 100%, none to light.

All Species Recorded – 4.

Nehalennia gracilis Morse 1895
Sphagnum Sprite, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S2.
Record 313058v, July 14,
Adult, Teneral, RSTAT 1 (emergence proven).

Leucorrhinia glacialis Hagen 1890
Crimson-ringed Whiteface, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313041v, June 11,
Teneral, Exuvia (assoc.), RSTAT 1 (emergence proven).
Record 313059v, July 14, COLL. Beth H. Cameron.
Adult, RSTAT 8 (males at appropriate habitat).

Leucorrhinia hudsonica (Sélys 1850)
Hudsonian Whiteface, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313054v, June 11,
Adult, RSTAT 8 (males at appropriate habitat).

Leucorrhinia proxima Calvert 1890
Belted Whiteface, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313088v, July 14, COLL. Beth H. Cameron.
Adult, RSTAT 8 (males at appropriate habitat).

Comments: This fairly rich domed fen should support a larger odonate list than was recorded.

Code Site: **NS1696** (aka ECPF).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.34126°N, -61.13718°W [45.341262N, 61.137182W].

Visits:
June 11 – 11:55 to 12:30 (35 min), sunny 100%, none to light.
July 14 – 14:45 to 15:00 (15 min), heavy overcast, none.

All Species Recorded – 2.

Epitheca (Tetragoneuria) spinigera (Sélys 1871)
Spiny Baskettail, Corduliidae,
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313042o, June 11, Adult,
RSTAT 9 (inappropriate habitat).

Leucorrhinia hudsonica (Sélys 1850)
Hudsonian Whiteface, Libellulidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313043o, June 11, Adult,
RSTAT 8 (males at appropriate habitat).

Comments: A small true bog a short distance north of the power-line cut along the eastern property cutline. The list of odonates observed at this site seemed depauperate.

Code Site: **NS1693** (aka FB).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.345431°N, -61.161658°W [45.345431N, 61.161658W].

Visits:
June 9 – 17:15 to 17:25 (10 min), cloudy 90%, light to moderate.
June 10 – 09:30 to 09:50 (20 min), sunny 95%, light to moderate.

All Species Recorded – 0.

Comments: This small stream drains Wetlands 8 and 9, flowing through forested bog and largely over bedrock. It has very little substrate other then that bedrock, and no odonate species were observed during the visits. This site is likely representative of the upper reaches of all brooks on the property.

Code Site: **NS1703** (aka LMSB).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6. CHECK
45.34038°N, -61.14361°w [45.340379N, 61.143614W]. CHECK

Visits:
June 11 – visited briefly in passing.
July 14 – visited briefly in passing.

All Species Recorded – 0.

Comments: This stream was visited where it drains the Beaverpond (site NS1695), and hence at that locale is just south of the project footprint. It flows strongly through forest, is heavily shaded, and likely represents the habitat type of the lower courses of most running waters on the property.

Barrens

Code Site: **NS1701** (aka FBa).
Mapbook: 43y04 (old 35e02), NTIS Map: 11F6.
45.34583°N, -61.15409°W [45.345826N, 61.154094W].

Visits: The barrens were passed through on all survey days.

All Species Recorded – 1.

Enallagma boreale (Sélys 1875)
Boreal Bluet, Coenagrionidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313050v, June 10, Adult, RSTAT 10 (not at water).

Comments: The barrens have very little soil over granite bedrock – no likely odonate habitats were seen, they seem well-drained.

Shoreline

Code Site: NS1698 (aka FHS).
Mapbook: 43y03 (old 35e02), NTIS Map: 11F6.
45.35742°N, -61.1459°W [45.357415N, 61.145902W].

Visits:
June 11 – 13:15 to 15:40 (95 min), sunny 100%, none to light.
July 15 – 10:00 to 18:00 (120 min), sunny 100%, none to light.

All Species Recorded – 4.

Anax junius (Drury 1770)
Common Green Darner, Aeshnidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313068o, July 15, Adult, RSTAT 10 (not at water).
Cordulia shurtleffii Scudder 1866
American Emerald, Corduliidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313045o, June 11, Adult, RSTAT 10 (not at water).
Epitheca (Tetragoneuria) spinigera (Sélys 1871)
Spiny Baskettail, Corduliidae
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313044o, June 11, Adult, RSTAT 10 (not at water).
Somatochlora cingulata Sélys 1871
Lake Emerald, Corduliidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S2.
Record 313069v, July 15, COLL. Beth H. Cameron.
Adult, RSTAT 10 (not at water).

Comments: An abrupt, cliffed shoreline with cobble beaches – the only potential odonate habitat seen there was pools in the bedrock. No odonates were seen in the pools. All adults taken along the shore appeared to be foraging.

Woods

Code Site: NS1699 (aka FHW).
Mapbook: 43y03 (old 35e02), NTIS Map: 11F6.
45.35379°N, -61.15743°W [45.353793N, 61.157434W].

Visits: The woods were passed through on most survey days.

All Species Recorded – 1.

Cordulia shurtleffii Scudder 1866
American Emerald, Corduliidae.
NTSV G5, NGSCDA 4, NSDNR Green, NGSNS 4, NTSV S3.
Record 313047o, June 11, Adult, RSTAT 10 (not at water).

Comments: The woods on the property are either dense coniferous growth, with a mossy forest floor, or dense stands of woody brush. Only foraging odonates were seen in the forest.

The full list of odonates for the province is provided in the following table. Species encountered during 2010 survey are highlighted in yellow.

Species have been characterized as occupying the following basic habitat types;

lotic obligate (running waters, blue) – 13 species, possibilities for running waters on the property,

peatlands obligate (brown) – 23 species, possibilities for bogs on the property,

saltmarsh obligate (green) – 1 species *(E. berenice)*,

The balance are *lentic* (slow waters) inhabitants, possibilities for the property.

Note that there are issues of range within the province (latitude and elevation related), micro-habitat preferences, and flexibility of habitat use which have not been addressed in this basic assignment.

The various status ranks are given and are current (see Appendix 1 for definitions); those of conservation interest are given in bold.

The best residence status and the greatest observed abundance of each species encountered at each site is given in the site columns.

Residence Status:
1 = emergence proven,
2 = larvae collected,
3 = laying observed,
4 = mating observed,
5 = reproductive behaviour obs.,
6 = both sexes obs.,
7 = females only obs.,
8 = males only obs.,
9 = inappropriate habitat,
10 = not at an aquatic habitat.

Abundance Codes:
A = 1 individual,
B = 2–5,
C = 6–25,
D = >25.

Basic Habitat Type *lotic obligate* *lentic (diverse types)* *peatland obligate* *saltmarsh obligate* Taxa	Statuses Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	Subnational (AC CDC)	*Lakes and Ponds* NS1689 Fogherty Lake	NS1697 WL2, Ponds 1 and 2	NS1693 Beaverpond	*Peatlands* NS1702 Wetland 2	NS1700 Wetland 5	NS1690 Wetland 9	NS1690 Wetland 12	NS1694 Wetland 17	NS1696 Wetland 19	*Running Waters* NS1693 Brook 1	NS1703 Brook 2	*Land Sites* NS1701 Barrens	NS1698 Shoreline	NS1699 Woods
Number of Species/Site						5	9	0	3	2	0	12	4	2	0	0	1	4	1
Zygoptera - Damselflies																			
Family **Calopterygidae**																			
Genus ***Calopteryx***																			
C. aequabilis	G5	4	Gr	4	S5														
C. amata	G4	4	Gr	4	S5														
C. maculata	G5	4	Gr	4	S5														
Family **Lestidae**																			
Genus ***Lestes***																			
L. congener	G5	4	Gr	4	S5														
L. disjunctus	G5	4	Gr	4	S5		1B					1A							
L. dryas	G5	4	Gr	4	S5														
L. eurinus	G4	4	Gr	4	S4														
L. forcipatus	G5	4	Gr	4	S5														
L. rectangularis	G5	4	Gr	4	S5														
L. unguiculatus	G5	4	Gr	4	S5														
L. vigilax	G5	**3**	Gr	4	S5														
Family **Coenagrionidae**																			
Genus ***Amphiagrion***																			
A. saucium	G5	4	Gr	4	**S3**														
Genus ***Argia***																			
A. fumipennis violacea	G5T	4	Gr	4	S5														
A. moesta	G5	4	Gr	4	S5														
Genus ***Chromagrion***																			
C. conditum	G5	4	Gr	4	S5														
Genus ***Coenagrion***																			
C. interrogatum	G5	4	**Re**	**2**	**S1**														
C. resolutum	G5	4	**Re**	**2**	**S1**														
Genus ***Enallagma***																			
E. annexum	G5	4	Gr	4	S5							1C							
E. aspersum	G5	4	Gr	4	S5														
E. boreale	G5	4	Gr	4	S5	1C	8B		8B			1D					10A		
E. carunculatum	G5	4	**In**	**5**	SNA														
E. civile	G5	4	Gr	4	S5														
E. ebrium	G5	4	Gr	4	S5		8B												
E. exsulans	G5	4	Gr	4	S5														
E. hageni	G5	4	Gr	4	S5		8B												
E. minusculum	G4	**3**	Gr	4	S4														
E. signatum	G5	4	**Re**	**2**	**S1**														
E. vernale	G4	4	**In**	**5**	SNA														
E. vesperum	G5	4	**Ye**	**3**	**S3**														
Genus ***Ischnura***																			
I. hastata	G5	**2**	**In**	**In**	**SU**														
I. posita	G5	4	Gr	4	S5		8B												
I. verticalis	G5	4	Gr	4	S5		1D					8B							
Genus ***Nehalennia***																			
N. gracilis	G5	4	Gr	4	S4							7A	1B						
N. irene	G5	4	Gr	4	S5														

Residence Status:
1 = emergence proven,
2 = larvae collected,
3 = laying observed,
4 = mating observed,
5 = reproductive behaviour obs.,
6 = both sexes obs.,
7 = females only obs.,
8 = males only obs.,
9 = inappropriate habitat,
10 = not at an aquatic habitat.

Abundance Codes:
A = 1 individual,
B = 2–5,
C = 6–25,
D = >25.

Basic Habitat Type
lotic obligate
lentic (diverse types)
peatland obligate
saltmarsh obligate

Taxa	Statuses: Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	Subnational (AC CDC)	*Lakes and Ponds*	NS1689 Fogherty Lake	NS1697 WL2, Ponds 1 and 2	NS1693 Beaverpond	*Peatlands*	NS1702 Wetland 2	NS1700 Wetland 5	NS1690 Wetland 9	NS1690 Wetland 12	NS1694 Wetland 17	NS1696 Wetland 19	*Running Waters*	NS1693 Brook 1	NS1703 Brook 2	*Land Sites*	NS1701 Barrens	NS1698 Shoreline	NS1699 Woods
Anisoptera - Dragonflies																							
Family **Aeshnidae**																							
Genus ***Aeshna***																							
A. canadensis	G5	4	Gr	4	S5																		
A. clepsydra	G4	4	Gr	4	S3																		
A. constricta	G5	4	Gr	4	S3																		
A. eremita	G5	4	Gr	4	S4						9B	9B											
A. i. interrupta	G5T	4	Gr	4	S5			1A															
A. septentrionalis	G5	4	In	5	SNA																		
A. sitchensis	G5	4	Gr	4	S4																		
A. subarctica	G5	4	Gr	4	S4									1B									
A. tuberculifera	G4	4	Gr	4	S5																		
A. u. umbrosa	G5T	4	Gr	4	S5																		
A. verticalis	G5	4	Gr	4	S4																		
Genus ***Anax***																							
A. junius	G5	4	Gr	4	S5B																	10A	
Genus ***Basiaeschna***																							
B. janata	G5	4	Gr	4	S5		8A																
Genus ***Boyeria***																							
B. grafiana	G5	4	Ye	3	S3																		
B. vinosa	G5	4	Gr	4	S4																		
Genus ***Gomphaeschna***																							
G. furcillata	G5	2	Ye	3	S3																		
Genus ***Rhionaeschna***																							
R. mutata	G3/4	2	In	5	SNA																		
Family **Gomphidae**																							
Genus ***Dromogomphus***																							
D. spinosus	G5	4	Gr	4	S5																		
Genus ***Gomphus***																							
G. adelphus	G4	4	Gr	4	S5																		
G. borealis	G4	4	Gr	4	S5																		
G. descriptus	G4	4	Ye	3	S2																		
G. exilis	G5	4	Gr	4	S5																		
G. spicatus	G5	4	Gr	4	S5																		
G. ventricosus	G3	2	In	2	S1																		
Genus ***Hagenius***																							
H. brevistylus	G5	4	Gr	4	S5																		
Genus ***Lanthus***																							
L. parvulus	G4	4	Gr	4	S3																		
Genus ***Ophiogomphus***																							
O. aspersus	G3/4	4	Re	2	S1																		
O. carolus	G5	4	Gr	4	S3																		
O. mainensis	G4	4	Re	2	S1																		
O. rupinsulensis	G5	4	Re	2	S1.5																		

Residence Status:
1 = emergence proven,
2 = larvae collected,
3 = laying observed,
4 = mating observed,
5 = reproductive behaviour obs.,
6 = both sexes obs.,
7 = females only obs.,
8 = males only obs.,
9 = inappropriate habitat,
10 = not at an aquatic habitat.

Abundance Codes:
A = 1 individual,
B = 2–5,
C = 6–25,
D = >25.

Basic Habitat Type *lotic obligate* *lentic (diverse types)* *peatland obligate* *saltmarsh obligate*	Statuses					*Lakes and Ponds*				*Peatlands*						*Running Waters*			*Land Sites*			
Taxa	**Global** (NatureServe)	**NGS Canada**	**NSDNR Colour Ranks**	**NGS Nova Scotia**	**Subnational** (AC CDC)		**NS1689** Fogherty Lake	**NS1697** WL2, Ponds 1 and 2	**NS1693** Beaverpond		**NS1702** Wetland 2	**NS1700** Wetland 5	**NS1690** Wetland 9	**NS1690** Wetland 12	**NS1694** Wetland 17	**NS1696** Wetland 19		**NS1693** Brook 1	**NS1703** Brook 2		**NS1701** Barrens	**NS1698** Shoreline	**NS1699** Woods
Family Gomphidae *cont.*																						
Genus ***Stylogomphus***																						
S. albistylus	G5	4	Gr	4	S5																	
Genus ***Stylurus***																						
S. scudderi	G4	4	**Re**	**4**	S**1.5**																	
Family **Cordulegastridae**																						
Genus ***Cordulegaster***																						
C. diastatops	G5	4	Gr	4	S5																	
C. maculata	G5	4	Gr	4	S5																	
Family **Macromiidae**																						
Genus ***Didymops***																						
D. transversa	G5	4	Gr	4	S5																	
Genus ***Macromia***																						
M. i. illinoiensis	G5	4	Gr	4	S5																	
Family **Corduliidae**																						
Genus ***Cordulia***																						
C. shurtleffii	G5	4	Gr	4	S5									1A							10B	10A
Genus ***Dorocordulia***																						
D. lepida	G5	4	Gr	4	S5																	
D. libera	G5	4	Gr	4	S**4**																	
Genus ***Epitheca***																						
E. canis	G5	4	Gr	4	S5																	
E. cynosura	G5	4	**In**	**5**	S**Na**																	
E. princeps	G5	4	**Ye**	**3**	S**2**																	
E. semiaquea	G4	**5**	**In**	**5**	S**NR**																	
E. spinigera	G5	4	Gr	4	S5											9B					10B	
Genus ***Helocordulia***																						
H. uhleri	G5	4	Gr	4	S5																	
Genus ***Somatochlora***																						
S. albicincta	G5	4	**Re**	**2**	S**1**																	
S. brevicincta	G**3**	**3**	**Re**	**2**	S**1**																	
S. cingulata	G5	4	Gr	4	S4		8A														10A	
S. elongata	G5	4	Gr	4	S4																	
S. forcipata	G5	4	**Re**	**2**	S**2**																	
S. franklini	G5	4	**Ye**	**3**	S**1**																	
S. incurvata	G4	4	Gr	4	S5																	
S. kennedyi	G5	4	**Re**	**2**	S**1.5**																	
S. minor	G5	4	Gr	4	S4																	
S. septentrionalis	G5	4	**Ye**	**3**	S**2**																	
S. tenebrosa	G5	**3**	Gr	4	S**3**																	
S. walshii	G5	4	Gr	4	S5																	
S. williamsoni	G5	4	**Re**	**2**	S**1**																	
Genus ***Williamsonia***																						
W. fletcheri	G3/4	**3**	**Re**	**2**	S**1**																	

Residence Status:
1 = emergence proven,
2 = larvae collected,
3 = laying observed,
4 = mating observed,
5 = reproductive behaviour obs.,
6 = both sexes obs.,
7 = females only obs.,
8 = males only obs.,
9 = inappropriate habitat,
10 = not at an aquatic habitat.

Abundance Codes:
A = 1 individual,
B = 2–5,
C = 6–25,
D = >25.

Basic Habitat Type
lotic obligate
lentic (diverse types)
peatland obligate
saltmarsh obligate

Taxa	Statuses: Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	Subnational (AC CDC)	*Lakes and Ponds*	NS1689 Fogherty Lake	NS1697 WL2, Ponds 1 and 2	NS1693 Beaverpond	*Peatlands*	NS1702 Wetland 2	NS1700 Wetland 5	NS1690 Wetland 9	NS1690 Wetland 12	NS1694 Wetland 17	NS1696 Wetland 19	*Running Waters*	NS1693 Brook 1	NS1703 Brook 2	*Land Sites*	NS1701 Barrens	NS1698 Shoreline	NS1699 Woods
Family **Libellulidae**																							
Genus ***Celithemis***																							
C. elisa	G5	4	Gr	4	S5																		
C. martha	G4	**5**	Gr	4	S4																		
Genus ***Erythrodiplax***																							
E. berenice (saltmarshes)	G5	**2**	**Ye**	**2**	S**3**																		
Genus ***Ladona***																							
L. exusta	G4	4	Gr	4	S5																		
L. julia	G5	4	Gr	4	S5		**1B**							**1C**									
Genus ***Leucorrhinia***																							
L. frigida	G5	4	Gr	4	S5																		
L. glacialis	G5	4	Gr	4	S5									**1C**	**1C**								
L. hudsonica	G5	4	Gr	4	S5										**8B**	**8A**							
L. intacta	G5	4	Gr	4	S5																		
L. patricia	G4	4	**Re**	**2**	S**1**																		
L. proxima	G5	4	Gr	4	S5										**8A**								
Genus ***Libellula***																							
L. incesta	G5	4	Gr	4	S5																		
L. luctuosa	G5	4	**In**	**5**	S**NA**																		
L. pulchella	G5	4	Gr	4	S5B																		
L. quadrimaculata	G5	4	Gr	4	S5			**8B**			**8B**												
Genus ***Nannothemis***																							
N. bella	G4	4	Gr	4	S**3**																		
Genus ***Pantala***																							
P. flavescens (puddles)	G5	4	Gr	4	S5B		**9B**					**9B**		**3A**									
P. hymenaea (puddles)	G5	4	**Ye**	**3**	S5B									**8A**									
Genus ***Plathemis***																							
P. lydia	G5	4	Gr	4	S5																		
Genus ***Sympetrum***																							
S. corruptum	G5	4	**Ac**	**8**	SNA																		
S. costiferum	G5	4	Gr	4	S5																		
S. danae	G5	4	**Ye**	**3**	S**3**																		
S. internum	G5	4	Gr	4	S5			**1B**						**1A**									
S. obtrusum	G5	4	Gr	4	S5	**1A**																	
S. rubicundulum	G5	4	**In**	**5**	S5																		
S. semicinctum	G5	4	Gr	4	S5																		
S. vicinum	G5	4	Gr	4	S5																		
Genus ***Tramea***																							
T. carolina	G5	**5**	**In**	**5**	S**1B**																		
T. lacerata	G5	**4**	**Re**	**2**	S**U**																		

Conservation Statuses

Italic comments are by Brunelle.

NatureServe Global Ranks

G1 Extremely rare throughout its range (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.

G2 Rare throughout its range (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.

G3 Uncommon throughout its range, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).

G4 Usually widespread, fairly common throughout its range, and apparently secure with many occurrences, but the Element is of long term concern (e.g. watch list, 100+ occurrences).

G5 Demonstrably widespread, abundant, and secure throughout its range, and essentially ineradicable under present conditions.

T This suffix indicates that there is some taxonomic confusion with the species.

/ This indicates that the rank is intermediate between two ranks.

National General Status Ranks – Canada and Nova Scotia

1 **At risk:** species for which a formal assessment has been completed and determined to be at risk of extirpation or extinction (i.e., endangered or threatened).

2 **May be at risk:** species that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment.

3 **Sensitive:** species which are not believed to be at risk of extirpation or extinction, but may require special attention or protection to prevent them from becoming at risk.

4 **Secure:** species which are not believed to be 'at risk' or 'sensitive'.

5 **Undetermined:** species for which insufficient data, information, or knowledge is available to reliably evaluate their status. *Generally rare where known.*

6 **Not assessed:** species known or believed to be present but which have not yet been assessed. *This status is usually is applied to recent discoveries.*

7 **Exotic:** species that have been introduced as a result of human activity.

8 **Extirpated/extinct:** species no longer thought to be present in the jurisdiction or that are believed to be extinct.

9 **Accidental/vagrant:** species occurring infrequently and unpredictably, outside their usual range.

Nova Scotia DNR Colour Ranks

Red May be at risk (Re).
Yellow Sensitive (Ye).
Green Secure (Gr)
Blue Thought to be extirpated (Bl).
Accidental Thought not to be resident (Ac).
Indeterminate Rank not determined (In). *Generally rare and of conservation concern, or the subject of taxonomic concerns. This rank is also given to recent additions to the provincial list, pending further consideration.*

National General Status Ranks – Nova Scotia

See definitions for Canada above.

AC CDC (NatureServe) Subnational Ranks – Nova Scotia

See definitions for Global above, but subnational ranks are given with an 's' prefix.

Residence Status

Developed by ADIP, residence status is a metric of the nature of a species' presence in a water body or wetland, based on the degree to which it has been indicated or proven that the larvae of the species develop successfully to emergence.

1 **Emergence recorded;**
- directly observed,
- collection of exuvia, or,
- teneral on its maiden flight near the site.

2 **Larvae collected,** unambiguous determination.

3 **Laying observed.**

4 **Mating observed.**

5 **Reproductive behavior observed;**
- male display for female,
- male priming (transferring semen to secondary genitalia), or,
- male towing female (an indicator of laying).

6 **Males and females observed,** at the aquatic habitat appropriate for the species.

7 **Females only observed,** at appropriate aquatic habitat.

8 **Males only observed,** at appropriate aquatic habitat.

9 **Not encountered at an appropriate aquatic habitat.**

10 **Not encountered at any aquatic habitat.**

Abundance Codes

Developed by ADIP, these codes are an estimate of the number of individuals of the species seen in each record. The number range is used in the site accounts, the letter code in the Nova Scotia Species list.

1	**A**	1 individual seen.
2–5	**B**	2 to 5 individuals seen.
6–25	**C**	6 to 25 individuals seen.
>25	**D**	more than 25 individuals seen.

Adults of the insect order Odonata are of one of the most ancient and widely-recognized groups of insects – with very few exceptions they are identifiable to suborder even by children.

Taxonomy

The suborder Zygoptera comprises the damselflies; very slim, with eyes widely separated on a short head, and wings of similar shape generally held together over the back when perched.

The suborder Anisoptera comprises the dragonflies; which tend to be larger and more robust, and which hold their differently-shaped fore and hindwings more or less flat out to the side when perched.

History of Study

There has been an extraordinary surge in interest in odonates in the last twenty years – fueled in part by the availability of photographs of these brilliantly-coloured insects and the publication of field guides, but also by increased interest in rare and endangered species among conservation and government authorities.

In the northeast of North America, this interest was first manifested in the formation of volunteer surveys – ADIP (Atlantic Dragonfly Inventory Program) in Atlantic Canada, and MDDS (Maine Damselfly and Dragonfly Survey). Based on these largely volunteer efforts, government and conservation authorities have begun supporting studies, and odonates are now often included in environmental assessments.

Much remains to be done before we have a firm body of knowledge upon which to base assumptions in the region – however the 58,000 records in hand for Acadia (Maritime Provinces and Maine) are a substantial baseline for further work.

Listing

See Appendix 1 for status definitions.

Until recently the NatureServe listing for the Maritime Provinces was not complete on the subnational (provincial) level – recent efforts by the Atlantic Canada Conservation Data Centre have addressed that.

Recently, the odonates of Canada were assigned statuses in the National General Status structure, as were species in all provinces and territories.

The Nova Scotia Department of Natural Resources uses a system of colour statuses which largely reflects the National General Status definitions.

Significance to Humans

The order is an important component in all freshwater aquatic habitats – as predators high on the aquatic foodchain they consume many organisms we consider injurious, and are prey for many others we value.

They are, in particular, an important brake on the abundance of the aquatic biting insects.

Impacts on Odonata

Human impacts on odonates are principally those from aquatic habitat alteration, and tend to favour the common species over those rarer in the natural environments. On the positive side, we have constructed ponds, reservoirs, bogs and ditches which generally house good lists of lentic (slow-water) species. The formation of bogs has been particularly beneficial to northern species. One the negative side, we have greatly altered and in some cases eliminated all sizes of lotic (running water) habitats, and as a result have negatively impact many of those species which are obligate to those habitats.

Direct impacts are confined to collection for scientific purposes and road-kill. The latter can be a powerful impact on species depending upon their flying characteristics, however the former is rarely intense enough to endanger even the most restricted species population.

Lifestages

Odonata are largely aquatic insects, spending their infancy in the water. Unlike many aquatic insects, their ***larvae*** breath the water (rather than taking their breath from the surface) and are hence vulnerable to a degree to changes in water chemistry. The larvae molt up to fourteen times during their development in the water, leaving ***molts*** or ***castoffs*** behind.

After a maturation period, variable by species, they emerge into the ***teneral*** lifestage, leaving the empty shell of the larva behind (called an ***exuvia***). The teneral is soft-bodied and does not generally have the brilliant colours of the adult. When a teneral is taken with its exuviae it is called ‘associated’.

After a period away from the water spent foraging and firming up, they return to their breeding arenas (usually at the water’s edge).

Mature ***adults*** may be significantly different in colour and pattern from their tenerals, and in some groups there is considerable sexual dichromatism.

Behaviour

Major behaviours observed informed the establishment of residence status (see Appendix 1), and are: ***emergence*** (a teneral leaving its larval form), ***mating*** and ***towing*** (indicative of laying), ***laying***, ***males fighting*** (indicative of territoriality at a larval habitat),
nuptial (reproductive behaviour), ***wandering*** (an adult thought to be foraging away from its normal larval habitat).

D.03
Appendix 3
Supplementary Odonata Specimens

Appendix 3-Table 1. Supplementary Odonata Specimens Collected by AMEC on the Black Point site, 2010.

Binomial	Common name	ACCDC Rank	General Status Rank-NS	AMEC Sample ID	ADIP Record Number	Site Name	Collection Date	Lifestage	Sex
Anax junius (Drury 1770)	Common Green Darner	5B	Green (4)	BC2010.09	354453	Barrens	27-Aug-10	Adult	Female
Lestes disjunctus (Sélys 1862)	Common Spreadwing	5	Green (4)	BC2010.11	354455	Barrens	27-Aug-10	Adult	Female
Lestes disjunctus (Sélys 1862)	Common Spreadwing	5	Green (4)	BC2010.13	354457	Wetland 2	23-Sep-10	Adult	Female
Aeshna eremita (Scudder 1866)	Lake Darner	4	Green (4)	BC2010.07	354451	Wetland 2 Ponds 1 and 2	24-Aug-10	Adult	Female
Ischnura verticalis (Say 1839)	Eastern Forktail	5	Green (4)	BC2010.06	354450	Wetland 2 Ponds 1 and 2	24-Aug-10	Adult	Female
Lestes disjunctus (Sélys 1862)	Common Spreadwing	5	Green (4)	BC2010.01,	354445	Wetland 2 Ponds 1 and 2	24-Aug-10	Adult	Male
Lestes disjunctus (Sélys 1862)	Common Spreadwing	5	Green (4)	BC2010.05	354445	Wetland 2 Ponds 1 and 2	24-Aug-10	Teneral	Female
Sympetrum rubicundulum (Say 1839)	Ruby Meadowhawk	5	Green (4)	BC2010.04	354448	Wetland 2 Ponds 1 and 2	24-Aug-10	Adult	NA
Sympetrum internum (Montgomery 1943)	Cherry-faced Meadowhawk	5	Green (4)	BC2010.12	354456	Wetland 2 Ponds 1 and 2	22-Sep-10	Adult	Male
Aeshna umbrosa umbrosa (Walker 1908)	Variable Darner	5	Green (4)	BC2010.14	354458	Wetland 2 Ponds 1 and 2	23-Sep-10	Adult	Male
Sympetrum costiferum (Hagen 1861)	Saffron-winged Meadowhawk	5	Green (4)	BC2010.16	354460	Wetland 2 Ponds 1 and 2	23-Sep-10	Adult	Male
Sympetrum internum (Montgomery 1943)	Cherry-faced Meadowhawk	5	Green (4)	BC2010.17	354461	Wetland 2 Ponds 1 and 2	23-Sep-10	Adult	Male
Aeshna eremita (Scudder 1866)	Lake Darner	4	Green (4)	BC2010.02	354446	Shoreline	23-Sep-10	Adult	Male
Aeshna eremita (Scudder 1866)	Lake Darner	4	Green (4)	BC2010.03	354446	Shoreline	24-Aug-10	Adult	Female
Aeshna umbrosa umbrosa (Walker 1908)	Shadow Darner	5	Green (4)	BC2010.15	354459	Shoreline	23-Sep-10	Adult	Male
Aeshna eremita (Scudder 1866)	Lake Darner	4	Green (4)	BC2010.10	354454	Fogherty Lake	27-Aug-10	Adult	Male
Aeshna umbrosa umbrosa (Walker 1908)	Shadow Darner	5	Green (4)	BC2010.08	354452	Fogherty Lake	27-Aug-10	Adult	Male
Aeshna eremita (Scudder 1866)	Lake Darner	4	Green (4)	BC2010.18	354462	Fogherty Lake	23-Aug-10	Exuvia	NA

LEGEND:

Odonata Sampling Location

AMEC Earth & Environmental
50 Troop Avenue, Unit 300
Dartmouth, N.S., B3B 1Z1
(P) 902-468-2848 (F) 902-468-1314

CLIENT

Erdene Resource Development Corp.
Metropolitan Place
99 Wyse Road, Suite 1480
Dartmouth, NS B3A 4S5

PROJECT

Black Point Quarry Project

TITLE

Odonata Sampling Locations

DWN BY: DS	PROJECTION: UTM Zone 20	DATE: February 2011
CHK'D BY: SB	DATUM: NAD83	PROJECT NO: TV01017
REV. NO.: N/A	SCALE: N.T.S.	FIGURE No. Appendix 4 Figure 1

Appendix C. Wetlands

Appendix C.1: Wetland Determination Sheets

Appendix C.2: Wetland Habitat Sketches

Appendix C.3: Wetland Photos

Appendix C.4: Wetland Vascular Plant Species List

Appendix C.1

Wetland Determination Sheets

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: G. Rd Municipality/County: Guysborough Sampling Date: Sept. 1/10

Applicant/Owner: Ecodyne Sampling Point: WL5 = UP1

Investigator(s): S. Burley Section, Township, Range: Blacks Point

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 25% Lat: 644453 Long: 5024120 Datum: NAD 83

Soil Map Unit Name: Rockland Wetland Type: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	20%	FACU	✓
2. Abies balsamea	5%	FAC	✓
3.			
4.			
5.			
	25	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m)			
1. Alnus incana	15%	FACW	✓
2.			
3.			
4.			
5.			
	15	= Total Cover	

Herb Stratum (Plot size: 1 m)			
1. Cornus canadensis	15%	FAC	✓
2. Dryopteris carthusiana	10%	FAC	✓
3. Solidago rugosa	5%	FAC	
4. Rhubus sp	5%		
5. Rosa sp	5%		
6. Dasiphora fruticosa	10%	NI	
7. Maianthemum canadense	2%		
8.			
9.			
10.			
	72%	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WLS-UP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0								Duff
0-35	7.5YR 4/4	100					Sandy loam	well drained

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (cm): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (cm): _____

Water Table Present? Yes _____ No _____ Depth (cm): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (cm): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GLC Municipality/County: Guysborough Sampling Date: Sept 1/10

Applicant/Owner: Eastern Sampling Point: WL5-UP1

Investigator(s): S. Burley Section, Township, Range: Blocks Point

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): concave

Slope (%): 15-90 Lat: E 644453 Long: 5024118 Datum: NAD 83

Soil Map Unit Name: Rockland Wetland Type: Herb Fen

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: WL5

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	2%		
2.			
3.			
4.			
5.			
	2	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m)			
1. Acer rubrum	2%		
2.			
3.			
4.			
5.			
	2	= Total Cover	

Herb Stratum (Plot size: 1 m)			
1. Vaccinium macrocarpon	15%	✓	OBL
2. Eriophorum vaginatum	10%	✓	OBL
3. Agalinis paupercula	20%	✓	FACW
4. Iris versicolor	5%		
5. Rubus - Black Berry	5%		
6.			
7.			
8.			
9.			
10.			
	55	= Total Cover	

Woody Vine Stratum (Plot size: —)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: GL5-WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+40-0							Histosol	Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (cm): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (cm): 3cm

Water Table Present? Yes ✓ No ___ Depth (cm): 5cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (cm): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GLRC Municipality/County: Guysborough Sampling Date: Sept. 1/10
Applicant/Owner: Ecodyne Sampling Point: WL6-UP1
Investigator(s): S. Burley Section, Township, Range: Blacks Point
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):
Slope (%): 5% Lat: 6446716 Long: 502 4127 Datum: NAD 83 UTM
Soil Map Unit Name: Rockland Wetland Type: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ____ No ✓
Wetland Hydrology Present? Yes ____ No ✓
Is the Sampled Area within a Wetland? Yes ____ No ✓
If yes, optional Wetland Site ID: ____
Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies balsamea	15%	✓	FAC
2.			
3.			
4.			
5.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. Abies balsamea	15%	✓	FAC
2. Picea mariana	5%		FACW
3. Betula cordifolia	2%		FAC
4.			
5.			
	22 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Maianthemum canadense	5%	✓	FAC
2. Viola incognita viridis-ciliata	5%	✓	FAC
3. Linnaea borealis	10%	✓	FAC
4. Mitchella repens	5%	✓	FACU
5. Picea mariana	2%		FACW
6. Abies balsamea	2%		FAC
7.			
8.			
9.			
10.			
	29 = Total Cover		
Woody Vine Stratum (Plot size: —)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	7	x 2 =	14
FAC species	54	x 3 =	162
FACU species	5	x 4 =	20
UPL species		x 5 =	
Column Totals:	66 (A)		196 (B)

Prevalence Index = B/A = 2.97

Hydrophytic Vegetation Indicators:
___ Rapid Test for Hydrophytic Vegetation
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WL6-UP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 6/1						Sandy loam	
10-30	7.5YR 4/6						Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (~~inches~~ cm): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (~~inches~~ cm): _____

Water Table Present? Yes _____ No _____ Depth (~~inches~~ cm): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (~~inches~~ cm): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GRQ Municipality/County: Guysborough Sampling Date: Sept. 1/10

Applicant/Owner: Erdware Sampling Point: WL6 - WA1

Investigator(s): S. Burley Section, Township, Range: Blacks Point

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Concave

Slope (%): 2% ~~Lat:~~ E 644740 ~~Long:~~ N 5024111 Datum: NAD 83

Soil Map Unit Name: Rockland Wetland Type: Bog

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____

Hydric Soil Present? Yes ✓ No ____

Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? Yes ✓ No ____

If yes, optional Wetland Site ID: WL6

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	2%		FAC
2. Abies balsamea	5%	✓	FAC
3. Picea mariana	5%	✓	FAC
4.			
5.			
	12	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Acer rubrum	1%		FAC
2. Picea mariana	5%	✓	FACW
3. Alnus incana	2%		FACW
4. Myrica pensylvanica	10%	✓	FAC
5. Gaylussacia baccata	5%	✓	FACU
	23	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Maianthemum trifolia	20%	✓	OBL
2. Eriophorum vaginicum	10%	✓	OBL
3. Gaylussacia baccata	5%		FACU
4. Ledum groenlandicum	5%		OBL
5. Aster nemoralis	2%		FACW
6. Rubus hispidus	2%		FACW
7. Rhynchospora alba	2%		OBL
8.			
9.			
10.			
	46	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 86 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WL6-WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-40							organic	peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (cm): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (cm): ___

Water Table Present? Yes ✓ No ___ Depth (cm): 20cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (cm): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GLA Municipality/County: Greyshorough Sampling Date: Sept 1/10
Applicant/Owner: Enbridge Sampling Point: WL7-WP1
Investigator(s): S. Burley Section, Township, Range: Blacks Point
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Flat
Slope (%): 2% Lat: 644035 Long: 502348 Datum: NAD83 UTM
Soil Map Unit Name: Rockland Wetland Type: Shrub Swamp
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	If yes, optional Wetland Site ID: WL7

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea mariana	10%	✓	FACW
2. Picea glauca	5%	✓	FACU
3.			
4.			
5.			
	15	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Abies balsamea	5%		FAC
2. Alnus incana	2%		FACW
3. Cornus sericea ssp. sericea	5%		FACW
4. Picea glauca	10%		FACU
5. Osmundastrum cinnamomeum	50%	✓	FACW
	72	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Calamagrostis Canadensis	15%	✓	FACW
2. Aster nemoralis	10%	✓	FACW
3. Rubus pubescens	2%		FAC
4. Rubus hispidus	5%		FACW
5. Rubus pubescens	5%		FACW
6.			
7.			
8.			
9.			
10.			
	37	= Total Cover	

Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:
___ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: Cell 7 - WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 + 40-0							Histosol	Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (cm): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (cm): 10 cm

Water Table Present? Yes ✓ No ___ Depth (cm): 5 cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (cm): 0 cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GRA Municipality/County: Guysborough Sampling Date: Sept 1/10

Applicant/Owner: Erchaw Sampling Point: WL8-WP1

Investigator(s): S. Burley Section, Township, Range: Blacks Point

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Hummocky

Slope (%): 1% Lat: 643949 Long: 5027628 Datum: NAD 83 UTM

Soil Map Unit Name: Rocklynch Wetland Type: Treed Swamp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____

Hydric Soil Present? Yes ✓ No ____

Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? Yes ✓ No ____

If yes, optional Wetland Site ID: WL8

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10M)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer Rubrum	5%	✓	FAC
2. Abies balsamea	15%	✓	FAC
3.			
4.			
5.			
	20	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5M)			
1. Sorbus americana	5%		FACU
2. Abies balsamea	5%		FAC
3. Osmunda cinnamomea	45%	✓	FACW
4. Picea mariana	2%		FACU
5.			
	57	= Total Cover	

Herb Stratum (Plot size: 1M)			
1. Osmunda cinnamomea	30%	✓	FACW
2. Carex trisperma	25%	✓	OBL
3. Cornus canadensis	5%		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	60	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WL8-WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (~~inches~~) cm	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-40+								Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (~~inches~~) cm: ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (~~inches~~) cm: ___

Water Table Present? Yes ✓ No ___ Depth (~~inches~~) cm: 25cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (~~inches~~) cm: 0cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GRQ Municipality/County: Queensborough Sampling Date: Sept. 2/10

Applicant/Owner: Erdene Sampling Point: WL-WP1

Investigator(s): S. Burley Section, Township, Range: Blocks Point

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Hummocky

Slope (%): 5% Lat: E 643859 Long: N 5023682 Datum: NAD 83 CSRS

Soil Map Unit Name: Rockland Wetland Type: Treed Swamp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: WL1

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10M)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies balsamea	20%	✓	FAC
2. Picea mariana	30%	✓	FACW
3.			
4.			
5.			
	50	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5M)			
1. Abies balsamea	20%	✓	FAC
2. Nemopanthus mucronata	15%	✓	OBL
3. Sorbus americana	1%		FACU
4.			
5.			
	36	= Total Cover	

Herb Stratum (Plot size: 1M)			
1. Cornus canadensis	5%	✓	OBL
2. Carex canadensis	2%		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	7	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WL-WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-40							organic	Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Bedrock

Depth (cm): 40cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (cm): ___

Water Table Present? Yes ___ No ___ Depth (cm): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (cm): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: ORQ Municipality/County: Guysborough Sampling Date: Sept 3/10

Applicant/Owner: Enclume Sampling Point: WL13-WP1

Investigator(s): S. Burley Section, Township, Range: Black's Point

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Hummocky

Slope (%): 1-2 ~~Lat:~~ E 644879 ~~Long:~~ N 5023522 Datum: NAD 83 UTM

Soil Map Unit Name: Rockland Wetland Type: Shrub Swamp / Bog

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: WL13
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea mariana	10%	✓	FACW
2. Abies balsamea	2%		FAC
3.			
4.			
5.			
	12	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 M)			
1. Rhododendron groenlandicum	75%	✓	OBL
2. Viburnum nudum	20%		FACW
3. Osmunda cinnamomea	60%	✓	FACW
4. Gaylussacia baccata	15%		FACW
5. Myrica gale	15%		
	135	= Total Cover	

Herb Stratum (Plot size: 1 m)			
1. Sarracenia purpurea	1%		OBL
2. Carex trisperma	5%	✓	OBL
3. Coptis trifolia	5%	✓	FACW
4. Rubus canadensis	5%	✓	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	16	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling Point: WH13-WP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-40+							Organic	Peat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (cm): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (cm): ___

Water Table Present? Yes ✓ No ___ Depth (cm): 15cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (cm): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: GRO Municipality/County: Guysborough Sampling Date: Sept. 3/10
Applicant/Owner: Erdene Sampling Point: WL14- WP1
Investigator(s): S. Burley Section, Township, Range: Blacks Point
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Hummocky
Slope (%): 2% E Lat: 644869 N Long: 5023348 Datum: NAD 83 UTM
Soil Map Unit Name: Rockland Wetland Type: Treed Swamp
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: WL14
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	15%	✓	FAC
2. Picea mariana	15%	✓	FACW
3. Abies balsamea	5%		FAC
4.			
5.			
	35	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Rhododendron groenlandicum	10%	✓	OBL
2. Viburnum nudum	5%	✓	FACW
3. Salix pedicellaris	10%	✓	FACW
4.			
5.			
	25	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Carex trisperma	50%	✓	OBL
2. Maianthemum canadense	20%	✓	FAC
3. Picea mariana	5%		FACW
4. Kalmia angustifolia	10%		FAC
5.			
6.			
7.			
8.			
9.			
10.			
	65	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Remarks: (Include photo numbers here or on a separate sheet.)

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
___ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Sampling Point: WL14-UP1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
O 20-0							organic	Peat
A 0-20	5YR 2.5/1						Silt	High organic content

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (cm): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (cm): ___

Water Table Present? Yes ___ No ✓ Depth (cm): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (cm): 0 cm

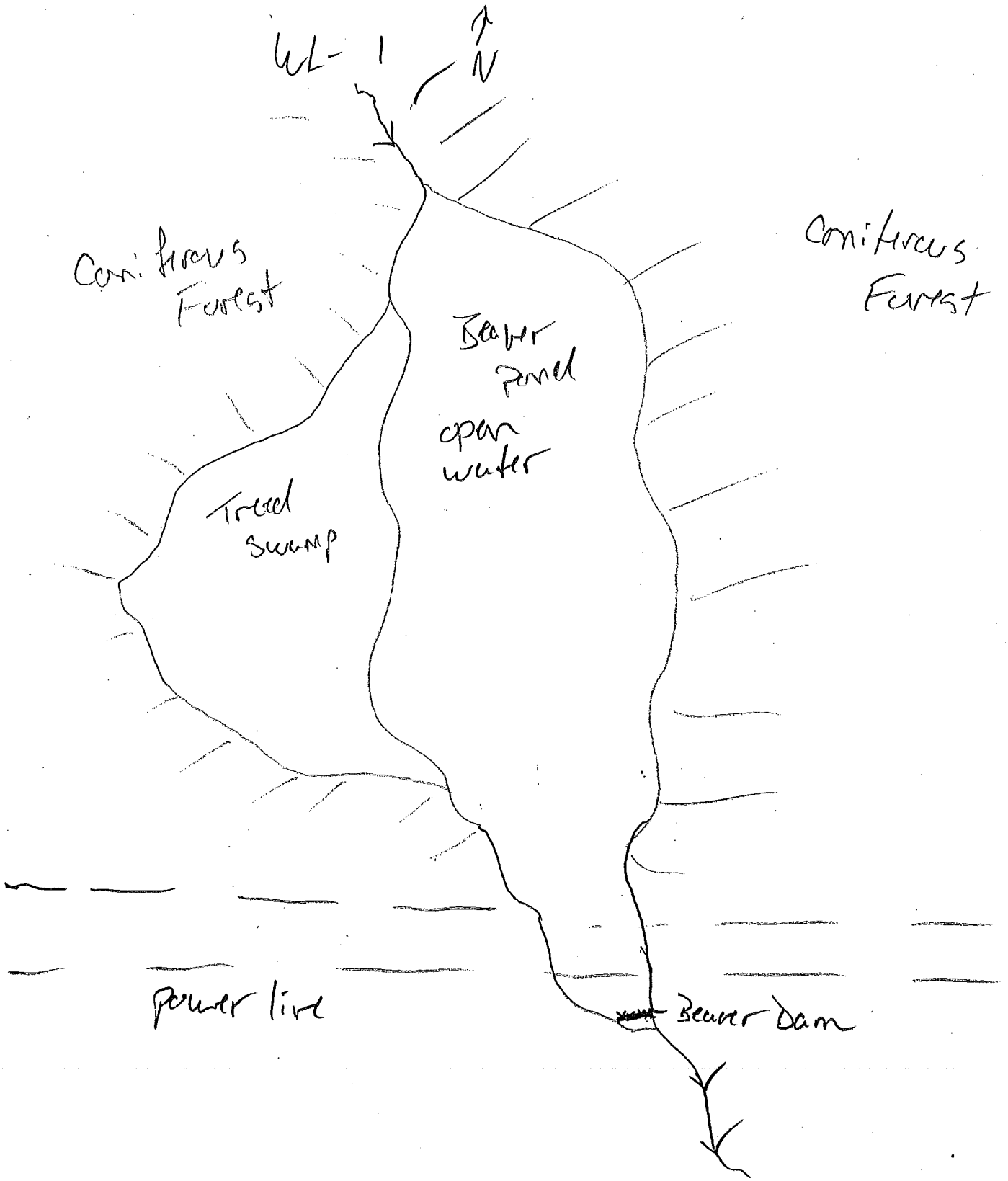
Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

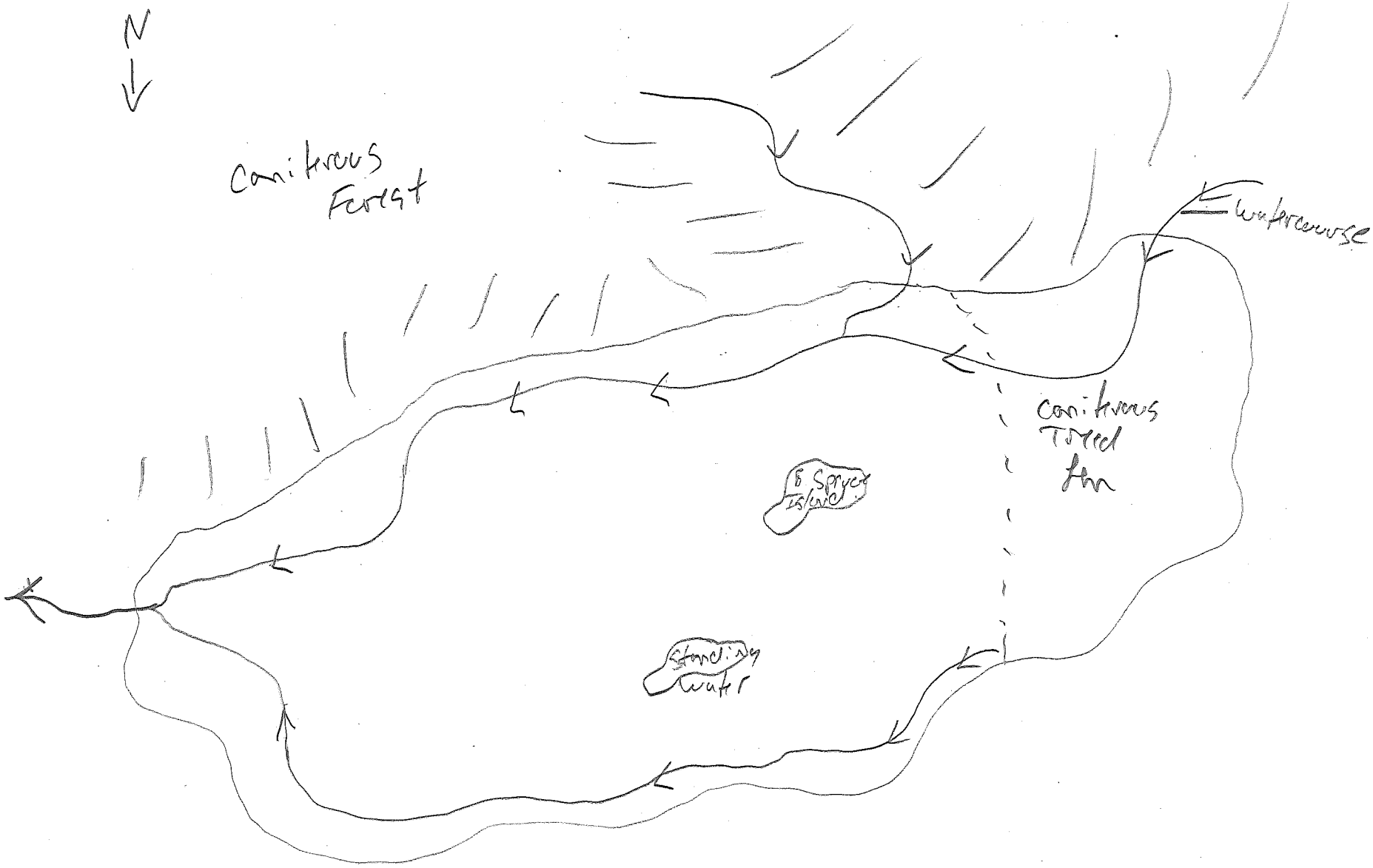
Remarks:

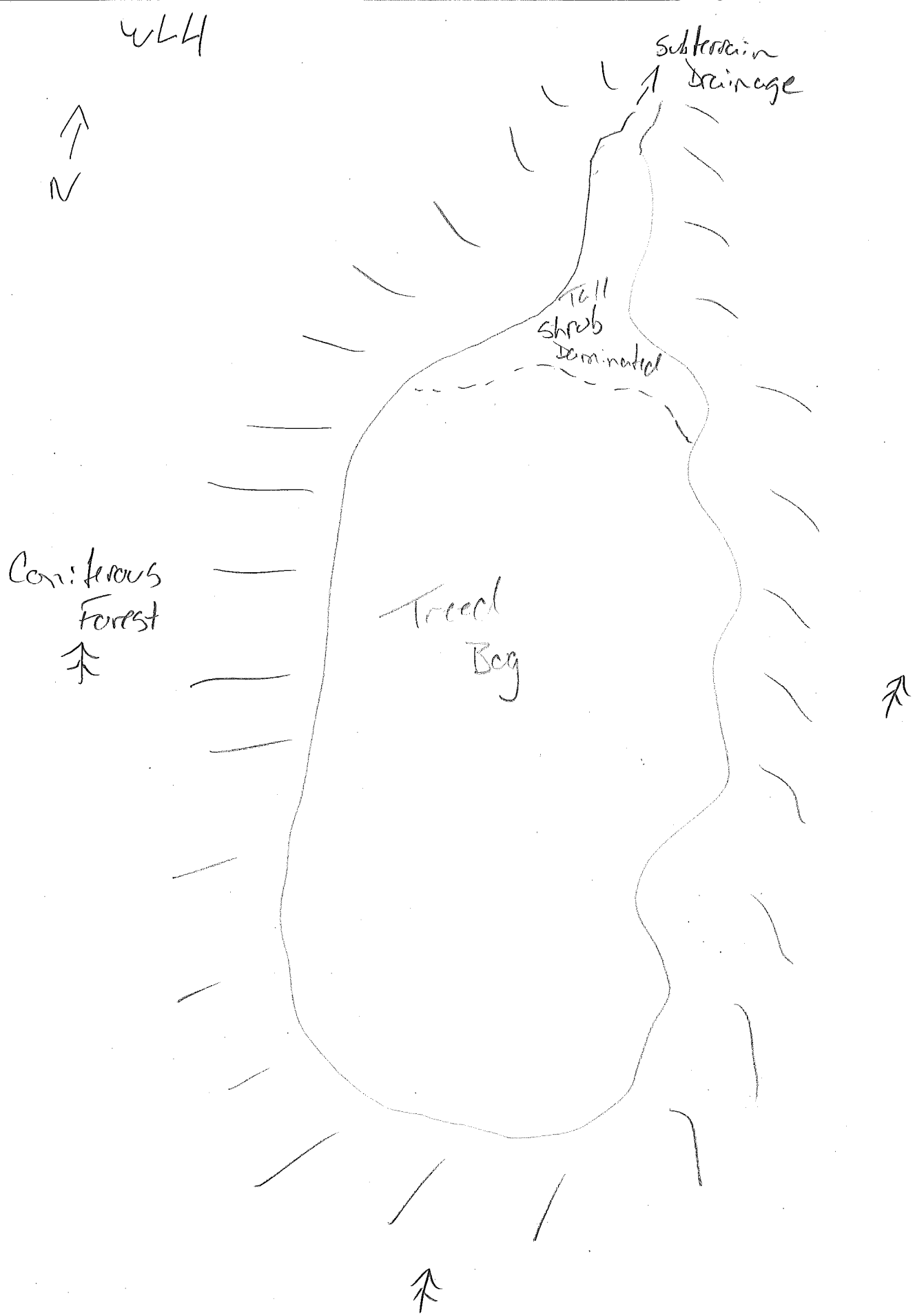
Appendix C.2

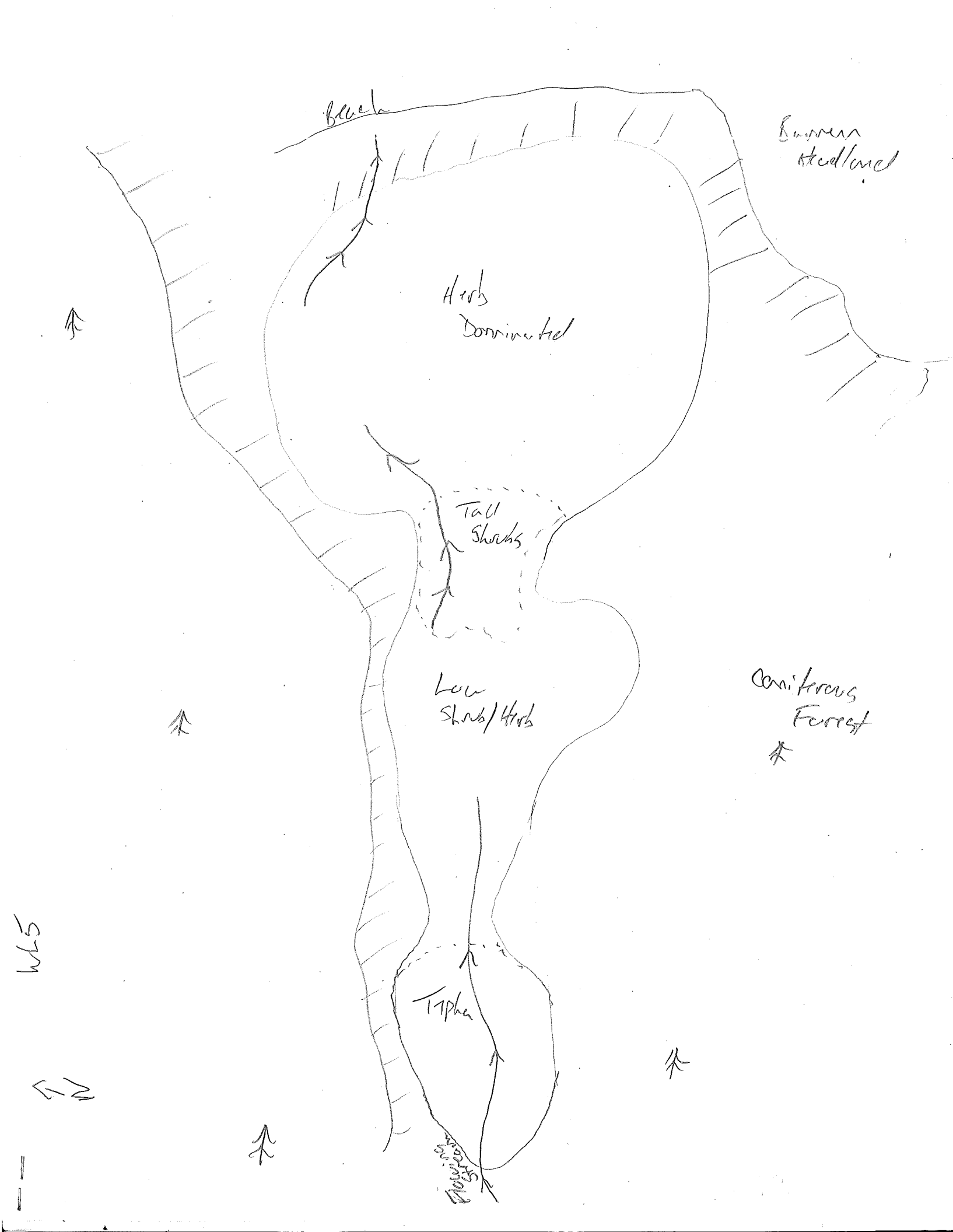
Wetland Habitat Sketches


WL-1
N
Coniferous Forest
Coniferous Forest
Beaver pond
open water
Treed swamp
power line
Beaver Dam

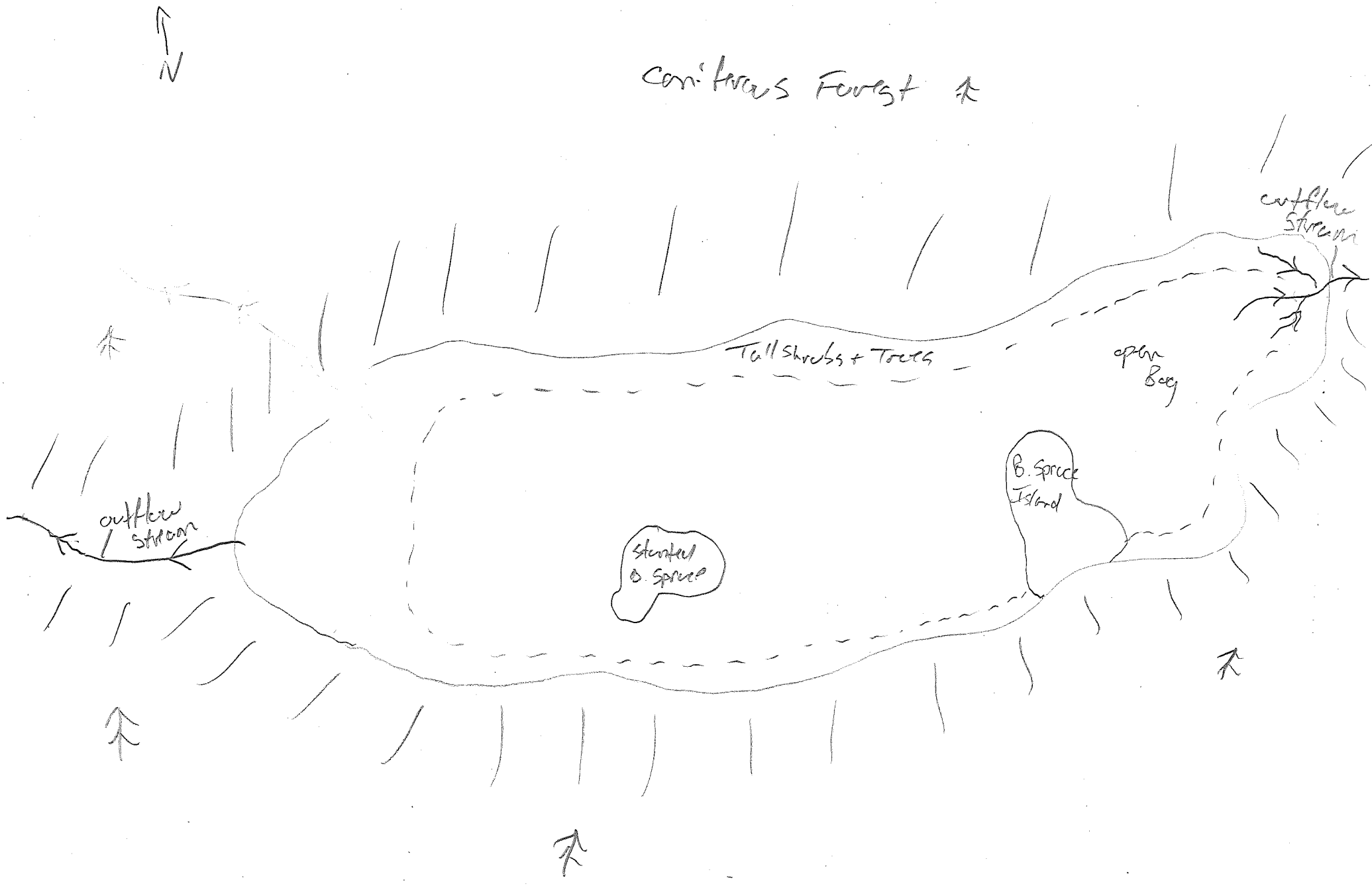

WL2
N
Beach
Natural Stone Berm
Robust Emergent Marsh
Typha
Saline Pond
Herb Fen
Eriophorum
Tall Shrub Fen
Osmunda Cinnamomea
Alnus
Stream

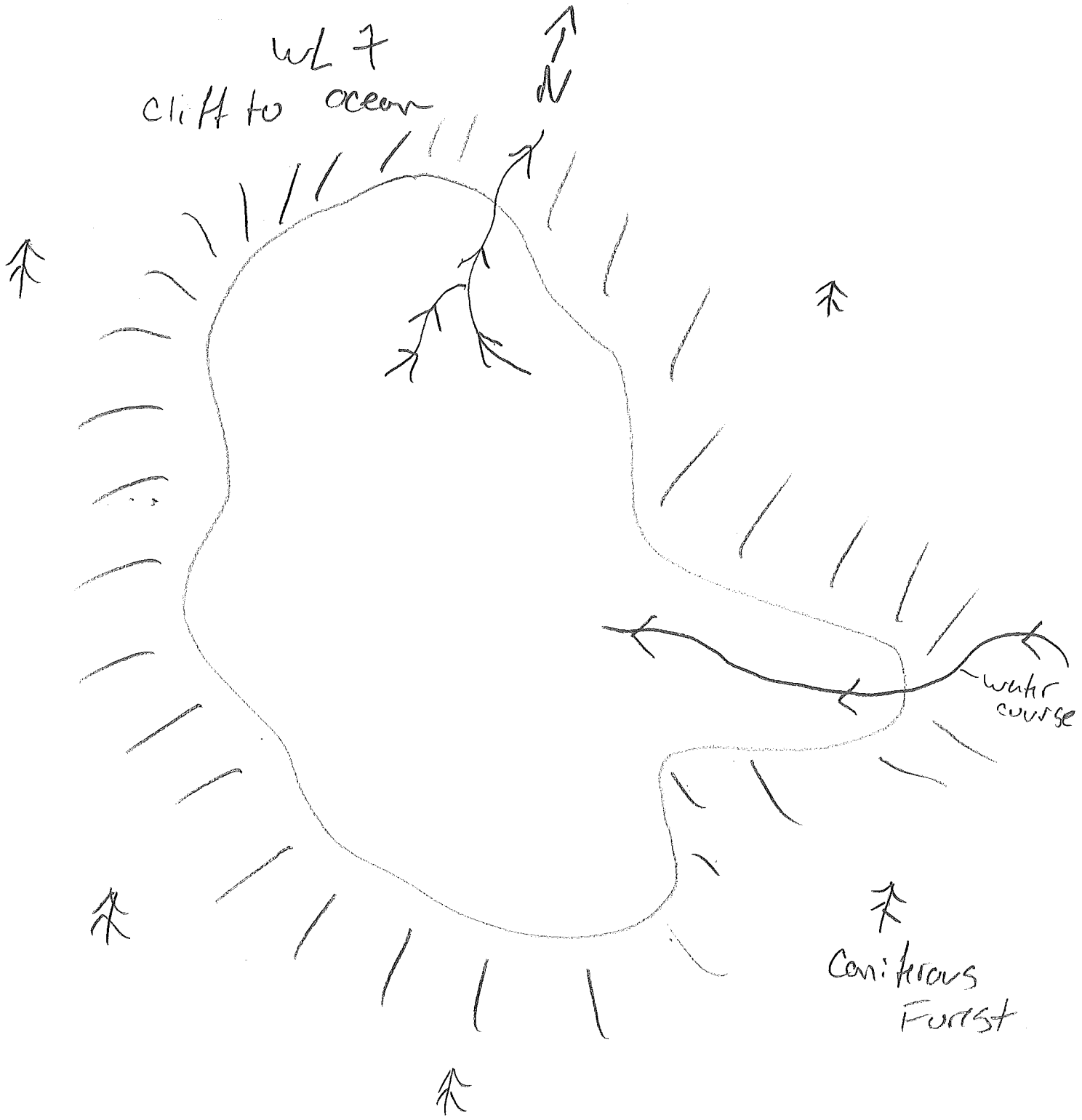

WL3
N
Coniferous Forest
Watercourse
Coniferous Treed Fen
6 Spruce Islands
Standing Water

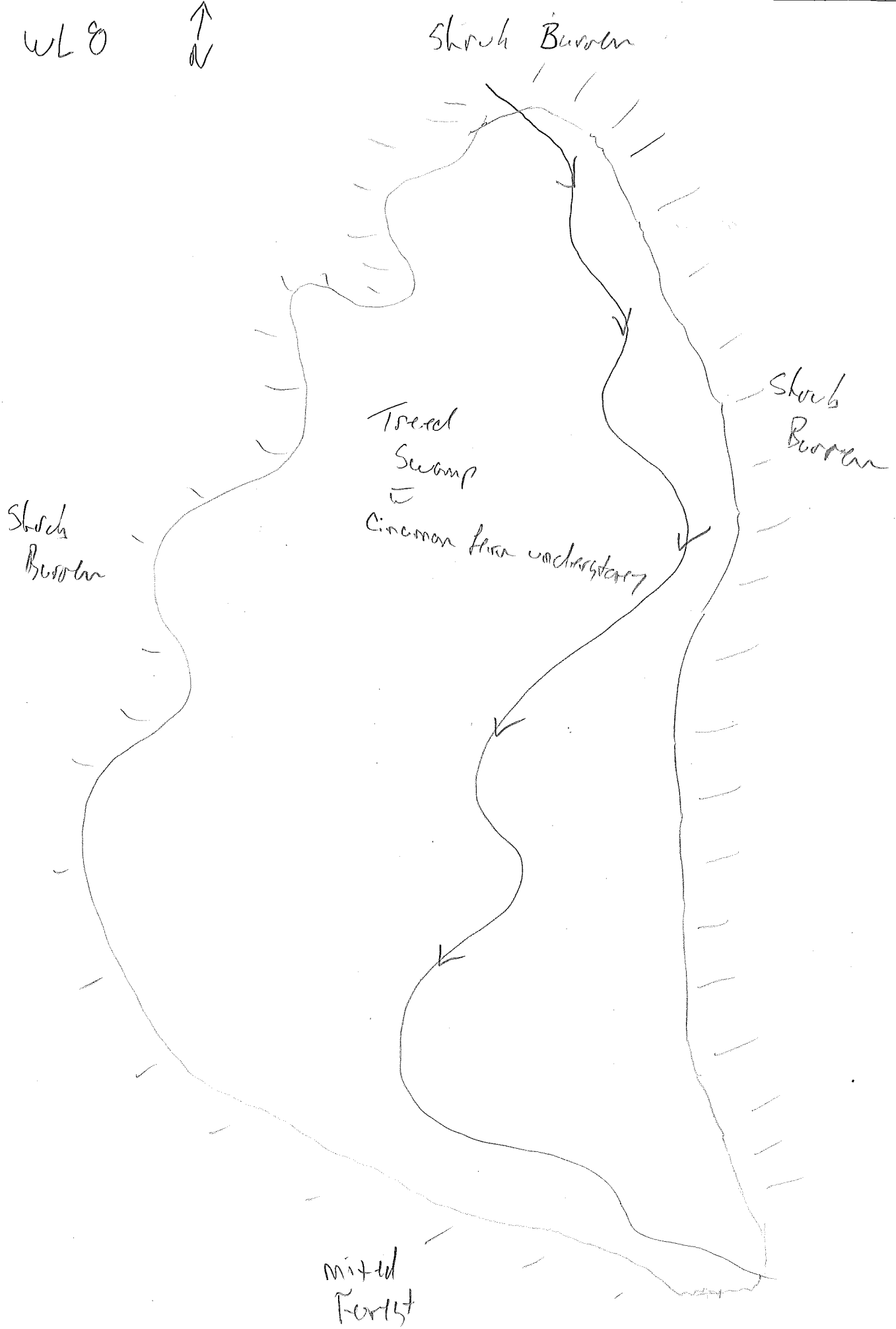

4L4
Subterrain
Drainage
N
Tall
shrub
Dominated
Coniferous
Forest
Treed
Bog

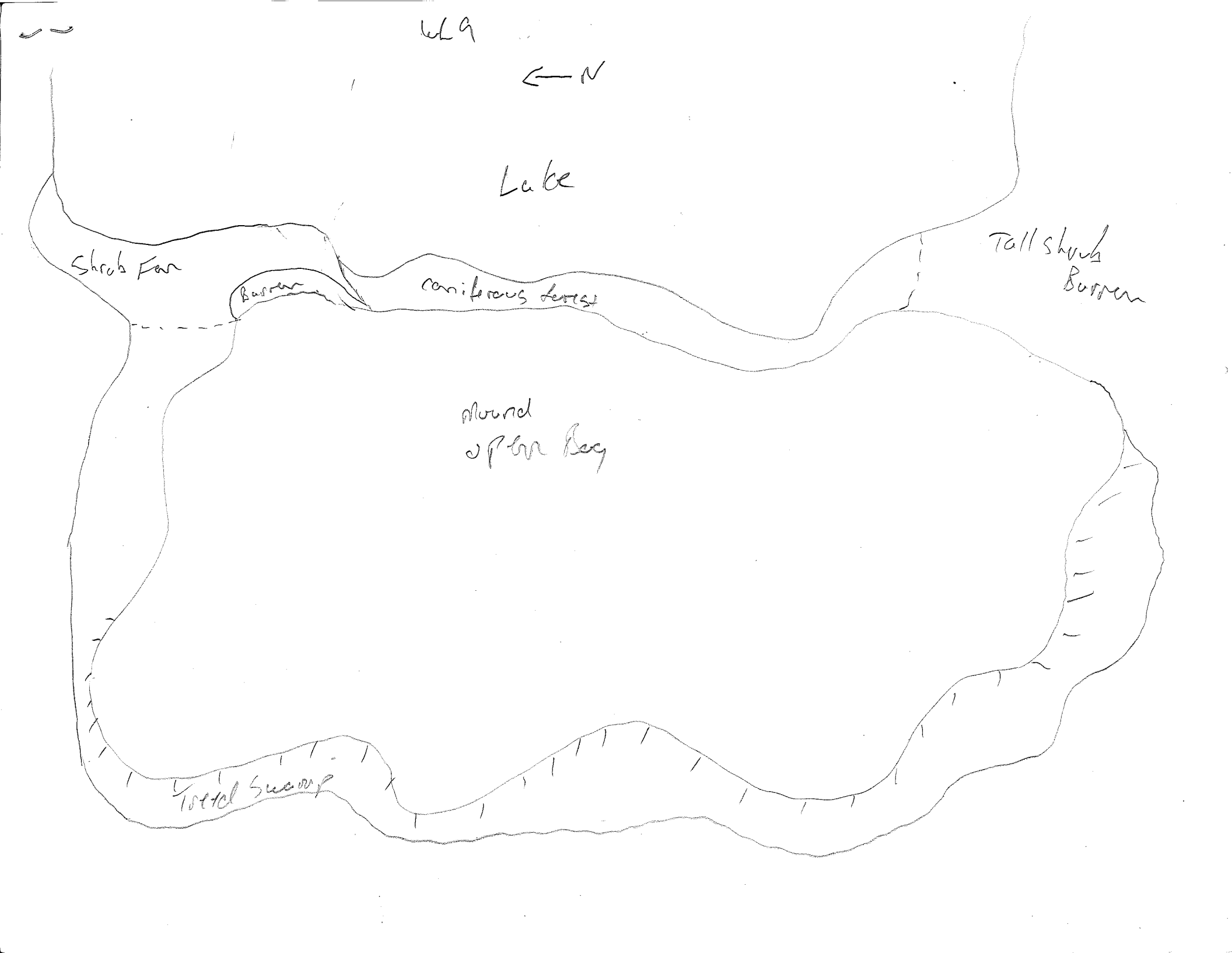

Herb
Dominated
Tall
Shrubs
Low
Shrub/Herb
Typha

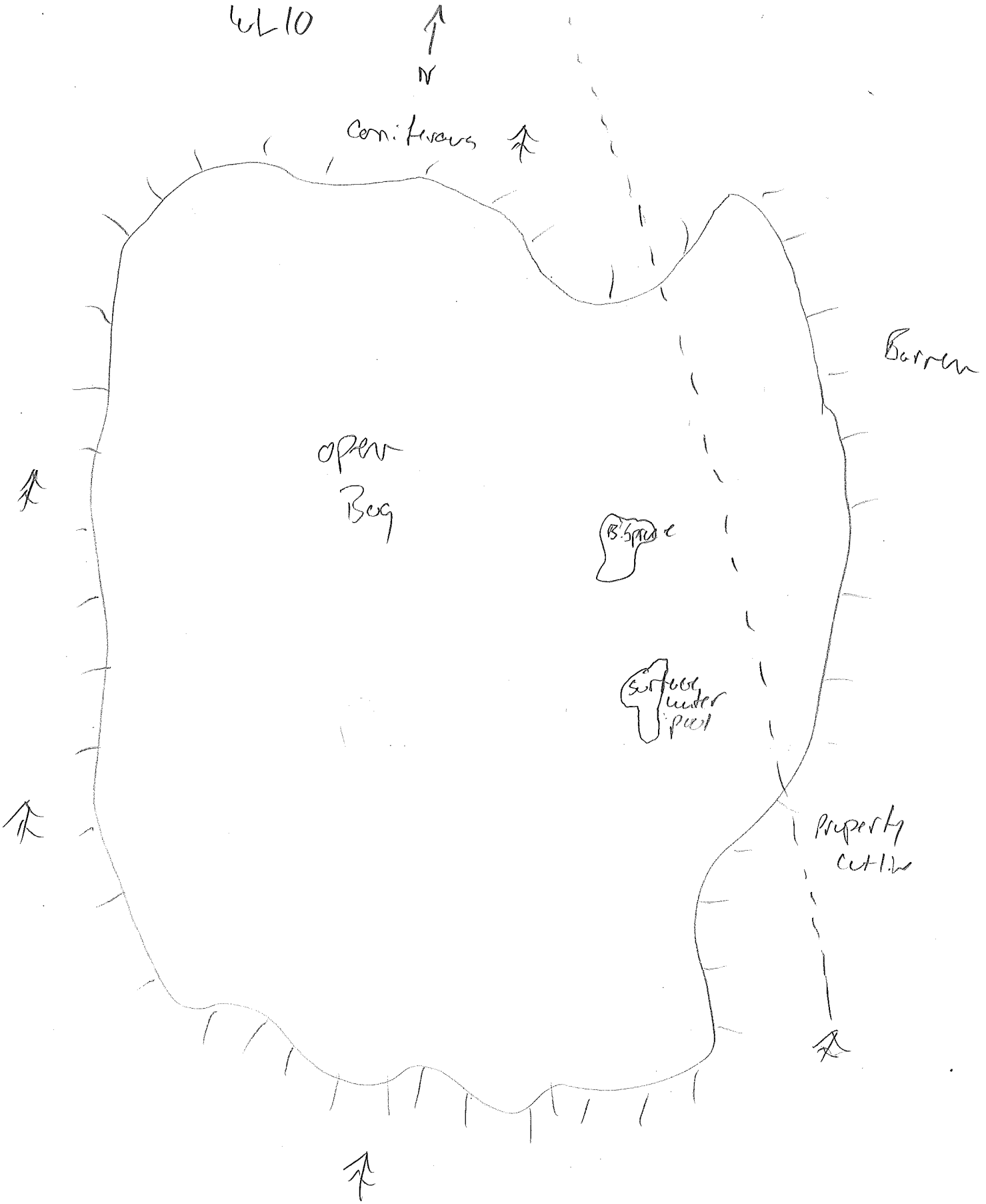
WLC

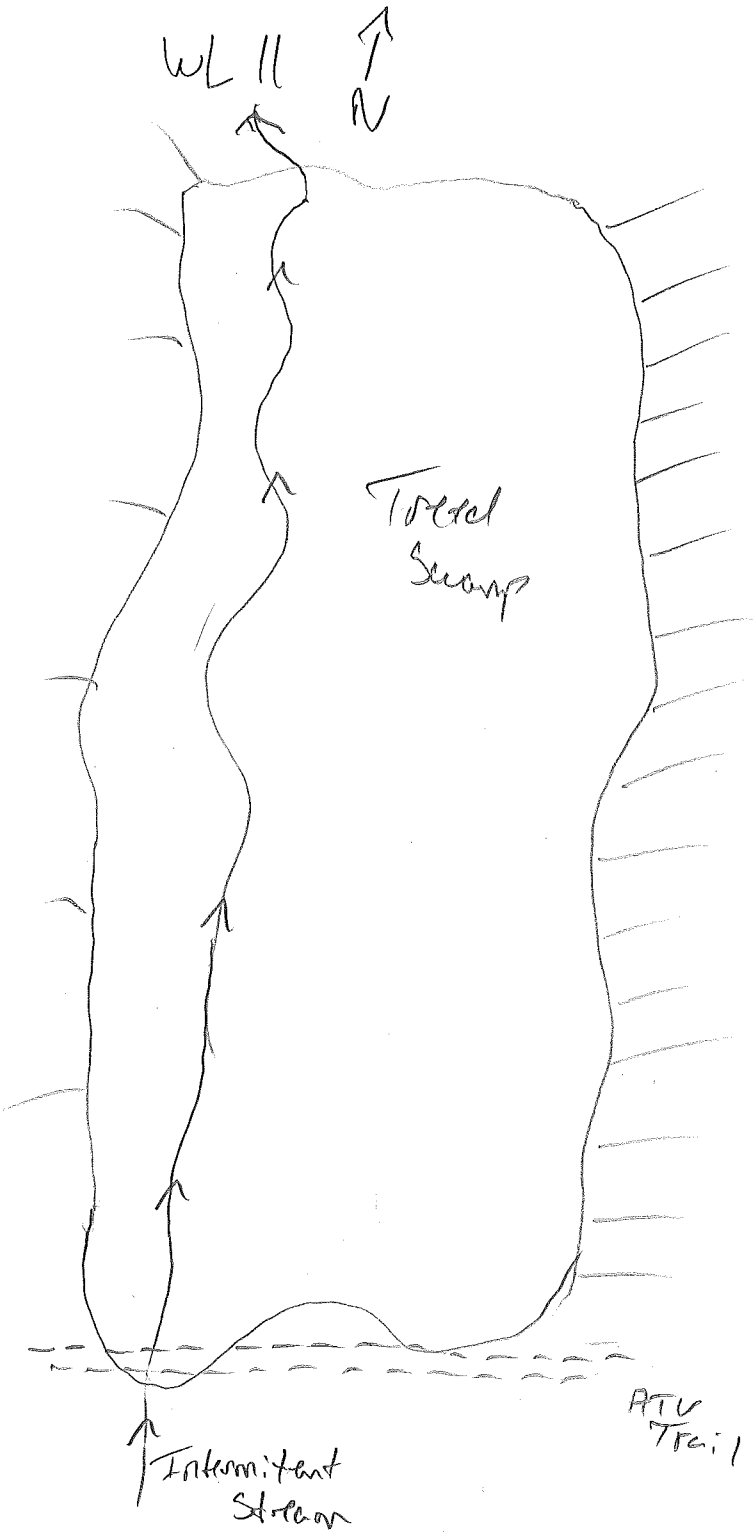

N
Coniferous Forest
outflow stream
Tall Shrubs + Trees
open Bog
outflow stream
B. Spruce Island
stunted B. spruce

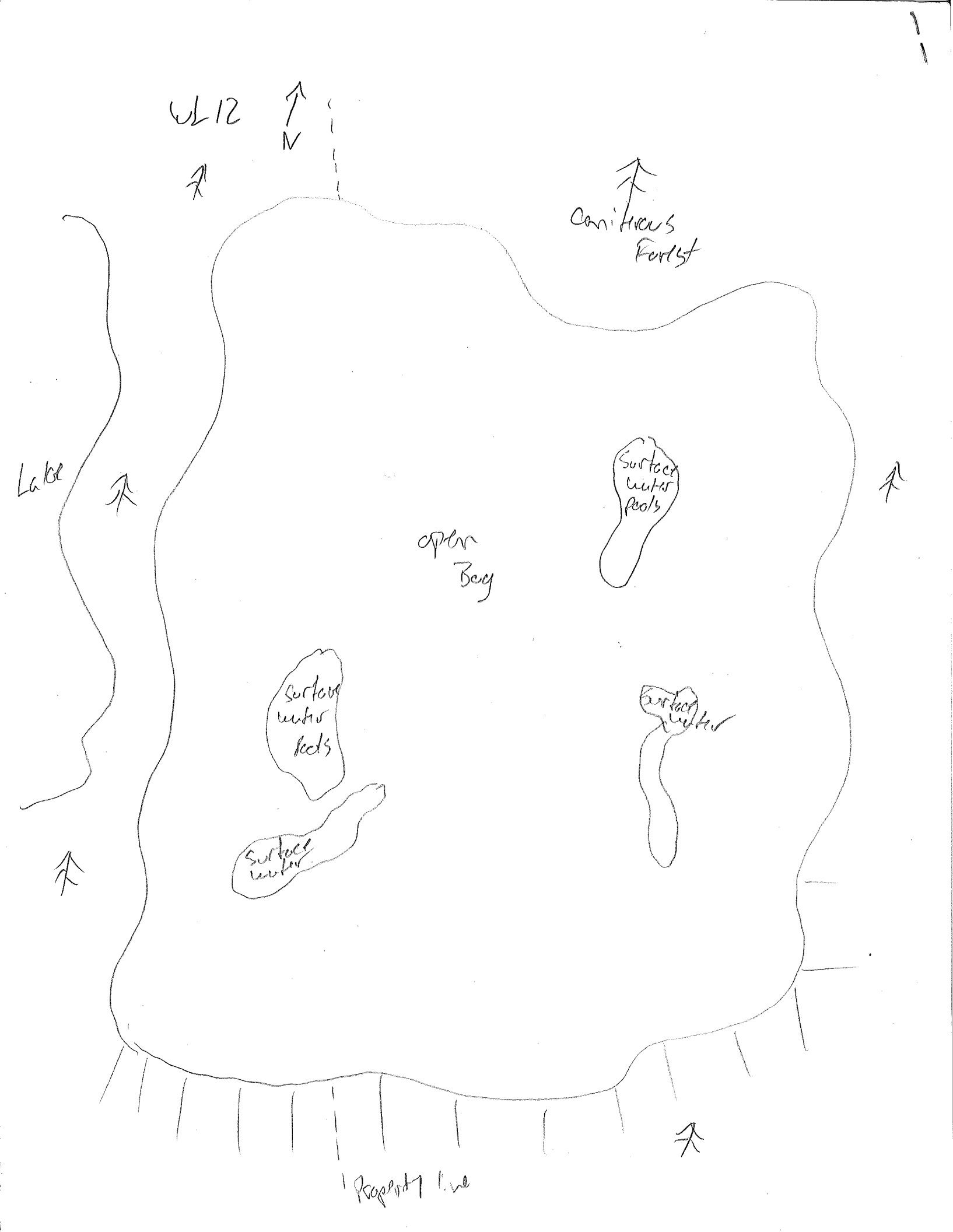

wl 7
cliff to ocean
water course
Coniferous Forest


WL 8
N
Shrub Burren
Shrub Burren
Shrub Burren
Treed Swamp
=
Cinnamon fern understory
Mixed Forest

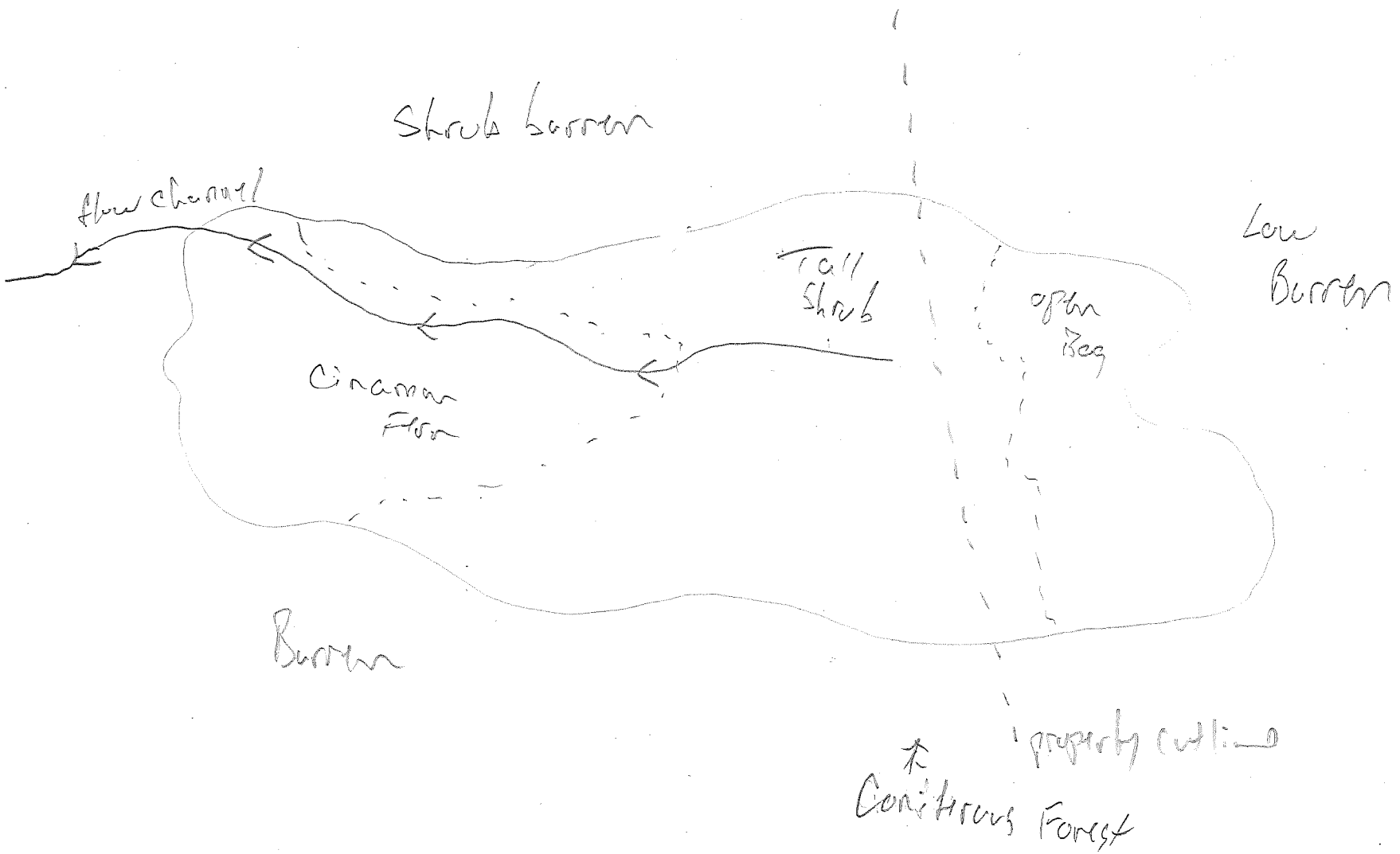

Lake
Shrub Fen
Burnet
coniferous forest
Tall shrub
Burnet
Mound
open bog
Treed Swamp


GL10
N
Coniferous
Barren
open
Bog
B. Space
surface
water
pool
Property
Cut line

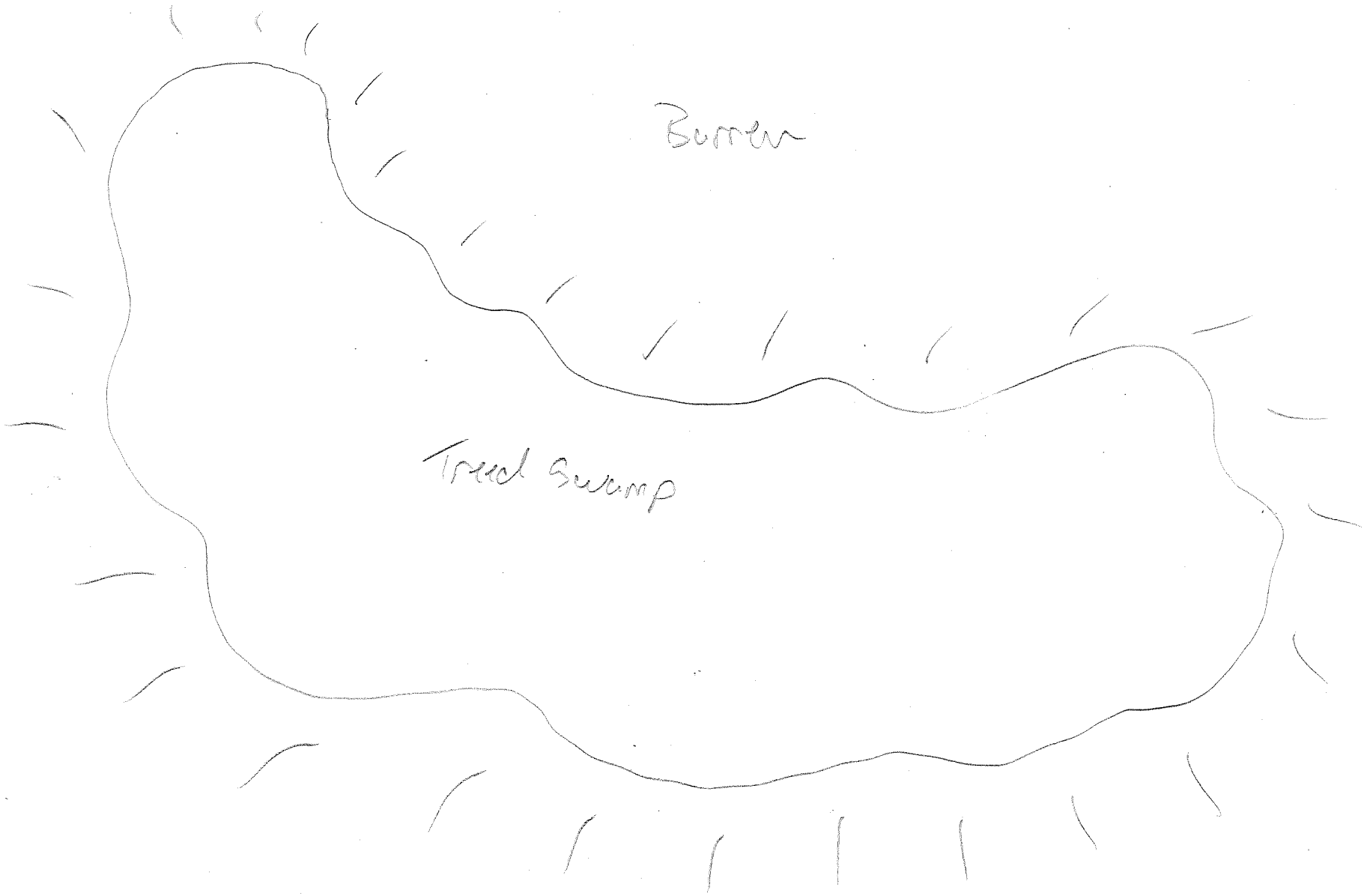

WL 11
N
Forest
Swamp
ATV
Trail
Intermittent
Stream

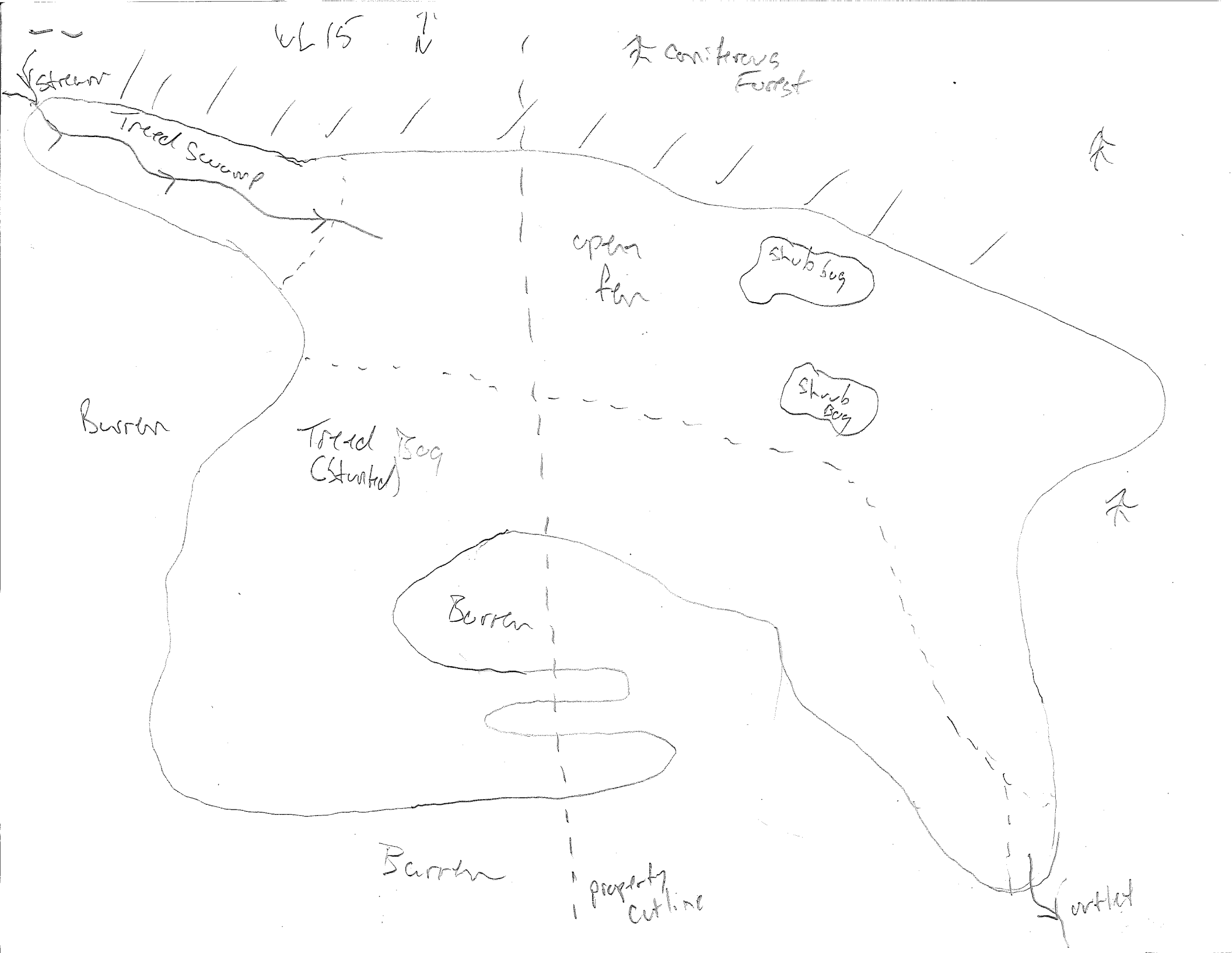

UL 12
N
Coniferous Forest
Lake
Surface water pools
open Bog
Surface water pools
Surface water
Surface water
Property line

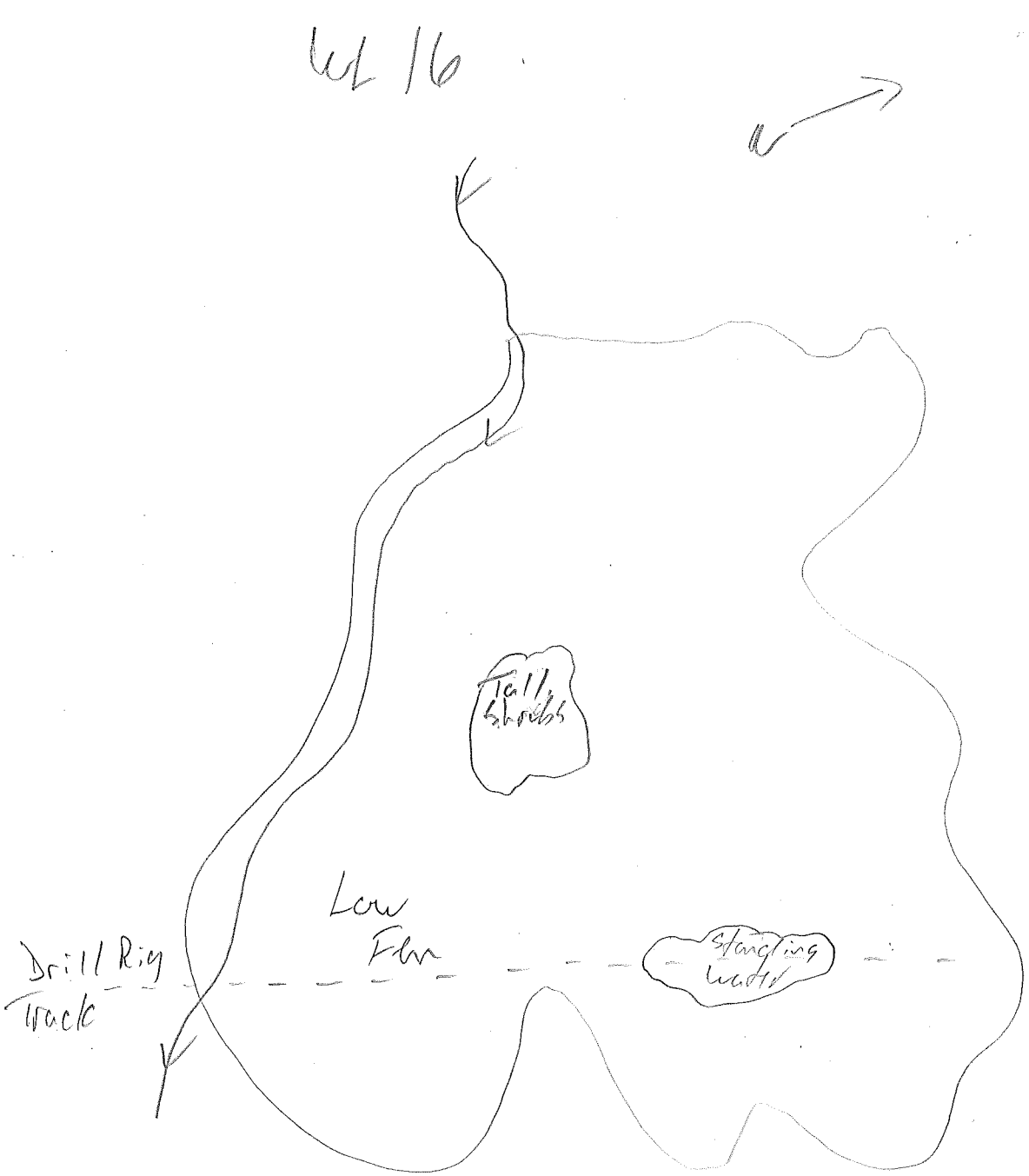
WL13

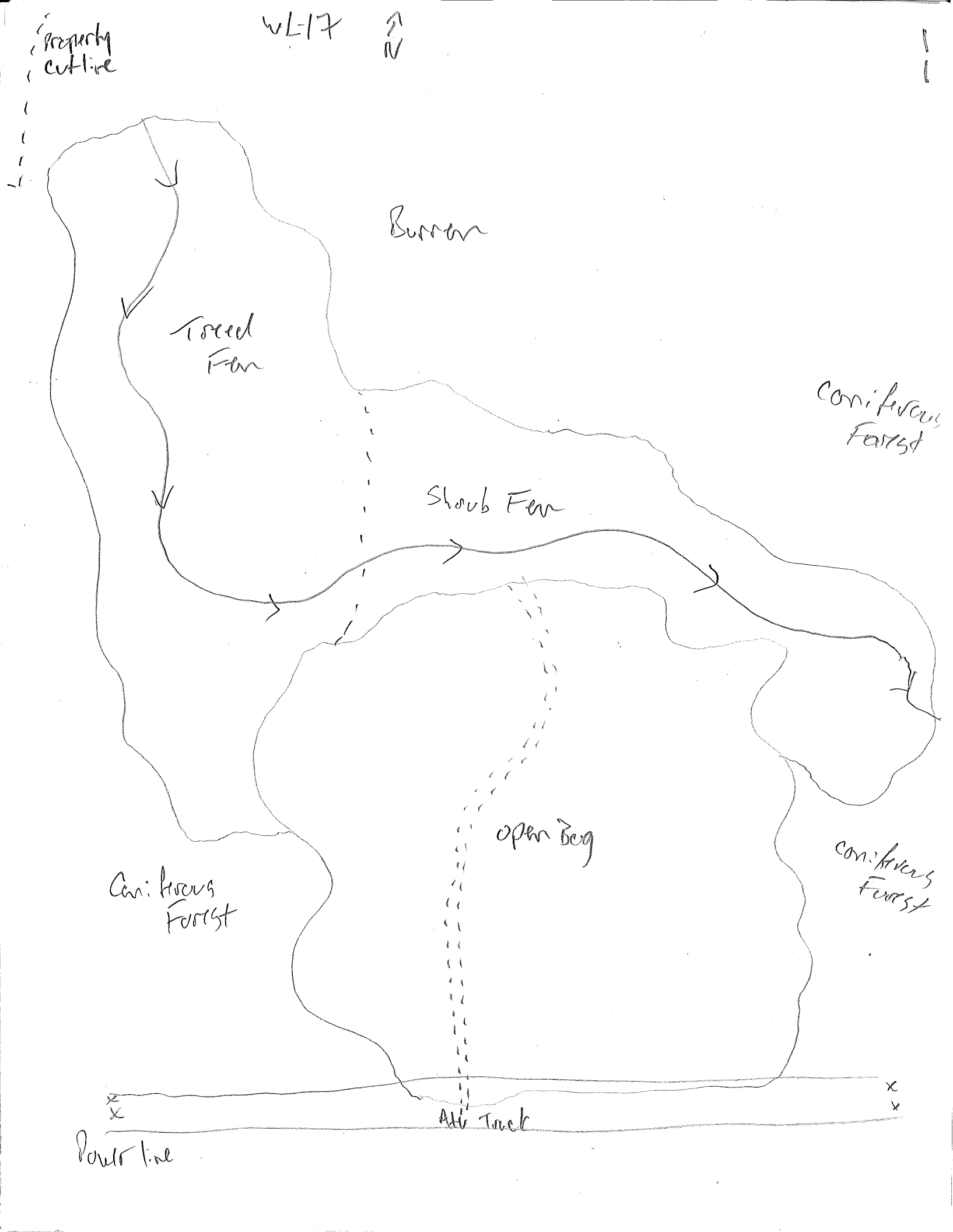

Shrub barren
flow channel
Tall shrub
open Bog
Low Barren
Cinaman Fen
Barren
property outline
Coniferous Forest

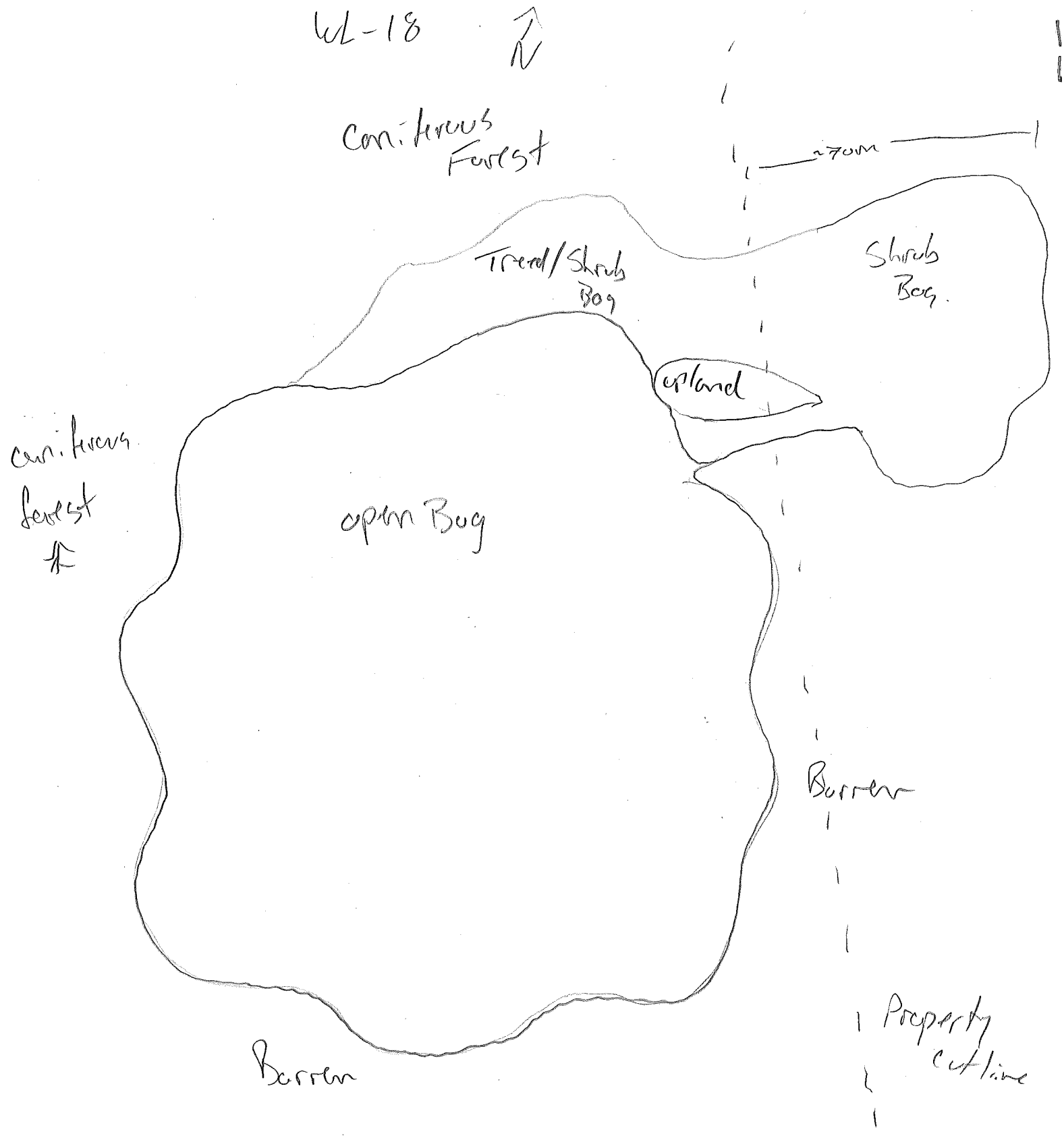
WL 14

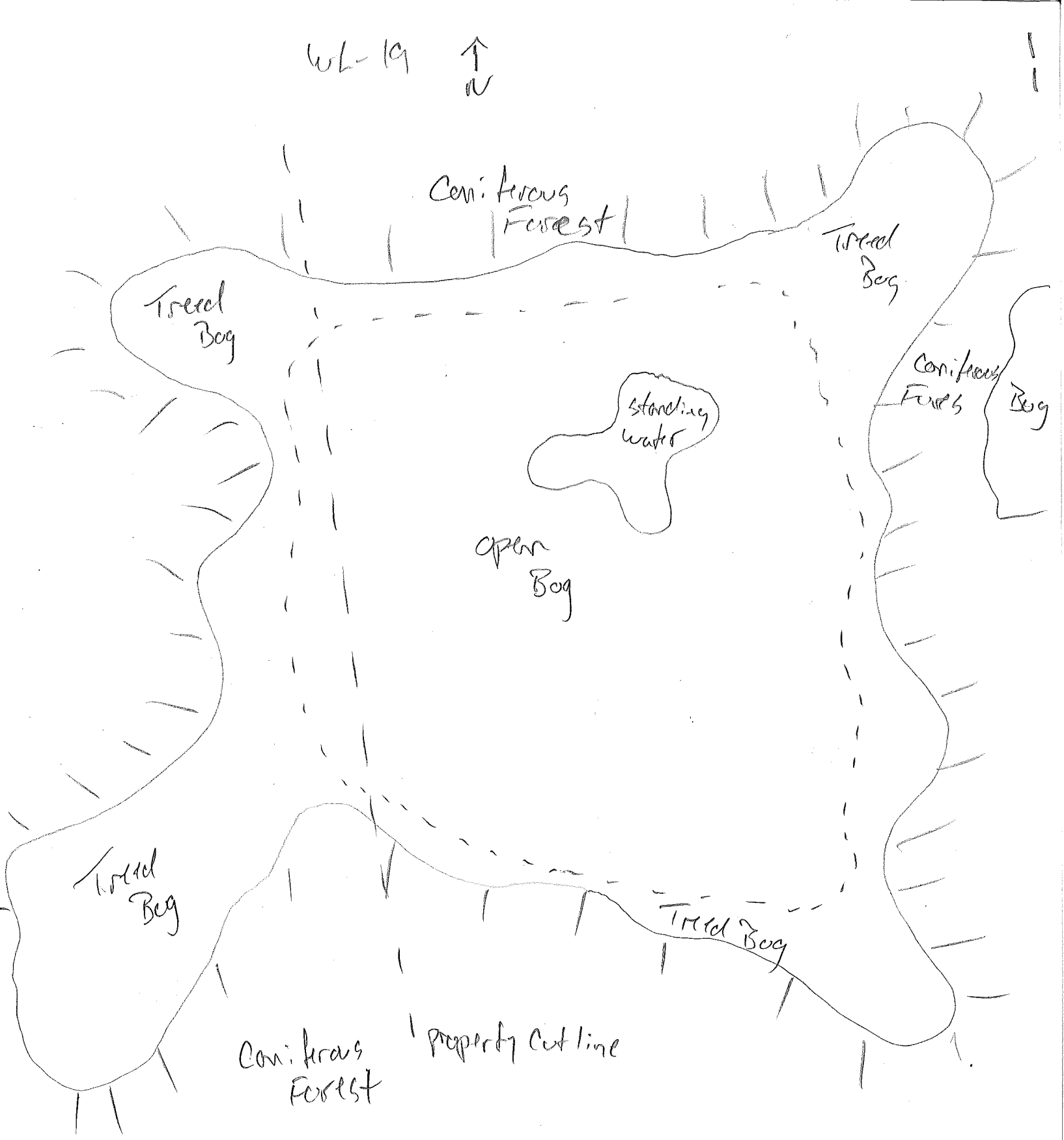



stream
Treed Swamp
coniferous Forest
open fen
shrub bog
shrub bog
Barren
Treed (Stunted)
Barren
Barren
property cutline
outlet

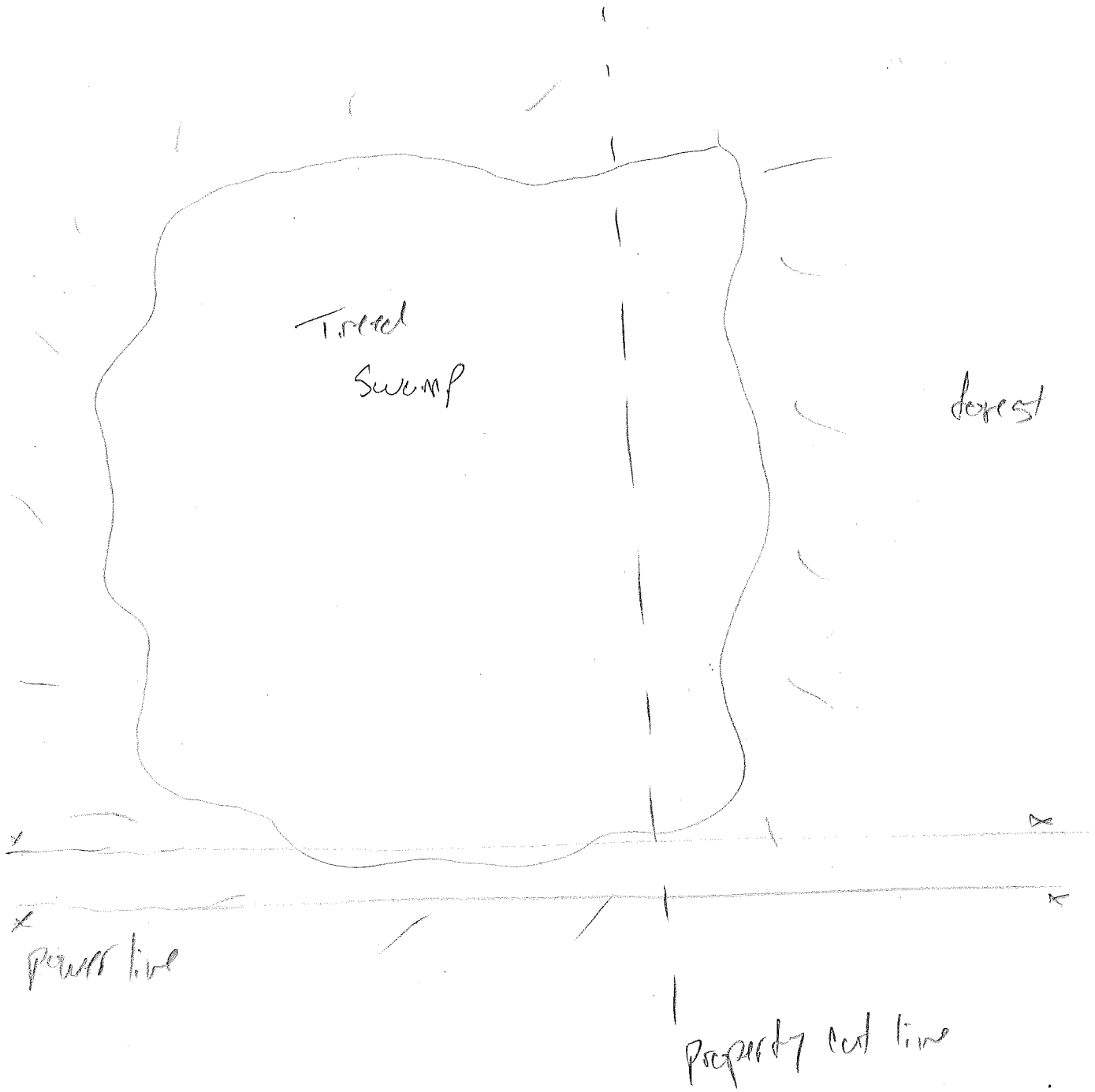

Tall Shrubs
Low Fen
Standing water
Drill Rig Track


Property cutline
WL-17
N
Barren
Treed Fen
Coniferous Forest
Shrub Fen
open Bog
Coniferous Forest
Coniferous Forest
Access Track
Power line


WL-18
N
Coniferous Forest
~70m
Treed/Shrub Bog
Shrub Bog
upland
coniferous forest
open Bog
Barren
Barren
Property outline


WL-19
N
Coniferous Forest
Treed Bog
Treed Bog
Coniferous Forest
Bog
standing water
open Bog
Treed Bog
Treed Bog
Coniferous Forest
property cut line

WL-20



Appendix C.3

Wetland Photos

Photo C.3-1. Wetland 1 – Treed Swamp

Photo C.3-2. Wetland 2 – Emergent Marsh/Shrub Fen Complex

Photo C.3-3. Wetland 3 – Riparian Fen

Photo C.3-4. Wetland 4 – Basin Bog

Photo C.3-5. Wetland 5 - Sloped Riparian Fen

Photo C.3-6. Wetland 6 – Basin Bog

Photo C.3-7. Wetland 7 – Riparian Swamp

Photo C.3-8. Wetland 8 – Riparian Treed Swamp

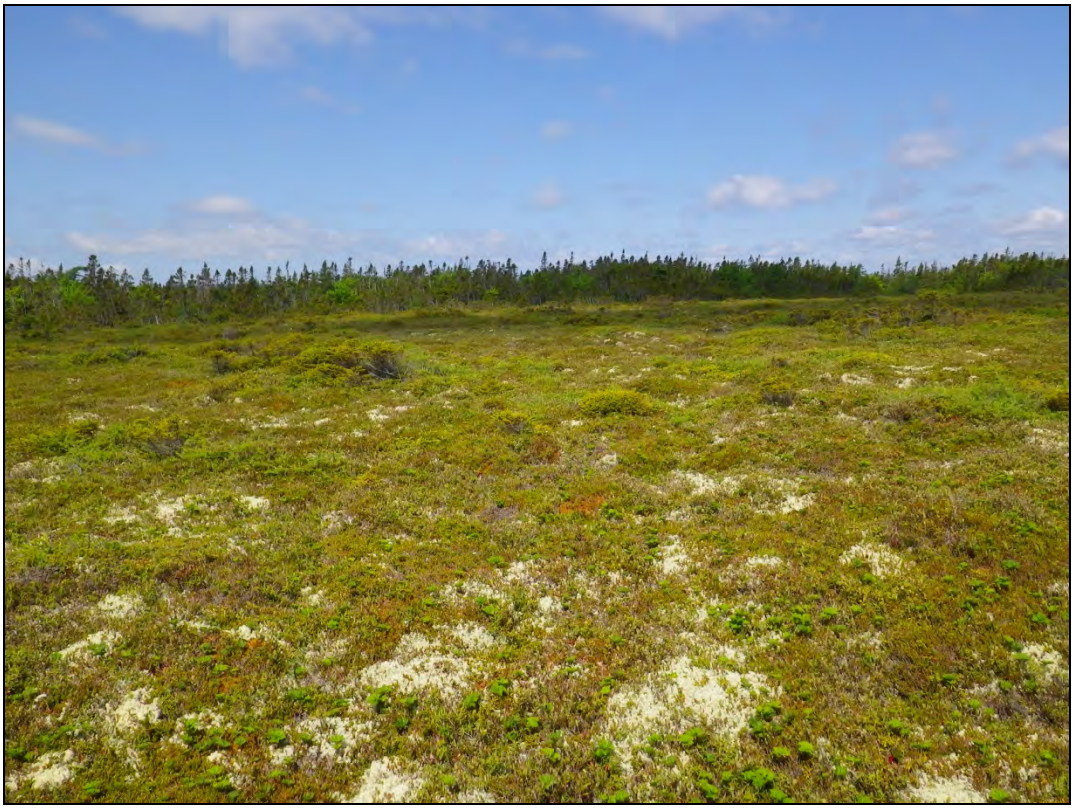


Photo C.3-9. Wetland 9 – Domed Bog/Treed Swamp/Fen Complex

Photo C.3-10. Wetland 10 – Domed Bog

Photo C.3-11. Wetland 11 – Treed Swamp

Photo C.3-12. Wetland 12 – Domed Bog

Photo C.3-13. Wetland 13 – Bog/Swamp Complex

Photo C.3-14. Wetland 14 – Treed Swamp

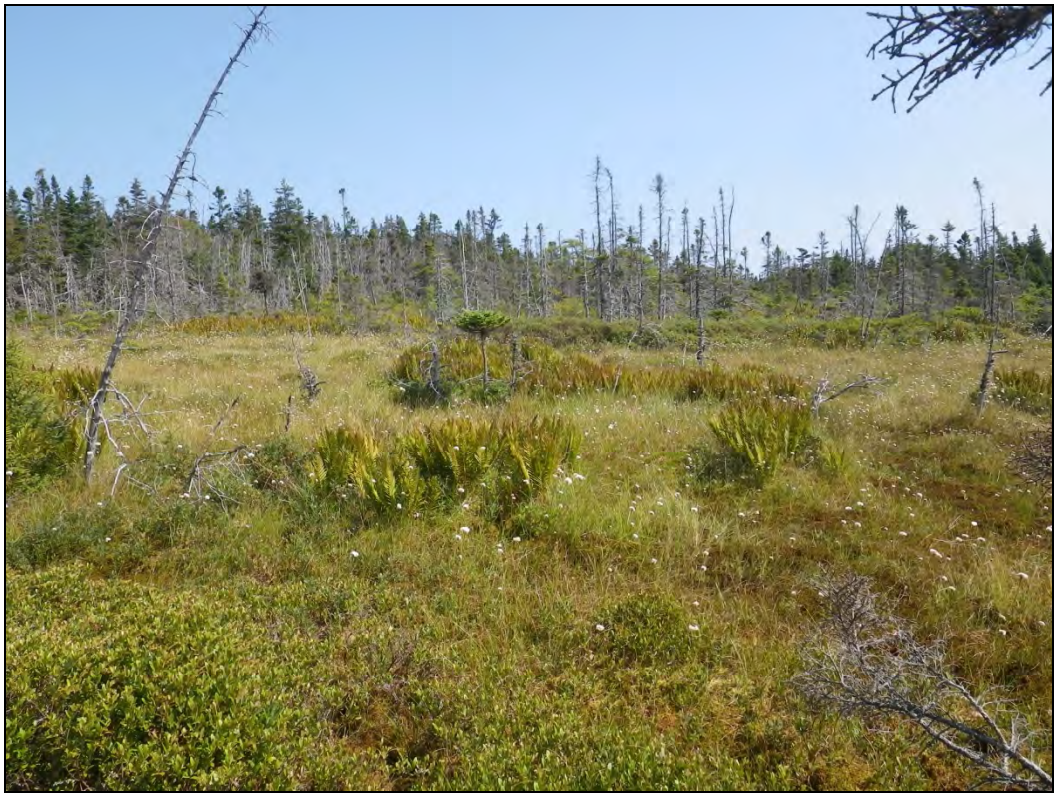


Photo C.3-15. Wetland 15 – Treed Bog/Treed Swamp/Fen Complex

Photo C.3-16. Wetland 16 – Riparian Fen

Photo C.3-17. Wetland 17 – Domed Bog/Treed Swamp/Shrub Fen Complex

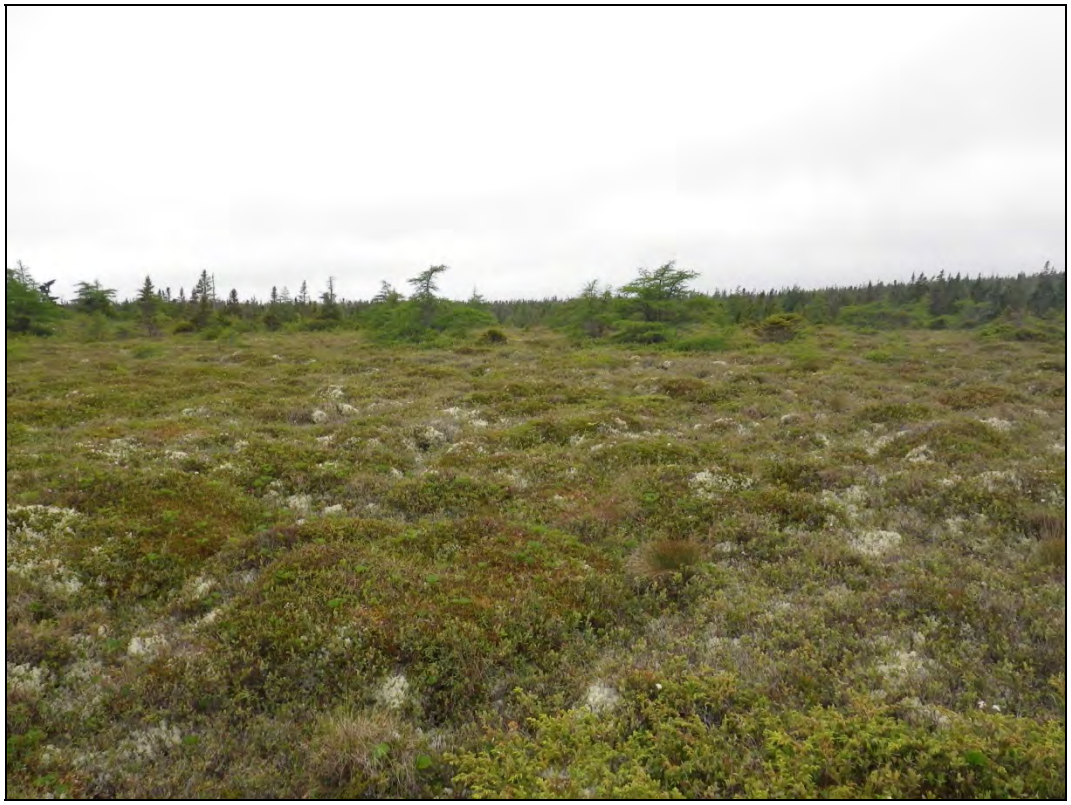


Photo C.3-18. Wetland 18 – Domed Bog

Photo C.3-19. Wetland 19 – Basin Bog

Appendix C.4

Wetland Vascular Plant Species List

Table C.4-1. Vascular Plant Species by Wetland on the Black Point Project Site in June and August 2010 and August 2014.

Species	Common Name	General Status 2010 Rank*	NSDNR 2010	ACCDC 2010	2010 survey	WL 1	WL 2	WL 3	WL 4	WL 5	WL 6	WL 7	WL 8	WL 9	WL 10	WL 11	WL 12	WL 13	WL 14	WL 15	WL 16	WL17	WL18	WL19	WL20	WL21	WL22
Abies balsamea	Balsam Fir	4	Green	S5	X	X	X		X	X		X	X	X	X	X		X			X		X	X	X		
Acer rubrum	Red Maple	4	Green	S5	X	X	X			X	X		X	X	X	X		X		X		X	X	X		X	X
Achillea millefolium	Yarrow	4	Green	S5	X																						
Agrostis scabra	Rough Bentgrass	4	Green	S5	X																					X	
Alnus incana	Speckled Alder	4	Green	S5	X	X	X			X			X			X											
Alnus viridis ssp.crispa	Green Alder, Mountain Alder	4	Green	S5																			X	X	X	X	X
Amelanchier sp.	A Service Berry	NA	NA	NA	X	X				X															X		
Ammophila breviligulata	Beachgrass	4	Green	S5	X																						
Andromeda polifolia	Bog- Rosemary	4	Green	S5	X	X	X			X			X	X		X											
Aralia hispida	Bristly Sarsaparilla	4	Green	S5	X															X							
Aralia nudicaulis	Wild Sarsaparilla	4	Green	S5	X	X				X		X				X	X						X				
Arctostaphylos uva-ursi	Bearberry	4	Green	S4	X						X																
Arethusa bulbosa	Arethusa, Swamp- Pink	4	Green	S4	X	X								X		X			X		X						
Argentina (Potentilla) anserina	Silverweed	4	Green	S5	X																						
Artemisia stelleriana	Dusty Miller	7	Exotic	SNA	X																						
Athyrium filix-femina	Northern Lady Fern	4	Green	S5	X					X		X															
Atriplex glabriuscula	Northeastern Saltbush	4	Green	S4S5	X																						
Betula papyrifera var. cordifolia	Heart-leaved paper Birch	4	Green	S5	X	X	X						X		X			X		X		X					X
Cakile edentula	American Searocket	4	Green	S5	X																						
Calamagrostis canadensis	Blue Joint	4	Green	S5	X	X	X			X		X										X			X	X	X
Calystegia sepium	Hedge Bindweed	4	Green	S5	X																						
Carex aquatilis var. aquatilis	Leafy Tussock Sedge	4	Green	S5	X					X			X	X											X		X
Carex canescens	Hoary Sedge	4	Green	S5	X																						
Carex echinata	Little Prickley Sedge	4	Green	S5	X	X				X	X	X									X					X	
Carex exilis	Coast Sedge	4	Green	S4	X	X				X												X			X		
Carex folliculata	Long Sedge	4	Green	S5	X																						
Carex gynandra	Nodding Sedge	4	Green	S5	X																					X	
Carex intumescens	Bladder Sedge	4	Green	S5	X			X				X															
Carex lenticularis	Shore Sedge	4	Green	S4	X																						
Carex magellanica var. irrigua	Stunted Sedge	4	Green	S5	X	X	X	X		X	X	X							X	X							
Carex nigra	Smooth Black Sedge	4	4	S5	X					X	X														X		X
Carex paleacea	Chaffy Sedge	4	Green	S5	X					X																	
Carex pauciflora	Few-flowered Sedge	4	Green	S4S5																					X		
Carex projecta	Necklace Sedge	4	Green	S4S5	X																						
Carex recta	Erect Sedge, Estuary Sedge	4	Green	S4?																						X	
Carex retrorsa	Retrorse Sedge	4	Green	S4	X																						
Carex scoparia	Broom Sedge	4	Green	S5	X																						
Carex sp.	a Sedge	NA	NA	NA	X		X			X			X	X									X				
Carex stipata	Stalk-grain sedge	4	Green	S5	X																						
Carex trisperma	Three-seeded Sedge	4	Green	S5	X	X	X		X	X		X	X	X		X	X	X		X	X	X	X		X		
Cerastium sp.(none rare)	A chickweed	NA	NA	NA	X																						
Chamaedaphne calyculata	Leatherleaf	4	Green	S5	X	X		X			X		X	X		X	X		X		X	X	X	X	X	X	X
Chamerion (Epilobium) angustifolium	Fireweed	4	Green	S5	X																						
Clintonia borealis	Clintonia Lily	4	Green	S5	X	X																	X				
Coptis trifolia	Goldthread	4	Green	S5	X								X	X				X					X		X		
Corema conradii	Broom Crowberry	4	Green	S4	X																						
Cornus canadensis	Bunchberry	4	Green	S5	X	X	X	X		X	X	X	X	X		X		X	X			X	X	X	X	X	
Cypripedium acaule	Pink Lady's Slipper	4	Green	S5	X								X														
Danthonia spicata	Poverty Oat-grass	4	Green	S5	X																						
Dennstaedtia punctilobula	Hay-Scented Fern	4	Green	S5	X																						
Deschampsia flexuosa	Wavy Hairgrass	4	Green	S5	X																						
Doellingeria (syn.Aster) umbellata	Tall White Aster	4	Green	S5	X							X														X	X
Drosera intermedia	Spoon-leaved Sundew	4	Green	S5	X											X										X	
Drosera rotundifolia	Round-leaved Sundew	4	Green	S5	X	X		X	X				X	X		X		X	X	X	X	X		X		X	
Dryopteris campyloptera	Mountain Woodfern	4	Green	S5	X																					X	X
Dryopteris carthusiana	Spinulose Woodfern	4	Green	S5	X																					X	
Dryopteris cristata	Crested Shield-fern	4	Green	S5	X															X							
Dryopteris sp.	a woodfern (seedling)	NA	NA	NA	X																						
Eleocharis sp.	Spike Rush	NA	NA	NA	X											X											
Empetrum nigrum	Black Crowberry	4	Green	S5	X	X		X		X	X		X	X		X					X	X	X	X		X	
Epigaea repens	Trailing Arbutis	4	Green	S5	X																						
Epilobium ciliatum	Hairy Willowherb	4	Green	S5	X																						
Epilobium palustre	Swamp willow-herb	4	Green	S5																							X
Equisetum arvense	Field Horsetail	4	Green	S5	X																					X	
Equisetum sylvaticum	Woodland Horsetail	4	Green	S5	X																						

Table C.4-1. Vascular Plant Species by Wetland on the Black Point Project Site in June and August 2010 and August 2014.

Species	Common Name	General Status 2010 Rank*	NSDNR 2010	ACCDC 2010	2010 survey	WL 1	WL 2	WL 3	WL 4	WL 5	WL 6	WL 7	WL 8	WL 9	WL 10	WL 11	WL 12	WL 13	WL 14	WL 15	WL 16	WL17	WL18	WL19	WL20	WL21	WL22
Eriophorum tenellum	Rough Cotton-grass	4	Green	S4S5	X					X																	
Eriophorum vaginatum	Tussock cotton-grass	4	Green	S5	X	X				X																	
Eriophorum virginicum	Tawny Cotton-grass	4	Green	S5	X	X	X	X		X	X		X	X		X	X		X	X	X	X	X	X	X	X	
Eurybia (syn. Aster) radula	Rough Wood-aster	4	Green	S5	X		X	X			X	X										X					
Galium palustre	Marsh Bedstraw	4	Green	S5	X	X							X														
Gaultheria hispidula	Snowberry	4	Green	S5	X	X			X		X		X	X				X									
Gaultheria procumbens	Teaberry	4	Green	S5	X	X																					
Gaylussacia baccata	Black Huckleberry	4	Green	S5	X	X					X		X	X		X	X	X	X		X		X	X	X		
Geocaulon lividum	Northern Comandra	3	Yellow	S3																			X				
Glyceria canadensis	Rattlesnake Grass	4	Green	S5	X	X				X																X	X
Hieracium x floribundum	Yellow Hawkweed	Exotic	Exotic	SNA	X																						
Hypericum boreale	Northern St. John's Wort	4	Green	S5			X																				
Hypericum canadense	Canadian St. John's Wort	4	Green	S5	X		X			X		X			X											X	
Ilex verticillata	Black Holly	4	Green	S5	X	X	X	X		X		X				X										X	X
Iris hookeri (syn. I. setosa)	Hooker's Iris (Beach-head Iris)	4	Green	S4	X			X																			
Iris sp.	An Iris	7	NA	NA	X			X																			X
Iris versicolor	Blueflag Iris	4	Green	S5	X																					X	X
Juncus balticus (syn. J. arcticus)	Arctic rush (syn. baltic rush)	4	Green	S5			X																				
Juncus brevicaudatus	Narrow-Panicled Rush	4	Green	S5	X																						
Juncus bufonius	Toad Rush	4	Green	S5	X		X	X		X						X											
Juncus canadensis	Canada Rush	4	Green	S5	X		X	X		X					X					X						X	X
Juncus effusus	Soft Rush	4	Green	S5	X	X		X		X					X				X							X	X
Juncus pelocarpus	Brown-Fruited Rush	4	Green	S5	X	X	X																			X	X
Juniperus communis	Common Juniper	4	Green	S5	X	X	X			X			X	X		X						X	X	X	X		
Juniperus horizontalis	Creeping Juniper	4	Green	S4	X	X							X			X											
Kalmia angustifolia	Lambkill, Sheep-laurel	4	Green	S5	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Kalmia polifolia	Bog Laurel, Pale Laurel	4	Green	S5	X	X		X		X	X			X		X	X					X	X	X	X	X	
Larix laricina	Larch	4	Green	S5	X	X					X					X					X	X	X	X	X		
Lathyrus japonicus (syn. L. maritimus)	Beach Pea	4	Green	S5	X																						
Ledum groenlandicum	Labrador-tea	4	Green	S5	X	X	X	X		X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	
Leontodon autumnalis	Fall Dandelion	7	Exotic	SNA	X																						
Leymus mollis	Wild Rye	4	Green	S5	X																						
Ligusticum scoticum	Scotch Lovage	4	Green	S5	X																						
Linnaea borealis	Twinflower	4	Green	S5	X	X						X										X	X				
Listera australis	Southern Twayblade	2	Red	S2	X																						
Lonicera canadensis	American Fly Honeysuckle	4	Green	S5	X																						
Lycopodium annotinum	Stiff Clubmoss	4	Green	S5	X	X																X		X	X		
Lycopodium obscurum	Tree Clubmoss	4	Green	S5	X	X																			X		
Lycopus americanus	Cut-leafed Water-horehound	4	Green	S5																							X
Lycopus uniflorus	Northern Bugleweed	4	Green	S5	X							X															
Lysimachia terrestris	Swamp Loosestrife	4	Green	S5	X		X																				X
Maianthemum (Smilacina) trifolia	Three-leaved False Solomon's Seal	4	Green	S5	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X			X	X
Maianthemum canadense	Wild Lily-of-the-valley	4	Green	S5	X	X		X					X	X		X											
Mertensia maritima	Sea Bluebells	4	Green	S5	X																						
Mitchella repens	Partridge Berry	4	Green	S5	X																						
Moehringia lateriflora	Grove Sandwort	4	Green	S5	X																						
Moneses uniflora	One-flowered Shinleaf	4	Green	S5	X																						
Monotropa uniflora	Indian-pipe	4	Green	S5	X																						
Myrica gale	Sweet Gale	4	Green	S5	X								X	X			X	X	X			X	X		X		
Myrica pensylvanica	Bayberry	4	Green	S5	X	X	X	X		X	X	X	X	X		X			X	X						X	
Nemopanthus mucronatus	False Mountain Holly	4	Green	S5	X	X	X	X	X		X		X	X	X	X	X	X	X			X	X	X	X		X
Nuphar sp.	Yellow pond-lily	NA	NA	NA		X										X											
Nymphaea sp.	Water Lily	NA	NA	NA	X									X		X											
Oclemena (syn. Aster) acuminata	Whorled Wood Aster	4	Green	S5	X	X						X															
Oclemena (syn.) Aster X blakei	Hybrid White Panicled American-Ast	NA	Green	SNR	X																						
Oclenema (Aster) nemoralis	Bog Aster	4	Green	S5	X	X	X			X						X			X						X	X	X
Osmunda cinnamomea	Cinnamon Fern	4	Green	S5	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X			X		X	X	X
Osmunda claytoniana	Interrupted Fern	4	Green	S5	X																						
Oxalis montana	Wood-sorrel	4	Green	S5	X	X																					
Persicaria (Polygonum) sagittata	Arrow-leafed Tearthumb	4	Green	S5	X																						X
Phegopteris connectilis	Northern Beech Fern	4	Green	S5	X					X		X															
Photinia melanocarpa	Black Chokeberry	4	Green	S5	X	X		X	X	X	X								X	X		X	X			X	
Picea glauca	White Spruce	4	Green	S5	X																						
Picea mariana	Black Spruce	4	Green	S5	X	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X			X	X
Plantago maritima	Seashore-plantain	4	Green	S5	X																						

Table C.4-1. Vascular Plant Species by Wetland on the Black Point Project Site in June and August 2010 and August 2014.

Species	Common Name	General Status 2010 Rank*	NSDNR 2010	ACCDC 2010	2010 survey	WL 1	WL 2	WL 3	WL 4	WL 5	WL 6	WL 7	WL 8	WL 9	WL 10	WL 11	WL 12	WL 13	WL 14	WL 15	WL 16	WL17	WL18	WL19	WL20	WL21	WL22
Platanthera blephariglottis	White Fringed orchid	4	Green	S4		X																					
Platanthera clavellata	Club-spur Orchid	4	Green	S5																						X	
Platanthera sp.	Rein orchid, Fringed Orchid	NA	NA	NA																		X					
Platanthera sp. (aquilonis or dilatata)	Northern Bog Orchid	4	4	S4S5	X																						
Poa sp	Grass	NA	NA	NA	X																					X	
Potentilla simplex	Cinquefoil	4	Green	S5	X																						
Prenanthes trifoliolata	Lion's Paw	4	Green	S5	X	X																					
Prunus pensylvanica	Fire Cherry / Pin Cherry	4	Green	S5	X	X																					
Pteridium aquilinum	Bracken	4	Green	S5	X	X	X		X		X	X	X	X				X	X	X			X	X			
Ranunculus acris	Tall Buttercup	7	Exotic	SNA	X																						
Rhodiola rosea (Sedum roseum)	Roseroot Stonecrop	4	Green	S4	X																						
Rhododendron canadense	Rhodora	4	Green	S5	X	X				X	X		X	X			X				X			X	X	X	
Rhynchospora alba	White Beak-rush	4	Green	S5	X	X		X			X			X		X					X	X		X	X	X	
Rosa nitida	Swamp Rose	4	Green	S4	X	X																				X	X
Rosa rugosa	Rugose Rose	7	Exotic	SNA	X																						
Rosa sp.	A Rose	NA	NA	NA																							X
Rosa virginiana	Virginia Rose	4	Green	S5	X					X		X															
Rubus allegheniensis	Common Blackberry	4	Green	S5	X	X				X										X							
Rubus chamaemorus	Cloudberry, Bakeapple	4	Green	S4	X	X							X	X		X			X			X	X	X	X		
Rubus hispidus	Bristly Dewberry	4	Green	S5	X	X				X																	
Rubus idaeus	Red Raspberry	4	Green	S5	X																						
Rubus pubescens	Dwarf Raspberry	4	Green	S5	X					X		X															
Rubus sp.	a bramble	NA	NA	NA	X																				X	X	X
Rumex acetosella	Sheep Sorrel	7	Exotic	SNA	X																						
Sagina procumbens or nodosa	Pearlwort	4	Green	S5	X																						
Salix sp	Willow	NA	NA	NA	X															X							
Sarracenia purpurea	Pitcher-plant	4	Green	S5	X	X	X				X		X	X		X	X	X	X		X	X	X	X	X		
Schoenoplectus subterminalis	Water- Bulrush	4	Green	S5		X																					
Scirpus atrocinctus	Black-girdle Bullrush	4	Green	S5	X																						
Scirpus cyperinus	Cottongrass Bullrush	4	Green	S5	X														X	X						X	
Sibbaldiopsis tridentata	Three- toothed- cinquefoil	4	Green	S5	X					X																	
Sisyrinchium montanum	Strict Blue-eyed-grass	4	Green	S5	X																						
Solidago macrophylla	Large-leaf Goldenrod	4	Green	S4	X																						
Solidago rugosa	Rough Goldenrod	4	Green	S5	X	X																					
Solidago sempervirens	Seaside Goldenrod	4	Green	S5	X																						
Solidago sp.	A Goldenrod	NA	NA	NA																				X			
Solidago uliginosa	Bog Goldenrod	4	Green	S5	X	X	X	X			X		X	X		X								X	X	X	X
Sorbus americana	Mountain-ash	4	Green	S5	X	X						X	X					X						X	X	X	
Sparganium sp.	Bur-reed	NA	NA	NA	X		X	X				X															
Spiraea alba	Meadowsweet	4	Green	S5	X	X																					
Symphiotrichum (Aster) novi-belgii	New york Aster/ New Belgium Aster	4	Green	S5	X							X															
Symphiotrichum (Aster) puniceum	Rough Aster	4	Green	S5	X																						
Thalictrum pubescens	Tall Meadow- Rue	4	Green	S5	X			X				X															
Thelypteris noveboracensis	New York fern	4	Green	S5																						X	
Thelypteris palustris	Marsh Fern	4		S5	X	X				X																	
Triadenum fraseri	Marsh St. John's Wort	4	Green	S5																						X	
Trichophorum (Scirpus) caespitosum	Tufted Leafless-Bullrush	4	Green	S5	X	X							X	X		X					X		X	X	X		
Trientalis borealis	Starflower	4	Green	S5	X	X							X					X						X	X		
Typha latifolia	Broadleaf cattail	4	Green	S5	X		X			X																	
Utricularia cornuta	Horned Bladderwort	4	Green	S5	X	X								X		X										X	
Utricularia intermedia	Flatleaf Bladderwort	4	Green	S5	X									X							X						
Utricularia minor	Lesser Bladderwort	4	Green	S4	X																						
Vaccinium angustifolium	Lowbush Blueberry	4	Green	S5	X	X	X		X	X			X	X			X			X			X	X			X
Vaccinium macrocarpon	Large Cranberry	4	Green	S5	X	X				X		X									X						
Vaccinium myrtilloides	Velvetleaf Blueberry	4	Green	S5	X								X	X											X		
Vaccinium oxycoccos	Small Cranberry	4	Green	S5	X	X	X	X		X	X			X		X			X			X	X	X			X
Vaccinium vitis-idaea	Mountain Cranberry	4	Green	S5	X	X	X		X			X	X	X									X				
Viburnum nudum	Wild Raisin	4	Green	S5	X	X	X			X			X	X			X	X		X	X	X	X	X	X	X	
Viola sp	Violet ---not a species at risk	NA	NA	NA	X							X															

** General Status Ranks accurate as of September 22, 2014*

Appendix D. Freshwater Habitat

Appendix D.1: Watercourse Assessment Forms

Appendix D.2: Watercourse Photos

Appendix D.3: Water Quality Results

Appendix D.4: AGAT QA/QC Forms for Freshwater Samples

Appendix D.1

Watercourse Assessment Forms

11-06

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

__of__

River: **Start Point:** **End Point:**

Date: **Stream/River No.**

Personnel: **Stream Order No.**

Unit No.	Stream Type	Channel Type	WPT at end	Length (m)	Ave Width (m)		Substrate (%)							Ave Depth – Wet Width (cm)	Undercut Bank 0-50%		Over-Hanging Bank Vegetation 0-50%		Large Woody Debris In-Stream (m)	Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	In-Stream Vegetation	Comments
					Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R				

STREAM TYPE						CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL RATING (reverse side)	
FASTWATER		POOLS							CRITERIA (NO.)	% OF POOLS IN SITE (LETTER)
1. Fall	6. Sheet (ledge)	10. Midchannel	14. Trench	18. Eddy	22. Wood Debris	1. Main (if measurement refers to main area of river)	1. Bedrock , Ledge 2. Boulder = > 461 mm 3. Rock = 180 - 460 mm 4. Rubble = 54 - 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05 mm	1. Survey Stream	Pool Depth > 1.5 m 1 - Instream Cover > 30% 2 - Instream Cover < 30%	a - > 30% b - 10% to 30% c - < 10%
2. Cascade	7. Chute	11. Convergence	15. Plunge	19. Gabion	23. Man-Made Dam	* 2. Side Channel (water diverted by islands)		2. Spring		
3. Riffle (GR/RB)	8. Run	12. Lateral	16.	20. Log Structure	24. Natural Deadwater	* 3. Split (if river is split into various different stream types)		3. Brook/River Tributary	Pool Depth .5 to 1.5m 3 - Instream Cover 5 - 30%	a - > 50%
4. Riffle (R/B)	9. Rapid	13. Beaver	17. Bogan	21. Road Crossing		* 4. Bogan		4. Spring Seep	4 - Instream Cover > 30%	b - < 50%
5. Riffle (Sand)						* - Specify Left (L), Right (R) or Middle (M)				

River:

Valley Slope L/M/H	Bank Height (m)	Flood Plain Width (m)	Shade (%)	Stream Banks										0^2 (Mg/L)	pH	Water Temperature (ºC)	Fish Species	Pool Rating		Pool Tail			Turbulence (%)
				Vegetation (%)				Erosion (%)												Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	Mean Substrate Size(cm)	Fines (%)	
				Bare	Grasses	Shrubs	Trees	Left Bank (0-50%)			Right Bank (0-50%)							No.	Letter				
								Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding										

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW cm/s
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom (A= 0.8 for rough bottom; 0.9 for smooth)

CRITERIA:

1. Chute: water depth equal to or greater than channel width
2. Riffle: GR/RB - is a riffle flowing over a gravel and/or rubble bottom
   R/B - is a riffle flowing over & through large substrates (e.g. rock and /or boulder), some of which protrudes the surface
3. Side channels - treat as a separate stream type
4. Undercut Bank - % of bank overhang (above water edge for stream type. Specify left (L) or right (R)
5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates, up to 100%
7. Woody Debris - total width should be >10 cm in diameter

11-06

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

__of__

River: **Start Point:** **End Point:**

Date: **Stream/River No.**

Personnel: **Stream Order No.**

Unit No.	Stream Type	Channel Type	WPT at end	Length (m)	Ave Width (m)		Substrate (%)							Ave Depth – Wet Width (cm)	Undercut Bank 0-50%		Over-Hanging Bank Vegetation 0-50%		Large Woody Debris In-Stream (m)	Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	In-Stream Vegetation	Comments
					Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R				

STREAM TYPE						CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL RATING (reverse side)	
FASTWATER		POOLS							CRITERIA (NO.)	% OF POOLS IN SITE (LETTER)
1. Fall	6. Sheet (ledge)	10. Midchannel	14. Trench	18. Eddy	22. Wood Debris	1. Main (if measurement refers to main area of river)	1. Bedrock , Ledge 2. Boulder = > 461 mm 3. Rock = 180 - 460 mm 4. Rubble = 54 - 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05 mm	1. Survey Stream	Pool Depth > 1.5 m 1 - Instream Cover > 30% 2 - Instream Cover < 30%	a - > 30% b - 10% to 30% c - < 10%
2. Cascade	7. Chute	11. Convergence	15. Plunge	19. Gabion	23. Man-Made Dam	* 2. Side Channel (water diverted by islands)		2. Spring		
3. Riffle (GR/RB)	8. Run	12. Lateral	16.	20. Log Structure	24. Natural Deadwater	* 3. Split (if river is split into various different stream types)		3. Brook/River Tributary	Pool Depth .5 to 1.5m 3 - Instream Cover 5 - 30%	a - > 50%
4. Riffle (R/B)	9. Rapid	13. Beaver	17. Bogan	21. Road Crossing		* 4. Bogan		4. Spring Seep	4 - Instream Cover > 30%	b - < 50%
5. Riffle (Sand)						* - Specify Left (L), Right (R) or Middle (M)				

River:

Valley Slope L/M/H	Bank Height (m)	Flood Plain Width (m)	Shade (%)	Stream Banks										0^2 (Mg/L)	pH	Water Temperature (ºC)	Fish Species	Pool Rating		Pool Tail			Turbulence (%)
				Vegetation (%)				Erosion (%)												Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	Mean Substrate Size(cm)	Fines (%)	
				Bare	Grasses	Shrubs	Trees	Left Bank (0-50%)			Right Bank (0-50%)							No.	Letter				
								Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding										

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW cm/s
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

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5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates, up to 100%
7. Woody Debris - total width should be >10 cm in diameter

11-06

DNR&E / DFO - NEW BRUNSWICK
STREAM SURVEY and HABITAT ASSESSMENT

__of__

River: **Start Point:** **End Point:**

Date: **Stream/River No.**

Personnel: **Stream Order No.**

Unit No.	Stream Type	Channel Type	WPT at end	Length (m)	Ave Width (m)		Substrate (%)							Ave Depth – Wet Width (cm)	Undercut Bank 0-50%		Over-Hanging Bank Vegetation 0-50%		Large Woody Debris In-Stream (m)	Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	In-Stream Vegetation	Comments
					Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R				

STREAM TYPE						CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL RATING (reverse side)	
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3. Riffle (GR/RB)	8. Run	12. Lateral	16.	20. Log Structure	24. Natural Deadwater	* 3. Split (if river is split into various different stream types)		3. Brook/River Tributary	Pool Depth .5 to 1.5m 3 - Instream Cover 5 - 30% 4 - Instream Cover > 30%	a - > 50% b - < 50%
4. Riffle (R/B)	9. Rapid	13. Beaver	17. Bogan	21. Road Crossing		* 4. Bogan		4. Spring Seep		
5. Riffle (Sand)						* - Specify Left (L), Right (R) or Middle (M)				

River:

Valley Slope L/M/H	Bank Height (m)	Flood Plain Width (m)	Shade (%)	Stream Banks										0^2 (Mg/L)	pH	Water Temperature (ºC)	Fish Species	Pool Rating		Pool Tail			Turbulence (%)
				Vegetation (%)				Erosion (%)												Embedded (Criteria) 1: < 20% 2: 20 - 35% 3: 35 - 50% 4: > 50%	Mean Substrate Size(cm)	Fines (%)	
				Bare	Grasses	Shrubs	Trees	Left Bank (0-50%)			Right Bank (0-50%)							No.	Letter				
								Stable	Bare Stable	Eroding	Stable	Bare Stable	Eroding										

NOTE: * For selected site study, these columns (reverse side) should be done for a habitat assessment

WATER FLOW MEASUREMENT

RIFFLE GRADIENT			UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4		COEFFICIENT (0.9 - smooth) (0.8 - rough)	LENGTH (3m)	FLOAT TIME (sec)				FLOW cm/s
LENGTH M	DROP M	GRADIENT %				1/4 way	1/2 way	3/4 way	CENTIMETERS	METERS (m)			1/4 way	1/2 way	3/4 way	AVERAGE	

Formula (CMS) = W (m) x D (m) x A x L (m) / T (sec) Where: W = width, D = depth, L = length, A is a coefficient for the stream bottom (A= 0.8 for rough bottom; 0.9 for smooth)

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5. Over-hanging Bank Vegetation - % of vegetation overhang for stream type. Specify L or R
6. Visual Embeddedness - % of sands or fines surrounding the larger substrates, up to 100%
7. Woody Debris - total width should be >10 cm in diameter

Appendix D.2

Watercourse Photos

Photo D.2-1. Unnamed Watercourse 2, Unit 2

Photo D.2-2. Unnamed Watercourse 2, Unit 2

Photo D.2-3. Unnamed Watercourse 2, Unit 3

Photo D.2-4. Unnamed Watercourse 2, Unit 3

Photo D.2-5. Unnamed Watercourse 1, Unit 1

Photo D.2-6. Unnamed Watercourse 1, Unit 1

Photo D.2-7. Unnamed Watercourse 1, Unit 1

Photo D.2-8. Unnamed Watercourse 1, Unit 1

Photo D.2-9. Unnamed Watercourse 1, Unit 1

Photo D.2-10. Unnamed Watercourse 1, Unit 2

Photo D.2-11. Unnamed Watercourse 1, Unit 2

Photo D.2-12. Unnamed Watercourse 1, Unit 3

Photo D.2-13. Unnamed Watercourse 1, Unit 3

Photo D.2-14. Unnamed Watercourse 1, Unit 4

Photo D.2-15. Unnamed Watercourse 1, Unit 4

Photo D.2-16. Unnamed Watercourse 1, start of steep dropoff

Photo D.2-17. Unnamed Watercourse 1, start of steep dropoff

Photo D.2-18. Unnamed Watercourse 3, Unit 2

Photo D.2-19. Unnamed Watercourse 3, Unit 2

Photo D.2-20. Unnamed Watercourse 3, Unit 3

Photo D.2-21. Unnamed Watercourse 3, Unit 3

Photo D.2-22. Unnamed Watercourse 3, Unit 4

Photo D.2-23. Unnamed Watercourse 3, Unit 4

Appendix D.3

Water Quality Results

Table D.3-1. Analytical Results of Water Quality, Three Unnamed Watercourses and Fogherty Lake, 2010.

Sample Name				GRQ-1	GRQ-2	GRQ-3	GRQ-4
Location			CCME FWAL	Unnamed Watercourse 3 East stream	Fogherty Lake	Unnamed Watercourse 2 North stream	Unnamed Watercourse 1 Fogherty Lake outflow
Parameter	Unit	RDL	Guideline	24-Aug-10	27-Aug-10	22-Sep-10	22-Sep-10
Field Parameters							
pH			6.5-9	**3.41**	**2.94**	**3.15**	**2.95**
Water Temperature	ºC			21.4	22.7	14.9	16
Conductivity	µS/cm			62	43	91	53
% Dissolved Oxygen	%			79.2	100.6	79.8	47
Dissolved Oxygen	mg/L			6.67	8.67	8.47	4.52
General Chemistry							
pH			6.5-9	**4.3**	**4.3**	**3.9**	**4.2**
Reactive Silica as SiO2	mg/L	0.5		7.2	0.9	10.2	1.8
Chloride	mg/L	1		14	10	18	13
Fluoride	mg/L	0.1	0.12	<0.1	<0.1	**0.4**	<0.1
Sulphate	mg/L	2		<2	<2	<2	<2
Alkalinity	mg/L	5		<5	<5	<5	<5
True Color	TCU	5	Narrative	395	198	411	195
Turbidity	NTU	0.1	Narrative	1	0.7	2.8	0.7
Electrical Conductivity	umho/cm	1		59	52	102	61
Nitrate + Nitrite as N	mg/L	0.05		<0.05	<0.05	0.24	<0.05
Nitrate as N	mg/L	0.05	2.9	<0.05	<0.05	0.24	<0.05
Nitrite as N	mg/L	0.05	0.06	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L	0.03	Fact Sheet	<0.03	0.03	0.06	0.11
Total Organic Carbon	mg/L	0.5		35.6	15.4	46.6	17.5
Ortho-Phosphate as P	mg/L	0.01		<0.01	<0.01	0.02	<0.01
Total Sodium	mg/L	0.1		8.8	6.8	10	6.8
Total Potassium	mg/L	0.1		0.3	0.4	0.4	0.5
Total Calcium	mg/L	0.1		0.5	0.3	0.5	0.4
Total Magnesium	mg/L	0.1		0.7	0.6	1.1	0.6
Bicarb. Alkalinity (as CaCO3)	mg/L	5		<5	<5	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L	10		<10	<10	<10	<10
Hydroxide	mg/L	5		<5	<5	<5	<5
Calculated TDS	mg/L	1		26	19	33	22
Hardness	mg/L			4.1	3.2	5.8	3.5
Langelier Index (@20C)	NA			-6.84	-7.05	-7.25	-7.03
Langelier Index (@ 4C)	NA			-7.16	-7.37	-7.57	-7.35
Saturation pH (@ 20C)	NA			11.1	11.3	11.1	11.2
Saturation pH (@ 4C)	NA			11.5	11.7	11.5	11.5
Anion Sum	me/L			0.39	0.28	0.52	0.37
Cation sum	me/L			0.68	0.47	0.84	0.49
% Difference/ Ion Balance (NS)	%			26.2	25.2	23.3	14.8
Total Suspended Solids	mg/L	5	Narrative	n/a	n/a	<5	<5
Total Phosphorous as P	mg/L	0.002	Fact Sheet	0.157	0.035	0.03	0.012

Table D.3-1. Analytical Results of Water Quality, Three Unnamed Watercourses and Fogherty Lake, 2010.

Sample Name				GRQ-1	GRQ-2	GRQ-3	GRQ-4
Location			**CCME FWAL**	**Unnamed Watercourse 3 East stream**	**Fogherty Lake**	**Unnamed Watercourse 2 North stream**	**Unnamed Watercourse 1 Fogherty Lake outflow**
Total Metals							
Total Aluminum	ug/L	5	5.0	**1050**	**335**	**1050**	**272**
Total Antimony	ug/L	2		<2	<2	<2	<2
Total Arsenic	ug/L	2	5.0	<2	<2	5	<2
Total Barium	ug/L	5		<5	<5	16	<5
Total Beryllium	ug/L	2		<2	<2	<2	<2
Total Bismuth	ug/L	2		<2	<2	<2	<2
Total Boron	ug/L	5		14	11	20	14
Total Cadmium	ug/L	0.017	0.017	**0.025**	**0.023**	**0.102**	<0.017
Total Chromium	ug/L	1		4	<1	<1	<1
Total Cobalt	ug/L	1		<1	<1	<1	<1
Total Copper	ug/L	2	2	<2	<2	<2	<2
Total Iron	ug/L	50	300	**976**	**319**	**936**	**415**
Total Lead	ug/L	0.5	1	**3.1**	**2.6**	**2.2**	0.7
Total Manganese	ug/L	2		37	16	87	15
Total Molybdenum	ug/L	2	73	<2	<2	<2	<2
Total Nickel	ug/L	2	25	<2	<2	<2	<2
Total Selenium	ug/L	1	1.0	1	<1	<1	<1
Total Silver	ug/L	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Total Strontium	ug/L	5		<5	<5	9	<5
Total Thallium	ug/L	0.1	0.8	<0.1	<0.1	<0.1	<0.1
Total Tin	ug/L	2		<2	<2	<2	<2
Total Titanium	ug/L	2		5	2	5	<2
Total Uranium	ug/L	0.1		0.3	0.1	0.3	<0.1
Total Vanadium	ug/L	2		<2	<2	<2	<2
Total Zinc	ug/L	5	30	9	26	20	10
Mercury	mg/L	0.00005	0.000026	<0.00005	<0.00005	<0.00005	<0.00005

Appendix D.4.

AGAT QA/QC Forms for Freshwater Samples

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
580 MAIN STREET, SUITE 105
SAINT JOHN, NB E2K1J5

ATTENTION TO: CHYANN KIRBY

PROJECT NO: GRQ

AGAT WORK ORDER: 10X432414

WATER ANALYSIS REVIEWED BY: Mike Earp, Operations Manager

DATE REPORTED: Sep 10, 2010

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718, or at 1-888-468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Dartmouth, Nova Scotia
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FAX (902)468-8924
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Standard Water Analysis + FWAL Metals (Total), Hg

DATE SAMPLED: Aug 24, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 10, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-1 1970509	GRQ-2 1970510
pH				4.3	4.3
Reactive Silica as SiO2	mg/L		0.5	7.2	0.9
Chloride	mg/L		1	14	10
Fluoride	mg/L		0.1	<0.1	<0.1
Sulphate	mg/L		2	<2	<2
Alkalinity	mg/L		5	<5	<5
True Color	TCU		5	395	198
Turbidity	NTU		0.1	1.0	0.7
Electrical Conductivity	umho/cm		1	59	52
Nitrate + Nitrite as N	mg/L		0.05	<0.05	<0.05
Nitrate as N	mg/L		0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	0.03
Total Organic Carbon	mg/L		0.5	35.6	15.4
Ortho-Phosphate as P	mg/L		0.01	<0.01	<0.01
Total Sodium	mg/L		0.1	8.8	6.8
Total Potassium	mg/L		0.1	0.3	0.4
Total Calcium	mg/L		0.1	0.5	0.3
Total Magnesium	mg/L		0.1	0.7	0.6
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L		1	26	19
Hardness	mg/L			4.1	3.2
Langelier Index (@20C)	NA			-6.84	-7.05
Langelier Index (@ 4C)	NA			-7.16	-7.37
Saturation pH (@ 20C)	NA			11.1	11.3
Saturation pH (@ 4C)	NA			11.5	11.7
Anion Sum	me/L			0.39	0.28
Cation sum	me/L			0.68	0.47
% Difference/ Ion Balance (NS)	%			26.2	25.2
Total Aluminum	ug/L		5	1050	335
Total Antimony	ug/L		2	<2	<2

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 10X432414
PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Standard Water Analysis + FWAL Metals (Total), Hg

DATE SAMPLED: Aug 24, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 10, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-1 1970509	GRQ-2 1970510
Total Arsenic	ug/L		2	<2	<2
Total Barium	ug/L		5	<5	<5
Total Beryllium	ug/L		2	<2	<2
Total Bismuth	ug/L		2	<2	<2
Total Boron	ug/L		5	14	11
Total Cadmium	ug/L		0.017	0.025	0.023
Total Chromium	ug/L		1	4	<1
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L		2	<2	<2
Total Iron	ug/L		50	976	319
Total Lead	ug/L		0.5	3.1	2.6
Total Manganese	ug/L		2	37	16
Total Molybdenum	ug/L		2	<2	<2
Total Nickel	ug/L		2	<2	<2
Total Selenium	ug/L		1	1	<1
Total Silver	ug/L		0.1	<0.1	<0.1
Total Strontium	ug/L		5	<5	<5
Total Thallium	ug/L		0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	5	2
Total Uranium	ug/L		0.1	0.3	0.1
Total Vanadium	ug/L		2	<2	<2
Total Zinc	ug/L		5	9	26
Mercury	mg/L		0.00005	<0.00005	<0.00005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Total Phosphorus (Low Level)

DATE SAMPLED: Aug 24, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 10, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-1 1970509	GRQ-2 1970510
Total Phosphorus	mg/L		0.002	0.157	0.035

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

Water Analysis

RPT Date: Sep 10, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Standard Water Analysis + FWAL Metals (Total), Hg															
pH	1	1965945	6.9	7.0	1.4%	<	100%	80%	120%		80%	120%		80%	120%
Reactive Silica as SiO2	1	1976151	13.2	13.1	0.8%	< 0.5	103%	80%	120%		80%	120%	102%	80%	120%
Chloride	1	1962422	10	10	0.0%	< 1	94%	80%	120%		80%	120%	100%	80%	120%
Fluoride	1	1962422	< 0.1	< 0.1	0.0%	< 0.1	98%	80%	120%		80%	120%	87%	80%	120%
Sulphate	1	1962422	5	5	0.0%	< 2	100%	80%	120%		80%	120%	102%	80%	120%
Alkalinity	1	1965945	8	8	0.0%	< 5	99%	80%	120%		80%	120%	97%	80%	120%
True Color	1	1965027	< 5	< 5	0.0%	< 5	95%	80%	120%		80%	120%		80%	120%
Turbidity	1	1965027	0.3	0.3	0.0%	< 0.1	88%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	1	1965945	184	187	1.6%	< 1	99%	80%	120%		80%	120%		80%	120%
Nitrate as N	1	1962422	0.08	0.09	11.8%	< 0.05	104%	80%	120%		80%	120%	83%	80%	120%
Nitrite as N	1	1962422	< 0.05	< 0.05	0.0%	< 0.05	110%	80%	120%		80%	120%	101%	80%	120%
Total Organic Carbon	1	1976101	2.4	2.1	13.3%	< 0.5	103%	80%	120%		80%	120%	93%	80%	120%
Ortho-Phosphate as P	1	1976151	<0.01	0.01		< 0.01	99%	80%	120%		80%	120%	94%	80%	120%
Total Sodium	90810	1977594	32.5	31.2	4.1%	< 0.1	115%	80%	120%	108%	90%	110%	97%	80%	120%
Total Potassium	90810	1977594	1.4	1.5	6.9%	< 0.1	103%	90%	110%	103%	90%	110%	82%	80%	120%
Total Calcium	90810	1977594	10.3	10.5	1.9%	< 0.1	102%	90%	110%	103%	90%	110%	117%	80%	120%
Total Magnesium	90810	1977594	1.7	1.6	6.1%	< 0.1	113%	80%	120%	104%	90%	110%	91%	80%	120%
Total Aluminum	90810	1977594	288	294	2.1%	< 5	117%	80%	120%	108%	90%	110%	114%	80%	120%
Total Antimony	90810	1977594	< 2	< 2	0.0%	< 2	83%	80%	120%	110%	90%	110%	98%	80%	120%
Total Arsenic	90810	1977594	74	73	1.4%	< 2	98%	90%	110%	95%	90%	110%	92%	80%	120%
Total Barium	90810	1977594	22	22	0.0%	< 5	99%	90%	110%	98%	90%	110%	83%	80%	120%
Total Beryllium	90810	1977594	< 2	< 2	0.0%	< 2	109%	90%	110%	106%	90%	110%	100%	80%	120%
Total Bismuth	90810	1977594	< 2	< 2	0.0%	< 2	95%	90%	110%	93%	90%	110%	93%	70%	130%
Total Boron	90810	1977594	53	53	0.0%	< 5	110%	90%	110%	110%	90%	110%	103%	80%	120%
Total Cadmium	90810	1977594	0.156	0.157	0.6%	< 0.017	97%	90%	110%	102%	90%	110%	98%	80%	120%
Total Chromium	90810	1977594	< 1	< 1	0.0%	< 1	105%	90%	110%	104%	90%	110%	87%	80%	120%
Total Cobalt	90810	1977594	< 1	< 1	0.0%	< 1	109%	90%	110%	103%	90%	110%	80%	80%	120%
Total Copper	90810	1977594	4	4	0.0%	< 2	105%	90%	110%	102%	90%	110%	84%	80%	120%
Total Iron	90810	1977594	282	274	2.9%	< 50	100%	90%	110%	100%	90%	110%	80%	80%	120%
Total Lead	90810	1977594	5.5	6.3	13.6%	< 0.5	100%	90%	110%	103%	90%	110%	104%	80%	120%
Total Manganese	90810	1977594	33	34	3.0%	< 2	104%	90%	110%	102%	90%	110%	85%	80%	120%
Total Molybdenum	90810	1977594	32	32	0.0%	< 2	93%	90%	110%	101%	90%	110%	103%	70%	130%
Total Nickel	90810	1977594	< 2	< 2	0.0%	< 2	106%	90%	110%	104%	90%	110%	85%	80%	120%
Total Selenium	90810	1977594	< 1	< 1	0.0%	< 1	97%	90%	110%	98%	90%	110%	90%	80%	120%
Total Silver	90810	1977594	< 0.1	< 0.1	0.0%	< 0.1	99%	90%	110%	90%	90%	110%	85%	80%	120%
Total Strontium	90810	1977594	74	73	1.4%	< 5	94%	90%	110%	97%	90%	110%	85%	80%	120%
Total Thallium	90810	1977594	< 0.1	< 0.1	0.0%	< 0.1	102%	90%	110%	104%	90%	110%	99%	80%	120%
Total Tin	90810	1977594	< 2	< 2	0.0%	< 2	91%	90%	110%	101%	90%	110%	98%	80%	120%
Total Titanium	90810	1977594	19	15	23.5%	< 2	104%	90%	110%	100%	90%	110%	91%	80%	120%

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

Water Analysis (Continued)

RPT Date: Sep 10, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Uranium	90810	1977594	16.9	17.0	0.6%	< 0.1	102%	90%	110%	106%	90%	110%	100%	80%	120%
Total Vanadium	90810	1977594	< 2	< 2	0.0%	< 2	104%	90%	110%	99%	90%	110%	80%	80%	120%
Total Zinc	90810	1977594	19	19	0.0%	< 5	103%	90%	110%	102%	90%	110%	84%	80%	120%
Mercury	1	1968366	< 0.00005	< 0.00005	0.0%	< 0.00005	103%	80%	120%		80%	120%	89%	80%	120%
Standard Water Analysis + FWAL Metals (Total), Hg															
Ammonia as N	1	1965026	<0.05	<0.05	0.0%	< 0.03	92%	80%	120%		80%	120%	102%	80%	120%
Total Phosphorus (Low Level)															
Total Phosphorus	1	1970509	0.157	0.136	14.3%	< 0.006	93%	90%	110%	96%	90%	110%	87%	80%	120%

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	IC
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS			
Hardness			
Langelier Index (@20C)			CALCULATION
Langelier Index (@ 4C)			CALCULATION
Saturation pH (@ 20C)			CALCULATION
Saturation pH (@ 4C)			CALCULATION
Anion Sum			
Cation sum			
% Difference/ Ion Balance (NS)			
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

AGAT Laboratories

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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432414

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Mercury	INOR-121-6100 & INOR-121-6107	SM 3112 B	CVAAS
Total Phosphorus	INOR-93-1022	SM 4500-P B&E	SPECTROPHOTOMETER

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Arrival Condition: 15°C ✓Good ☐ Poor (complete 'notes')
Arrival Temperature: _____ AGAT Job Number: 10X432444
Notes: _____

Drinking Water Sample (y/n): _____ Reg. No. _____
Waterworks Number: _____

CHAIN OF CUSTODY RECORD

Report To:
Company: AMEC
Contact: Chyann Kirby
Address: Saint John, NB
Phone: (506) 652-9497 FAX: _____
PO#: _____
AGAT Quotation: _____
Client Project Name/ #: GRQ

Invoice To: Same (Y) / N) Circle
Company: _____
Contact: _____
Address: _____
Phone: _____ FAX: _____
PO#/Credit Card #: _____

Report Information
1. Name: Chyann Kirby
Email: chyann.kirby@amec.com
2. Name: Maureen Cameron-MacMillan
Email: maureen.cameron@amec.com

Regulatory Requirements (Check)
✓ List Guidelines on Report ☐ Do Not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res.
☐ Tier 2 ☐ Com
☐ Gas ☐ Fuel ☐ Lube
☐ CCME
☐ Ind ☐ CDWQ
☐ Com ☐ NSDFOSP
☐ Res/p ☐ HRM 101 Storm Water
☐ Ag ☐ HRM 101
✓ FWAL Waste Water
☐ Sediment
☐ Other _____

Site Info (check all that apply):
☐ Pot. ☐ Coarse
☐ N/Pot. ☐ Fine

Report Format
☐ Single PDF sample per page
☐ Multiple PDF samples per page
✓ Excel format included

Turnaround Time (TAT) Business Days
Regular TAT:
✓ 5 - 7 days
Rush TAT:
☐ 1 day ☐ 2 days
☐ 3 - 4 days
Date Required: _____
Time Required: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info/Containment	Lab Filtration Required	Standard Water Analysis + MS	Metals	(circle - Total, Diss or Available)	Mercury	BOD	pH	TSS	TKN	Anions	Total Phosphorus	Phenols	TPH/BTEX (PIRI) Tier 1	TPH/BTEX - Fractionation Tier 2	VOC	THM	PAH	PCB	Other: Low-level phosphorus	Other:	Hazardous (Y/N)	Lab Sample #
GRQ-1	24 Aug	SW	6			✓	✓	✓	✓			✓											✓		N	
GRQ-2	27 Aug	SW	6			✓	✓	✓	✓			✓											✓		N	

Sample Relinquished by (print name): Maureen Cameron MacMillan
Date/Time: 01 Sept.
Sample Received by (print name): A. Carmichael
Date/Time: Sept 2 10

Sample Relinquished by (sign):
Date/Time:
Sample Received by (sign):
Date/Time:

White Copy - AGAT
Yellow Copy - AGAT
Pink Copy - Client

NO: 19868

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CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
580 MAIN STREET, SUITE 105
SAINT JOHN, NB E2K1J5

ATTENTION TO: CHYANN KIRBY

PROJECT NO: GRQ

AGAT WORK ORDER: 10X438935

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganic Supervisor

DATE REPORTED: Oct 06, 2010

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718, or at 1-888-468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 10X438935
PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Standard Water Analysis + Metals (Total)

DATE SAMPLED: Sep 22, 2010 | DATE RECEIVED: Sep 28, 2010 | DATE REPORTED: Oct 06, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-3 2018956	GRQ-4 2018959
pH		6.5-9		3.9	4.2
Reactive Silica as SiO2	mg/L		0.5	10.2	1.8
Chloride	mg/L		1	18	13
Fluoride	mg/L	0.12	0.1	0.4	<0.1
Sulphate	mg/L		2	<2	<2
Alkalinity	mg/L		5	<5	<5
True Color	TCU	Narrative	5	411	195
Turbidity	NTU	Narrative	0.1	2.8	0.7
Electrical Conductivity	umho/cm		1	102	61
Nitrate + Nitrite as N	mg/L		0.05	0.24	<0.05
Nitrate as N	mg/L	2.9	0.05	0.24	<0.05
Nitrite as N	mg/L	0.06	0.05	<0.05	<0.05
Ammonia as N	mg/L	Fact Sheet	0.03	0.06	0.11
Total Organic Carbon	mg/L		0.5	46.6	17.5
Ortho-Phosphate as P	mg/L		0.01	0.02	<0.01
Total Sodium	mg/L		0.1	10.0	6.8
Total Potassium	mg/L		0.1	0.4	0.5
Total Calcium	mg/L		0.1	0.5	0.4
Total Magnesium	mg/L		0.1	1.1	0.6
Bicarb. Alkalinity (as CaCO3)	mg/L		5	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L		1	33	22
Hardness	mg/L			5.8	3.5
Langelier Index (@20C)	NA			-7.25	-7.03
Langelier Index (@ 4C)	NA			-7.57	-7.35
Saturation pH (@ 20C)	NA			11.1	11.2
Saturation pH (@ 4C)	NA			11.5	11.5
Anion Sum	me/L			0.52	0.37
Cation sum	me/L			0.84	0.49
% Difference/ Ion Balance (NS)	%			23.3	14.8
Total Aluminum	ug/L	5.0	5	1050	272
Total Antimony	ug/L		2	<2	<2

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Standard Water Analysis + Metals (Total)

DATE SAMPLED: Sep 22, 2010 | DATE RECEIVED: Sep 28, 2010 | DATE REPORTED: Oct 06, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-3 2018956	GRQ-4 2018959
Total Arsenic	ug/L	5.0	2	5	<2
Total Barium	ug/L		5	16	<5
Total Beryllium	ug/L		2	<2	<2
Total Bismuth	ug/L		2	<2	<2
Total Boron	ug/L		5	20	14
Total Cadmium	ug/L	0.017	0.017	0.102	<0.017
Total Chromium	ug/L		1	<1	<1
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L	2	2	<2	<2
Total Iron	ug/L	300	50	936	415
Total Lead	ug/L	1	0.5	2.2	0.7
Total Manganese	ug/L		2	87	15
Total Molybdenum	ug/L	73	2	<2	<2
Total Nickel	ug/L	25	2	<2	<2
Total Selenium	ug/L	1.0	1	<1	<1
Total Silver	ug/L	0.1	0.1	<0.1	<0.1
Total Strontium	ug/L		5	9	<5
Total Thallium	ug/L	0.8	0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	5	<2
Total Uranium	ug/L		0.1	0.3	<0.1
Total Vanadium	ug/L		2	<2	<2
Total Zinc	ug/L	30	5	20	10
Mercury	mg/L	0.026	0.00005	<0.00005	<0.00005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to NS - FWAL(ug/L)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Water Analysis - Various Inorganics

DATE SAMPLED: Sep 22, 2010 | DATE RECEIVED: Sep 28, 2010 | DATE REPORTED: Oct 06, 2010 | SAMPLE TYPE: Water

Parameter	Unit	G / S	RDL	GRQ-3 2018956	GRQ-4 2018959
Total Suspended Solids	mg/L	Narrative	5	<5	<5
Total Phosphorous as P	mg/L	Fact Sheet	0.002	0.030	0.012

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to NS-FWAL(mg/L)

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Guideline Violation

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Fluoride	0.12	0.4
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Aluminum	5.0	1050
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Cadmium	0.017	0.102
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Iron	300	936
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Lead	1	2.2
2018956	GRQ-3	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	pH	6.5-9	3.9
2018959	GRQ-4	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Aluminum	5.0	272
2018959	GRQ-4	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	Total Iron	300	415
2018959	GRQ-4	NS - FWAL(ug/L)	Standard Water Analysis + Metals (Total)	pH	6.5-9	4.2

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

Water Analysis

RPT Date: Oct 06, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Standard Water Analysis + Metals (Total)															
pH	1	2017954	7.4	7.4	0.0%		100%	80%	120%		80%	120%		80%	120%
Reactive Silica as SiO2	1	2014611	13.4	13.3	0.7%	< 0.5	99%	80%	120%		80%	120%	102%	80%	120%
Chloride	1	2021445	8	7	13.3%	< 1	102%	80%	120%		80%	120%	106%	80%	120%
Fluoride	1	2021445	< 0.1	< 0.1	0.0%	< 0.1	94%	80%	120%		80%	120%	94%	80%	120%
Sulphate	1	2021445	14	15	6.9%	< 2	108%	80%	120%		80%	120%	105%	80%	120%
Alkalinity	1	2017954	18	17	5.7%	< 5	101%	80%	120%		80%	120%	95%	80%	120%
True Color	1	2016154	30	28	6.9%	< 5	90%	80%	120%		80%	120%		80%	120%
Turbidity	1	2016154	7.6	7.5	1.3%	< 0.1	87%	80%	120%		80%	120%		80%	120%
Electrical Conductivity	1	2017954	93	93	0.0%	< 1	98%	80%	120%		80%	120%		80%	120%
Nitrate as N	1	2021445	2.63	2.67	1.5%	< 0.05	110%	80%	120%		80%	120%	102%	80%	120%
Nitrite as N	1	2021445	< 0.05	< 0.05	0.0%	< 0.05	118%	80%	120%		80%	120%	105%	80%	120%
Ammonia as N	1	2023292	<0.05	<0.05	0.0%	< 0.05	98%	80%	120%		80%	120%	97%	80%	120%
Ortho-Phosphate as P	1	2016250	<0.01	<0.01	0.0%	< 0.01	97%	80%	120%		80%	120%	104%	80%	120%
Total Sodium	92920	2018917	6.0	6.3	4.9%	< 0.1	102%	90%	110%	92%	90%	110%	113%	80%	120%
Total Potassium	92920	2018917	1.4	1.3	7.4%	< 0.1	105%	90%	110%	103%	90%	110%	89%	80%	1020
Total Calcium	92920	2018917	481	427	11.9%	< 0.1	104%	90%	110%	103%	90%	110%	90%	80%	120%
Total Magnesium	92920	2018917	15.7	16.6	5.6%	< 0.1	100%	90%	110%	99%	90%	110%	117%	80%	120%
Total Aluminum	92920	2018917	206	212	2.9%	< 10	100%	90%	110%	100%	90%	110%	106%	80%	120%
Total Antimony	92920	2018917	< 2	< 2	0.0%	< 2	97%	90%	110%	104%	90%	110%	109%	80%	120%
Total Arsenic	92920	2018917	14	14	0.0%	< 2	97%	90%	110%	97%	90%	110%	113%	80%	120%
Total Barium	92920	2018917	13	11	16.7%	< 5	97%	90%	110%	100%	90%	110%	106%	80%	120%
Total Beryllium	92920	2018917	< 2	< 2	0.0%	< 2	103%	90%	110%	102%	90%	110%	110%	80%	120%
Total Bismuth	92920	2018917	< 2	< 2	0.0%	< 2	102%	90%	110%	87%	80%	120%	84%	80%	120%
Total Boron	92920	2018917	79	77	2.6%	< 5	102%	90%	110%	94%	90%	110%	120%	80%	120%
Total Cadmium	92920	2018917	< 0.3	< 0.3	0.0%	< 0.3	98%	90%	110%	100%	90%	110%	101%	80%	120%
Total Chromium	92920	2018917	< 2	< 2	0.0%	< 2	105%	90%	110%	104%	90%	110%	80%	80%	120%
Total Cobalt	92920	2018917	< 1	< 1	0.0%	< 1	105%	90%	110%	103%	90%	110%	91%	80%	120%
Total Copper	92920	2018917	3	3	0.0%	< 2	108%	90%	110%	106%	90%	110%	107%	80%	120%
Total Iron	92920	2018917	2270	2000	12.6%	< 50	106%	90%	110%	105%	90%	110%	89%	80%	120%
Total Lead	92920	2018917	< 0.5	< 0.5	0.0%	< 0.5	102%	90%	110%	100%	90%	110%	86%	80%	120%
Total Manganese	92920	2018917	105	91	14.3%	< 2	105%	90%	110%	104%	90%	110%	80%	80%	120%
Total Molybdenum	92920	2018917	5	5	0.0%	< 2	99%	90%	110%	92%	90%	110%	86%	80%	120%
Total Nickel	92920	2018917	< 2	< 2	0.0%	< 2	107%	90%	110%	106%	90%	110%	90%	80%	120%
Total Selenium	92920	2018917	< 2	< 2	0.0%	< 2	99%	90%	110%	99%	90%	110%	111%	80%	120%
Total Silver	92920	2018917	< 0.5	< 0.5	0.0%	< 0.5	98%	90%	110%	105%	90%	110%	98%	80%	120%
Total Strontium	92920	2018917	7750	7650	1.3%	< 5	98%	90%	110%	98%	90%	110%	96%	80%	120%
Total Thallium	92920	2018917	< 0.1	< 0.1	0.0%	< 0.1	101%	90%	110%	100%	90%	110%	90%	80%	120%
Total Tin	92920	2018917	< 2	< 2	0.0%	< 2	96%	90%	110%	100%	90%	110%	115%	80%	120%
Total Titanium	92920	2018917	20	21	4.9%	< 2	103%	90%	110%	100%	90%	110%	106%	80%	120%

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

Water Analysis (Continued)

RPT Date: Oct 06, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Uranium	92920	2018917	0.5	0.5	0.0%	< 0.1	102%	90%	110%	98%	90%	110%	84%	80%	120%
Total Vanadium	92920	2018917	< 2	< 2	0.0%	< 2	105%	90%	110%	98%	90%	110%	91%	80%	120%
Total Zinc	92920	2018917	< 5	< 5	0.0%	< 5	103%	90%	110%	103%	90%	110%	104%	80%	120%
Mercury	1	2016154	< 0.00005	< 0.00005	0.0%	< 0.00005	103%	80%	120%		80%	120%	96%	80%	120%
Water Analysis - Various Inorganics															
Total Suspended Solids	1	2020180	<5	<5	0.0%	< 5	100%	80%	120%		80%	120%	102%	80%	120%
Total Phosphorous as P	1		0.055	0.051	7.5%	< 0.002	90%	80%	120%	95%	80%	120%	94%	80%	120%

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-121-6001	SM 4500 H+B	PC-TITRATE
Reactive Silica as SiO2	INORG-121-6028	SM 4110 B	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	IC
Fluoride	INORG-121-6005	SM 4110 B	IC
Sulphate	INORG-121-6005	SM 4110 B	IC
Alkalinity	INORG-121-6001	SM 2320 B	PC-TITRATE
True Color	INORG-121-6014	EPA 110.2	NEPHELOMETER
Turbidity	INORG-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC-TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	IC
Nitrate as N	INORG-121-6005	SM 4110 B	IC
Nitrite as N	INORG-121-6005	SM 4110 B	IC
Ammonia as N	INORG-121-6003	SM 4500-NH3 G	COLORIMETER
Total Organic Carbon	INORG-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INORG-121-6005	SM 4110 B	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Potassium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Calcium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Magnesium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC-TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS			
Hardness			
Langelier Index (@20C)			CALCULATION
Langelier Index (@ 4C)			CALCULATION
Saturation pH (@ 20C)			CALCULATION
Saturation pH (@ 4C)			CALCULATION
Anion Sum			
Cation sum			
% Difference/ Ion Balance (NS)			
Total Aluminum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Arsenic	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Barium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Beryllium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Bismuth	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Boron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cadmium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS

AGAT Laboratories

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Dartmouth, Nova Scotia
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FAX (902)468-8924
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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X438935

PROJECT NO: GRQ

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Cobalt	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Copper	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Iron	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Lead	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Manganese	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Molybdenum	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Nickel	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Selenium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Silver	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Strontium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Thallium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Tin	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Titanium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Uranium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Vanadium	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Total Zinc	MET121-6104 & MET-121-6105	SM 3125	ICP/MS
Mercury	INOR-121-6100 & INOR-121-6107	SM 3112 B	CVAAS
Total Suspended Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Total Phosphorous as P	INORG-121-6009	SM 365.2	COLORIMETER

AGAT Laboratories

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Dartmouth, NS B3B 1M2
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http://webearth.agatlabs.com

Arrival Condition: 10 OK ☑ Good ☐ Poor (complete notes)
Arrival Temperature: 10 AGAT Job Number: 10X432095
Notes:

Drinking Water Sample (y/n): _____ Reg. No. _____
Waterworks Number: _____

CHAIN OF CUSTODY RECORD

Report To:
Company: AMEC
Contact: Chyann Kirby
Address: Saint John, NB
Phone: (506)652-9497 FAX: _____
PO#: _____
AGAT Quotation: _____
Client Project Name/ #: GRQ

Invoice To: Same (Y) N) Circle
Company: _____
Contact: _____
Address: _____
Phone: _____ FAX: _____
PO#/Credit Card #: _____

Report Information
1. Name: Chyann Kirby
Email: chyann.kirby@amec.com
2. Name: Maureen Cameron-MacMillan
Email: maureen.cameron@amec.com

Regulatory Requirements (Check)
☑ List Guidelines on Report ☐ Do Not List Guidelines on Report
☐ PIRI
☐ Tier 1 ☐ Res.
☐ Tier 2 ☐ Com
☐ Gas ☐ Fuel ☐ Lube
☑ CCME ☐ CDWQ
☐ Ind ☐ NSDFOSP
☐ Com ☐ HRM 101
☐ Res/p Storm Water
☐ Ag ☐ HRM 101
☑ FWAL Waste Water
☐ Sediment
☐ Other _____

Site Info (check all that apply):
☐ Pot. ☐ Coarse
☐ N/Pot. ☐ Fine

Report Format
☐ Single PDF sample per page
☐ Multiple PDF samples per page
☑ Excel format included

Turnaround Time (TAT) Business Days
Regular TAT:
☑ 5 - 7 days
Rush TAT:
☐ 1 day ☐ 2 days
☐ 3 - 4 days
Date Required: _____
Time Required: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info/Containment	Lab Filtration Required	Standard Water Analysis + MS	Metals	(circle Total / Diss or Available)	Mercury	BOD	pH	TSS	TKN	Anions	Total Phosphorus	Phenols	TPH/BTEX (PIRI) Tier 1	TPH/BTEX Fractionation Tier 2	VOC	THM	PAH	PCB	Other: Low-level phosphorous	Other:	Hazardous (Y/N)	Lab Sample #
GRQ-3	22 Sept	SW	6			✓	✓	✓	✓			✓											✓		N	
GRQ-4	22 Sept	SW	6			✓	✓	✓	✓			✓											✓		N	

Sample Relinquished by (print name): Maureen Cameron-MacMillan
Date/Time: 27 Sept
Sample Relinquished by (sign):
Date/Time:

Sample Received by (print name): A Carmichael
Date/Time: Sep 29, 10
Sample Received by (sign):
Date/Time: 3:15

White Copy - AGAT
Yellow Copy - AGAT
Pink Copy - Client

PAGE 1 of _____
NO: 19869

Appendix E: Marine Habitat

Appendix E.1: Video Transect Results

Appendix E.2: Benthic Invertebrate Sample Results

Appendix E.3: Marine Sediment Results

Appendix E.4: AGAT Quality Assurance/Quality Control and Certificates of Analyses for Marine Sediment Samples

Appendix E.1

Video Transect Results

Table E.1-1. 250m Transect – Transect T1, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Sand (75%); Cobble (20%); Silt (5%)	Shell Hash	-----
5-10	5-10	Cobble (80%); Sand (10%); Silt (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Encrusting Red Alga (*Leptophyllum* sp.) (5%)
10-15	10-15	Cobble (80%); Sand (10%); Silt (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Waved Whelk (*Buccinum undatum*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
15-20	15-20	Cobble (80%); Sand (10%); Silt (10%)	Waved Whelk (*Buccinum undatum*) (**O: 5-10 individuals**); Sea Cucumber (*Cucumaria frondosa*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
20-25	20-25	Cobble (80%); Sand (10%); Silt (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 2 individuals**); Sea Star (*Asterias* sp.) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%)
25-30	25-30	Cobble (65%); Sand (25%); Silt (10%)	Periwinkle (*Littorina* sp.) (**C**); Waved Whelk (*Buccinum undatum*) (**U: 2 individuals**); Blue Mussel (*Mytilus edulis*) (**U: 2 individuals**); American Oyster (*Crassostrea virginica*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (15%); Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
30-35	30-35	Cobble (65%); Sand (25%); Silt (10%)	Blue Mussel (*Mytilus edulis*) (**O: 10-15 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
35-40	35-40	Cobble (65%); Sand (25%); Silt (10%)	Waved Whelk (*Buccinum undatum*) (**O: 10-15 individuals**); Deep Sea Scallop (*Placopecten magellanicus*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
40-45	40-45	Cobble (65%); Sand (25%); Silt (10%)	Waved Whelk (*Buccinum undatum*) (**O: 10-15 individuals**); Sea Star (*Asterias* sp.) (**U: 1 individual**); Sea Cucumber (*Cucumaria frondosa*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%); Bladderwrack (*Fucus* sp.) (5%)
45-50	45-50	Cobble (65%); Sand (25%); Silt (10%)	Periwinkle (*Littorina* sp.) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
50-55	50-55	Cobble (65%); Sand (25%); Silt (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
55-60	55-60	Cobble (65%); Sand (25%); Silt (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Bladderwrack (*Fucus* sp.) (5%)
60-65	60-65	Cobble (65%); Sand (25%); Silt (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%); Bladderwrack (*Fucus* sp.) (5%)
65-70	65-70	Cobble (65%); Sand (25%); Silt (10%)	Waved Whelk (*Buccinum undatum*) (U**: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
70-75	70-75	Cobble (65%); Sand (25%); Silt (10%)	Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (20%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
75-80	75-80	Cobble (65%); Sand (25%); Silt (10%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
80-85	80-85	Cobble (75%); Sand (20%); Silt (5%)	Blue Mussel (*Mytilus edulis*) (**U: 1 individual**); Shell Hash	Encrusting Red Alga (*Leptophyllum* sp.) (5%); Bladderwrack (*Fucus* sp.) (5%)
85-90	85-90	Cobble (75%); Sand (20%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (20%)
90-95	90-95	Cobble (75%); Sand (20%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (10%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
95-100	95-100	Cobble (75%); Sand (20%); Silt (5%)	Blue Mussel (*Mytilus edulis*) (**O 15-20 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
100-105	100-105	Cobble (75%); Sand (20%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
105-110	105-110	Cobble (75%); Sand (20%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (10%); Encrusting Red Alga (*Leptophyllum* sp.) (5%); Bladderwrack (*Fucus* sp.) (5%)
110-115	110-115	Cobble (75%); Sand (20%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (10%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
115-120	115-120	Cobble (75%); Sand (20%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (15%)
120-125	120-125	Cobble (75%); Sand (15%); Rock (5%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (10%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)

Table E.1-1. 250m Transect – Transect T1, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
125-130	125-130	Cobble (90%); Sand (5%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O:5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Bladderwrack (*Fucus* sp.) (5%)
130-135	130-135	Cobble (90%); Sand (5%); Silt (5%)	Not visible	Sea Colander (*Agarum clathratum*) (5%)
135-140	135-140	Cobble (90%); Sand (5%); Silt (5%)	Not visible	Not visible
140-145	140-145	Cobble (85%); Boulder (5%); Sand (5%); Silt (5%)	Not visible	Not visible
145-150	145-150	Boulder (50%); Cobble (40%); Sand (5%); Silt (5%)	Frilled Anemone (*Metridium senile*) (**O:5-10 individuals**); Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**O:5-10 individuals**)	Not visible
150-155	150-155	Boulder (75%); Cobble (20%); Sand (5%)	Not visible	Not visible
155-160	155-160	Boulder (50%); Cobble (40%); Sand (5%); Silt (5%)	Not visible	Black Whip Weed (*Chordaria flagelliformis*) (5%)
160-165	160-165	Cobble (85%); Sand (10%); Silt (5%)	Not visible	Black Whip Weed (*Chordaria flagelliformis*) (5%)
165-170	165-170	Cobble (85%); Sand (10%); Silt (5%)	Not visible	Black Whip Weed (*Chordaria flagelliformis*) (5%)
170-175	170-175	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
175-180	175-180	Cobble (85%); Sand (10%); Silt (5%)	Lobster (*Homarus americanus*) (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)
180-185	180-185	Cobble (85%); Sand (10%); Silt (5%)	Lobster (*Homarus americanus*) (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)
185-190	185-190	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
190-195	190-195	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
195-200	195-200	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
200-205	200-205	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%); Bladderwrack (*Fucus* sp.) (5%)
205-210	205-210	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
210-215	210-215	Cobble (85%); Sand (10%); Silt (5%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (5%)
215-220	215-220	Cobble (85%); Sand (10%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
220-225	220-225	Cobble (80%); Boulder (5%); Sand (5%); Silt (5%)	-----	Bladderwrack (*Fucus* sp.) (5%)
225-230	225-230	Cobble (80%); Boulder (5%); Sand (5%); Silt (5%)	Waved Whelk (*Buccinum undatum*) (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)
230-235	230-235	Boulder (45%); Cobble (40%); Sand (10%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
235-240	235-240	Boulder (45%); Cobble (40%); Sand (10%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
240-245	240-245	Boulder (45%); Cobble (40%); Sand (10%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Cunner (*Tautogolabrus adspersus*) (**U: 2 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
245-250	245-250	Boulder (45%); Cobble (40%); Sand (10%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Sea Peach (*Holacynthia pyriformis*) (**O:5-10 individuals**); Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**O:5-10 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes "no life observed".

Table E.1-2. 250m Transect – Transect T2, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Cobble (85%); Sand (10%); Silt (5%)	Shorthorn Sculpin (*Myoxocephalus scorpius*) (**U: 1 individual**); American Oyster (*Crassostrea virginica*) (**U: 1 individual**); Shell Hash	-----
5-10	5-10	Cobble (85%); Sand (10%); Silt (5%)	Blue Mussel (*Mytilus edulis*) (**U: 1 individual**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
10-15	10-15	Cobble (85%); Sand (10%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
15-20	15-20	Cobble (85%); Sand (10%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
20-25	20-25	Cobble (85%); Sand (10%); Silt (5%)	Blue Mussel (*Mytilus edulis*) (**O: 5-10 individuals**)	Sea Colander (*Agarum clathratum*) (5%)
25-30	25-30	Cobble (85%); Sand (10%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)
30-35	30-35	Cobble (85%); Sand (10%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
35-40	35-40	Cobble (85%); Sand (10%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Unidentified Fish Species (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
40-45	40-45	Cobble (65%); Sand (30%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
45-50	45-50	Cobble (65%); Sand (30%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
50-55	50-55	Cobble (65%); Sand (30%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
55-60	55-60	Cobble (65%); Sand (30%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
60-65	60-65	Cobble (65%); Sand (30%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
65-70	65-70	Cobble (90%); Sand (10%)	Shell Hash	-----
70-75	70-75	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 2 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
75-80	75-80	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (10%)
80-85	80-85	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (10%)
85-90	85-90	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (10%)
90-95	90-95	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Kelp (*Laminaria saccharina*) (5%)
95-100	95-100	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
100-105	100-105	Cobble (90%); Sand (10%)	Blue Mussel (*Mytilus edulis*) (**U:1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
105-110	105-110	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (10%)
110-115	110-115	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%)
115-120	115-120	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (20%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
120-125	120-125	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
125-130	125-130	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
130-135	130-135	Cobble (90%); Sand (10%)	Shorthorn Sculpin (*Myoxocephalus scorpius*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Bladderwrack (*Fucus* sp.) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)

Table E.1-2. 250m Transect – Transect T2, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
135-140	135-140	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Bladderwrack (*Fucus* sp.) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
140-145	140-145	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Bladderwrack (*Fucus* sp.) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
145-150	145-150	Cobble (90%); Sand (10%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (15%); Sea Colander (*Agarum clathratum*) (10%)
150-155	150-155	Cobble (90%); Sand (10%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (15%); Sea Colander (*Agarum clathratum*) (10%)
155-160	155-160	Boulder (45%); Cobble (40%); Sand (5%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**);	Sea Colander (*Agarum clathratum*) (5%)
160-165	160-165	Boulder (75%); Cobble (20%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**)	-----
165-170	165-170	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
170-175	170-175	Cobble (90%); Sand (5%); Silt (5%)	Lobster (*Homarus americanus*) (**U: 2 individuals**)	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
175-180	175-180	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
180-185	180-185	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
185-190	185-190	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (15%); Sea Colander (*Agarum clathratum*) (5%)
190-195	190-195	Cobble (90%); Sand (5%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
195-200	195-200	Cobble (90%); Sand (5%); Silt (5%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
200-205	200-205	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
205-210	205-210	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
210-215	210-215	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
215-220	215-220	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
220-225	220-225	Cobble (90%); Sand (5%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
225-230	225-230	Cobble (60%); Boulder (30%); Sand (5%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	Green Fleece (*Codium fragile*) (5%)
230-235	230-235	Cobble (60%); Boulder (30%); Sand (5%); Silt (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	-----
235-240	235-240	Boulder (75%); Cobble (20%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**)	-----
240-245	240-245	Boulder (75%); Cobble (20%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**O: 5 individuals**); Deep Sea Scallop (*Placopecten magellanicus*) (**U: 1 individual**)	-----
245-250	245-250	Boulder (75%); Cobble (20%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	-----

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes “no life observed”.

Table E.1-3. 250m Transect – Transect T3, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**A**)	-----
5-10	5-10	Cobble (65%); Rock (30%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**A**); ShellHash	Sea Colander (*Agarum clathratum*) (20%)
10-15	10-15	Rock (50%); Cobble (30%); Boulder (15%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**A**); Blue Mussel (*Mytilus edulis*) (**C**); Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**O: 5-10 individuals**); Sea Star (*Asterias* sp.) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%)
15-20	15-20	Rock (50%); Cobble (30%); Boulder (15%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**); Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
20-25	20-25	Rock (50%); Cobble (30%); Boulder (15%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**); Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
25-30	25-30	Rock (50%); Cobble (30%); Boulder (15%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
30-35	30-35	Rock (50%); Cobble (30%); Boulder (15%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**); Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (15%)
35-40	35-40	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
40-45	40-45	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**C**)	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
45-50	45-50	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**C**); American Oyster (*Crassostrea virginica*) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
50-55	50-55	Cobble (85%); Sand (10%); Rock (5%)	Barnacle (*Semibalanus balanoides*) (**C**)	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
55-60	55-60	Cobble (90%); Sand (10%)	Barnacle (*Semibalanus balanoides*) (**C**)	Black Whip Weed (*Chordaria flagelliformis*) (15%); Sea Colander (*Agarum clathratum*) (5%)
60-65	60-65	Cobble (75%); Boulder (15%); Rock (5%); Sand (5%)	Barnacle (*Semibalanus balanoides*) (**C**)	Black Whip Weed (*Chordaria flagelliformis*) (5%)
65-70	65-70	Boulder (60%); Cobble (30%); Sand (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Sea Star (*Asterias* sp.) (**U: 2 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**)	-----
70-75	70-75	Boulder (80%); Cobble (15%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**)	-----
75-80	75-80	Boulder (100%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
80-85	80-85	Boulder (80%); Rock (10%); Cobble (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Sea Star (*Asterias* sp.) (**U: 1 individual**)	-----
85-90	85-90	Boulder (80%); Rock (10%); Cobble (10%)	Barnacle (*Semibalanus balanoides*) (**C**); Blue Mussel (*Mytilus edulis*) (**C**); Sea Star (*Asterias* sp.) (**U: 1 individual**)	-----
90-95	90-95	Boulder (50%); Cobble (30%); Rock (20%)	Blue Mussel (*Mytilus edulis*) (**C**); Shell Hash	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
95-100	95-100	Boulder (50%); Cobble (30%); Rock (20%)	Barnacle (*Semibalanus balanoides*) (**C**); Cunner (*Tautogolabrus adspersus*) (**U: 1 individual**); Lobster (*Homarus americanus*) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%)
100-105	100-105	Cobble (100%)	Sea Star (*Asterias* sp.) (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (20%)
105-110	105-110	Cobble (100%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Unidentified Fish Species (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (60%); Bladderwrack (*Fucus* sp.) (10%)

Table E.1-3. 250m Transect – Transect T3, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
110-115	110-115	Cobble (100%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (60%); Bladderwrack (*Fucus* sp.) (5%); Sea Colander (*Agarum clathratum*) (5%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
115-120	115-120	Cobble (100%)	Cunner (*Tautogolabrus adspersus*) (**U: 3 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (40%); Bladderwrack (*Fucus* sp.) (25%); Tube Weed (*Polysiphonia lanosa*) (10%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
120-125	120-125	Boulder (100%)	Cunner (*Tautogolabrus adspersus*) (**U: 4 individuals**)	Bladderwrack (*Fucus* sp.) (50%); Black Whip Weed (*Chordaria flagelliformis*) (20%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
125-130	125-130	Boulder (100%)	Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (40%); Black Whip Weed (*Chordaria flagelliformis*) (25%); Tube Weed (*Polysiphonia lanosa*) (10%)
130-135	130-135	Boulder (50%); Cobble (50%)	-----	Bladderwrack (*Fucus* sp.) (25%); Black Whip Weed (*Chordaria flagelliformis*) (25%); Tube Weed (*Polysiphonia lanosa*) (5%)
135-140	135-140	Boulder (50%); Cobble (50%)	-----	Bladderwrack (*Fucus* sp.) (60%); Kelp (*Laminaria saccharina*) (15%); Black Whip Weed (*Chordaria flagelliformis*) (10%)
140-145	140-145	Boulder (50%); Cobble (50%)	Cunner (*Tautogolabrus adspersus*) (**U: 3 individuals**); Sea Star (*Asterias* sp.) (**U: 4 individuals**)	Bladderwrack (*Fucus* sp.) (75%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
145-150	145-150	Boulder (75%); Cobble (25%)	-----	Bladderwrack (*Fucus* sp.) (60%); Black Whip Weed (*Chordaria flagelliformis*) (20%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
150-155	150-155	Boulder (75%); Cobble (25%)	-----	Bladderwrack (*Fucus* sp.) (60%); Black Whip Weed (*Chordaria flagelliformis*) (20%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
155-160	155-160	Boulder (75%); Cobble (25%)	Unidentified Fish Species (**U: 2 individuals**)	Bladderwrack (*Fucus* sp.) (60%); Black Whip Weed (*Chordaria flagelliformis*) (20%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
160-165	160-165	Boulder (75%); Cobble (25%)	Cunner (*Tautogolabrus adspersus*) (**O: 5-10 individuals**)	Bladderwrack (*Fucus* sp.) (60%); Black Whip Weed (*Chordaria flagelliformis*) (20%); Tube Weed (*Polysiphonia lanosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
165-170	165-170	Boulder (75%); Cobble (25%)	Unidentified Fish Species (**O: 5-10 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (45%); Bladderwrack (*Fucus* sp.) (25%); Tube Weed (*Polysiphonia lanosa*) (5%)
170-175	170-175	Boulder (75%); Cobble (25%)	Sea Star (*Asterias* sp.) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (25%); Black Whip Weed (*Chordaria flagelliformis*) (15%)
175-180	175-180	Boulder (75%); Cobble (25%)	-----	Bladderwrack (*Fucus* sp.) (30%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Tube Weed (*Polysiphonia lanosa*) (5%); Kelp (*Laminaria saccharina*) (15%); Irish Moss (*Chondrus crispus*) (5%)
180-185	180-185	Boulder (75%); Cobble (25%)	Cunner (*Tautogolabrus adspersus*) (**U: 2 individuals**)	Bladderwrack (*Fucus* sp.) (65%); Black Whip Weed (*Chordaria flagelliformis*) (15%); Tube Weed (*Polysiphonia lanosa*) (10%)
185-190	185-190	Boulder (75%); Cobble (25%)	Cunner (*Tautogolabrus adspersus*) (**U: 1 individual**); Lobster (*Homarus americanus*) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (80%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Tube Weed (*Polysiphonia lanosa*) (5%); Irish Moss (*Chondrus crispus*) (5%)
190-195	190-195	Boulder (75%); Cobble (25%)	Cunner (*Tautogolabrus adspersus*) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (40%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%); Irish Moss (*Chondrus crispus*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
195-200	195-200	Cobble (80%); Boulder (20%)	-----	Black Whip Weed (*Chordaria flagelliformis*) (25%); Bladderwrack (*Fucus* sp.) (15%); Tube Weed (*Polysiphonia lanosa*) (5%); Brown alga (*Pilayella littoralis*) (5%)
200-205	200-205	Cobble (100%)	Deep Sea Scallop (*Placopecten magellanicus*); (**O: 5-10 individuals**)	Bladderwrack (*Fucus* sp.) (25%); Brown alga (*Pilayella littoralis*) (10%); Black Whip Weed (*Chordaria flagelliformis*) (5%)

Table E.1-3. 250m Transect – Transect T3, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
205-210	205-210	Cobble (80%); Boulder (20%)	Unidentified Fish Species (**U: 1 individual**); Sea Star (*Asterias* sp.) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (20%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%); Brown alga (*Pilayella littoralis*) (5%)
210-215	210-215	Cobble (65%); Boulder (35%)	-----	Bladderwrack (*Fucus* sp.) (20%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%); Brown alga (*Pilayella littoralis*) (5%)
215-220	215-220	Cobble (100%)	-----	Bladderwrack (*Fucus* sp.) (20%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%); Brown alga (*Pilayella littoralis*) (5%)
220-225	220-225	Cobble (65%); Boulder (35%)	-----	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
225-230	225-230	Cobble (65%); Boulder (35%)	Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
230-235	230-235	Cobble (65%); Boulder (35%)	-----	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
235-240	235-240	Cobble (65%); Boulder (35%)	Cunner (*Tautogolabrus adspersus*) (**U: 1 individual**); Sea Star (*Asterias* sp.) (**U: 1 individual**); Deep Sea Scallop (*Placopecten magellanicus*); (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
240-245	240-245	Cobble (65%); Boulder (35%)	-----	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
245-250	245-250	Cobble (65%); Boulder (35%)	Cunner (*Tautogolabrus adspersus*) (**O: 5-10 individuals**)	Bladderwrack (*Fucus* sp.) (35%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Irish Moss (*Chondrus crispus*) (10%); Brown alga (*Pilayella littoralis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes “no life observed”.

Table E.1-4. 150m Transect – Transect T4, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Encrusting Red Alga (*Leptophyllum* sp.) (5%)
5-10	5-10	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Encrusting Red Alga (*Leptophyllum* sp.) (5%); Bladderwrack (*Fucus* sp.) (5%)
10-15	10-15	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Bladderwrack (*Fucus* sp.) (5%)
15-20	15-20	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Waved Whelk (*Buccinum undatum*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
20-25	20-25	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Waved Whelk (*Buccinum undatum*) (**O: 5-10 individuals**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**)	-----
25-30	25-30	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
30-35	30-35	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Waved Whelk (*Buccinum undatum*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (10%); Sea Colander (*Agarum clathratum*) (5%)
35-40	35-40	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
40-45	40-45	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Waved Whelk (*Buccinum undatum*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
45-50	45-50	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
50-55	50-55	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
55-60	55-60	Cobble (70%); Sand (25%); Silt (5%)	Barnacle (*Semibalanus balanoides*) (**C**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
60-65	60-65	Cobble (70%); Sand (25%); Silt (5%)	Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
65-70	65-70	Cobble (70%); Sand (25%); Silt (5%)	Waved Whelk (*Buccinum undatum*) (**O: 5-10 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
70-75	70-75	Cobble (70%); Sand (25%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
75-80	75-80	Cobble (70%); Sand (25%); Silt (5%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (10%)
80-85	80-85	Cobble (70%); Sand (25%); Silt (5%)	Shell Hash	Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
85-90	85-90	Cobble (90%); Sand (10%)	Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
90-95	90-95	Cobble (60%); Boulder (30%); Sand (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%)
95-100	95-100	Boulder (70%); Cobble (25%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**O: 15-20 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**)	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
100-105	100-105	Boulder (70%); Cobble (25%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Sea Star (*Asterias* sp.) (**U: 1 individual**)	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
105-110	105-110	Boulder (85%); Cobble (10%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Lobster (*Homarus americanus*) (**U: 1 individual**); Shell Hash	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Encrusting Red Alga (*Leptophyllum* sp.) (5%)
110-115	110-115	Boulder (90%); Sand (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**O: 25-30 individuals**); Sea Star (*Asterias* sp.) (**U: 1 individual**)	-----
115-120	115-120	Boulder (90%); Sand (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	Bladderwrack (*Fucus* sp.) (5%)

Table E.1-4. 150m Transect – Transect T4, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
120-125	120-125	Boulder (90%); Sand (10%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**O:5-10 individuals**); Cunner (*Tautogolabrus adspersus*) (**O: 10-15 individuals**)	Bladderwrack (*Fucus* sp.) (15%); Sea Colander (*Agarum clathratum*) (5%)
125-130	125-130	Boulder (90%); Sand (10%)	Sea Star (*Asterias* sp.) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (15%); Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%)
130-135	130-135	Boulder (90%); Sand (10%)	Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (25%); Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Tube Weed (*Polysiphonia lanosa*) (10%); Irish Moss (*Chondrus crispus*) (5%)
135-140	135-140	Boulder (90%); Sand (10%)	Unidentified Fish Species (**O: 5-10 individuals**)	Bladderwrack (*Fucus* sp.) (60%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Tube Weed (*Polysiphonia lanosa*) (5%)
140-145	140-145	Boulder (90%); Sand (10%)	Cunner (*Tautogolabrus adspersus*) (**O: 5-10 individuals**); Lobster (*Homarus americanus*) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (75%); Irish Moss (*Chondrus crispus*) (10%); Tube Weed (*Polysiphonia lanosa*) (10%)
145-150	145-150	Boulder (90%); Sand (10%)	-----	Bladderwrack (*Fucus* sp.) (85%); Black Whip Weed (*Chordaria flagelliformis*) (10%); Kelp (*Laminaria saccharina*) (5%)

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes "no life observed".

Table E.1-5. 150m Transect – Transect T5, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Not visible	Not visible	Not visible
5-10	5-10	Not visible	Not visible	Not visible
10-15	10-15	Cobble (80%); Sand (20%)	Shell Hash	-----
15-20	15-20	Cobble (80%); Sand (20%)	Shell Hash	Bladderwrack (*Fucus* sp.) (5%)
20-25	20-25	Cobble (80%); Sand (20%)	Shell Hash	Bladderwrack (*Fucus* sp.) (5%)
25-30	25-30	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 2 individuals**); Shell Hash	-----
30-35	30-35	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	-----
35-40	35-40	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Sea Star (*Asterias* sp.) (**U: 1 individual**);Shell Hash	-----
40-45	40-45	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	-----
45-50	45-50	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Green Alga (*Acrosiphonia arcta*) (10%); Red Alga (*Plumaria plumosa*) (10%)
50-55	50-55	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Green Alga (*Acrosiphonia arcta*) (10%); Red Alga (*Plumaria plumosa*) (10%)
55-60	55-60	Cobble (90%); Sand (10%)	Shell Hash	Green Alga (*Acrosiphonia arcta*) (30%); Red Alga (*Plumaria plumosa*) (30%); Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
60-65	60-65	Cobble (90%); Sand (10%)	Shell Hash	Green Alga (*Acrosiphonia arcta*) (20%); Red Alga (*Plumaria plumosa*) (20%); Sea Colander (*Agarum clathratum*) (5%)
65-70	65-70	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Green Alga (*Acrosiphonia arcta*) (20%); Red Alga (*Plumaria plumosa*) (20%)
70-75	70-75	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 1 individual**); Shell Hash	Green Alga (*Acrosiphonia arcta*) (10%); Red Alga (*Plumaria plumosa*) (10%); Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
75-80	75-80	Cobble (80%); Sand (20%)	Blue Mussel (*Mytilus edulis*) (**O: 15-20 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%); Kelp (*Laminaria saccharina*) (5%)
80-85	80-85	Cobble (80%); Sand (20%)	Shell Hash	Green Alga (*Acrosiphonia arcta*) (20%); Red Alga (*Plumaria plumosa*) (20%); Sea Colander (*Agarum clathratum*) (5%)
85-90	85-90	Cobble (80%); Sand (20%)	Shell Hash	Green Alga (*Acrosiphonia arcta*) (20%); Red Alga (*Plumaria plumosa*) (20%); Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
90-95	90-95	Cobble (80%); Sand (20%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Green Alga (*Acrosiphonia arcta*) (15%); Red Alga (*Plumaria plumosa*) (15%); Sea Colander (*Agarum clathratum*) (5%); Kelp (*Laminaria saccharina*) (5%)
95-100	95-100	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (25%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
100-105	100-105	Cobble (90%); Sand (10%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (20%); Bladderwrack (*Fucus* sp.) (5%)
105-110	105-110	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (10%); Bladderwrack (*Fucus* sp.) (5%)
110-115	110-115	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
115-120	115-120	Cobble (90%); Sand (10%)	Shell Hash	Bladderwrack (*Fucus* sp.) (5%)
120-125	120-125	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
125-130	125-130	Cobble (90%); Sand (10%)	Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (10%); Sea Colander (*Agarum clathratum*) (5%)

Table E.1-5. 150m Transect – Transect T5, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
130-135	130-135	Cobble (75%); Rock (20%); Sand (5%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Blue Mussel (*Mytilus edulis*) (**U: 1 individual**); Lobster (*Homarus americanus*) (**U: 1 individual**); Unidentified Fish Species (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (35%); Bladderwrack (*Fucus* sp.) (15%)
135-140	135-140	Boulder (75%); Cobble (20%); Sand (5%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Unidentified Fish Species (**U: 1 individual**)	Black Whip Weed (*Chordaria flagelliformis*) (10%); Bladderwrack (*Fucus* sp.) (10%)
140-145	140-145	Boulder (100%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**)	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Bladderwrack (*Fucus* sp.) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
145-150	145-150	Boulder (100%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (75%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Tube Weed (*Polysiphonia lanosa*) (5%)

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes "no life observed".

Table E.1-6. 150m Transect – Transect T6, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
0-5	0-5	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 1 individual**); Shell Hash	-----
5-10	5-10	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**U: 2 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%)
10-15	10-15	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%)
15-20	15-20	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**)	-----
20-25	20-25	Cobble (75%); Sand (25%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Black Whip Weed (*Chordaria flagelliformis*) (5%)
25-30	25-30	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	-----
30-35	30-35	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	-----
35-40	35-40	Cobble (65%); Sand (35%)	Shell Hash	-----
40-45	40-45	Cobble (65%); Sand (35%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (5%);
45-50	45-50	Cobble (75%); Sand (25%)	Shell Hash	-----
50-55	50-55	Cobble (75%); Sand (25%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Black Whip Weed (*Chordaria flagelliformis*) (5%)
55-60	55-60	Cobble (75%); Sand (25%)	Deep Sea Scallop (*Placopecten magellanicus*) (**O: 5-10 individuals**); Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Kelp (*Laminaria saccharina*) (5%)
60-65	60-65	Cobble (90%); Sand (10%)	Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Green Alga (*Acrosiphonia arcta*) (10%); Red Alga (*Plumaria plumosa*) (10%)
65-70	65-70	Cobble (90%); Sand (10%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Green Alga (*Acrosiphonia arcta*) (15%); Red Alga (*Plumaria plumosa*) (10%)
70-75	70-75	Cobble (70%); Rock (25%); Sand (5%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Shell Hash	Sea Colander (*Agarum clathratum*) (20%);
75-80	75-80	Cobble (85%); Sand (10%); Rock (5%)	Shell Hash	Green Alga (*Acrosiphonia arcta*) (10%); Red Alga (*Plumaria plumosa*) (10%); Sea Colander (*Agarum clathratum*) (5%); Bladderwrack (*Fucus* sp.) (5%)
80-85	80-85	Cobble (75%); Sand (25%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Deep Sea Scallop (*Placopecten magellanicus*) (**U: 1 individual**); Shell Hash	Sea Colander (*Agarum clathratum*) (15%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Bladderwrack (*Fucus* sp.) (5%)
85-90	85-90	Rock (90%); Cobble (10%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	Bladderwrack (*Fucus* sp.) (5%)
90-95	90-95	Rock (90%); Cobble (5%); Sand (5%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**O: 5-10 individuals**)	-----
95-100	95-100	Rock (100%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**)	-----
100-105	100-105	Rock (100%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Blue Mussel (*Mytilus edulis*) (**O: 5-10 individuals**); Unidentified Fish Species (**U: 1 individual**)	-----
105-110	105-110	Rock (100%)	Green Sea Urchin (*Strongylocentrotus droebachiensis*) (**C**); Unidentified Fish Species (**U: 1 individual**)	Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%); Black Whip Weed (*Chordaria flagelliformis*) (5%); Kelp (*Laminaria saccharina*) (5%)
110-115	110-115	Rock (100%)	Bowerbank's Halichonidria (*Halichondria bowerbanki*) (**C**); Fish (**O: 5-10 individuals**)	Black Whip Weed (*Chordaria flagelliformis*) (25%); Bladderwrack (*Fucus* sp.) (15%); Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%)

Table E.1-6. 150m Transect – Transect T6, August 31-September 3, 2010

Transect Distance (m)	Transect Tag Numbers	Substrate (% Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (% Coverage)
115-120	115-120	Rock (100%)	-----	Kelp (*Laminaria saccharina*) (5 Bladderwrack (*Fucus* sp.) (25%); %); Green Alga (*Acrosiphonia arcta*) (5%); Red Alga (*Plumaria plumosa*) (5%)
120-125	120-125	Rock (100%)	Unidentified Fish Species (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (75%); Tube Weed (*Polysiphonia lanosa*) (15%); Kelp (*Laminaria saccharina*) (5%)
125-130	125-130	Rock (90%); Cobble (10%)	Barnacle (*Semibalanus balanoides*) (**C**)	Bladderwrack (*Fucus* sp.) (75%); Irish Moss (*Chondrus crispus*) (15%); Tube Weed (*Polysiphonia lanosa*) (10%)
130-135	130-135	Rock (100%)	Barnacle (*Semibalanus balanoides*) (**C**)	Bladderwrack (*Fucus* sp.) (85%); Kelp (*Laminaria saccharina*) (15%)
135-140	135-140	Rock (100%)	Sea Star (*Asterias* sp.) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (85%); Kelp (*Laminaria saccharina*) (5%); Tube Weed (*Polysiphonia lanosa*) (5%); Sea Lettuce (*Ulva* sp.) (5%)
140-145	140-145	Rock (85%); Cobble (15%)	Sea Star (*Asterias* sp.) (**U: 1 individual**)	Bladderwrack (*Fucus* sp.) (85%); Tube Weed (*Polysiphonia lanosa*) (5%); Dulse (*Palmaria palmata*) (5%)
145-150	145-150	Rock (80%); Cobble (20%)	-----	Bladderwrack (*Fucus* sp.) (85%); Tube Weed (*Polysiphonia lanosa*) (5%)

*Definitions:

A = Abundant (Numerous (not quantifiable) observations made throughout the entire 5 m segment)

C = Common (Numerous (not quantifiable) observations made intermittently along the 5 m segment)

= Occasional (Quantifiable observations made intermittently along the 5 m segment)

U = Uncommon (Quantifiable observations made infrequently along the 5 m segment)

----- denotes “no life observed”.

Table E.1-7. List of Species Observed during Video Transect Survey of Benthic Habitat off Black Point, September 2010.

Marine Fauna	
American Oyster	*Crassostrea virginica*
Barnacle	*Semibalanus balanoides*
Blue Mussel	*Mytilus edulis*
Bowerbank's Halichonidria	*Halichondria bowerbanki*
Cunner	*Tautogolabrus adspersus*
Frilled Anemone	*Metridium senile*
Green Sea Urchin	*Strongylocentrotus droebachiensis*
Lobster	*Homarus americanus*
Periwinkle	*Littorina sp.*
Scallop	*Placopecten magellanicus*
Sea Cucumber	*Cucumaria frondosa*
Sea Peach	*Holacynthia pyriformis*
Sea Star	*Asterias sp.*
Shorthorn Sculpin	*Myoxocephalus scorpius*
Waved Whelk	*Buccinum undatum*
Marine Flora	
Black Whip Weed	*Chordaria flagelliformis*
Bladderwrack	*Fucus sp.*
Brown alga	*Pilayella littoralis*
Encrusting Red Alga	*Leptophyllum sp.*
Green Alga	*Acrosiphonia arcta*
Green Fleece	*Codium fragile*
Irish Moss	*Chondrus crispus*
Kelp	*Laminaria saccharina*
Red Alga	*Plumaria plumosa*
Sea Colander	*Agarum clathratum*
Tube Weed	*Polysiphonia lanosa*

Appendix E.2

Benthic Invertebrate Sample Results

Table E.2-1. Species Presence and Abundance within Benthic Invertebrate Samples Collected off Black Point, September 2010.

PHYLUM	SPECIES	Abundance (# of individuals per sample)					
		GQ 02	GQ 25	GQ 27	GQ 31	GQ 47	GQ 50
CNIDARIA	*Metridium senile*	1	0	0	0	0	0
	Sertularia sp.	5	0	0	0	0	0
NEMERTEA	*Cerebratulus lacteus*	0	0	0	0	0	1
OLIGOCHAETA	*Peloscolex benedeni*	0	4	0	1	0	1
	Other Tubificidae	0	0	0	0	1	2
POLYCHAETA	*Acmira catherinae*	0	40	1	0	6	3
	Amphitrite johnstoni	0	0	0	0	0	1
	Anaitides groenlandica	1	0	0	0	0	0
	Anaitides maculata	0	5	0	0	0	2
	Capitella capitata	0	5	3	0	0	0
	Dexiospira spirillum	29	0	0	0	0	0
	Eualia bilineata	1	0	0	0	0	0
	Exogone sp.	0	2	2	1	0	0
	Glycera dibranchiata	2	10	1	6	2	2
	Harmothoe extenuata	2	7	0	2	0	6
	Harmothoe imbricata	1	1	3	0	2	2
	Lepidonotus squamatus	0	1	0	0	0	0
	Lumbrineris fragilis	5	4	2	13	5	1
	Micropthalamus sp.	0	0	1	0	0	0
	Naineris quadricuspida	1	0	0	0	0	1
	Neanthes virens	1	0	1	0	0	1
	Nephtys caeca	1	0	0	0	0	0
	Pectenaria granulata	0	2	5	1	5	0
	Pherusa sp.	0	0	0	0	1	0
	Pholoe minuta	1	8	9	0	3	1
	Polycirrus sp.	0	0	3	0	0	1
	Prionospio steenstrupi	0	0	1	0	0	0
	Schistomeringus caeca	0	0	4	3	0	0
	Scoloplos sp.	1	0	0	0	0	0
	Spio filicornis	0	0	0	0	0	1
	Spirorbis borealis	48	0	0	0	0	0
	Syllis cornuta	0	2	2	0	0	5
	Tharyx sp.	1	7	9	34	14	5
BRYOZOA	*Dendrobeania murryana*	2	0	0	0	0	0
	Electra pilosa	0	0	0	0	0	1
	Membranipora membranacea	0	0	0	8	0	0
POLYPLACOPHORA	*Ischnochiton albus*	2	0	0	0	0	0
	Ischnochiton rubra	4	2	0	1	8	0

Table E.2-1. Species Presence and Abundance within Benthic Invertebrate Samples Collected off Black Point, September 2010.

PHYLUM	SPECIES	Abundance (# of individuals per sample)					
		GQ 02	GQ 25	GQ 27	GQ 31	GQ 47	GQ 50
GASTROPODA	*Bittium alternatum*	7	0	0	0	0	0
	Euspira triseriata	0	0	0	0	1	0
	Lacuna vincta	0	2	1	0	3	3
	Margarites groenlandicus	2	0	0	0	0	0
	Moelleria costulata	2	0	0	0	0	0
	Nassarius trivittatus	1	4	3	0	8	0
	Oenopota sp.	5	0	1	0	0	0
	Onoba aculeus	2	2	2	0	3	2
	Tectura testudinalis	13	44	49	21	34	35
	Trichtropis borealis	1	0	0	0	0	0
	Turbonilla interrupta	4	4	73	10	6	2
BIVALVIA	*Anomia simplex*	1	0	2	1	1	0
	Arctica islandica	1	0	0	0	0	0
	Astarte undata	13	0	1	2	0	0
	Cerastoderma pinnulatum	6	0	2	0	1	2
	Clinocardium ciliatum	2	0	0	0	0	0
	Crenella glandula	9	0	0	0	1	0
	Hiatella arctica	2	2	0	0	1	0
	Modiolus modiolus	3	1	0	3	4	53
	Mysella planulata	0	0	1	0	0	4
	Mytilus edulis	2	0	0	0	0	0
	Nucula delphinodonta	3	0	0	0	0	0
	Thyasira gouldii	9	0	0	0	0	0
CIRRIPEDIA	*Semibalanus balanoides*	3	0	2	0	0	0
ISOPODA	*Idotea phosphorea*	0	0	0	0	0	2
AMPHIPODA	*Corophium sp.*	0	0	1	0	4	0
	Caprella linearis	0	0	0	0	0	3
	Caprella septentrionalis	5	2	0	0	16	5
	Dexamine thea	0	0	0	0	1	0
	Gammarus oceanicus	0	2	0	0	0	0
	Melita dentata	1	0	0	0	0	0
	Unciola irrorata	0	53	0	1	1	17
DECAPODA	*Cancer irroratus*	0	0	0	0	0	1
	Pagurus acadianus	0	3	2	0	4	0
INSECTA	Chironomidae	0	0	0	0	0	1
ASTEROIDEA	*Asterias* sp.	2	3	0	0	0	2
OPHIUROIDEA	*Amphipholis squamatus*	4	1	1	1	3	1
	Ophiopholis aculeata	2	1	1	0	6	1
ECHINOIDEA	*Echinarachnius parma*	2	0	0	0	0	0
	Strongylocentrotus droebachiensis	3	94	8	0	21	11
ASCIDIACEA	*Molgula sp.*	0	0	0	0	0	1
Total # individuals		**219**	**318**	**197**	**109**	**166**	**183**
Number of Taxa		**47**	**30**	**31**	**17**	**30**	**36**
Wet weight g.		**10.14**	**1.45**	**1.74**	**0.81**	**19.82**	**5.82**

Appendix E.3

Marine Sediment Results

Table E.3-1. PAH Results of the Sediment Samples Collected for Black Point Quarry Project

Parameter	Units	Sample Identification and Date			CEPA Ocean Disposal Guidelines - Atlantic Region	CCME Probable Effects Levels, Rev. 2002[1]	CCME Soil Quality Guidelines, Rev. 2008[2]				
							Human Health	Environmental Health			
							Potable Water	Soil Contact		Soil and Food Ingestion	Freshwater Life
		GQ 02	GQ 25	GQ 50			Agricultural, Residential / Parkland, Commercial, and Industrial Land Uses	Agricultural, Residential / Parkland Land Uses	Commercial / Industrial Land Uses	Agricultural, Residential / Parkland Land Uses	Agricultural, Residential / Parkland, Commercial, and Industrial Land Uses
		September 1, 2010				Marine / Estuarine Sediment					
Polycyclic Aromatic Hydrocarbons (PAH) Results											
2-Methylnapthalene	mg/kg	<0.02	<0.02	<0.02	-	0.201	-	-	-	-	-
Acenaphthene	mg/kg	<0.005	<0.005	<0.005	-	0.0889	-	-	-	-	0.28
Acenaphthylene	mg/kg	<0.005	<0.005	<0.005	-	0.128	-	-	-	21.5	320
Anthracene	mg/kg	<0.04	<0.04	<0.04	-	0.245	-	2.5	32	61.5	-
Benz(a)anthracene	mg/kg	<0.01	<0.01	<0.01	-	0.693	0.33	-	-	6.2	-
Benzo(a)pyrene	mg/kg	<0.01	<0.01	<0.01	-	0.763	0.37	20	72	0.6	8800
Benzo(b)fluoranthene	mg/kg	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
Benzo(b+j)fluoranthene	mg/kg	<0.01	<0.01	<0.01	-	-	0.16	-	-	6.2	-
Benzo(g,h,i)perylene	mg/kg	<0.01	<0.01	<0.01	-	-	6.8	-	-	-	-
Benzo(k)fluoranthene	mg/kg	<0.01	<0.01	<0.01	-	-	0.034	-	-	6.2	-
Chrysene	mg/kg	<0.01	<0.01	<0.01	-	0.846	2.1	-	-	6.2	-
Dibenz(a,h)anthracene	mg/kg	<0.006	<0.006	<0.006	-	0.135	0.23	-	-	-	-
Fluoranthene	mg/kg	<0.05	<0.05	<0.05	-	1.494	-	50	180	15.4	-
Fluorene	mg/kg	<0.02	<0.02	<0.02	-	0.144	-	-	-	15.4	0.25
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	<0.01	<0.01	-	-	2.7	-	-	-	-
Naphthalene	mg/kg	<0.01	<0.01	<0.01	-	0.391	-	-	-	8.8	0.013
Phenanthrene	mg/kg	<0.04	<0.04	<0.04	-	0.544	-	-	-	43.0	0.046
Pyrene	mg/kg	<0.05	<0.05	<0.05	-	1.398	-	-	-	7.7	-
Total PAH[3]	mg/kg	0.168	0.168	0.168	2.5	-	-	-	-	-	-
IACR (Protection of Potable Water)[4]	-	0.225	0.225	0.225	-	-	1	-	-	-	-

[1] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Sediment Quality Guidelines, revised 2002.

[2] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Soil Quality Guidelines, revised 2008.

[3] Total PAH calculation based on the sum of 16 PAH compounds (acenapthene, acenapthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluorene, fluoranthene, ideno(1,2,3-cd)pyrene, napthalene, phenanthrene, and pyrene) as per guidance from Environment Canada, 2009.

[4] denotes Index of Additive Cancer Risk (IACR) = ([Benz(a)anthracene]/0.33mg/kg) + ([Chrysene]/2.1mg/kg) + ([Benzo(b+j)fluoranthene]/0.16mg/kg) + ([Benzo(k)fluoranthene]/0.034) + ([Benzo(a)pyrene]/0.37mg/kg) + ([Indeno(1,2,3-c,d)pyrene]/2.7mg/kg) + ([Dibenz(a,h)anthracene]/0.23mg/kg) + ([Benzo(g,h,i)perylene]/6.8mg/kg).

[5] denotes Total Potency Equivalent (TPE) SQG based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10^{-5}).

[6] "NA" denotes the Benzo(a)pyrene TPE has not been multiplied by an uncertainty factor (UF) of 3 as results from the lab indicate there is no evidence of creosote in the sample.

NOTE: All results below the laboratory detection limit were divided by 2 prior to further calculations.

Table E.3-2. PAH Results of the Sediment Samples Collected for Black Point Quarry Project, with Application of Benzo(a)pyrene Potency Equivalency Factors

Parameter	Units	Sample Identification and Date			Benzo(a)pyrene Potency Equivalency Factors	CCME Soil Quality Guidelines, Rev. 2008[1]
		GQ 02	GQ 25	GQ 50		Human Health
						Direct Contact
		July 22, 2010				Agricultural, Residential / Parkland, Commercial, and Industrial Land Uses
Polycyclic Aromatic Hydrocarbons (PAH) Results (with application of Benzo(a)pyrene Potency Equivalency Factors)						
Benz(a)anthracene	mg/kg	0.000500	0.000500	0.000500	0.1	-
Benzo(a)pyrene	mg/kg	0.005000	0.005000	0.005000	1	-
Benzo(b+j)fluoranthene	mg/kg	0.000500	0.000500	0.000500	0.1	-
Benzo(g,h,i)perylene	mg/kg	0.000050	0.000050	0.000050	0.01	-
Benzo(k)fluoranthene	mg/kg	0.000500	0.000500	0.000500	0.1	-
Chrysene	mg/kg	0.000050	0.000050	0.000050	0.01	-
Dibenz(a,h)anthracene	mg/kg	0.003000	0.003000	0.003000	1	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.000500	0.000500	0.000500	0.1	-
Benzo(a)pyrene TPE (10^{-5})[5]	mg/kg	0.010100	0.010100	0.010100	-	5.3
Benzo(a)pyrene TPE (10^{-5}) with UF[6]	mg/kg	NA	NA	NA		

[1] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Sediment Quality Guidelines, revised 2002.

[5] denotes Total Potency Equivalent (TPE) SQG based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10^{-5}).

Table E.3-3. Metal Concentrations in the Sediment Samples Collected for Black Point Quarry Project

Metals	Units	Sample Identification and Date			CEPA Ocean Disposal Guidelines-Atlantic Region	CCME Probable Effects Levels, Rev. 2002[1]	CCME Soil Quality Guidelines, Rev. 2008[2]		
		GQ 02	GQ 25	GQ 50			Agricultural	Residential/ Parkland	Commercial/ Industrial
		September 1, 2010				Marine / Estuarine Sediment			
Antimony	mg/kg	<2	<2	<2	-	-	20	20	40
Arsenic	mg/kg	3	<2	3	-	41.6	12	12	12
Barium	mg/kg	18	6	<5	-	-	750	500	2000
Beryllium	mg/kg	<2	<2	<2	-	-	4	4	8
Cadmium	mg/kg	<0.3	<0.3	<0.3	0.6	4.2	1.4	10	22
Chromium +6	mg/kg	<0.5	<0.5	<0.5	-	-	0.4	0.4	1.4
Chromium (Total)	mg/kg	10	11	11	-	160	64	64	87
Cobalt	mg/kg	3	3	3	-	-	40	50	300
Copper	mg/kg	4	4	4	81*	108	63	63	91
Lead	mg/kg	5.5	3.1	3	66*	112	70	140	260 / 600
Mercury	mg/kg	<0.05	<0.05	<0.05	0.75	0.7	6.6	6.6	24 / 50
Molybdenum	mg/kg	<2	<2	<2	-	-	5	10	40
Nickel	mg/kg	9	10	10	-	-	50	50	50
Selenium	mg/kg	<1	<1	<1	-	-	1	1	2.9
Silver	mg/kg	<0.5	<0.5	<0.5	-	-	20	20	40
Thallium	mg/kg	<0.1	<0.1	<0.1	-	-	1	1	1
Tin	mg/kg	<2	<2	<2	-	-	5	50	300
Uranium	mg/kg	0.6	0.5	0.3			23	23	33 / 300
Vanadium	mg/kg	12	12	12	-	-	130	130	130
Zinc	mg/kg	29	25	20	160*	271	200	200	360

*Former Interim Rejection Limits (1991) which are not currently used to screen for ocean based disposal permitting but may be considered in terms of further investigation prior to issuance of an Ocean Disposal Permit (Victor Li, Environment Canada, pers. comm., June 2002).

[1] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Sediment Quality Guidelines, revised 2002.

[2] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Soil Quality Guidelines, revised 2008.

Table E.3-4. Results Table for BTEX Compounds (mg/kg) and Individual TPH Carbon Segments (mg/kg) in the Sediment Samples Collected for Black Point Quarry Project

Sample Identification	Date	Benzene	Toluene	Ethylbenzene	Xylene (Total)	C_6-C_{10} Less BTEX	C_{10}-C_{16}	C_{16}-C_{21}	C_{21}-C_{32}	C_6-C_{10} Less BTEX	Modified TPH	Resemblance*
GQ 02	Sept 1, 2010	<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<3	<20	No resemblance to fuel products.
GQ 25		<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<3	<20	No resemblance to fuel products.
GQ 50		<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<3	<20	No resemblance to fuel products.

Atlantic RBCA Version 2.0 and CCME SQGs for Comparison with the Above Analytical Results (mg/kg)

Atlantic RBCA Tier I Risk-Based Screening Levels**			**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Gasoline**	**Diesel #2**	**#6 Oil**
Residential	Potable	Coarse-grained	0.03	0.38	0.08	11	39	140	690
		Fine-grained	0.01	0.08	0.02	2.3	140	220	970
	Non-Potable	Coarse-grained	0.16	14	58	17	39	140	690
		Fine-grained	1.5	120	430	160	330	4,400	8,300
Commercial	Potable	Coarse-grained	0.03	0.38	0.08	11	450	7,400	10,000
		Fine-grained	0.01	0.08	0.02	2.3	520	840	4,700
	Non-Potable	Coarse-grained	1.8	160	430	200	450	7,400	10,000
		Fine-grained	11	680	430	650	10,000	7,700	10,000
CCME SQGs for Surface Soils***									
Agricultural		Coarse-grained	0.03[1] (0.0095[2])	0.37	0.082	11.0	-	-	-
		Fine-grained	0.0068[1,2]	0.08	0.018	2.4	-	-	-
Residential/Parkland		Coarse-grained	0.03[1] (0.0095[2])	0.37	0.082	11.0	-	-	-
		Fine-grained	0.0068[1,2]	0.08	0.018	2.4	-	-	-
Commercial		Coarse-grained	0.03[1,2]	0.37	0.082	11.0	-	-	-
		Fine-grained	0.0068[1,2]	0.08	0.018	2.4	-	-	-
Industrial		Coarse-grained	0.03[1,2]	0.37	0.082	11.0	-	-	-
		Fine-grained	0.0068[1,2]	0.08	0.018	2.4	-	-	-

*Modified TPH values reflect the sum of the individual carbon fractions that resembles gasoline, diesel #2, and lube oil. No guideline comparison required as results indicate no resemblance to fuel products observed in the samples.

**Atlantic RBCA Version 2.0 Reference Document for Petroleum Impacted Sites (2003, updated March 2007).

***A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. Report CCME-EPC-101E, March 1997 with updates to 2004.

"-" denotes no guideline available.

1 denotes guideline value based on "10-5 Incremental Risk". For the purposes of this report, an incremental risk of 10-5 is used.

2 denotes guideline value based on "10-6 Incremental Risk".

Table E.3-5. Analytical Results of the Sediment Samples Collected for Black Point Quarry Project

Parameter	Units	Sample Identification and Date			CEPA Ocean Disposal Guidelines-Atlantic Region	CCME Probable Effects Levels, Rev. 2002[1]	CCME Soil Quality Guidelines, Rev. 2008[2]		
		GQ 02	GQ 25	GQ 50			Agricultural	Residential / Parkland	Commercial / Industrial
		September 1, 2010				Marine / Estuarine Sediment			
Polychlorinated Biphenyl (PCB) Results*									
Aroclor 1254	mg/kg	<0.1	<1.0	<1.0	-	0.709	-	-	-
Total PCB Concentration	mg/kg	<0.05	<0.5	<0.5	0.1	0.189	0.5	1.3	33
Dichloro-Diphenyl-Trichloroethane (DDT) Results*									
2,4' - DDD + 4,4' - DDD	mg/kg	<0.0015	<0.015	<0.015	-	0.00781	-	-	-
2,4' - DDE + 4,4' - DDE	mg/kg	<0.001	<0.010	<0.010	-	0.37400	-	-	-
2,4' - DDT + 4,4' - DDT	mg/kg	<0.001	<0.010	<0.010	-	0.00477	-	-	-
Total DDT	mg/kg	<0.0035	<0.035	<0.035	-	-	0.7	0.7	12
Grain Size Results									
<PHI -4.00 (12.5 mm)	%	100	100	100	-	-	-	-	-
<PHI -3.00 (9.5 mm)	%	87.3	86.3	100	-	-	-	-	-
<PHI -2.00 (4.75 mm)	%	53.4	46.6	34.3	-	-	-	-	-
<PHI -1.00 (2.00 mm)	%	48.9	23.6	17.6	-	-	-	-	-
<PHI 0.00 (1.00 mm)	%	45.9	16.5	13	-	-	-	-	-
<PHI +1.0 (0.50 mm)	%	40.5	11.1	7.6	-	-	-	-	-
<PHI +2.0 (0.25 mm)	%	28	7	3.6	-	-	-	-	-
<PHI +3.0 (0.125 mm)	%	12	5.3	2.3	-	-	-	-	-
<PHI +4.0 (0.0625 mm)	%	7.3	4.4	1.9	-	-	-	-	-
<PHI +5.0 (0.031 mm)	%	6.4	3.4	1.8	-	-	-	-	-
<PHI +6.0 (0.0156 mm)	%	5.1	2.5	1.2	-	-	-	-	-
<PHI +7.0 (0.0078 mm)	%	3.3	1.4	0.9	-	-	-	-	-
<PHI +8.0 (0.0039 mm)	%	2.8	1.2	0.6	-	-	-	-	-
<PHI +9.0 (0.002 mm)	%	1.9	0.6	<0.1	-	-	-	-	-
Gravel	%	51	76	82	-	-	-	-	-
Sand	%	42	19	16	-	-	-	-	-
Silt	%	5	3	1	-	-	-	-	-
Clay	%	3	1	<1	-	-	-	-	-
Carbon and Moisture Results									
Total Carbon	g/kg	1.62	0.60	1.10	-	-	-	-	-
Total Organic Carbon	g/kg	0.17	0.25	0.55	-	-	-	-	-
Total Inorganic Carbon	g/kg	1.45	0.35	0.55	-	-	-	-	-
Moisture	%	17	14	13	-	-	-	-	-

[1] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Sediment Quality Guidelines, revised 2002.

[2] denotes Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines - Soil Quality Guidelines, revised 2008.

*Standard laboratory detection limits were increased for samples GQ 25 and GQ 50 due to chromatographic interference.

NOTE: All results below the laboratory detection limit were divided by 2 prior to further calculations.

Appendix E.4

AGAT Quality Assurance/Quality Control and Certificates of Analyses for Marine Sediment Samples

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
580 MAIN STREET, SUITE 105
SAINT JOHN, NB E2K1J5

ATTENTION TO: CHYANN KIRBY

PROJECT NO: GRQ - Marine

AGAT WORK ORDER: 10X432562

SOIL ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganic Supervisor

TRACE ORGANICS REVIEWED BY: Kelly Hogue, Senior Organic Chemist

DATE REPORTED: Sep 15, 2010

PAGES (INCLUDING COVER): 16

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718, or at 1-888-468-8718

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Available Metals in Soil

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
Aluminum	mg/kg		10	5550	4760	4300
Antimony	mg/kg		2	<2	<2	<2
Arsenic	mg/kg		2	3	<2	3
Barium	mg/kg		5	18	6	<5
Beryllium	mg/kg		2	<2	<2	<2
Boron	mg/kg		5	<5	<5	<5
Cadmium	mg/kg		0.3	<0.3	<0.3	<0.3
Chromium	mg/kg		2	10	11	11
Cobalt	mg/kg		1	3	3	3
Copper	mg/kg		2	4	4	4
Iron	mg/kg		50	14100	12100	11600
Lead	mg/kg		0.5	5.5	3.1	2.9
Manganese	mg/kg		2	413	267	213
Molybdenum	mg/kg		2	<2	<2	<2
Nickel	mg/kg		2	9	10	10
Selenium	mg/kg		1	<1	<1	<1
Silver	mg/kg		0.5	<0.5	<0.5	<0.5
Strontium	mg/kg		5	60	69	155
Thallium	mg/kg		0.1	<0.1	<0.1	<0.1
Tin	mg/kg		2	<2	<2	<2
Uranium	mg/kg		0.1	0.6	0.5	0.3
Vanadium	mg/kg		2	12	12	12
Zinc	mg/kg		5	29	25	20

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1971606-1971639 Results are based on the dry weight of the sample.

Certified By:

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AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

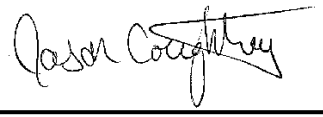
Grain Size Analysis (Sieve & Pipette)

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
Particle Size Distribution (<12.5mm, -4 PHI)	%		0.1	100.0	100.0	100.0
Particle Size Distribution (<9.5mm, -3 PHI)	%		0.1	87.3	86.3	100.0
Particle Size Distribution (<4.75mm, -2 PHI	%		0.1	53.4	46.6	34.3
Particle Size Distribution (<2mm, -1 PHI)	%		0.1	48.9	23.6	17.6
Particle Size Distribution (<1mm, 0 PHI)	%		0.1	45.9	16.5	13.0
Particle Size Distribution (<1/2mm, 1 PHI)	%		0.1	40.5	11.1	7.6
Particle Size Distribution (<1/4mm, 2 PHI)	%		0.1	28.0	7.0	3.6
Particle Size Distribution (<1/8mm, 3 PHI)	%		0.1	12.0	5.3	2.3
Particle Size Distribution (<1/16mm, 4 PHI)	%		0.1	7.3	4.4	1.9
Particle Size Distribution (<1/32mm, 5 PHI)	%		0.1	6.4	3.4	1.8
Particle Size Distribution (<1/64mm, 6 PHI)	%		0.1	5.1	2.5	1.2
Particle Size Distribution (<1/128mm, 7 PHI)	%		0.1	3.3	1.4	0.9
Particle Size Distribution (<1/256mm, 8 PHI)	%		0.1	2.8	1.2	0.6
Particle Size Distribution (<1/512mm, 9 PHI)	%		0.1	1.9	0.6	<0.1
Particle Size Distribution (Gravel)	%		1	51	76	82
Particle Size Distribution (Sand)	%		1	42	19	16
Particle Size Distribution (Silt)	%		1	5	3	1
Particle Size Distribution (Clay)	%		1	3	1	<1
Particles >75um	%		1	92	95	98
Classification	Coarse/Fine			Coarse	Coarse	Coarse

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Mercury and Hexavalent Chromium Analysis in Soil

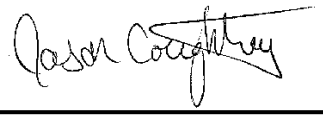
DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
Mercury	mg/kg		0.05	<0.05	<0.05	<0.05
Chromium, Hexavalent	mg/kg		0.5	<0.5	<0.5	<0.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1971606-1971639 Results are based on the dry weight of the soil.

Certified By:



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AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
Total Organic Carbon	%		0.15	0.17	0.25	0.55
Total Inorganic Carbon	%		0.01	1.45	0.35	0.55

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Atlantic RBCA Tier 1 Hydrocarbons in Soil - Low Level HC (Version 3.0)

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
Benzene	mg/kg		0.005	<0.005	<0.005	<0.005
Ethylbenzene	mg/kg		0.01	<0.01	<0.01	<0.01
Toluene	mg/kg		0.04	<0.04	<0.04	<0.04
Xylene (Total)	mg/kg		0.05	<0.05	<0.05	<0.05
C6-C10 (less BTEX)	mg/kg		3	<3	<3	<3
>C10-C16 Hydrocarbons	mg/kg		15	<15	<15	<15
>C16-C21 Hydrocarbons	mg/kg		15	<15	<15	<15
>C21-C32 Hydrocarbons	mg/kg		15	<15	<15	<15
Modified TPH (Tier 1)	mg/kg		20	<20	<20	<20
Return to Baseline at C32				Y	Y	Y
% Moisture	%		1	17	14	13
Surrogate	**Unit**	**Acceptable Limits**				
Isobutylbenzene - EPH	%	60-140		99	92	95
Isobutylbenzene - VPH	%	60-140		113	112	111
n-Dotriacontane - EPH	%	60-140		112	94	102

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1971606-1971639 Results are based on the dry weight of the soil.
Resemblance: No resemblance.

Certified By: Kelly Hogue

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Certificate of Analysis

AGAT WORK ORDER: 10X432562
PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

OC Pesticides and PCBs in Soil

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	RDL	GQ 25 1971621	GQ 50 1971639
alpha-BHC	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
beta-BHC	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Gamma-BHC (Lindane)	mg/Kg		0.0003	<0.0003	0.0030	<0.0030	<0.0030
delta-BHC	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Heptachlor	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Aldrin	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Heptachlor Epoxide	mg/Kg		0.0006	<0.0006	0.0060	<0.0060	<0.0060
Alpha-Chlordane	mg/Kg		0.002	<0.002	0.020	<0.020	<0.020
Gamma-Chlordane	mg/Kg		0.002	<0.002	0.020	<0.020	<0.020
Endosulfan I	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Endosulfan II	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Endosulfan Sulfate	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Dieldrin	mg/Kg		0.0007	<0.0007	0.0070	<0.0070	<0.0070
p,p'-DDE	mg/Kg		0.001	<0.001	0.010	<0.010	<0.010
o,p'-DDE	mg/Kg		0.001	<0.001	0.010	<0.010	<0.010
Endrin	mg/Kg		0.002	<0.002	0.020	<0.020	<0.020
DDD (o,p')	mg/Kg		0.002	<0.002	0.020	<0.020	<0.020
p,p'-DDD	mg/Kg		0.001	<0.001	0.010	<0.010	<0.010
p,p'- DDT	mg/Kg		0.001	<0.001	0.010	<0.010	<0.010
o,p'-DDT	mg/Kg		0.001	<0.001	0.010	<0.010	<0.010
Endrin Aldehyde	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Endrin ketone	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Methoxychlor	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Mirex	mg/Kg		0.005	<0.005	0.050	<0.050	<0.050
Hexachlorobenzene	mg/Kg		0.05	<0.05	0.50	<0.50	<0.50
PCBs	mg/Kg		0.05	<0.05	0.50	<0.50	<0.50
Aroclor 1254	mg/Kg		0.1	<0.1	1.0	<1.0	<1.0
Surrogate	Unit	Acceptable Limits					
Decachlorobiphenyl	%	50-130		100		89	101

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AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

OC Pesticides and PCBs in Soil

DATE SAMPLED: Sep 01, 2010	DATE RECEIVED: Sep 02, 2010	DATE REPORTED: Sep 15, 2010	SAMPLE TYPE: Soil

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

1971606 Results are based on the dry weight of the soil.
Due to the high moisture content the sample was air dried prior to extraction.

1971621-1971639 Results are based on the dry weight of the soil.
Due to the high moisture content the sample was air dried prior to extraction.
Sample was diluted and Reporting Detection Limit raised due to chromatographic interference.

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AGAT WORK ORDER: 10X432562
PROJECT NO: GRQ - Marine

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

ATTENTION TO: CHYANN KIRBY

Polycyclic Aromatic Hydrocarbons in Soil (CCME)

DATE SAMPLED: Sep 01, 2010 | DATE RECEIVED: Sep 02, 2010 | DATE REPORTED: Sep 15, 2010 | SAMPLE TYPE: Soil

Parameter	Unit	G / S	RDL	GQ 02 1971606	GQ 25 1971621	GQ 50 1971639
1-Methylnaphthalene	mg/kg		0.05	<0.05	<0.05	<0.05
2-Methylnaphthalene	mg/kg		0.02	<0.02	<0.02	<0.02
Acenaphthene	mg/kg		0.005	<0.005	<0.005	<0.005
Acenaphthylene	mg/kg		0.005	<0.005	<0.005	<0.005
Acridine	mg/Kg		0.05	<0.05	<0.05	<0.05
Anthracene	mg/kg		0.04	<0.04	<0.04	<0.04
Benzo(a)anthracene	mg/kg		0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05
Benzo(b+j)fluoranthene	mg/kg		0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	mg/kg		0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg		0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	mg/kg		0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg		0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene	mg/kg		0.006	<0.006	<0.006	<0.006
Fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg		0.02	<0.02	<0.02	<0.02
Indeno(1,2,3)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg		0.01	<0.01	<0.01	<0.01
Perylene	mg/kg		0.05	<0.05	<0.05	<0.05
Phenanthrene	mg/kg		0.04	<0.04	<0.04	<0.04
Pyrene	mg/kg		0.05	<0.05	<0.05	<0.05
Quinoline	mg/Kg		0.05	<0.05	<0.05	<0.05
% Moisture	%			17	14	13
Surrogate	**Unit**	**Acceptable Limits**				
Nitrobenzene-d5	%	50-140		101	113	106
2-Fluorobiphenyl	%	50-140		85	90	83
Terphenyl-d14	%	50-140		94	101	93

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
1971606-1971639 Results are based on the dry weight of the soil.

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
AGAT WORK ORDER: 10X432562
PROJECT NO: GRQ - Marine
ATTENTION TO: CHYANN KIRBY

Soil Analysis

RPT Date: Sep 15, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Available Metals in Soil															
Aluminum	90920	1964787	4770	5070	6.1%	< 10	101%	90%	110%	96%	90%	110%	106%	70%	130%
Antimony	90920	1964787	< 2	< 2	0.0%	< 2	100%	90%	110%	99%	90%	110%	86%	70%	130%
Arsenic	90920	1964787	7	8	13.3%	< 2	97%	90%	110%	96%	90%	110%	111%	70%	130%
Barium	90920	1964787	18	18	0.0%	< 5	96%	90%	110%	103%	90%	110%	107%	70%	130%
Beryllium	90920	1964787	< 2	< 2	0.0%	< 2	99%	90%	110%	102%	90%	110%	99%	70%	130%
Boron	90920	1964787	16	20	22.2%	< 5	102%	90%	110%	91%	90%	110%	88%	70%	130%
Cadmium	90920	1964787	0.8	0.8	0.0%	< 0.3	98%	90%	110%	102%	90%	110%	103%	70%	130%
Chromium	90920	1964787	11	12	8.7%	< 2	104%	90%	110%	108%	90%	110%	97%	70%	130%
Cobalt	90920	1964787	3	4	28.6%	< 1	108%	90%	110%	104%	90%	110%	92%	70%	130%
Copper	90920	1964787	36	42	15.4%	< 2	107%	90%	110%	103%	90%	110%	91%	70%	130%
Iron	90920	1964787	12500	16400	27.0%	< 50	105%	90%	110%	104%	90%	110%	99%	70%	130%
Lead	90920	1964787	749	624	18.2%	< 0.5	99%	90%	110%	102%	90%	110%	102%	70%	130%
Manganese	90920	1964787	813	763	6.3%	< 2	108%	90%	110%	108%	90%	110%	106%	70%	130%
Molybdenum	90920	1964787	< 2	< 2	0.0%	< 2	98%	90%	110%	87%	80%	120%	94%	70%	130%
Nickel	90920	1964787	9	11	20.0%	< 2	108%	90%	110%	109%	90%	110%	95%	70%	130%
Selenium	90920	1964787	< 1	< 1	0.0%	< 1	101%	90%	110%	97%	90%	110%	99%	70%	130%
Silver	90920	1964787	< 0.5	< 0.5	0.0%	< 0.5	100%	90%	110%	88%	80%	120%	101%	70%	130%
Strontium	90920	1964787	16	15	6.5%	< 5	96%	90%	110%	98%	90%	110%	105%	70%	130%
Thallium	90920	1964787	0.1	0.1	0.0%	< 0.1	100%	90%	110%	103%	90%	110%	104%	70%	130%
Tin	90920	1964787	13	15	14.3%	< 2	95%	90%	110%	100%	90%	110%	97%	70%	130%
Uranium	90920	1964787	1.0	1.0	0.0%	< 0.1	95%	90%	110%	104%	90%	110%	117%	70%	130%
Vanadium	90920	1964787	11	12	8.7%	< 2	99%	90%	110%	102%	90%	110%	97%	70%	130%
Zinc	90920	1964781	33	32	3.1%	< 5	109%	90%	110%	110%	90%	110%	98%	70%	130%
Mercury and Hexavalent Chromium Analysis in Soil															
Mercury	1	1971606	<0.05	<0.05	0.0%	< 0.05	113%	70%	130%		70%	130%	93%	70%	130%
Chromium, Hexavalent	1	1965291	<0.5	<0.5	0.0%	< 0.5	96%	80%	120%	93%	80%	120%		80%	120%
Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)															
Total Organic Carbon	6159	1606	0.17	0.15	12.5%	< 0.15	100%	90%	110%				106%	90%	110%

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL
AGAT WORK ORDER: 10X432562
PROJECT NO: GRQ - Marine
ATTENTION TO: CHYANN KIRBY

Trace Organics Analysis

RPT Date: Sep 15, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Atlantic RBCA Tier 1 Hydrocarbons in Soil - Low Level HC (Version 3.0)															
Benzene	1	1971639	< 0.005	<0.005	0.0%	< 0.005	87%	60%	140%	76%	60%	140%	92%	30%	130%
Ethylbenzene	1	1971639	< 0.01	<0.01	0.0%	< 0.01	83%	60%	140%	83%	60%	140%	95%	30%	130%
Toluene	1	1971639	< 0.04	< 0.04	0.0%	< 0.04	83%	60%	140%	80%	60%	140%	94%	30%	130%
Xylene (Total)	1	1971639	< 0.05	< 0.05	0.0%	< 0.05	85%	60%	140%	85%	60%	140%	96%	30%	130%
C6-C10 (less BTEX)	1	1971639	< 3	< 3	0.0%	< 3	94%	60%	140%	88%	60%	140%	74%	30%	130%
>C10-C16 Hydrocarbons	1		<15	<15	0.0%	< 15	101%	70%	130%	102%	60%	140%	122%	30%	130%
>C16-C21 Hydrocarbons	1		<15	<15	0.0%	< 15	87%	70%	130%	102%	60%	140%	122%	30%	130%
>C21-C32 Hydrocarbons	1		<15	<15	0.0%	< 15	86%	60%	140%	102%	60%	140%	122%	30%	130%
Polycyclic Aromatic Hydrocarbons in Soil (CCME)															
1-Methylnaphthalene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	76%	50%	140%	83%	50%	140%	78%	50%	140%
2-Methylnaphthalene	1	1971621	< 0.02	< 0.02	0.0%	< 0.02	102%	50%	140%	84%	50%	140%	75%	50%	140%
Acenaphthene	1	1971621	< 0.005	< 0.005	0.0%	< 0.005	103%	50%	140%	97%	50%	140%	96%	50%	140%
Acenaphthylene	1	1971621	< 0.005	< 0.005	0.0%	< 0.005	104%	50%	140%	91%	50%	140%	93%	50%	140%
Acridine	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	118%	50%	140%	68%	50%	140%	70%	50%	140%
Anthracene	1	1971621	< 0.04	< 0.04	0.0%	< 0.04	90%	50%	140%	84%	50%	140%	82%	50%	140%
Benzo(a)anthracene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	93%	50%	140%	82%	50%	140%	79%	50%	140%
Benzo(a)pyrene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	94%	50%	140%	109%	50%	140%	83%	50%	140%
Benzo(b)fluoranthene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	79%	50%	140%	80%	50%	140%	96%	50%	140%
Benzo(b+j)fluoranthene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	87%	50%	140%	87%	50%	140%	91%	50%	140%
Benzo(e)pyrene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	113%	50%	140%	66%	50%	140%	64%	50%	140%
Benzo(ghi)perylene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	115%	50%	140%	107%	50%	140%	105%	50%	140%
Benzo(k)fluoranthene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	102%	50%	140%	69%	50%	140%	112%	50%	140%
Chrysene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	92%	50%	140%	117%	50%	140%	87%	50%	140%
Dibenzo(a,h)anthracene	1	1971621	< 0.006	< 0.006	0.0%	< 0.006	106%	50%	140%	96%	50%	140%	95%	50%	140%
Fluoranthene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	96%	50%	140%	86%	50%	140%	87%	50%	140%
Fluorene	1	1971621	< 0.02	< 0.02	0.0%	< 0.02	106%	50%	140%	101%	50%	140%	103%	50%	140%
Indeno(1,2,3)pyrene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	114%	50%	140%	108%	50%	140%	81%	50%	140%
Naphthalene	1	1971621	< 0.01	< 0.01	0.0%	< 0.01	107%	50%	140%	104%	50%	140%	96%	50%	140%
Perylene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	85%	50%	140%	80%	50%	140%	76%	50%	140%
Phenanthrene	1	1971621	< 0.04	< 0.04	0.0%	< 0.04	110%	50%	140%	87%	50%	140%	87%	50%	140%
Pyrene	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	105%	50%	140%	92%	50%	140%	86%	50%	140%
Quinoline	1	1971621	< 0.05	< 0.05	0.0%	< 0.05	87%	50%	140%	105%	50%	140%	85%	50%	140%
OC Pesticides and PCBs in Soil															
alpha-BHC	1		< 0.050	< 0.050	0.0%	< 0.050	101%	60%	140%	102%	60%	140%	102%	60%	140%
beta-BHC	1		< 0.050	< 0.050	0.0%	< 0.050	96%	90%	110%	90%	80%	120%	112%	80%	120%
Gamma-BHC (Lindane)	1		< 0.0030	< 0.0030	0.0%	< 0.0030	98%	60%	140%	91%	60%	140%	114%	60%	140%
delta-BHC	1		< 0.050	< 0.050	0.0%	< 0.050	104%	80%	120%	85%	80%	120%	112%	80%	120%
Heptachlor	1		< 0.050	< 0.050	0.0%	< 0.050	102%	60%	140%	82%	60%	140%	96%	60%	140%

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Quality Assurance

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

ATTENTION TO: CHYANN KIRBY

Trace Organics Analysis (Continued)

RPT Date: Sep 15, 2010			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Aldrin	1		< 0.050	< 0.050	0.0%	< 0.050	97%	60%	140%	97%	60%	140%	97%	60%	140%
Heptachlor Epoxide	1		< 0.0060	< 0.0060	0.0%	< 0.0060	98%	60%	140%	89%	60%	140%	112%	60%	140%
Alpha-Chlordane	1		< 0.020	< 0.020	0.0%	< 0.020	104%	60%	140%	90%	60%	140%	114%	60%	140%
Gamma-Chlordane	1		< 0.020	< 0.020	0.0%	< 0.020	96%	60%	140%	104%	60%	140%	97%	60%	140%
Endosulfan I	1		< 0.050	< 0.050	0.0%	< 0.050	98%	90%	110%	102%	90%	110%	96%	80%	120%
Endosulfan II	1		< 0.050	< 0.050	0.0%	< 0.050	104%	60%	140%	90%	60%	140%	97%	60%	140%
Endosulfan Sulfate	1		< 0.050	< 0.050	0.0%	< 0.050	104%	80%	120%	86%	80%	120%	114%	80%	120%
Dieldrin	1		< 0.0070	< 0.0070	0.0%	< 0.0070	97%	60%	140%	85%	60%	140%	114%	60%	140%
p,p'-DDE	1		< 0.010	< 0.010	0.0%	< 0.010	96%	60%	140%	97%	60%	140%	120%	60%	140%
o,p'-DDE	1		< 0.010	< 0.010	0.0%	< 0.010	120%	60%	140%	92%	60%	140%	114%	60%	140%
Endrin	1		< 0.020	< 0.020	0.0%	< 0.020	112%	60%	140%	91%	60%	140%	98%	60%	140%
DDD (o,p')	1		< 0.020	< 0.020	0.0%	< 0.020	102%	90%	110%	90%	90%	110%	96%	60%	140%
p,p'-DDD	1		< 0.010	< 0.010	0.0%	< 0.010	97%	60%	140%	87%	60%	140%	97%	60%	140%
p,p'- DDT	1		< 0.010	< 0.010	0.0%	< 0.010	97%	60%	130%	90%	60%	130%	96%	60%	130%
o,p'-DDT	1		< 0.010	< 0.010	0.0%	< 0.010	96%	60%	140%	85%	60%	140%	112%	60%	140%
Endrin Aldehyde	1		< 0.050	< 0.050	0.0%	< 0.050	104%	80%	120%	87%	80%	120%	114%	80%	120%
Endrin ketone	1		< 0.050	< 0.050	0.0%	< 0.050	102%	80%	120%	90%	80%	120%	120%	80%	120%
Methoxychlor	1		< 0.050	< 0.050	0.0%	< 0.050	96%	60%	140%	91%	60%	140%	120%	60%	140%
Mirex	1		< 0.050	< 0.050	0.0%	< 0.050	97%	70%	130%	92%	70%	130%	104%	70%	130%
Hexachlorobenzene	1		< 0.50	< 0.50	0.0%	< 0.50	104%	60%	140%	90%	60%	140%	102%	60%	140%
PCBs	1		< 0.50	< 0.50	0.0%	< 0.50	96%	60%	140%	112%	60%	140%		60%	140%

Certified By: Kelly Hogue

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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Aluminum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Antimony	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Arsenic	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Barium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Beryllium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Boron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cadmium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Chromium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cobalt	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Copper	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Iron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Lead	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Manganese	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Molybdenum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Nickel	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Selenium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Silver	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Strontium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Thallium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Tin	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Uranium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Vanadium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Zinc	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Particle Size Distribution (<12.5mm, -4 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<9.5mm, -3 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<4.75mm, -2 PHI	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<2mm, -1 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1mm, 0 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/2mm, 1 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/4mm, 2 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/8mm, 3 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE

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Method Summary

CLIENT NAME: AMEC EARTH AND ENVIRONMENTAL

AGAT WORK ORDER: 10X432562

PROJECT NO: GRQ - Marine

ATTENTION TO: CHYANN KIRBY

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Particle Size Distribution (<1/16mm, 4 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/32mm, 5 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/64mm, 6 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/128mm, 7 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/256mm, 8 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (<1/512mm, 9 PHI)	INOR-121-6034	ASTM D-422-63 & ODCA, 1976	SIEVE & PIPETTE
Particle Size Distribution (Gravel)	INOR-121-6031	Canadian Society of Soil Science - SSMA	HYDROMETER
Particle Size Distribution (Sand)	INOR-121-6031	Canadian Society of Soil Science - SSMA	HYDROMETER
Particle Size Distribution (Silt)	INOR-121-6031	Canadian Society of Soil Science - SSMA	HYDROMETER
Particle Size Distribution (Clay)	INOR-121-6031	Canadian Society of Soil Science - SSMA	HYDROMETER
Particles >75um	INOR-121-6031, INOR-121-6034	ASTM D-422-63 & ODCA, 1976, SSMA	CALCULATED
Classification	INOR-121-6031, INOR-121-6031	Atlantic RBCA	CALCULATED
Mercury	INOR-121-6101 & INOR-121-6107	Based on EPA 245.5 & SM 3112B	CV/AA
Chromium, Hexavalent	INOR-121-6029	SSSA 5;25 p. 683	SPECTROPHOTOMETER
Total Organic Carbon	SOIL 0480; SOIL 0110; SOIL 0120	NELSON 1996; SHEPPARD 2007	COLOR
Total Inorganic Carbon		ASA 11 - 2.2	CVAAS

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Ethylbenzene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Toluene	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
Xylene (Total)	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
C6-C10 (less BTEX)	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
>C10-C16 Hydrocarbons	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
>C16-C21 Hydrocarbons	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
>C21-C32 Hydrocarbons	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
Modified TPH (Tier 1)	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS/FID
Return to Baseline at C32	ORG-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
% Moisture	LAB-131-4024	Topp, G.C. 1993. Soil Water Content. CSSS	GRAVIMETRIC
Isobutylbenzene - EPH	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
Isobutylbenzene - VPH	VOL-120-5013	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/MS
n-Dotriacontane - EPH	VOL-120-5007	Atlantic RBCA Guidelines for Laboratories Tier 1	GC/FID
alpha-BHC	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
beta-BHC	ORG 5508	EPA SW-846 3541 & 8081A	GC/ECD
Gamma-BHC (Lindane)	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
delta-BHC	TO 0110	EPA SW-846 355	GC/ECD
Heptachlor	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Aldrin	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Heptachlor Epoxide	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Alpha-Chlordane	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Gamma-Chlordane	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Endosulfan I	TO 0110	EPA SW-846 355	GC/ECD
Endosulfan II	ORG 5009	EPA SW-846 3550 & 8081	GC/MS & GC/ECD
Endosulfan Sulfate	TO 0110	EPA SW-846 355	GC/ECD
Dieldrin	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
p,p'-DDE	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
o,p'-DDE	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Endrin	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
DDD (o,p')	ORG-91-5113	EPA SW - 846 3541/8081	GC/ECD
p,p'-DDD	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
p,p'- DDT	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
o,p'-DDT	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Endrin Aldehyde	TO 0110	EPA SW-846 355	GC/ECD
Endrin ketone	TO 0110	EPA SW-846 355	GC/ECD
Methoxychlor	ORG 5513	EPA SW-846 3541,3550B, 3620B,8081A,8082	GC/ECD
Mirex	ORG 5009	EPA SW-846 3550 & 8081	GC/ECD
Hexachlorobenzene	ORG 5508	EPA SW-846 3510C & 8270	GC/MS
Decachlorobiphenyl	ORG-120-5106, ORG-120-5108	EPA SW846 3510C/8080/8010, 8081A	GC/ECD
PCBs	ORG-120-5107	EPA SW-846 8081A & 8082	GC/ECD
Aroclor 1254	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
1-Methylnaphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
2-Methylnaphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acenaphthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acenaphthylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Acridine	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(a)anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(a)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(b)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(b+j)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(e)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(ghi)perylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Benzo(k)fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Chrysene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Dibenzo(a,h)anthracene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Fluoranthene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Fluorene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Indeno(1,2,3)pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Naphthalene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Perylene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Phenanthrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Pyrene	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Quinoline	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
% Moisture			GRAVIMETRIC
Nitrobenzene-d5	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
2-Fluorobiphenyl	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS
Terphenyl-d14	ORG-120-5104	EPA SW846/3541/3510/8270C	GC/MS

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Laboratory use Only
Arrival Condition: ☑ Good ☐ Poor (complete 'notes')
Arrival Temperature: 7 C AGAT Job Number: 10-4325602
Notes:

Drinking Water Sample (y/n): No Reg. No.
Waterworks Number:

Report To:
Company: AMEC Earth & Environmental
Contact: Chyann Kirby
Address: 580 Main Street, Suite 105, Hilyard Place, Building B, Saint John, New Brunswick E2K 1J5
Phone: 506.652.9497 FAX: 506.652.9517
PO#: TV01017
AGAT Quotation: 10 -192
Client Project #: GRQ - Marine

Invoice to: Same (Y/N) - Circle
Company:
Contact:
Address:
Phone: Fax:
PO#/Credit Card #:

Report Information
1. Name: Chyann Kirby
Email: chyann.kirby@amec.com
2. Name:
Email:

Regulatory Requirements (Check):
☐ List Guidelines on Report ■ Do Not List Guidelines on Report
■ PIRI
Site Info (check all that apply):
■ Tier 1 ■ Res ☐ Pot ☐ Coarse
☐ Tier 2 ■ Com ☐ N/Pot ☐ Fine
■ Gas ■ Fuel ■ Lube
■ CCME ☐ CDWQ
■ Ind ☐ NSDFOSP
■ Com ☐ HRM 101
■ Res/P Storm Water
■ Ag ☐ HRM 101
■ FWAL Waste Water
■ Sediment
☐ Other

Report Format
☐ Single PDF sample per page
■ Multiple PDF samples per page
■ Excel Format Included

Turnaround Time (TAT) Business Days
Regular TAT:
■ 5 - 7 days
Rush TAT:
☐ 1 day ☐ 2 days
☐ 3 - 4 days
Date Required:
Time Required:

SAMPLE IDENTIFICATION	DATE / TIME SAMPLED	SAMPLE MATRIX	# OF CONTAINERS	COMMENTS - Site/Sample Info, Sample Containment	Metals (Code 121-349)	Hexavalent Chromium (Code 93-021)	Mercury (Code 121-325)	TPH/BTEX (PIRI) Tier 1 (Code 120-104)	PAH (low-level (CCME) Code 120-127)	PCB (Code 120-331)	Particle Size (Code 121-337)	TIC/TOC (Codes 121-378 and 58-109)				EXTRACT AND HOLD FOR THE FOLLOWING (ARCHIVE)	Metals (Code 121-349)	Hexavalent Chromium (Code 93-021)	Mercury (Code 121-325)	TPH/BTEX (PIRI) Tier 1 (Code 120-104)	Particle Size (Code 121-337)	TIC/TOC (Codes 121-376 and 58-109)		Hazardous (Y/N)	Lab Sample #
GQ 02	1-Sep-10	sed./soi	2 x 250mL	Sample jars labelled "A" and "B" for each sample.	√	√	√	√	√	√	√	√													N	
GQ 25	1-Sep-10	sed./soi	2 x 250mL		√	√	√	√	√	√	√	√													N	
GQ 27	1-Sep-10	sed./soi	2 x 250mL														√	√	√	√	√	√			N	
GQ 31	1-Sep-10	sed./soi	2 x 250mL														√	√	√	√	√	√			N	
GQ 47	1-Sep-10	sed./soi	2 x 250mL														√	√	√	√	√	√			N	
GQ 50	1-Sep-10	sed./soi	2 x 250mL		√	√	√	√	√	√	√	√													N	
					*SEE QUOTATION FOR SPECIFICS ON SEDIMENT ANALYSES REQUESTED																						

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time	Special Instructions
Beth Cameron	2-Sep-10	A. Cole-Jensen	02-Sep-10	
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time	
			17:15	Page 1 of 1