



 enison Mines

Wheeler River Project

Final Environmental
Impact Statement

November 2024

Powering
**PEOPLE, PARTNERSHIPS
AND PASSION.**

TO:

Denison Mines – Janna Switzer

FROM:

Ecometrix

REF:

Wheeler River Project EIS – Appendix 8-F:
Wetland Effects Assessment Report

DATE:

3 October 2024

1.0 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Responses to these IRs were provided in July and August of 2023. Additional FIRT IRs were provided to Denison on December 5, 2024. Of these IR-101 was not adequately answered and additional information was requested. This appendix was initially included in the January 2024 revised draft EIS and has been updated in October 2024 in response to Round 4 IR-101.

This appendix provides additional information to address IR-101 provided by Environment Canada and Climate Change (ECCC) as part of the second and fourth round of FIRT comments. The comment included a request for a further summary of wetland characterization information from available sources, baseline information pertaining to water quality and sediment quality, and assessment of potential effects to wetlands within the LSA for all phases of the Project and provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.

2.0 Scope of the Assessment

This section addresses the potential effects of the Project on the Fish and Fish Habitat VC for which wetland habitats are considered a component. The purpose of this assessment is to assess potential changes to wetlands (as represented by the Fish and Fish Habitat VC) in consideration of all phases of the Project at the Project Area, local, and regional study area scales. Pathways affecting wetlands are directly associated with potential changes to the Surface Water Quantity (hydrology), Surface Water Quality, Sediment Quality, and Benthic Invertebrates VCs. Changes to

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hydrology, water quality, sediment quality, and benthic invertebrate communities may directly affect wetlands as both fish and wildlife habitat and food resources. The assessment approach reflects these connections within the environment, as the significance determination for the Surface Water Quantity and Surface Water Quality VCs was conducted at the receptor VC level.

The Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are interrelated, to varying extents, and are linked to other VCs, including:

Surface Water Quality – surface water contributes to local moisture regimes, and surface water quality can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Surface Water Quantity – surface water contributes to local moisture regimes, and surface water quantity contributes to site drainage and discharge, which can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Sediment Quality – Vegetation and Ecosystems, Listed Plant Species, and Wetlands contribute to ecosystem form and function that stabilize riparian areas and influence quality of surface water runoff to aquatic systems.

This appendix will focus on the interrelations between these VCs as they apply to Wetland function.

Pathways that are of interest include those associated with site clearing and the potential for erosion-driven mobilization of suspended sediment into local surface waters; groundwater interactions with surface water features including wetlands; the establishment of new subwatershed boundaries and the resulting effects of effluent discharge to the receiving environment; and the potential overprinting of wetland habitat by Project infrastructure.

2.1 Key indicators and Measurable Parameters

The KIs for the wetland component of the Fish and Fish Habitat VC include potential changes in surface water quantity, surface water quality, and available wetland habitat from baseline conditions. The rationale for each KI and associated MPs is summarized in Table 1.

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Table 1: Key Indicators and Measurable Parameters for the Wetlands Valued Component

Key Indicator	Rationale for Key Indicator	Measurable Parameter
Change in available wetland habitat from baseline conditions	<ul style="list-style-type: none"> Project activities may result in a change in the extent of Wetlands. Of provincial and federal management concern Contributes to biodiversity and habitat for wildlife species and listed plant species. Cultural importance. Contributes to biodiversity, maintenance of hydrologic cycles, nutrient cycling, water quality, and carbon storage. Sensitive to disturbance. Historically addressed for other mining projects in northern Saskatchewan. 	Aerial extent (m ² or ha) of overprinted wetland habitat.
Change to water levels or flows from baseline conditions	Project activities are expected to result in changes to local hydrology. A reduction or increase in flows may result due to the elimination or redirection of subwatershed area and through Project water management (i.e., water taking, storage, and effluent discharge). These changes in flow to the environment may alter stream flows, lake levels and such feature interactions (inundation) with wetland features required for fish and wildlife during all life stages.	Changes in water levels (m) or percent changes to flow conditions (%).
Change in surface water quality from baseline conditions	Changes in water quality are regulated (subsection 36(1) of the <i>Fisheries Act</i> and the MDMER). Changes that may occur as a result of the Project include: <ul style="list-style-type: none"> mobilization of solids into local watersheds; and deposition of deleterious substances into the receiving environment as a result of mine effluent and/or surface runoff. 	Change in the concentration of constituents that are directly related to Project activities, measured as a mass of a chemical per unit volume in water (e.g., mg/L).

2.2 Spatial and Temporal Boundaries

The areas used to assess the effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are (Figure 1):

Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area is considered to be a conservative estimate of the area of direct disturbance effects on VCs in this assessment.

Vegetation LSA: the area that surrounds the Project Area where all direct effects and most indirect effects are likely to occur on the Vegetation and Ecosystems, Listed Plant Species, and

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Wetlands VCs. The Vegetation LSA is defined as the Project Area plus a 250 m buffer along roads and a 500 m buffer around all other infrastructure (1,161.8 ha).

Terrestrial RSA: the area that surrounds and includes the Vegetation LSA, established to assess the potential, largely indirect effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs in a regional context. The Terrestrial RSA (40,173.6 ha) is defined as a minimum 8 km buffer around the Vegetation LSA and has been delineated to capture all indirect effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs and provide context for the type, distribution, extent, and prevalence of plant species and ecosystems in the region. The Terrestrial RSA also defines the area within which cumulative effects are likely to occur (i.e., CEA boundary).

Temporal boundaries identify when an effect is expected to occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, with the associated interactions with each VC and KI (where applicable). In the EA, the temporal boundaries are described as appropriate for each activity and cumulatively for the life of the Project.

The temporal boundaries for the EA represent the timeframes that the Project is expected to interact with and potentially affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. The temporal boundaries are aligned with the Project development schedule as described in the EIS: Construction; Operation; Decommissioning; and Post-Decommissioning.

3.0 Existing Conditions

Wetlands are defined as “land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment” (National Wetlands Working Group 1997). As such, ecosites have been determined to be wetland ecosystems where these conditions are expected to occur. This includes both wetland ecosites and sparsely vegetated ecosites where the water table is within 50 cm of the ground surface (McLaughlan et al. 2010). No wetlands within the Terrestrial RSA have been designated as Ramsar Wetlands of International Importance (The RAMSAR Convention Secretariat 2022).

Project-specific investigations pertaining to the Terrestrial Environment were conducted by Omnia Ecological Consulting (Omnia; Calgary, AB) from 2017 to 2019. Details on the methods, survey parameters and assumptions, and comprehensive data summaries/findings are presented in the Project-specific baseline report (Omnia 2020; see Appendix 9-B of the EIS) and a supplementary baseline annex report completed in 2021 (EDI 2021; see Appendix 9-C of the EIS).

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Project baseline studies for vegetation presented a description of the ecosystems/habitat types (i.e., ecosite classifications) within the Terrestrial RSA. Vegetation communities and ecosystems are represented by provincial ecosite classifications for the Boreal Shield Ecozone in accordance with the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010). These ecosite classifications were summarized within a 1:20,000 interpreted ecosite mapping product compiled within the Terrestrial RSA with the use of the following inputs:

- 1:5,000 anthropogenic features mapping;
- historical fires data;
- provincial Predicted Ecosite Mapping;
- current and historical imagery; and
- field sampling/ground truthing sites (EIS Appendix 9-B).

As the Boreal Shield Ecozone experiences a largely natural fire regime, much of the vegetation within the Terrestrial RSA (70.6%) is comprised of post-fire regeneration (i.e., shrubby structural stages). Twenty (20) upland ecosites were identified within the RSA with relative percentages by area estimated for each ecosite code.

The assessment also identified fourteen (14) wetland ecosite types within the RSA which included swamps, bogs, fens and shallow open water ecosite codes. The area of these wetlands was also estimated to provide a relative percent area of representation within the RSA.

This cataloguing of ecosite presence and relative area composition across the RSA provides the basis for understanding landscape change and succession over the course of the construction and operation of the Wheeler River Operation.

Waterbodies were conservatively included as wetlands, as they have the potential to be classified as shallow open water wetlands (i.e., water bodies 2 m deep or less; Warner et al. 1997). Waterbodies represent the most common wetland ecosystem within the Vegetation LSA and the Terrestrial RSA, comprising 3.9% (44.9 ha) and 10.7% (4,101.9 ha), respectively. The black spruce treed bog is the second most common wetland ecosystem within the Vegetation LSA (18.2 ha, 1.6%) and the Terrestrial RSA (1,157.1 ha; 2.9%). The Labrador tea shrubby bog is the most common wetland ecosystem in the Vegetation LSA, comprising 2.0% (23.3 ha), and the second most common wetland ecosystem in the Terrestrial RSA (989.9 ha, 2.5%). All other wetland ecosites are relatively uncommon, each comprising less than 0.5% of the Vegetation LSA and Terrestrial RSA. The location, size and relative area composition of the wetland features is

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provided in Table 2 and Figure 1). The initial classification and subsequent assessment of wetlands in the Terrestrial Environment (EIS Section 9) took a conservative approach in that the area of wetlands within the terrestrial study areas was likely overestimated to assess potential changes in areal extend of wetlands.

Table 2: Summary of Wetlands

Ecosite Code ¹	Ecosite Description ¹	Structure Code ²	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
Swamps						
BS16	Black spruce / balsam poplar / river alder swamp	6	--	--	8.8	<0.1
Swamps Subtotal			--	--	8.8	<0.1
Bogs						
BS17	Black spruce treed bog	5	18.2	1.6	1,157.1	2.9
BS18	Labrador tea shrubby bog	3	23.3	2.0	967.6	2.4
		3a	--	--	20.3	0.1
		3b	--	--	2.0	<0.1
		Total	23.3	2.0	989.9	2.5
BS19	Graminoid bog	2	2.8	0.2	160.5	0.4
BS19/24 ³	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS20	Open bog	1	0.6	<0.1	65.5	0.2
Bogs Subtotal			45.6	3.9	2,374.2	5.9
Fens						
BS19/24 ³	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS21	Tamarack treed fen	5	1.9	0.2	66.5	0.2
BS22	Leatherleaf shrubby poor fen	3a	-	-	28.5	0.1
BS23	Willow shrubby rich fen	3b	0.6	<0.1	20.9	0.1
BS24	Graminoid fen	2	-	-	9.0	<0.1
BS25	Open fen	1	0.4	<0.1	5.7	<0.1

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Ecosite Code ¹	Ecosite Description ¹	Structure Code ²	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
Fens Subtotal			3.6	0.3	131.8	0.3
Shallow Open Water						
BS26	Rush sandy shore	2	-	-	15.1	<0.1
BS27	Sedge rocky shore	2	4.2	0.4	29.3	0.1
Waterbody ⁴	--	0	44.9	3.9	4,101.9	10.7
Shallow Open Water Subtotal			49.0	4.2	4,146.3	10.3
Total Wetlands⁵			98.3	8.5	6,661.1	16.6

Notes:

- 1 Ecosystems are described in detail in the Guide to the Ecosites of Saskatchewan’s Provincial Forests (McLaughlan et al. 2010).
- 2 Modified from the Field Manual for Describing Terrestrial Ecosystems (BC Ministry of Environment, Lands, and Parks, and BC Ministry of Forests 1998). 0 = unvegetated; 1 = sparse / bryophyte / lichen; 2 = herb/graminoid; 3a = low shrub; 3b = tall shrub; 5 = young forest, 6 = mature forest.
- 3 This ecosite type is an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between these ecosites due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). As such, this ecosite has conservatively been split between bog and fen classifications.
- 4 Areas of open water <2 m deep are defined as shallow open water wetland ecosystems (National Wetlands Working Group 1997); as such, unnamed waterbodies and areas of open water observed to exhibit an average depth of <2 m (Ecometrix Incorporated 2020) have been conservatively included as wetland ecosystems.
- 5 Some numbers are rounded for presentation purposes. Therefore, the totals may not equal the sum of the individual values.

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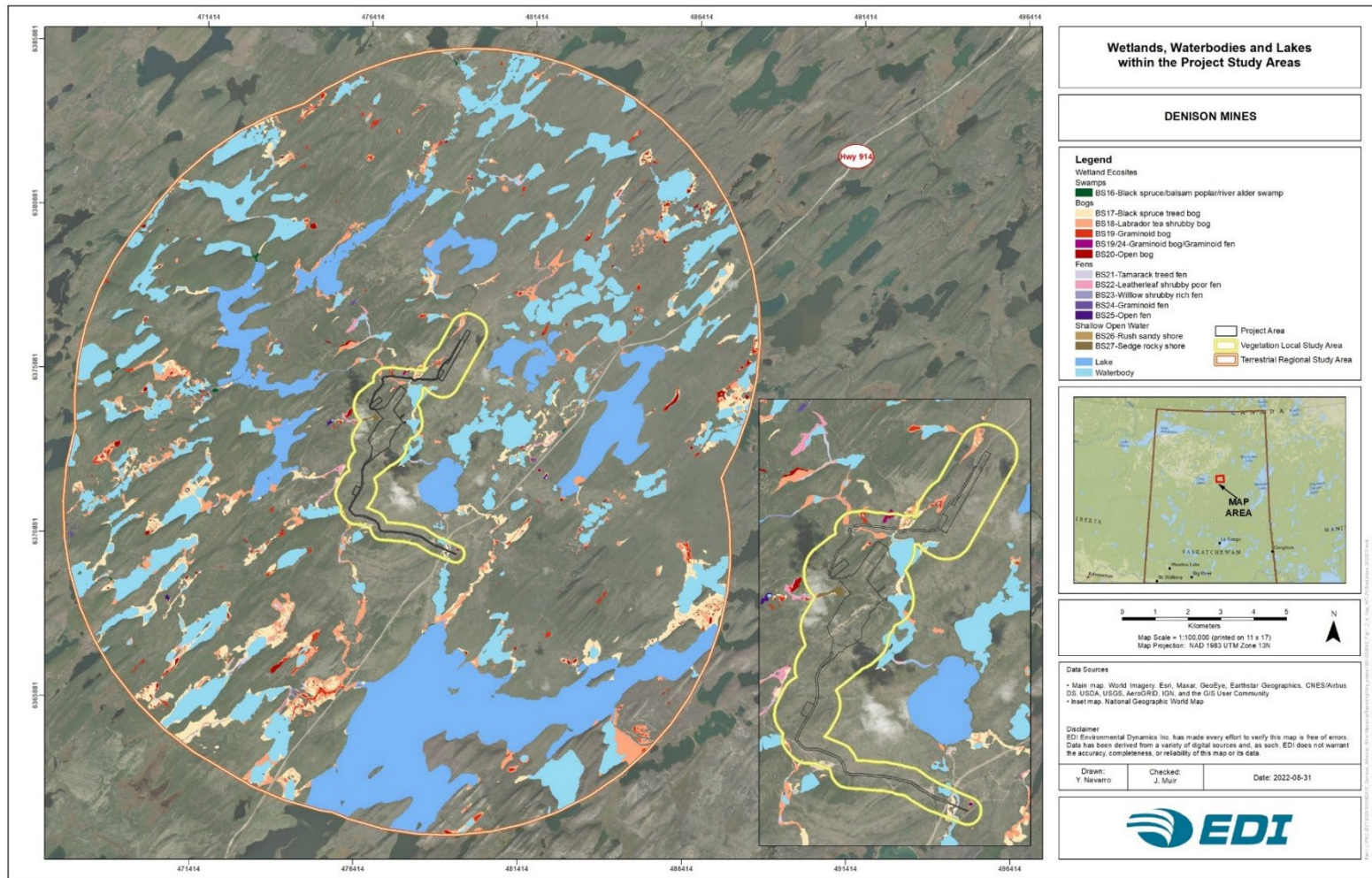


Figure 1: Wetlands, Waterbodies and Lakes within the Project Study Areas

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Surface elevations for the wetland have been assessed and the information is summarized below and in the Figure 1.

- Wetlands 1.5 km west of the Project Area range from 526-524 masl.
- Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl.
- Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl.
- Wetlands north of the Project Area and in the vicinity of the proposed air strip range from 514-508 masl.
- Wetlands situated further north of the Project Area in the LSA were at an elevation of approximately 526 masl.
- Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl.
- Most wetland evaluated south of the Project Area had elevations ranging from 491.488 masl.

Wetland depth, presence of fish or fish habitat, water quality and sediment quality are not currently available for the non-waterbody wetlands (i.e. those not identified as a lake or watercourse in Section 8 of the EIS). However, Denison is committed to conducting field surveys to collect this data prior to the initiation of construction of the Operation. This will allow for baseline information to be available to compare future changes and assess the success of mitigation measures and the predicted effects or lack thereof.

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Refer to Appendix A below for additional information on the in-lake wetlands.

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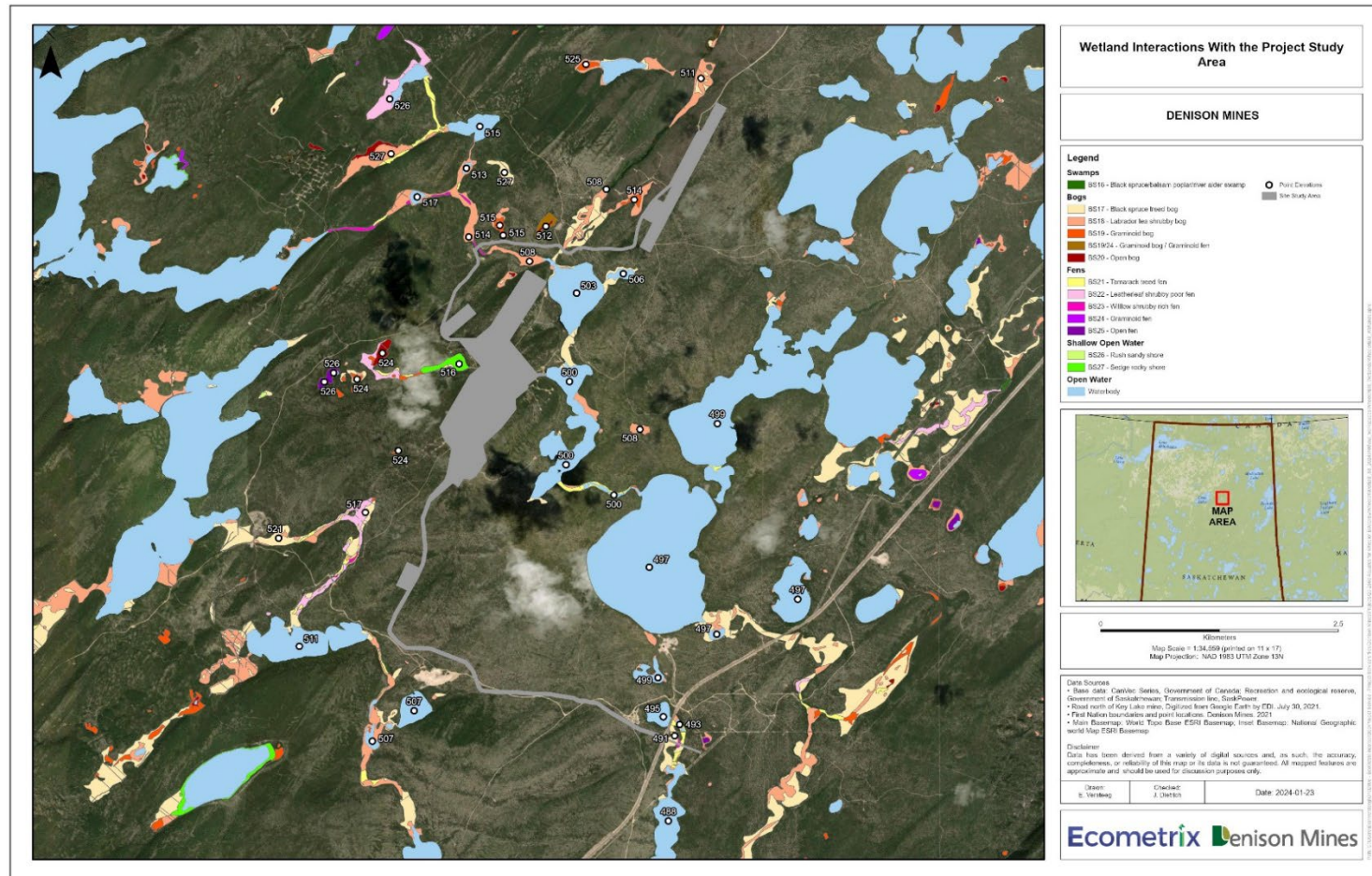


Figure 2: Elevations of wetland features in the LSA

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4.0 Assessment of Project Related Effects

4.1 Potential Interactions Between the Project and Valued Component/Key Indicators

The Project will require the Construction, Operation, and Decommissioning of several components (as described in Section 2 of the EIS). Potential interactions between these Project components and activities and Fish and Fish Habitat in the form of Wetlands and their associated KIs are summarized by Project phase and activity in Table.

Potential interactions in Table are ranked as:

Primary Interaction (✓): Project activity is expected to interact with the VC / KI which may result in an adverse effect on the VC (i.e., a measurable or detectable change in the MP) and is further considered in the effects assessment as the primary contributor to potential adverse effects.

Other Interaction (✓): Project activity is expected to interact with the VC / KI. While the interaction is further considered in the effects assessment, it is not expected to be a primary contributor to potential adverse effects.

No Interaction: Project activity is not expected to interact with the VC or the KI, no adverse effects are expected, and rationale is provided for not considering this potential interaction further.

Table 4: Potential Project Interactions for Wetlands Valued Component

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Development of access roads and air strip	✓
Site preparation and earthworks; clearing, leveling and grading of the Project Area	✓
Power generation - generators	✓
Installation of main substation and distribution of power around site	✓
Wellfield and freeze hole drilling; ground freezing	✓
Batch plant operation (concrete); crusher at borrow area	✓
Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Water management (including treatment and site runoff)	✓
Groundwater supply	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Surface water withdrawal	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Air transportation for workers	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Operation of the ISR wellfield	
Wellfield and freeze wall drilling	✓
Operation and expansion of freeze wall	✓
Batch plant operation (grout and cement); crusher in borrow area	✓
Expansion of pond and pads	✓
Operation of the processing plant and production of uranium concentrate	
Water withdrawal from groundwater or surface water body	✓
Management of surface water (including seepage and site runoff)	✓
Water treatment, both domestic and industrial	
Water release to surface water body	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Hazardous waste management (temporary storage, handling, and off-site transportation)	✓
Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates	✓
On-site and off-site operation of vehicles and transport of materials	✓
Power supply – primarily power from the grid, also generators and back-up generators	✓
Package and transport of nuclear substances	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
Air transportation for workers	✓
Progressive decommissioning and reclamation	✓
Regulatory site inspections	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Engagement – site visit from Interested Parties	✓
Site water management, treatment, and release	✓
Mining horizon remediation and thawing of freeze wall	✓
Process water treatment and release	✓
Closure of ISR and freeze wells and related infrastructure	✓
Decontamination of surface facilities and injection, recovery and monitoring wells	
Asset removal (including site power transmission lines and electrical infrastructure)	✓
Demolition and disposal of non-salvageable surface infrastructure and materials	✓
Remediation of contaminated areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)	✓
Generators	✓
Waste management (composting and landfill operation)	
Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Reclamation of disturbed areas	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Environmental monitoring	✓
Regulatory site inspections	✓
Engagement - Site visit from Interested Parties	✓

1 Operational activities include maintenance.

4.2 Potential Project-related Effects

Based on the timing and nature of the interactions identified in Table 4, the following adverse effects have a potential to occur on the Wetland VC (Table 5). The key indicator of effects to wetlands is the change in areal extent of wetlands in the study area.

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Table 5: Potential Project-related Effects on Wetlands Valued Component During all Project Phases

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Construction	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Introduction and/or Proliferation of Invasive Plants	✓
Changes in Water Quantity (water levels or flow)	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓
Operation	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Decommissioning	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Post-Decommissioning	

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Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Direct disturbance	✓
Introduction and/or Proliferation of Invasive Plants	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓

4.3 Mobilization of Suspended Materials

Construction

The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features including wetlands as a result of land disturbance and clearing. The mobilization of suspended material into natural surface water features is readily mitigatable by virtue of the mine development plan and through the implementation of standard water management and sediment control practices. Water management infrastructure (e.g., collection ditches, ponds, pumping stations) and various aspects of the water management and sediment control management systems will be put into place coincident with the initiation of construction activities. Waters (e.g., runoff) associated with areas under development will be collected and stored within management infrastructure (e.g., clean waste rock pond, see Figure 2.2-14 in Section 2 of the EIS). In the event that releases to the natural environment are necessary, they would only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, fish and fish habitat including wetlands are expected.

Operation

During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of surface water management through the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds. No specific discharge is expected to wetland features in the Project Area. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No

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downstream effects on surface waters, natural sediments, or fish and fish habitat including wetlands are expected.

Decommissioning and Post-Decommissioning

During Decommissioning and Post-Decommissioning, the site-wide water management system will continue to operate such that Denison will maintain control of the site aspect affected water through the IWWTP. Surface drainage during Decommissioning activities will continue to be directed to the system of collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds to facilitate the control of suspended solids and achieve low TSS levels in the discharge, thereby minimizing any potential for adverse changes to water quality, sediment quality, and fish and fish habitat including wetland features.

4.4 Overprinting of Wetlands as Fish Habitat

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction (Figure 3). Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA (Table 2).

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is isolated to those areas where stream crossings for access roads and hydro-line connections are proposed (Figure 3). With the use of single span bridges and implementation of best management practices, direct wetland disturbance associated with the crossings of Kratchkowsky Creek and Hart Creek is expected to be avoided. It should be noted that SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection. As such, wetland disturbance related to the SaskPower Hydro Corridor is expected to be addressed through the SaskPower permitting process.

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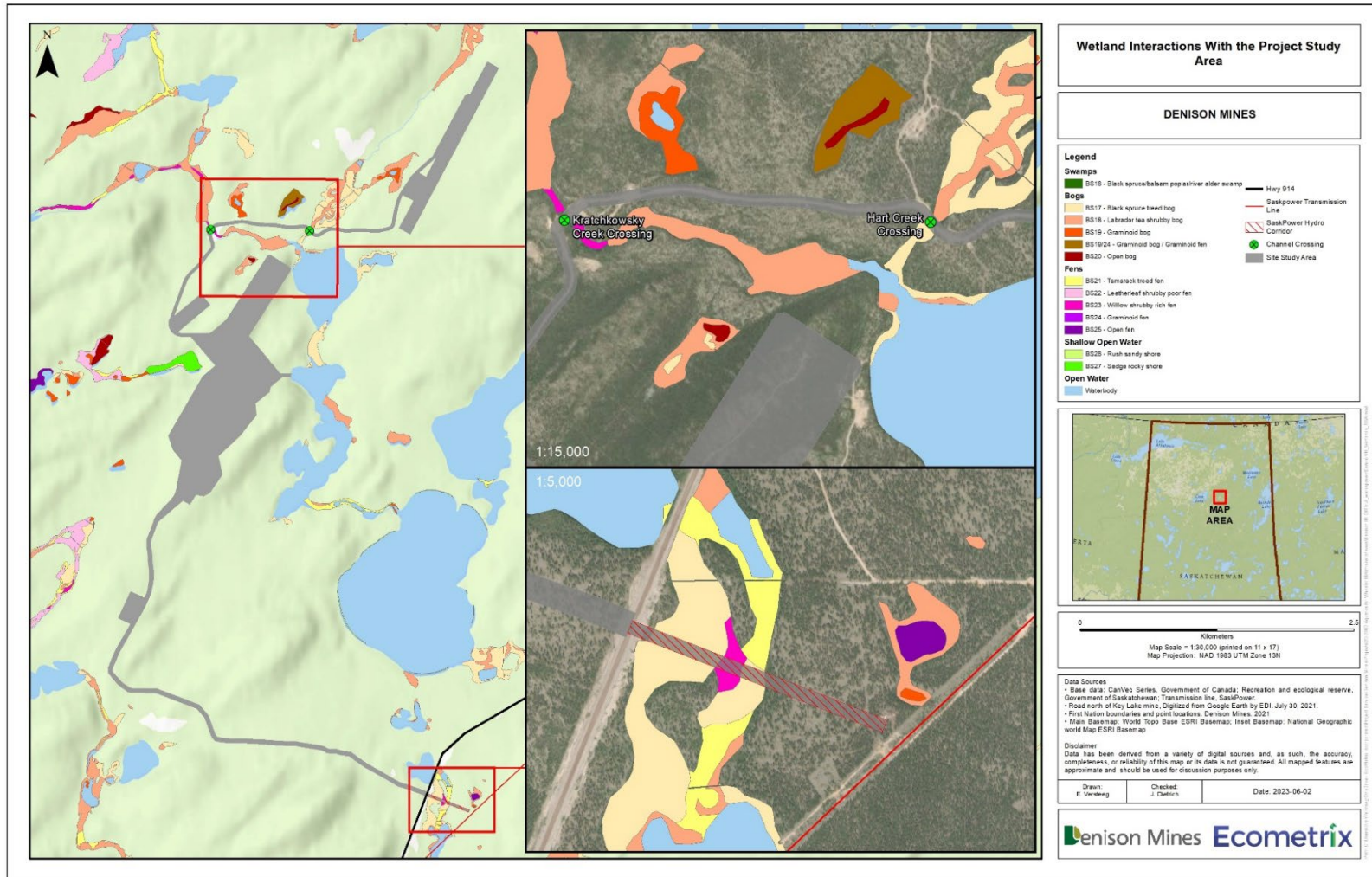


Figure 3: Denison Wheeler River Project Area and Wetland Feature Distribution

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4.5 Controlled Discharge to Receiving Environments

According to the site water balance (Figure 2.2-14 in Section 2 of the EIS), there is no planned discharge to Whitefish Lake during Construction. Other than LA-5 (Whitefish Lake) no other controlled discharge will occur to the natural environment and no wetlands will be impacted as a result.

4.6 Change in Water Levels and Flow

As detailed in Section 8.1 of the EIS, the projected withdrawal and discharge rates proposed for the Project are the largest influence on the hydrological effects of the Project. The largest predicted change in streamflow rate is -3.1% at the LA-5 and SA-2 nodes (immediately downstream of the Project) during Operation and Decommissioning, as projected against the 5th percentile low flow dataset in March. Lake levels and wetlands are expected to deviate less than ± 0.01 m due to all Project influences. All Project influences on the environment are expected to return to baseline conditions during Post-Decommissioning. These changes are within the range of fluctuation of environmental flows and water levels and are unlikely to affect fish passage or life history environmental cues.

4.7 Introduction and/or Proliferation of Invasive Plants

Vegetation clearing and soil disturbance during Construction are expected to create conditions suitable for the introduction and proliferation of invasive plants. Vehicles and construction equipment can inadvertently transport seeds and other invasive plant propagules in tires or the undercarriage to previously unaffected areas. The effects of invasive plants on native vegetation diversity are well documented and recognized as the second greatest threat to listed species after habitat loss (Enserink 1999). Competition with native species can lead to a reduction in the growth and vigour of native species (including Wetlands), as well as changes in the diversity, structure and function of ecosystems and habitats.

The potential for the introduction and proliferation of invasive plants by transport on vehicles and equipment is expected to continue throughout Operation during wellfield and freeze wall drilling, expansion of ponds and pads, drill waste rock, process precipitates and industrial wastewater treatment plant precipitates, on-site and off-site operation of vehicles and transport of materials, package and transport of nuclear substances, and air transportation for workers (i.e., landing and taking off of airplanes). Progressive decommissioning and reclamation has the potential to introduce invasive plants on vehicles and equipment and if seed used for revegetation is not supplied from a native seed source (Polster 2003) with a certificate of analysis indicating an absence of invasive plant seeds.

The potential for the introduction and proliferation of invasive plants is expected to continue throughout Decommissioning (e.g., during closure of the ISR and freeze wells and infrastructure,

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asset removal, demolition and disposal of non-salvageable surface infrastructure and materials, remediation of contaminated areas, reclamation of disturbed areas, and operation of vehicles and transportation of materials). The potential for the introduction and proliferation of invasive plants is expected to continue throughout Post-Decommissioning, but at lower levels due to reduced vehicle traffic.

4.8 Edge Effects

Edge habitat refers to an area on either side of a border between vegetation communities. Edges between vegetation communities often result in altered microclimatic conditions that can influence environmental conditions further away from the edge (Bannerman 1998). Edge effects are expected to extend into areas of native vegetation and habitats at the interface of disturbed areas and undisturbed native ecosystems, and could include altered microclimatic conditions that can influence quality in habitat away from the edge (Bannerman 1998). Where edge effects occur, Wetlands may experience changes in light intensity, temperature, wind, moisture, relative humidity, and patterns of snow accumulation and melt relative to undisturbed conditions. This can, in turn, affect plant health and alter natural disturbance regimes (e.g., blowdown), plant population persistence, and the structure and function of ecosystems and habitats. If changes to microclimatic conditions or vegetative structure at an edge exceed a species habitat preference or physiological tolerance, then edge habitat may result in lower occupancy or use, reduced survival, or lowered reproductive success.

Edge effects at the interface of disturbed areas and native ecosystems are expected to occur along the edges of the Project Area resulting from vegetation clearing during site preparation and earthworks during Construction. Edge effects are expected to continue throughout Operation, Decommissioning, and Post-Decommissioning, decreasing over time as revegetation and tree growth within reclaimed areas of the Project create a gradual structural transition at forest edges, aided by natural encroachment.

4.9 Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries

During the 'future centuries' scenario as described in Section 8.3.1.3 of the EIS, remediation works will be completed and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post-mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport. The results of this was described in Section 8.3.4.2.5 with respect to Fish and Fish Habitat and therefore wetlands.

The results of the numerical modelling (as provided in Section 7 and Appendix 10-A in Section 10 of the EIS) support the conclusion that with the implementation of appropriate mitigation during the decommissioning and restoration phases of the Project, the residual effects of the

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Project on the intermediate Groundwater VC will not result in an adverse effect on surface water. Dissolved constituent concentrations emanating over hundreds to thousands of years in the future from the deep Ore Zone to Whitefish Lake are expected to remain below fresh water environmental quality criteria in Whitefish Lake.

Although the precise location of the groundwater discharge to the surface is somewhat uncertain, the groundwater transport scenarios that have been evaluated (Appendix 7-C of the EIS) to date suggest groundwater discharge impacted from mining will most likely be relegated to Whitefish Lake. The discharge to Whitefish Lake is generally predicted to occur along the eastern shore of the lake, as this is interpreted to be the eastern edge of the underlying desilicified zone. The Laborador Tea Shrubby Bog habitat located on the eastern shore of Whitefish Lake may be in the zone of influence of groundwater discharge, yet chemically will remain below freshwater environmental quality criteria. Groundwater impacts to other surrounding wetlands will be negligible as groundwater is not predicted to discharge within any area beyond the central portion of Whitefish Lake.

4.10 Indirect Effects

Indirect disturbance associated with the potential to adversely affect BS19/24 includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while ecosite BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing waterbodies, alteration of water quantity would be expected to have the highest potential to cause an adverse effect. Therefore, maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.

5.0 Mitigation Measures

Mitigation measures specific to the wetlands, discussed in the following subsection are applicable during all Operation phases and expected to be effective immediately following implementation and managed through the EMP.

Disturbance Reduction

- Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.

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- Disturbance to vegetation and soils will be avoided by clearly delineating Project Area boundaries (e.g., with the use of fencing, staking, or flagging), adhering to construction plans and schedules, and by restricting off-site machine use.
- Wetland boundaries in the proximity of planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable.
- Should they occur, areas prone to potential instability and areas in proximity to water bodies and drainage features will be identified and appropriate setbacks will be established and maintained.
- Temporary workspaces or laydown areas will be sited and constructed within existing disturbance or on previously compacted soils, where practicable. In areas requiring clearing only, grubbing will be avoided, and roots and groundcover will be retained to the extent feasible.
- Pre-construction listed plant surveys will be completed within the Project Area.
- Listed plants located adjacent to planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable and reduce the potential for accidental encroachment outside of the Project footprint.
- Should Listed Plants be identified within the Vegetation LSA prior to Construction, site- and species-specific mitigation measures to avoid and/or limit Project effects will be determined by a Qualified Vegetation Ecologist. Specific mitigation measures will depend on the species, its life history characteristics, time of year, and the location of the occurrence in relation to Project activities.
- Herbicide use will be avoided within 100 m of any known listed plant occurrences. Where herbicide use is unavoidable, use will be restricted to direct application instead of broadcast spraying and completed by qualified personnel.

Soil Handling and Reclamation

- Construction activities will be sequenced (i.e., site clearing, grading preparations, major earthworks and construction of infrastructure/facilities) so that surface vegetation, mineral soil and organic matter can be salvaged for later use in Project Decommissioning.
- Soil resources within the Project Area will be stripped/salvaged and stockpiled within the Project Area in accordance with relevant soil management BMPs, i.e., providing guidance on ground-truthing soil conditions, flagging potential hazards and sensitivities, and

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modifying practices in relation to environmental conditions and avoiding or minimizing inadvertent/incidental disturbance.

- A soil monitoring program/protocol (or equivalent) will be undertaken to verify soil salvage volumes and reclamation suitability (Section 9.1.8.2).
- Soil stockpiling locations will be sited to reduce soil handling and travel distances and designed to minimize the potential for soil degradation and downgradient effects, e.g., having defined height and width that optimize soil storage and stockpile stability, and having integrated erosion control measures and surface water management features (if/where necessary). Sediment and erosion control measures will be implemented in accordance with BMPs and commensurate to site conditions and sensitivities.
- Sediment and erosion control measures and surface water management features will be installed and maintained at the Project. Erosion controls (e.g., sediment fencing, check-damns and/or sediment ponds) will be installed as necessary and at the discretion of construction personnel commensurate to site conditions and sensitivities to manage/mitigate erosion and sedimentation.
- Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable with the use of suitable native species and in accordance with the Reclamation and Closure Plan.

Surface Water Management

- Snow melt and runoff will be controlled within the Project Area to prevent the potential release of contaminated runoff from affecting vegetation in adjacent areas.
- Sediment and erosion control measures will be implemented in accordance with the EMS.
- Surface water management features (e.g., culverts and ditches) will be constructed and maintained (as per Project design specification) along access roads and facility sites to facilitate surface drainage continuity and hydrologic connectivity—especially in proximity to wetlands, water crossings, and waterbodies.
- Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction, and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and at facility sites.

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Invasive Plant Management

- Equipment and vehicles will arrive at the Project Area clean, and will be inspected for soil, plant material, and seeds, and cleaned as appropriate, to limit the potential for the introduction of invasive plants and noxious weeds.
- Areas with a high risk for the potential spread of invasive plants and noxious weeds (i.e., within or adjacent to existing infestations) will be avoided to the extent practicable; if work must occur in these areas, invasive plant management will be implemented before starting work.
- Gravel, fill, straw matting, or similar materials to be used for erosion control will be inspected to minimize the potential for seeds or propagules of invasive plants being brought to site.
- All employees and contractors on the Project will receive an employee orientation appropriate to the work they are undertaking, including instruction on the definition of invasive plants and their potential effects, mitigation measures to avoid the introduction and spread of invasive plants, and training on the presence and identification of common invasive plant species and those known to occur within the Project Area.
- Invasive plant monitoring will be conducted periodically by personnel skilled in invasive plant identification during all Project phases to assess, evaluate, and document invasive plant occurrences within the Project Area. Invasive plant surveys will be completed during a biologically appropriate time of year (e.g., when invasive plants can be identified) within areas identified as most susceptible to invasive plant introduction and spread, including roads, ROW, debris and vegetation management areas (e.g., slash piles, timber decks, exposed soil or stockpiles) and other regularly disturbed habitats.
- Three general treatment options may be used alone or in combination to control of invasive plants in the Project Area:
 - mechanical control – involves the physical removal of the plants;
 - chemical control – involves application of synthetic and/or natural herbicides; and,
 - biological control measures – involves use of living organisms (e.g., rusts, insects) to control selected invasive plant species.
- The type of treatment option selected for an invasive plant occurrence will be based on a combination of specific information including the identity of the invasive plant species and its provincial designation, the size and extent of the occurrence, time of year, the proximity of the occurrence to other susceptible areas (e.g., rare plant occurrences, wetlands, waterbodies), and the available control options. Where possible, control of

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invasive plants will be completed in consultation with a qualified professional to minimize potential effects on native vegetation, ecosystems and wetlands.

- Seed used during re-vegetation will be certified weed free, with a valid “Certificate of Seed Analysis”.

6.0 Residual Effects Evaluation

6.1 Residual Effects Characterization

Residual effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs have been assessed in relation to the RSA, and characterized in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, context, and likelihood (Table 6). Residual effect evaluation of residual effects are provided in Tables 7, 8 and 9.

Table 6: Definitions of Effect Characteristics Considered When Determining the Significance of Residual Effects

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect will be adverse or positive.	<p>Adverse – Negative effect or effect is not desirable.</p> <p><i>Water Quantity</i> – Effect moves MPs (flow or water level) in a direction detrimental to water quantity relative to baseline conditions. A Project-related increase in surface water flows and levels during flooding, or a decrease in surface water flow below environmental flow requirements.</p> <p><i>Water Quality</i> – An increase in constituent concentrations attributable to the Project in comparison to baseline conditions and trends.</p> <p><i>Wetlands / Fish Habitat</i> – A physical loss of available fish habitat (extent of area) in comparison to baseline conditions.</p> <p>Positive – Beneficial effect or effect is desirable.</p>
Magnitude	The amount of change in a measurable parameter relative to baseline conditions.	<p>Low</p> <ul style="list-style-type: none"> ▪ measurable decrease in the spatial extent of Wetlands, but less than a 10% loss; all original wetland classes are present. ▪ A measurable change that is not within the variability of baseline conditions but below relevant water quality objectives and criteria. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is <5% from baseline conditions

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Residual Effect Characteristic	Definition	Rating
		<p>Moderate</p> <ul style="list-style-type: none"> ▪ measurable decrease in the spatial extent of Wetlands between 10% and 30% loss; measurable changes in the diversity of wetland classes; some original wetland classes may be absent. ▪ A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is >5% from baseline conditions, and could, therefore, have an adverse effect on Fish and Fish Habitat within the LSA. <p>High</p> <ul style="list-style-type: none"> ▪ measurable decrease in the spatial extent of Wetlands greater than 30% loss; some original wetland classes are absent. ▪ monthly flows (>10%), or lake surface elevation (m) in a waterbody or watercourse that is greater than the range of natural variability and large enough that fish can no longer rely on this habitat to carry out one or more of their life processes. A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives and is likely to have an adverse effect on Wetlands (Fish and Fish Habitat) within the LSA, with the effect extending beyond the LSA.
Geographic Extent	The geographic area within which the residual effect is expected to occur.	<p>Project Area – Effect is limited to the Project Area.</p> <p>Local – Effect is limited to the Vegetation LSA.</p> <p>Regional – Effect extends beyond the Vegetation LSA into the Terrestrial RSA.</p> <p>Beyond Regional – Effect extends beyond the Terrestrial RSA.</p>
Duration	Length of time over which the residual effect is expected to persist.	<p>Short-term – Less than 3 years (i.e., effect happens during Construction only).</p> <p>Medium-term – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</p> <p>Long-term – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</p>
Frequency	How often the residual effect is expected to occur.	<p>Infrequent – Effect occurs several times at sporadic intervals.</p> <p>Frequent – Effect occurs many times on a regular basis.</p> <p>Continuous – Effect occurs continuously.</p>

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Residual Effect Characteristic	Definition	Rating
Reversibility	Whether or not the residual effect can be reversed once the activity causing the residual effect ceases.	<p>Fully Reversible – A residual effect that diminishes to baseline conditions.</p> <p>Partially Reversible – A residual effect that partially diminishes to baseline conditions.</p> <p>Irreversible – A residual effect that will not diminish to baseline conditions.</p>
Context	The extent to which the VC or KI has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	<p>Low – VC/KI has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. No listed species present.</p> <p>Moderate – VC/KI has moderate resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or an intermediate level of historic or ongoing anthropogenic or natural disturbance with the capacity to assimilate more change. Presence of listed species</p> <p>High – VC/KI has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance. Presence of SARA-listed species</p>
Likelihood	Likelihood that the residual effect will occur including consideration of the likelihood that the mitigation will be successful.	<p>Likely – A moderate to high probability that the residual effect will occur.</p> <p>Unlikely – A low probability that the residual effect will occur.</p>

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Table 7: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Surface Water Quality

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	The Project (specifically the discharge of effluent to the natural environment) will cause a change in the concentration of constituents, as measured as a mass of a chemical per unit volume in water (e.g., mg/L). Surface water quality in the local receiving environment will be adversely affected by effluent discharge to the aquatic environment, thereby providing a pathway to adversely affect surface waters. However, no discharge is planned to wetlands outside of Whitefish Lake.
Magnitude	Low	The magnitude of the residual effect is predicted to be low as constituents that may be introduced as part of Project activities are expected to remain below criteria for the protection of aquatic life and human health.
Geographic Extent	Local	The geographic extent of the residual effect is predicted to be confined to the immediate waterbody adjacent to the Project (i.e., Whitefish Lake). The estimated mixing zone is less than 5 m, implementing an effluent discharge configuration that promotes mixing.
Duration	Long-term	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuous	For the purposes of this EIS, a conservative scenario was identified, with effluent discharge being considered as continuous during Operation and Decommissioning.
Reversibility	Fully reversible	Surface water quality is expected to return to pre-development levels following Post-Decommissioning as Project-related sources will cease to operate.
Context	Low	Wetland health is expected to be resilient to changes in surface water quality in the context of this assessment, as COPC meet protective criteria even at the extreme low water scenario. Therefore, under applicable mitigative measures and average flow conditions, the contextual resilience of the aquatic system to respond to change is considered to be great.
Likelihood	Likely	A high probability exists that a change in water quality from background conditions will occur, but be restricted to Whitefish Lake and not other surrounding wetland features.

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Table 8: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Area Extent

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Impacts to wetlands in the LSA from physical disturbance or overprinting are expected to be minor in nature and relegated to wetlands located at stream crossings for access roads and the hydro-line corridor. In both cases the approach to design will be one of avoidance and minimal disturbance with clear span bridges and minimal clearing required for hydro-line installation where avoidance of open water areas can be met.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Less than 0.1% of Wetlands within the Terrestrial RSA are predicted to be directly affected as a result of Project Construction, and up to 1.5% may be indirectly affected during all Project phases.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically to wetlands located at stream crossings for access roads and the hydro-line corridor
Duration	Long-term	Once natural drainage patterns are re-established following Operation, the structure and function of Wetlands altered as a result of indirect Project effects are expected to re-establish after Post-Decommissioning (more than 38 years).
Frequency	Frequent	While direct affects to specific Wetlands will occur over a short time period during Construction, Wetland alteration by indirect effects is anticipated to occur frequently throughout Construction, Operation, and Decommissioning, and infrequently during Post-Decommissioning.
Reversibility	Partially Reversible	Wetland effects are predicted to be partially reversible during Decommissioning once natural hydrologic conditions are reinstated. Alterations to wetland extent, structure and/or function as a result of indirect Project effects during all Project phases are predicted to be reversible over time once natural hydrologic conditions are reinstated and edge effects, dust, water quality changes, and invasive plant propagule pressure are reduced at the end of Decommissioning.
Context	Moderate	Wetlands can exhibit low resilience and high susceptibility to disturbance; however, disturbance is common within the Terrestrial RSA, and existing Wetlands have been historically disturbed by access roads and exploration activities.
Likelihood	Likely	The infrastructure associated with the bridges and the hydro-line are likely to affect the localized area for which they span in a limited way.

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Table 9: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Surface Water Quantity (Hydrology)

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Water quantity (flow and level) will be reduced in LA-5 as a result of the overprinting of its reporting drainage area by mine infrastructure and through site water balance. Water taking has an additional potential to reduce water levels in LA-5 and associated wetlands.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Under all scenarios, the Project-related change in hydrology (flows or levels) compared to baseline conditions is less than 5% of baseline conditions, and generally less than 3%.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically the lakes and wetlands within proximity to the Project site (i.e., LA-5, LA-6, and LA-1).
Duration	Moderate	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuously	Although the mine is unlikely to require water taking on a continuous basis, this has been assessed as a bounding scenario and, as such, must be considered as a continuous effect.
Reversibility	Fully reversible	Surface water hydrology is expected to return to pre-development levels following Post-Decommissioning.
Context	Moderate	Surface water flow regimes are variable, and it is this variability that provides for morphological form to be maintained and for ecological reliance (i.e., wetlands, fish habitat). Some change to environmental flows is tolerated by wetland biota.
Likelihood	Low	Due to the localized nature and low magnitude of the effect on surface water hydrology, the likelihood of an effect is considered to be very low; therefore, the likelihood of an effect on Wetlands is expected to be low.

6.2 Significance and Confidence

The residual effect of change in the areal extent of the Wetlands VC as a result of the Project is not expected to result in a change to the wetlands KI that will alter its integrity within the Terrestrial RSA to the point where it is not sustainable or unavailable to contribute to ecological functions.

The threshold for significance for the Wetlands VC relates to predicted changes in the concentrations of water quality parameters, where changes could result in exceedances of

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relevant water quality benchmarks that are protective of aquatic biota in waterbodies that receive mine-affected drainage. The threshold for significance for Wetlands also includes predicted changes in surface water flows greater than baseline environmental flows and direct habitat loss.

The significance of the residual effects on the Wetlands VC has been deemed **not significant**. Following mitigation, the residual effects are not expected to cause a change in Wetland habitat (or associated KIs) to the extent that they might alter the ecological integrity of the VC in the LSA beyond an acceptable level.

The predicted confidence with respect to the Wetlands VC is high as the mobilization of suspended materials can be readily mitigated, making the effects prediction relative to this effect pathway easily understood.

Confidence in the assessment of predicted effects on water levels or flow is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that the water withdrawal and discharge scenarios presented herein represent the bounding case, and hydrogeological modelling projections are not changed (Section 8.1 of the EIS).

Potential effects on water quality as a result of Project discharges to local receiving environments were assessed by way of numerical modeling. The in-lake wetlands will be subject to the same processes by which constituents are expected to accumulate in all lake sediments. That is sediments are in dynamic equilibrium with the water, with the relationship between the two defined by the K_d (partition coefficient). The K_d s used in the EIS are not habitat specific; they are derived from years of water and sediment data collected in the Athabasca Basin. The K_d s would include a variety of habitats (e.g., nearshore vegetated littoral zones, depositional habitats) from which water and sediment quality data have been collected. These predictions are generally considered conservative in nature because the assumptions on which they are based are conservative. For example:

- The assessment is based on a continuous (year-round) discharge at an expected average effluent rate of $0.0101 \text{ m}^3/\text{s}$ ($36.5 \text{ m}^3/\text{hr}$) throughout Construction, Operation, and Decommissioning, despite the likelihood that effluent discharge will not be continuous and will only discharge when site water balance requires, based on water storage capabilities.
- The constituents in effluent discharge have been estimated conservatively. Presented discharge concentrations provided herein include contingency factors of one to three times.

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- Baseline water quality is defined by the 95th percentile concentrations of individual constituents. Such an assumption is conservative as it constrains the assimilative capacity associated with the receiving environment. By definition, the assimilative capacity of a receiving environment is equal to the incremental difference between the existing baseline condition and the assessment benchmark (i.e., water quality criterion) on which the evaluation is based. Use of the 95th percentile concentration, rather than a measure of central tendency (i.e., 50th percentile, geomean), means that the incremental change in a given constituent concentration that can be assimilated by the receiving environment (whereby use of the receiving environment is protected) is relatively small in magnitude.

Due to the conservative nature of the assumptions on which the numerical assumptions are based, a high degree of confidence can be assumed.

6.3 Summary of Project Related Residual Adverse Effects

The results of the characterizations for these residual effects are summarized in Table 10. The residual effects of the Project on the Wetland KIs were predicted to be **not significant**. Thus, the residual effects of the Project on the Wetlands VC are predicted to be **not significant**.

Table 10: Summary of Project-related Residual Effects

Valued Component	Residual Effect	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance
Wetlands	Change in Water Quality	C, O, D	A	L	L	LT	C	FR	L	L	NS
	Change in Water Level or Flow	C, O, D	A	L	L	MT	C	FR	L	L	NS
	Change in the Areal Extent of Wetlands	C, O, D	A	L	L	LT	F	PR	M	L	NS

¹ Direction: Adverse (A), Positive (P)
 Magnitude: Low (L), Moderate (M), High (H)
 Geographic Extent: Local (L), Regional (R), Beyond Regional (BR)
 Duration: Short-term (ST), Medium-term (MT), Long-term (LT)

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Frequency:	Infrequent (IF), Frequent (F), Continuous (C)
Reversibility:	Fully Reversible (FR), Partially Reversible (PR), Irreversible (IR)
Context:	Low (L), Moderate (M), High (H)
Likelihood:	Unlikely (U), Likely (L)
Significance:	Not-Significant (NS), Significant (S)
Level of Confidence:	High (H), Moderate (M), Low (L)

7.0 Cumulative Effects

The cumulative effects are discussed in detail in Section 9.2.7 of the EIS and are not re-examined herein.

8.0 Summary

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction. Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA.

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and hydro-line connections are proposed.

Avoidance through design as well as mitigation measures to control sedimentation to wetland features during construction, operation and decommissioning phases. Water quantity and quality are not expected to cause impacts to wetlands as the change in surface water feature levels and flow are nearly negligible and water will not be discharged to wetlands save for Whitefish Lake, for which effluent will not be released unless meeting criteria for the protection of aquatic life.

Residual effects on the Wetlands VC resulting from the Project were identified and assessed as **not significant**. Existing provincial legislation (Environmental Management and Protection Act [Government of Saskatchewan 2010] and the Water Security Agency Act [Government of Saskatchewan 2019b]) requires written approval (i.e., Aquatic Habitat Protection Permits) prior to any works within a wetland.

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To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction of the operation to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.

9.0 References

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Appendix A Orientation for CNSC Round 4 IR reviewers: Whitefish Lake (middle basin) inflow to McGowan Lake inflow

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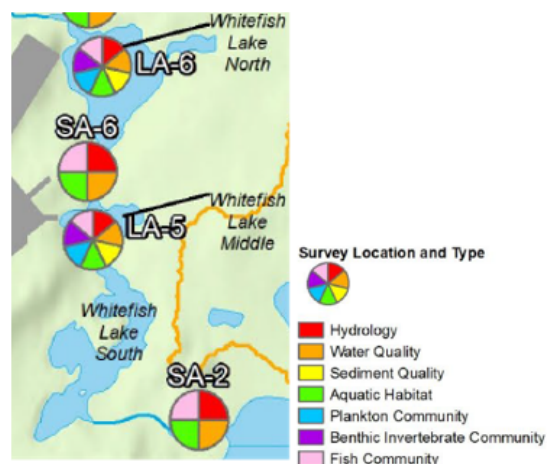
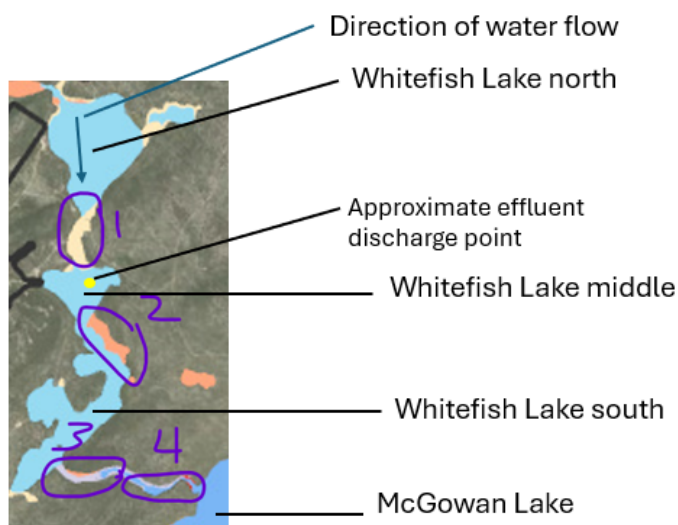
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During the June 14, 2024, meeting to discuss Round 3 IR-101, the federal review team indicated that the wetlands of interest are those located within the nearshore environments of Whitefish Lake (Upper, Mid and Lower) as these lakes will directly receive treated effluent during operation.

The purpose of this appendix is to facilitate the CNSC’s review of Denison’s Round 4 response to IR-101 by summarizing information on the in-lake wetlands of interest.

While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of interest are littoral / nearshore zones in the lake and connecting channels. These in-lake wetland areas of interest are not cut-off from or isolated from the main basin of the lake. As such, it can be assumed that the lake environment is likely to be as depositional as the nearshore environment. The lakes of interests are very shallow (on average 1.5 m in depth) and therefore deposition may be as likely in the “offshore” environment as the nearshore.

This appendix provides a summary of four general areas (see marked up wetland map image below with areas circled and numbered in purple) from the inflow to Whitefish Lake (middle basin) to the inflow to McGowan Lake. An excerpt from Section 8’s Figure 8.2-4 is also provided to orient the reviewer to the water quality, biota, and sediment sampling locations (refer to EIS Section 8 for details). The four areas shown in the wetland image are reviewed in the balance of this appendix with photographs and text/descriptive excerpts from the EIS to provide a general site orientation to the reviewers.

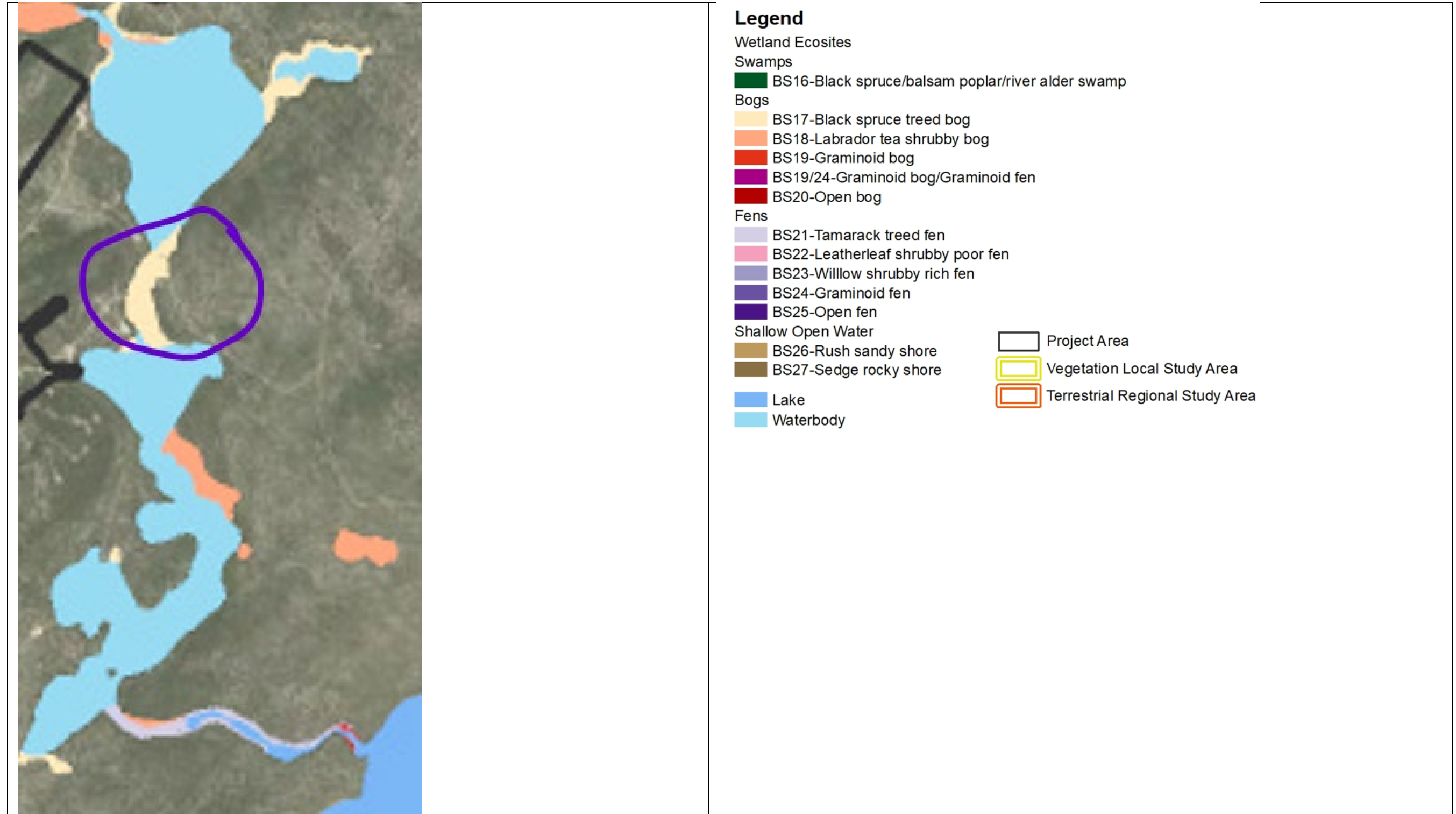


(Excerpt from EIS Figure 8.2-4)

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Notes from Appendix 8-B, Appendix F (2019):

SA-6 (Outflow from LA-6)

SA-6 is the outflow from LA-6 and is equipped with a stage recording datalogger. The sensor and sensor housing at this location were replaced in August. Stage and discharge data for SA-6 are presented in Table 6 and the rating curve is shown as Figure 6. The cross-section is shown in Photo 11 for the July field program and Photo 12 is from the August field program.

Photo 11: SA-6 - July Field Program



Photo 12: SA-6 - August Field Program



Notes from Appendix 8-D (2016)

4.6 SA-6

Station SA-6 is situated on the connecting channel between the north and south basins of Whitefish Lake, LA-6 (upstream) and LA-5 (downstream), respectively (see Figure 1-8). At this location the watercourse is 3rd order.

4.6.3 Aquatic Habitat

The surveyed reach (390 m) included the entire length of stream between the two lake basins. Mean wetted channel width, water depth and water velocity were 14 m, 0.7 m and 0.2 m/s, respectively. The banks were stable, and the channel was meandering (see Appendix C, Photo 11). The stream gradient was low, and stream morphology was primarily runs (75%) and pools (20%), with some flats (5%). The canopy was partly open. Instream cover was diverse, afforded by deep pools, aquatic macrophytes, boulders, logs and trees, and undercut banks. Substrates were comprised of 85% sand, 10% boulder and 2% silt. Observed aquatic vegetation included sedges, pondweed and horsetail (see Appendix C, Photo 12). Moderate algae growth and slight sediment were observed overlying the substrate and no barriers to fish migration were observed. The surrounding terrain was 50% upland and 50% lowland forest, and observed riparian vegetation included jack pine, black spruce, sweet gale, and Labrador tea. Snails (Gastropoda), mayfly nymphs (*Hexagenia* sp.) and dragonfly nymphs were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.

4.6.4 Fish Community

A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. Within a 150-m stretch of the reach, 1,531 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 24 fish from 4 species. Twelve YOY and 3 adult Spottail Shiner, 4 YOY and 2 juvenile Burbot, 2 adult Ninespine Stickleback and 1 YOY Longnose Sucker were captured. The CPUE was 0.94 fish/minute of electrofishing. Three adult White Sucker, 1 adult Walleye, and 3 juvenile and 3 adult Northern Pike were captured by gillnet during the spring 2017 survey. In addition, 6 adult Northern Pike and 2 adult White Sucker were observed. The list of fish species identified during baseline surveys was reviewed by Bobby John, and is considered inclusive and comprehensive (Denison, 2020).

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Photo 11: Stream station SA-6 looking downstream (12 September 2016). This drainage area station is situated on the connecting channel between lakes LA-6 (upstream) and LA-5 (downstream).



Photo 12: Stream station SA-6 looking downstream (12 September 2016). Suitable spawning habitat for Northern Pike occurred near the inlet to lake LA-5, and adult pike were observed in the vicinity during the May 2017 spawning survey.



SA-6 facing upstream, March 2018.

Notes from Appendix 8-B, Appendix D (2011):

SA-6

Streamflow monitoring Station SA-6 drains from LA-6 and is upstream of SA-2. The stream section at this monitoring site is characterized by a sandy substrate, slow, deep, and laminar flow, and vertical banks. Although the right bank is well defined, high, and vegetated with trees, sand, and moss, the left bank is low lying with muskeg, shrubs and black spruce. The cross-section has a width of approximately 14 m. SA-6 produces a very good stage-discharge relationship and hydrograph.

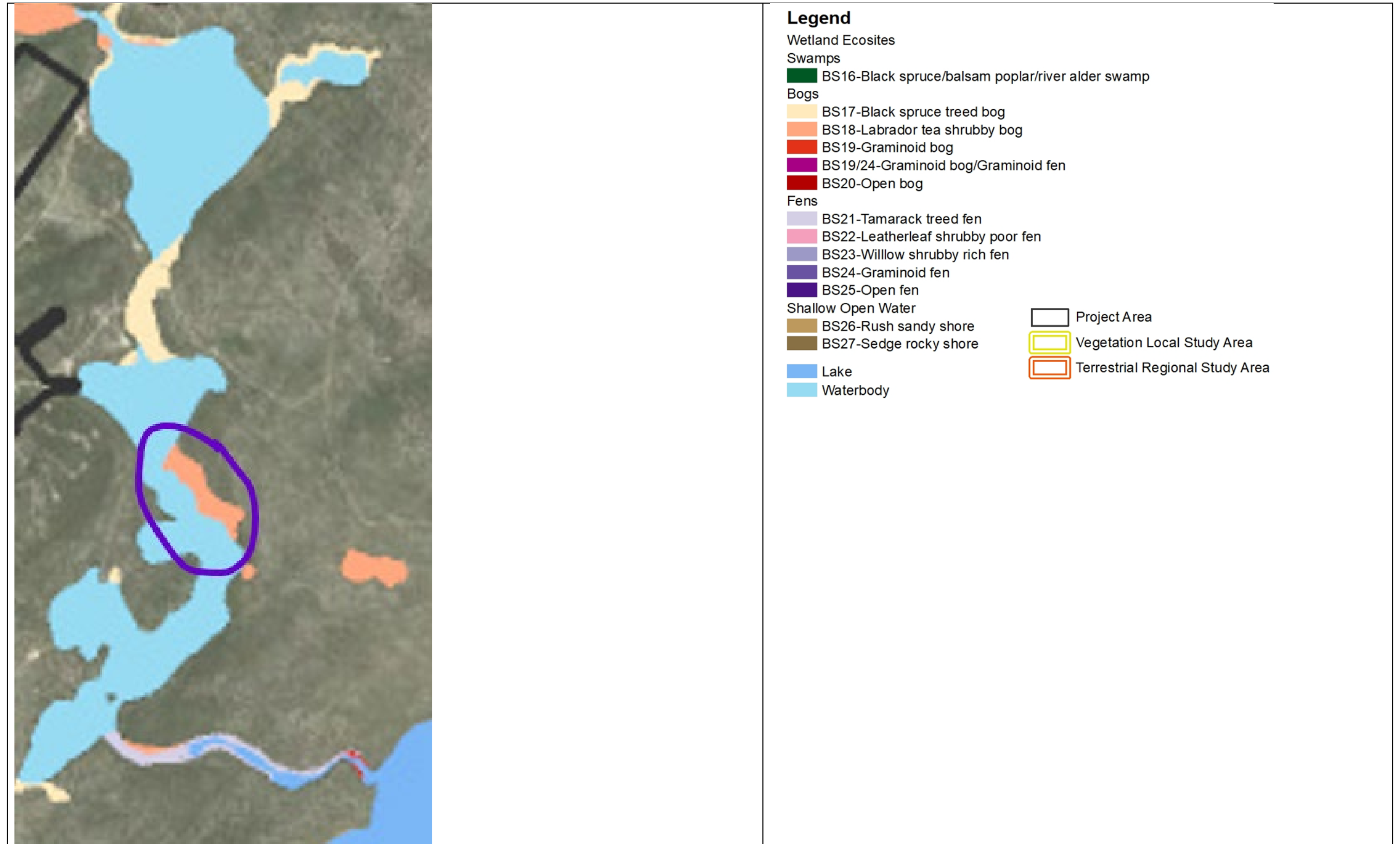


Photo 6: SA-6 looking upstream. Photo taken May 13, 2011.

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Area of interest in Whitefish Lake, August 16, 2024



Appendix 8-D:

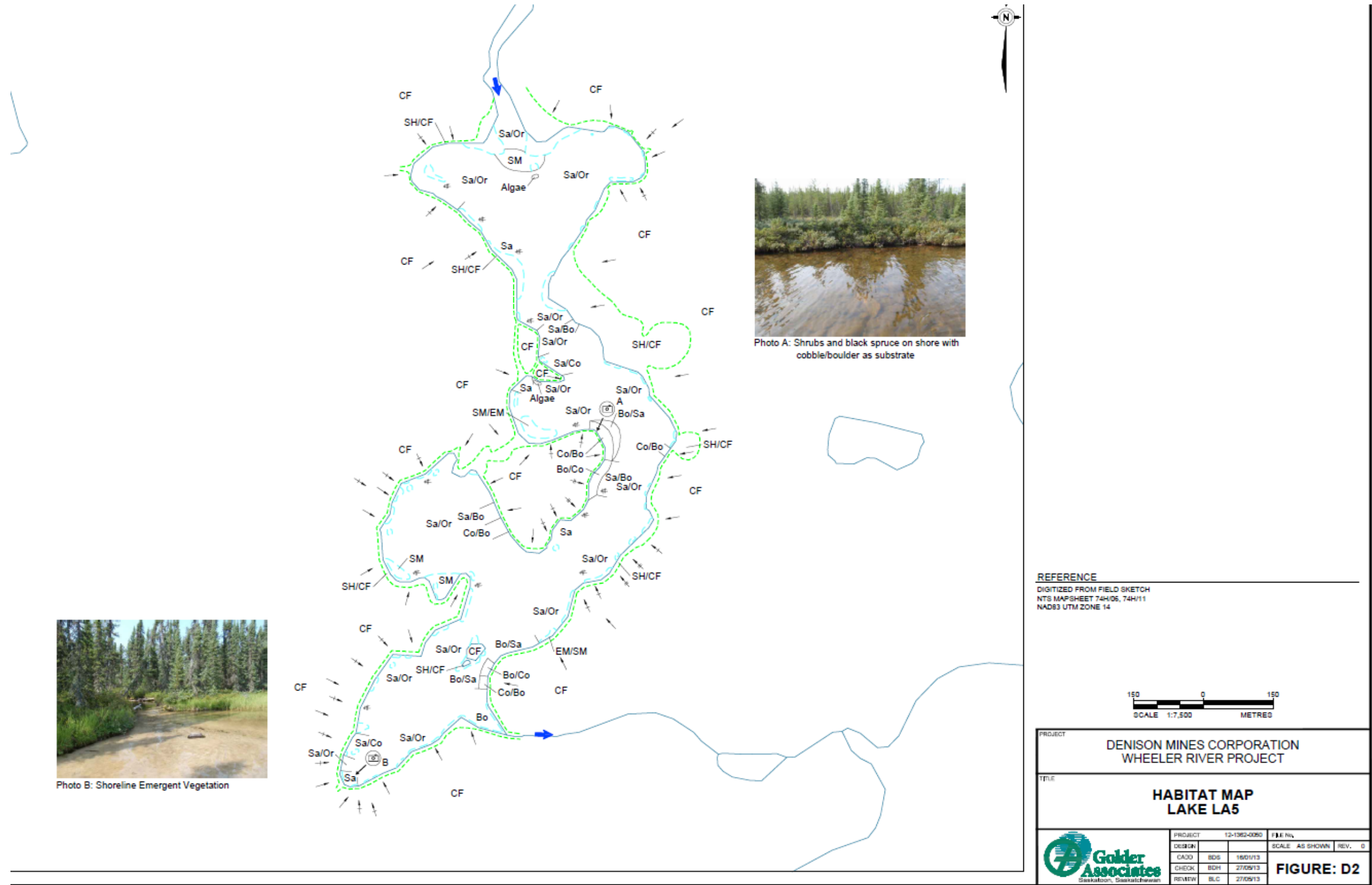
LA-5: 3.5.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (Appendix F). Shoreline vegetation at LA-5 consisted mainly of shrubs and black spruce with upland jack pine forest. The typical substrate observed for LA-5 was sand and organic matter. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar, confirming the earlier survey data.

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Legend - Lakes, Wetlands, Ponds

Substrate Types	
Cl	Clay
Sl	Silt
Sa	Sand
Gr	Gravel
Co	Cobble
Bo	Boulder
Bd	Bedrock
Or	Organic

Bank/Upland Vegetation Types	
BA	Bare Ground
OT	Open Tundra
MU	Muskeg/Bog
DF	Deciduous Forest
CF	Coniferous Forest
MW	Mixedwood Forest
GS	Grassland
GF	Grass/Forbs
GF/SH	Grass/Forbs/Shrubs
SE	Sedge
SH	Shrubs
EM	Emergent Vegetation
MO	Moss
OR	Organic

Habitat Features		
XXXX	BD	Beaver Dam
	MD	Man-Made Dam
	BL	Beaver Lodge
	BG	Boulder Garden
		Bridge
		Culvert
	DP	Debris Pile
	EM	Emergent Vegetation
		Flow Direction
	ISC	Instream Cover
	IV	Instream Vegetation
	INV	Inundated Vegetation
	LWD	Large Woody Debris
	LE	Ledge
	LJ	Log Jam
	LS	Landslide
	ML	Multiple Island
	OHV	Overhanging Vegetation
	OHC	Overhead Cover
	RW	Root Wad
		Sand Bar
	SIL	Singular Island
	SWD	Small Woody Debris
	SM	Submergent Vegetation
	UCB	Undercut Bank
	USB	Unstable Bank

Bank Slope	
	Shallow Slope (0-5%)
	Intermediate Slope (6-30%)
	Steep Slope (31-70%)
	Very Steep Slope (>70%)

Bank Instability Ratings	
A	Aggrading
E	Eroding
S	Slumping
G	Gullying

Capture Methods		
	BP	Electrofishing - Backpack
	EF	Electrofishing - Boat
	GN	Gill Net
	SN	Selne
	FF	Fish Fence
	MT	Minnow Trap
	AN	Angling
	HN/TN	Hoop Net/Trap Net

Sample Type Symbols		
		Water
		Sediment
		Benthic
		Fish

General	
	Photo Location/Direction
	Habitat Type Divider
	Fish Bearing/Potential Bearing Watercourse
	Width
	Depth

Site Summary Symbol

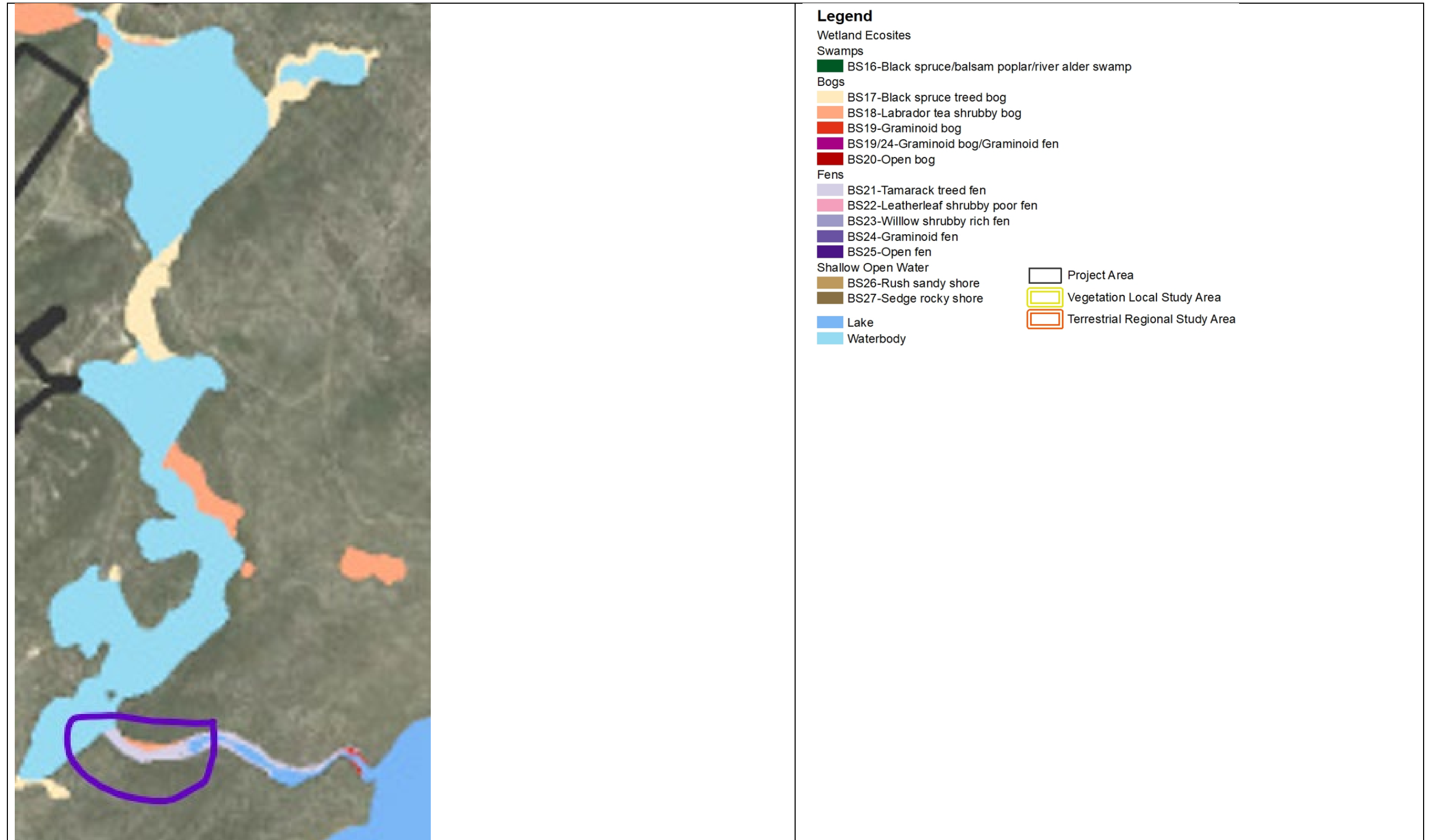
	Lake (L), Wetland (W) or Pond (P)
	Surface Area (ha)
	Main Shoreline Perimeter (m)
	Max Depth (m)
	Secchi Depth (m)
	Dissolved Oxygen (mg/L)
	Conductivity (µS/cm)
	pH
	Fish Species

Notes:
 ha = hectares
 m = metres
 mg/L = milligrams per litre
 µS/cm = microsiemens per centimetre
 Max depth was the depth recorded at sampling locations.

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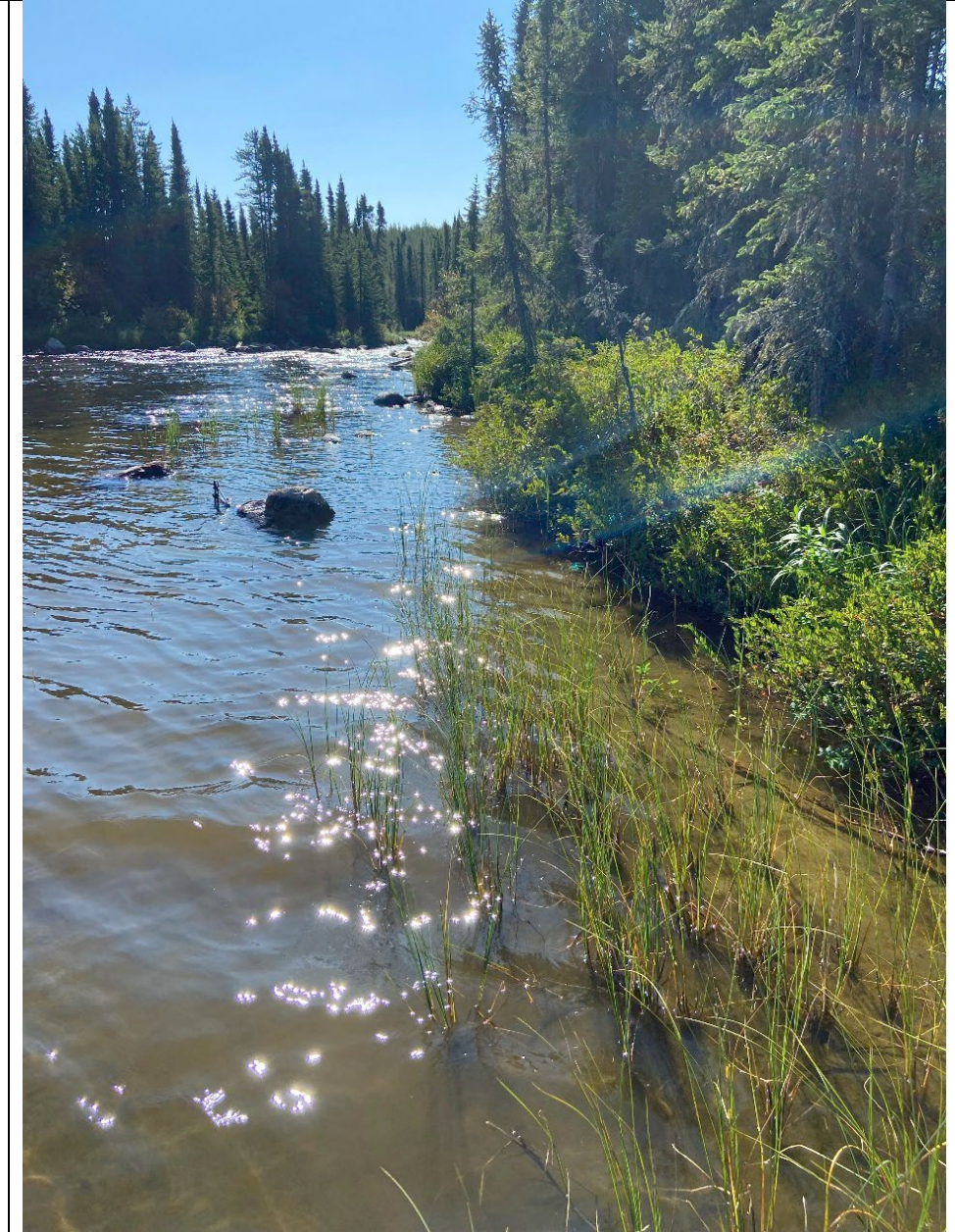
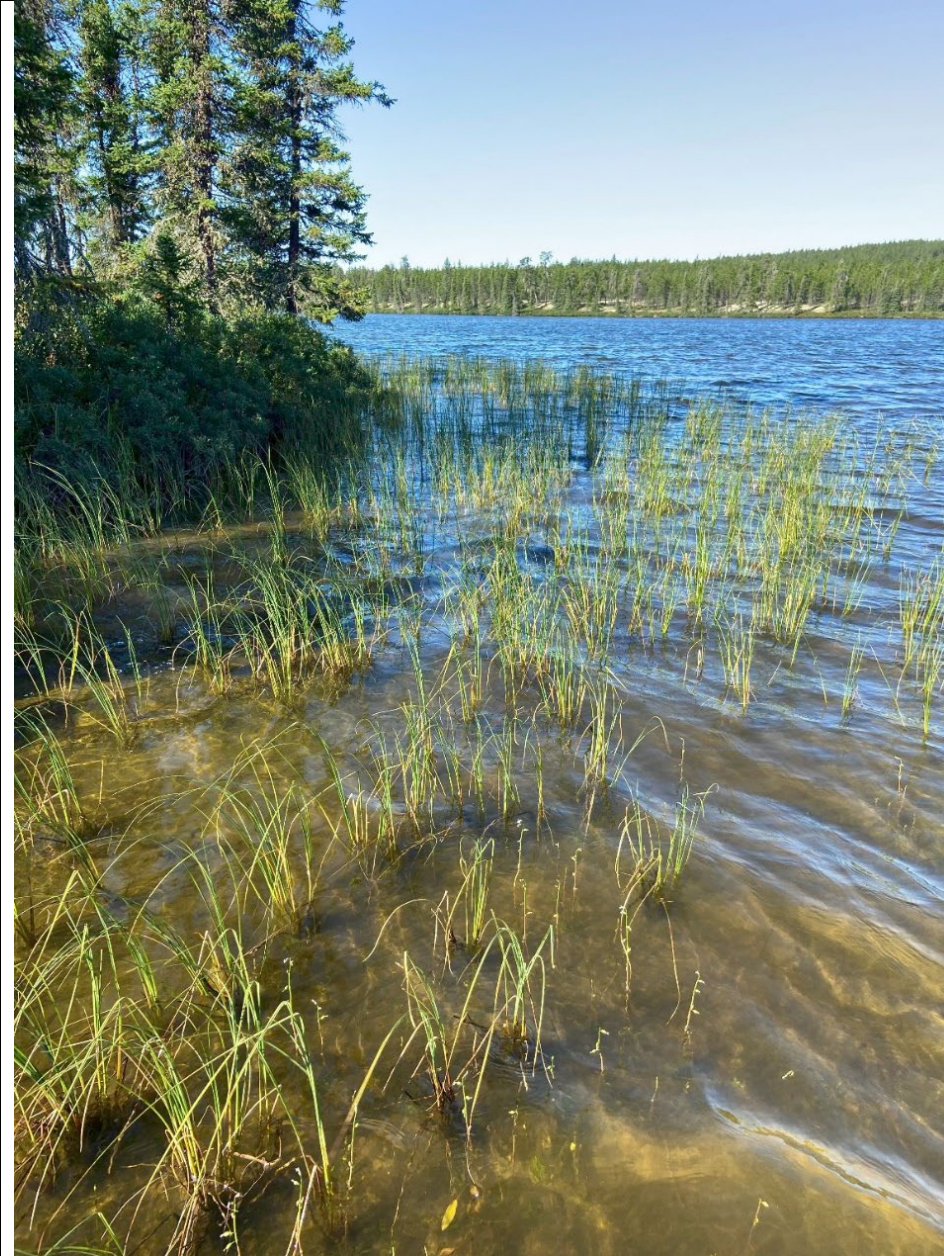
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Area of interest at outlet of Whitefish Lake, August 16, 2024:

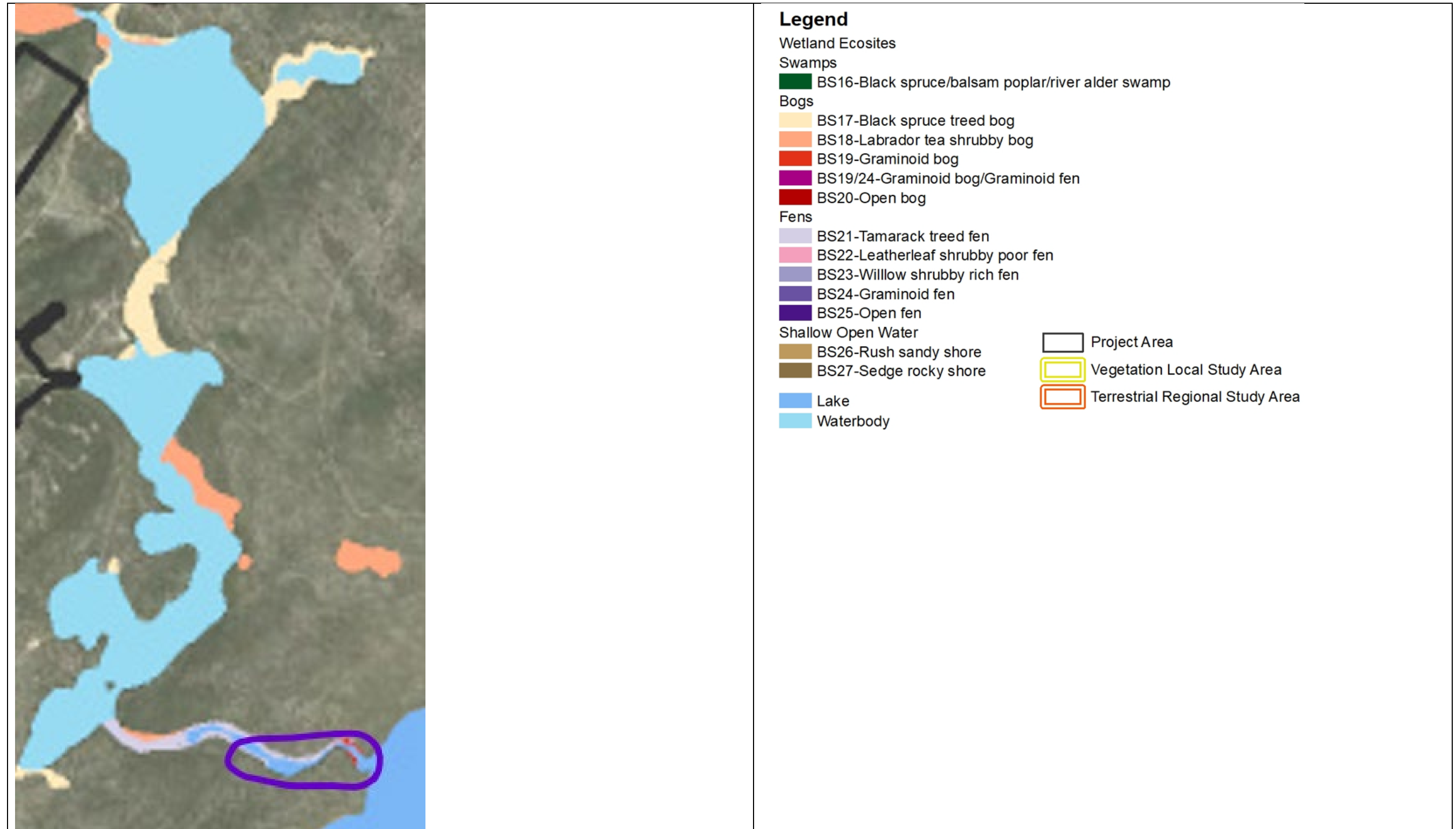
This area has stable banks and the substrate primarily composed of sand and detritus. The surrounding terrestrial vegetation was Black Spruce, Blue Spruce, and Jack Pine. The aquatic vegetation was Bur-reed and Potamogeton.



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Notes from Appendix 8-B, Appendix F (2019):

SA-2 (Northwest Flow into McGowan Lake) Station SA-2 is located to the northwest of McGowan Lake. A datalogger is not installed at this location. During the 2019 monitoring program it was learned that the cross-section had been moved in 2016 creating a discrepancy in water levels. The old cross-section was identified during the August field program and sufficient data are available to correct the July 2019 measurement (Table 2 and Figure 2). The original cross-section will be used for measurements in future field monitoring programs. Photo 3 is taken of the cross-section used during the July field program while Photo 4 is the original cross-section used in August.

Photo 3: SA-2 - July Field Program



Photo 4: SA-2 - August Field Program



Notes from Appendix 8-D (2016):

4.2 SA-2

Stream station SA-2 is situated within the Icelander River watershed, on the northwest tributary of McGowan Lake (LA-1), immediately upstream of the lake, approximately 800 m downstream of Whitefish Lake (LA-6) (see Figure 1-8). At this location the stream is 3rd order.

Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 285 m long surveyed reach were 9 m, 0.35 m and 1 m/s, respectively. The stream banks were stable, and the channel was meandering with some braiding (see Appendix C, Photo 3). Within the surveyed reach, the stream gradient was mainly high to moderate. The stream morphology was mostly riffles (90%), with minor runs (5%) and pools (5%). The canopy was dense to partly open. Instream cover was primarily afforded by boulders and undercut banks, with minor contributions from logs and trees, deep pools and aquatic macrophytes. Substrates were comprised of 45% boulder, 40% cobble and 5% gravel, with trace amounts of sand and silt. Aquatic vegetation included sedges and horsetail (*Equisetum* sp.). Algal growth was moderate, and no sediment was observed overlying the substrate. No barriers to fish migration were observed in the reach. The surrounding terrain was 90% upland and 10% lowland forest, and observed riparian vegetation included jack pine, black spruce, alder (*Alnus* sp.), sweet gale, Labrador tea (*Ledum groenlandicum*) and willow. Stonefly nymphs and caddisfly larvae (*Trichoptera*) were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.

4.2.4 Fish Community

A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. During the fall 2016 survey, 1,271 seconds of electrofishing effort was expended within a 285-m reach, resulting in the capture of 97 fish from 6 species. Slimy Sculpin were the most abundant species encountered, with 16 YOY, 19 juveniles and 35 adults collected. One YOY, 7 juvenile and 5 adult Lake Chub; 2 YOY and 5 juvenile Burbot; 2 YOY and 1 juvenile Northern Pike; 1 juvenile and 1 adult Arctic Grayling; and 2 juvenile White Sucker

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were also captured. In addition, Walleye was observed but not captured. CPUE was 4.58 fish/minute of electrofishing. Eighteen adult White Suckers were captured by gillnet at this location during the spring 2017 survey. The list of fish species identified was reviewed by Bobby John and is considered inclusive and comprehensive.



Photo 3: Stream station SA-2 looking upstream (16 September 2016). This drainage area A station is situated on the northwest tributary of lake LA-1, immediately upstream of the lake, approximately 800 m downstream of lake LA-6.



Photo 4: Stream station SA-2 looking downstream (16 September 2016). Use of the reach by White Sucker and Walleye for spawning was observed during the May 2017 spawning survey.



SA-2 facing upstream, March 2018.

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Notes from Appendix 8-B, Appendix D (2011):

SA-2

Streamflow monitoring station SA-2 flows into the northwest end of LA-1. The monitoring station at SA-2 is located several meters downstream of the transition between an upstream meandering channel and a downstream riffle section. The monitoring site has a cross-section width of approximately 11 m, is relatively shallow with high velocity flow. The substrate is primarily composed of boulders and cobble, with well-defined and stable vertical banks vegetated with shrubs and trees. SA-2 produces a fair stage-discharge relationship; however, the slope is nearly linear, so it may overestimate low and high flows. Further measurements at extreme flows would help verify the accuracy of this rating curve.



Photo 2: SA-2 looking downstream. Photo taken July 30, 2011.