Wetland Compensation Plan
April 2020 Rev. C

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Joint venture companies

Mitsubishi Corporation

Executive Summary

LNG Canada Development Inc. (LNG Canada) is proposing to develop a liquefied natural gas (LNG) production and export terminal, referred to as the LNG Canada Export Terminal (the Project), in the District of Kitimat, British Columbia (BC).

The Project was subject to a substituted environmental assessment to address the requirements of the British Columbia *Environmental Assessment Act* and the *Canadian Environmental Assessment Act, 2012*. The Project received a provincial Environmental Assessment Certificate (EAC) and a federal Decision Statement, each with a condition to address project effects to wetlands: provincial condition 10 and federal condition 4 (EAO 2015; CEA Agency 2015). Stantec Consulting Ltd. (Stantec) has prepared this Wetland Compensation Plan on behalf of LNG Canada to describe the measures proposed to offset the residual loss of wetland ecological functions associated with the Project and address both provincial and federal conditions. The Wetland Compensation Plan was submitted to the EAO in July 2015, following consultation with Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), and Aboriginal groups (which includes Haisla Nation) and prior to the commencement of construction. As LNG Canada continued consultation with these groups and refined their approach to implementing the plan, the plan was revised in May 2018, August 2019 and again in April 2020.

The Project infrastructure (LNG facility, workforce accommodation centre, and supporting infrastructure) will require complete vegetation clearing, grading, and replacement with infrastructure, while the tree clearing areas located within a safety setback and along the LNG rundown line require only tree-clearing; shrub and herb vegetation will remain, and minimal ground disturbance will occur within tree clearing areas. Some of the habitat offsetting measures associated with the Project's Fisheries Act authorizations are located within wetlands adjacent to these Project components. Site preparation within the Project infrastructure, tree clearing areas, and adjacent fisheries habitat offsetting areas (together referred to in this plan as the Project footprint) has the potential to affect approximately 94.3 ha of wetlands.

The Canadian Wildlife Service of Environment and Climate Change Canada indicates that the Federal Policy on Wetland Conservation (1991; the Policy) applies to the Project due to the potential effects on wetland functions and because federal decisions would be required before the Project could proceed (e.g., issuance of federal authorizations and permits). Regional guidance for application of the Policy in BC provided to LNG Canada during initial development of the Wetland Compensation Plan (Environment Canada 2014) and revised guidance provided during consultation on implementation of the Plan (ECCC/CWS 2019) indicates that the Policy goal of no net loss of wetland functions applies to wetlands that are ecologically or socioeconomically important to a region, which include:

- Provincially red- and blue-listed wetlands
- Estuarine wetland communities

Of the 94.3 ha of wetlands within the Project footprint, 49.0 ha are provincially red or blue-listed, or estuarine (or both) and therefore, ecologically important and subject to the no net loss of wetland functions goal of the Policy according to Environment Canada (2014).

Wetland ecological functions will be lost permanently or for the long-term within 40.1 of the 49.0 ha of ecologically important wetlands within the Project footprint; wetland functions will be retained within herb and shrub-dominated wetlands within tree clearing areas and in areas subject to only temporary disturbance during construction.

Applying a 2:1 compensation ratio (wetland functions replaced: wetland functions lost) to areas of permanent or long-term loss of ecologically important wetlands associated with construction of Project infrastructure and tree clearing areas (31.7 ha), and a 1:1 compensation ratio to the ecologically important wetlands within the fish habitat offsetting areas where wetland types and functions may be changed, but not entirely lost (8.4 ha), results in a requisite 71.8 ha of compensatory wetlands and associated functions to achieve the no net loss goal of the Policy.

To offset the loss of wetland functions, this wetland compensation plan includes the following components:

- Implementation of authorized fish habitat offsetting measures as outlined in the *Fisheries Act* authorizations (FAAs) issued for the Project (15-HPAC-00585, 15-HPAC-00918, 16-HPAC-00220, and 16-HPAC-01079) and the FAA associated with the Rio Tinto Terminal A Extension (17-HPAC-00076). These result in approximately 47.8 ha of wetland habitat gains, as follows:
    - 7.4 ha of salt marsh restoration
    - 4.2 ha of estuarine wetland enhancement
    - 18.2 ha of freshwater wetland enhancement and creation
    - 17.1 ha of salt marsh creation in Minette Bay
    - 0.9 ha of salt marsh creation at Hospital Beach (associated with the FAA for Rio Tinto)
- Securement and restoration or enhancement of 24.0 ha of comparable wetlands through a conservation allowance on District Lot 95 (DL95) in the District of Kitimat
- A wetland monitoring program to document compliance and performance of compensatory wetlands
- Incorporation of traditional use plants where appropriate and technically feasible in wetland compensation measures and access to those sites to Aboriginal people for the purposes of gathering traditional use plants whenever possible.

LNG Canada will seek input on the implementation of wetland compensation measures from Aboriginal groups, the Canadian Wildlife Service of Environment and Climate Change Canada (ECCC/CWS), Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), and the BC Environmental Assessment Office (EAO).

Overall, the proposed compensation plan is expected to result in no net loss of wetland functions within the applicable terms of the Policy.

ABBREVIATIONS

BC	British Columbia
CWHvm1	Coastal Western Hemlock Very Wet Maritime Subzone Submontane Variant
CWS	Canadian Wildlife Service
EAC	environmental assessment certificate
EAO	environmental assessment office
ECCC	Environment and Climate Change Canada
Ed	estuarine meadows
Em	estuarine marshes
ENGO	environmental non-government organization
FAA	*Fisheries Act* Authorization
ha	hectares
LNG	liquefied natural gas
LNG Canada	LNG Canada Development Inc.
LSA	local study area
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
Project	LNG Canada Export Terminal
SARA	*Species at Risk Act*
TDR	technical data report
the Policy	Federal Policy on Wetland Conservation (1991)
TEM	terrestrial ecosystem mapping

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1. INTRODUCTION

1.1. Project Overview

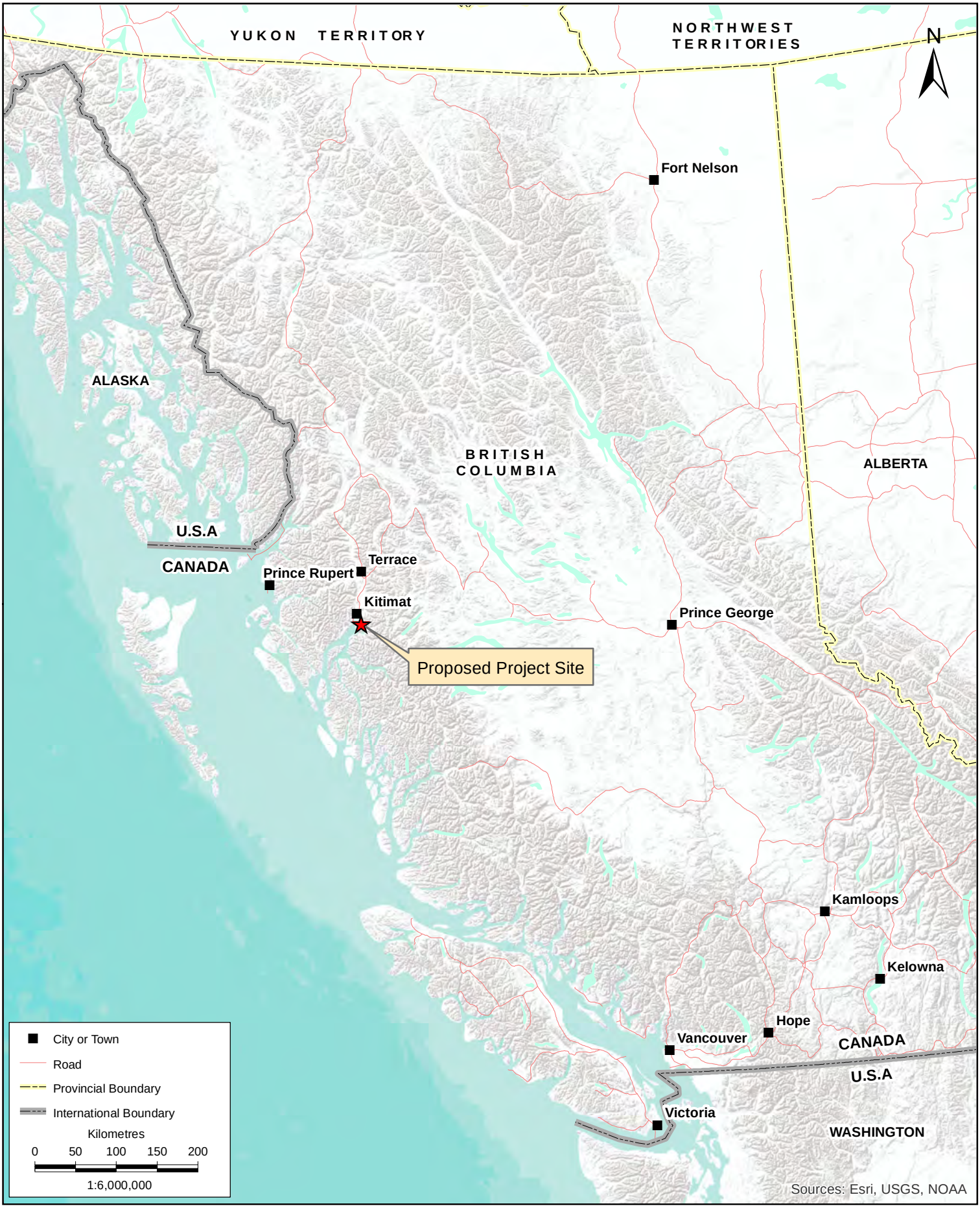
LNG Canada Development Inc. (LNG Canada) is proposing to construct and operate a liquefied natural gas (LNG) export facility, the LNG Canada Export Terminal (the Project), that will consist of an LNG processing and storage site and marine terminal for exporting LNG via shipping. This Project is located in the District of Kitimat, British Columbia (BC) (Figure 1-1). It lies within the Coastal Western Hemlock Very Wet Maritime Submontane Variant (CWHvm1) biogeoclimatic ecosystem classification unit.

The Project has received an Environmental Assessment Certificate (EAC) and federal Decision Statement with conditions to address project effects to wetlands: provincial condition 10 and federal condition 4 (EAO 2015; CEA Agency 2015). Stantec prepared this Wetland Compensation Plan on behalf of LNG Canada to describe the measures proposed to offset the residual loss of wetland ecological functions associated with the Project. The Wetland Compensation Plan was submitted to the EAO in July 2015, following consultation with Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), and Aboriginal groups (which includes Haisla Nation); and prior to the start of construction.

The 2015 Wetland Compensation Plan addressed the Project's compensation requirements through implementation of the marine fish habitat offsetting outlined in the marine *Fisheries Act* authorization for the Project, with the remainder addressed through in-lieu fees to an environmental non-governmental organization (ENGO) responsible for delivering land securement and restoration, enhancement, and/or creation of wetlands. Based on feedback regarding the importance of delivering compensation as close to Kitimat as possible and as the project developed additional fish offsetting measures associated with subsequent *Fisheries Act* authorizations, this Plan was revised to address the remainder of compensation requirements (after implementation of the marine offsets) via wetland creation, enhancement and restoration through additional fish habitat offsets for the Project and through securement of local lands for a conservation allowance, rather than through in-lieu fees to an ENGO. An effectiveness monitoring plan has also been developed and included in this revision.

Project activities have the potential to affect approximately 94.3 ha of wetlands. This includes areas that will require complete vegetation clearing and grading for construction of the LNG facility, workforce accommodation centre, and supporting infrastructure, and areas requiring tree clearing-only for safety setbacks (in the vicinity of the flare derrick and LNG loading lines), where shrub and herb vegetation will remain, and no ground disturbance will occur (Figure 1-2). For the purposes of this Wetland Compensation Plan, the Project footprint also includes fish offsetting measures outlined in the *Fisheries Act* Authorizations for the Project that are located adjacent to the LNG facility, workforce accommodation centre, and supporting infrastructure; and areas of temporary disturbance to vegetation and soils for construction access roads and water supply pipelines (Figure 1-2).

Regional guidance on the application of the Federal Policy on Wetland Conservation (the Policy) within BC was provided to LNG Canada by the Canadian Wildlife Service of Environment and Climate Change Canada and was used as guidance to develop the scope of this plan, with revised guidance provided in 2019 as LNG Canada continued to consult on its implementation (Environment Canada 2014, ECCC/CWS 2019; APPENDIX 1).



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WETLAND COMPENSATION PLAN

LNG CANADA PROJECT LOCATION MAP

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

PROJECTION	DRAWN BY
UTM9	LT
DATUM	CHECKED BY
NAD 83	MR
DATE	FIGURE NO.
16-MAY-18	**1-1**

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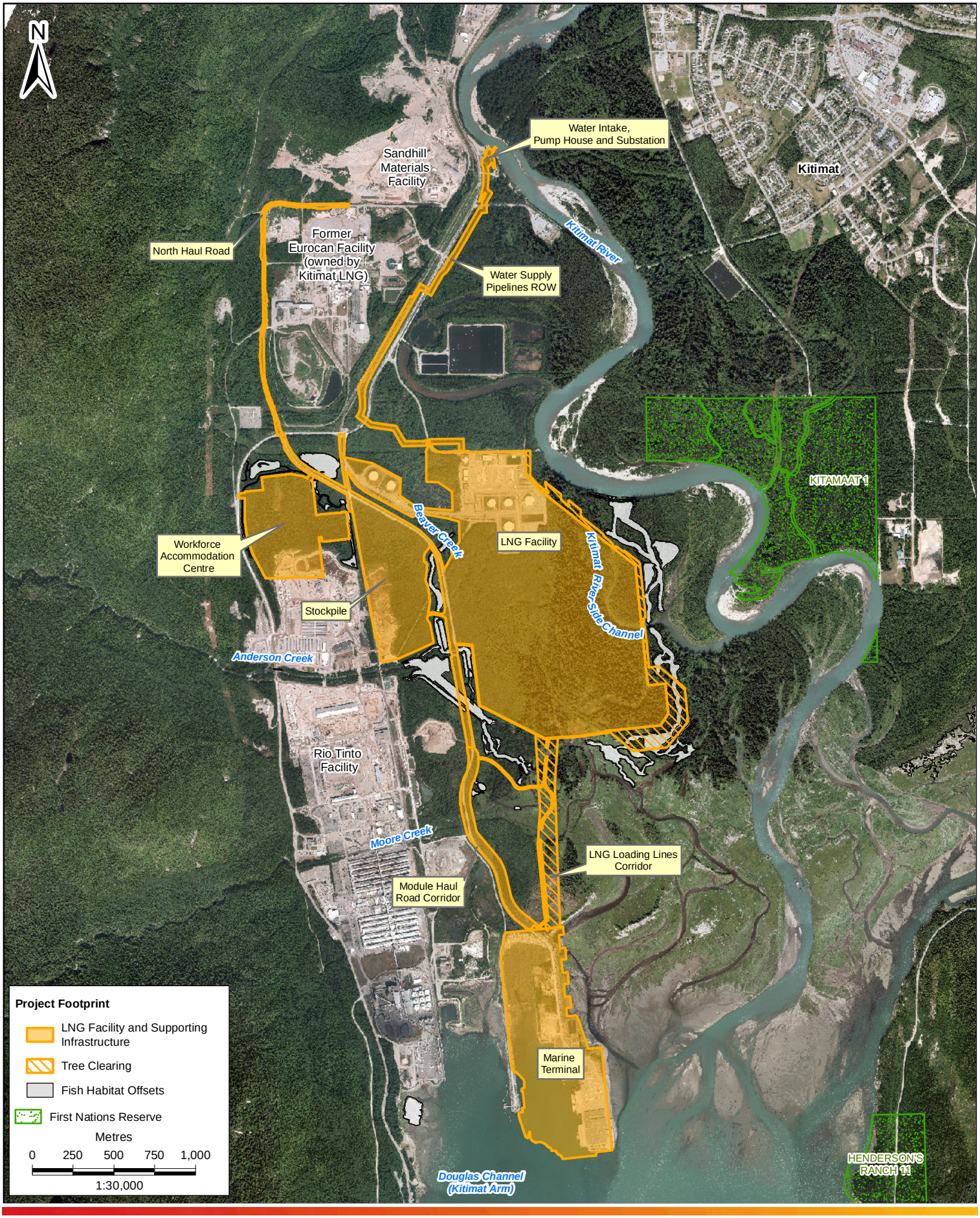

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WETLAND COMPENSATION PLAN

PROJECT FOOTPRINT

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

PROJECTION: UTM9	DRAWN BY: LT
DATUM: NAD 83	CHECKED BY: MR
DATE: 17-APR-20	FIGURE NO.: **1-2**

1.2. Regulatory Context

The Project was subject to a substituted environmental assessment to address the requirements of both the BC *Environmental Assessment Act* and the *Canadian Environmental Assessment Act*, *2012*. On June 17, 2015, the Project received both provincial and federal approvals of its environmental assessment, subject to conditions. Table 1-1 provides a summary of relevant conditions related to wetlands and information on how they are met by this Wetland Compensation Plan and other management plans being developed for the Project.

Table 1-1 Concordance Tracking

Condition Reference Number	Condition Requirements	Wetland Compensation Plan Section
Provincial Conditions (from Environmental Assessment Certificate #E15-01)		
10	Wetland Compensation The Holder must develop, in consultation with EC and FLNR, a wetland compensation plan that is consistent with the Federal Policy on Wetland Conservation and compensates any permanent loss of wetland function for red-listed or blue-listed wetlands and estuarine wetland communities. The Holder must demonstrate reasonable efforts to engage with Haisla Nation in developing and sharing information regarding implementation of the plan. The Holder must provide the final plan to EAO, EC, FLNR, and Haisla Nation no less than 30 days prior to the Holder's planned date to commence Construction. The Holder must implement the plan to the satisfaction of EAO.	Section 1.4 provides methods, inclusive of consultation. Section 1.5 provides a summary of consultation to-date. Section 4 provides a commitment of continued consultation with Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), and Aboriginal groups (which includes Haisla Nation) through to implementation. The Wetland Compensation Plan was first submitted to the EAO July 2015, then revised in May 2018, August 2019 and again in April 2020 as LNG Canada progressed the approach to implementing the Plan.
Federal Conditions (from Environmental Assessment Decision Statement—reference number 80038)		
4.1	The Proponent shall mitigate the adverse environmental effects of the Designated Project on wetland functions that support migratory birds, species at risk or the current use of lands and resources for traditional purposes by Aboriginal people. The Proponent shall give preference to avoiding the loss of wetlands over minimizing the adverse effects on wetlands and for managing the effects on wetlands over compensating for lost or adversely affected wetlands.	Section 3.1 Note: Final management plans referenced in this section can be made available upon request.

Table 1-1 Concordance Tracking

Condition Reference Number	Condition Requirements	Wetland Compensation Plan Section
4.2	To avoid loss of wetlands or to manage adverse effects on wetlands impacted by the Designated Project footprint and adverse effects on wetland function on and for those wetlands adjacent to the Designated Project footprint, the Proponent shall:	See bulleted list below
4.2.1	Delineate clearing boundaries prior to the commencement of construction and respect those boundaries during construction	Section 3.1
4.2.2	Maintain, where practicable, tidal flow and wildlife passage in the LNG loading line corridor between the LNG processing and storage site and the marine terminal	Section 3.1
4.2.3	Manage surface water and avoid erosion or sedimentation to maintain hydrology of adjacent wetlands and protect water quality	Section 3.1
4.2.4	Conduct follow-up monitoring prior to and during construction to detect potential unanticipated loss of wetland functions and implement adjustments to mitigate loss of those wetland functions	Section 4.2
4.3	For effects on ecologically important wetlands that cannot be avoided or minimized, mitigation measures shall be set out in a Wetland Compensation Plan that shall be prepared by the Proponent in consultation with Aboriginal groups. The mitigation measures to be set out in the Wetland Compensation Plan shall include:	Section 1.4, 4, and 4.1
4.3.1	Implementing a 2:1 ratio of compensation area to the loss of ecologically important wetland area	Sections 4 and 4.1

Table 1-1 Concordance Tracking

Condition Reference Number	Condition Requirements	Wetland Compensation Plan Section
4.3.2	Identifying sites to compensate for the lost wetlands referred to in Section 4.3.1, that are as close to Kitimat as possible and that reflect similar wetland types and functions to those that are lost	Sections 4 and 4.1
4.3.3	A preference for wetland restoration over enhancement, and wetland enhancement over creation	Section 4 and 4.1
4.3.4	Whenever possible, using traditional plants in the enhancement or creation of the compensation sites referred to in Section 4.3.2 and providing access to those sites to Aboriginal people for the purposes of gathering traditional use plants	Sections 3.1, 4, and 4.1
4.4	The Proponent shall implement the wetland compensation plan within five years of the date of the start of construction.	Section 4
4.5	The Proponent shall implement a follow-up program to verify that the compensation wetland sites are fulfilling the functions of the wetlands they are replacing and shall implement corrective actions in respect of the compensation wetlands if the latter do not fulfill those functions. The follow-up program shall include monitoring of the compensatory wetland sites to verify that lost habitat is being restored at or on those sites, in year one, and in years three, five, and ten following the enhancement or creation of the compensating wetlands.	Sections 4.3

1.3. Policy Context

During initial development of the Wetland Compensation Plan, Environment and Climate Change Canada's regional office of the Canadian Wildlife Service advised that based on the Project description, wetland baseline information and requirements for a federal authorization, the *Federal Policy on Wetland Conservation* (the Policy) would apply (Environment Canada 2014). This Wetland Compensation Plan was prepared with consideration of the Policy and Environment Canada's Operational Framework for Use of Conservation Allowances (Environment Canada 2012).

The Government of Canada adopted the Policy in 1991 as a commitment to promoting wetland conservation within all federal decisions and responsibilities. Although it is not a regulatory document, the Cabinet-level direction has been to apply this Policy to all federal policies, plans, programs, projects, and activities (Lynch-Stewart et al. 1996).

The Canadian Wildlife Service of Environment and Climate Change Canada is responsible for coordinating the implementation of the Policy whenever federal corporations, agents or authorities are making decisions that may affect wetlands. These decisions include actions such as granting permits, constructing facilities, leasing Crown land, or conducting land use planning. Through ongoing consultation as LNG Canada developed its approach to implementing the Wetland Compensation Plan, ECCC/CWS provided revised regional guidance on the application of the Policy (ECCC/CWS 2019). This guidance is generally consistent with the 2014 guidance and provides additional clarity that the no net goal of the federal policy is not limited to areas of federal jurisdiction but rather applies to all wetland functions (hydrological, biogeochemical, and habitat), and that CWS considers temporary impacts to be those that are limited to 5 years duration or less (ECCC/CWS 2019).

The Policy commits all federal departments to the goal of no net loss of wetland functions where any of the following conditions apply:

i. On federal lands and waters

ii. In areas affected by the implementation of federal programs where the continuing loss or degradation of wetlands has reached critical levels

iii. Where federal activities affect wetlands designated as ecologically or socio-economically important to a region (Government of Canada 1991)

The issuance of a federal authorization or permit, such as a *Fisheries Act* authorization or a disposal at sea permit, represents a federal activity that would enable the Project to proceed and, thereby, affect wetlands and their functions and bring the Policy into effect for the Project, specifically bullet (iii) above.

In BC, wetlands designated as ecologically important to a region are defined by Environment Canada (2014) as:

- Provincially red-listed (threatened or endangered) and blue-listed (of special concern) wetland ecological communities
- Estuaries, as identified by the Pacific Estuary Conservation Program
- Areas of continental or regional significance to waterfowl within the Habitat Joint Venture planning boundaries of BC (e.g., estuaries in the Pacific Coast Joint Venture delivery area)
- All eelgrass (Zostera subspecies) beds

Red-listed, blue-listed, and estuarine wetlands occur in the Project footprint. Estuaries are also considered areas of continental significance to waterfowl within the Pacific Bird Habitat Joint Venture delivery area (Environment Canada 2014). Eelgrass beds with the potential to be affected by Project activities are addressed within the scope of the marine *Fisheries Act* Authorization (15-HPAC-00585).

For projects on non-federal lands and waters, as is the case for the Project, wetland losses are evaluated in terms of the scope of any federal permits, licenses, authorizations, and other instruments under federal jurisdiction that may be applicable and where the associated wetland functions support areas of federal jurisdiction (such as habitat for migratory birds and species at risk). The wetlands within the Project footprint support migratory birds and some wildlife species listed on Schedule I of the *Species at Risk Act* (SARA), thereby, supporting wetland functions that correspond to areas of federal regulatory jurisdiction.

The Policy's objective, goals, and strategies emphasize consideration of wetland functions, rather than wetland area as such. Under the Policy, wetland functions include:

> "the natural processes and derivations of benefits and values associated with wetland ecosystems, including economic production (e.g., peat, agricultural crops, wild rice, peatland forest products), fish and wildlife habitat, organic carbon storage, water supply and purification (groundwater recharge, flood control, maintenance of flow regimes, shoreline erosion buffering), and soil and water conservation as well as tourism, heritage, recreational, educational, scientific, and aesthetic opportunities" (Government of Canada 1991).

The Policy's definition of wetland functions includes both "wetland ecological functions" and "wetland values" as these two terms have more-recently come to refer to different concepts within the scientific literature. Wetland ecological functions are the inherent physical, chemical, and biological processes associated with wetlands independent of their benefit to humans; whereas, wetland values are ecosystem services that wetlands provide to humans (Hanson et al. 2008).

Federal corporations, agents or authorities aim to meet the objectives of the Policy by planning projects and activities using a mitigation hierarchy of first, seeking to avoid any project-related effects on wetlands to the greatest extent possible; second, minimizing unavoidable effects; and last, compensating for remaining unavoidable wetland losses through reasonable and practical means (Lynch-Stewart et al. 1996). Without such compensation, a project's residual adverse environmental effects could be deemed significant, if a net loss of wetland ecological functions were to occur.

Wetland compensation typically entails restoration, enhancement, or creation. Restoration is defined as returning a damaged wetland as close as possible to its original condition prior to the damage; enhancement is making changes or improvements to wetlands to enhance existing functions performed by the wetlands; and creation is shaping dry land so that it will support the physical and biological characteristics of a wetland (Wetland Stewardship Partnership 2009). Environment and Climate Change Canada recommends wetland restoration over enhancement, and enhancement over creation (Environment Canada 2014; ECCC/CWS 2019).

Examples of compensation implementation include the following: providing in-lieu fees to an environmental non-government organization (ENGO) with an established record of successfully delivering wetland compensation offsets in western Canada (ENGO wetland compensation delivery agent); proponent-delivered compensation on land leased or acquired for the purpose; implementing projects identified by other local stakeholders or communities; land securement where there is an imminent threat of loss of wetland area or function; and/or use of instruments such as carbon offset banks to replace the loss of specific functions (e.g., carbon sequestration and storage).

1.4. Methods

To meet the goals of the Policy, this wetland compensation plan provides an evaluation of wetland functions associated with the potentially affected wetlands using the results of the Project's effects assessment to identify the loss of wetland functions and proposes specific measures to compensate for the loss of identified wetland functions.

The methods of assessing wetland functions for this Project follow guidance contained in Hanson et al. (2008) and Hruby et al. (1999). Methods from the Washington State Department of Ecology have been adapted for application at a landscape-scale (as opposed to site-scale) and to the range of ecosystems in BC, as described by *MacKenzie and Moran* (2004).

Hydrologic, biogeochemical, and habitat functions of wetlands were determined from literature review, project mapping, and field studies. Many indicators of a wetland's potential to provide particular functions were derived from wetland mapping and based on the defining characteristics of wetland classes or site associations.

Wetland hydrological and biogeochemical functions often correlate with wetland classes in accordance with the defining hydrogeomorphic attributes of each class. Hydrogeomorphic attributes of wetlands refer to the position of the wetland on the landscape (geomorphic setting), its dominant source of water, and patterns of surface or subsurface water flow (wetland hydrology). The vegetation structure of particular wetland associations also affects the potential of wetlands to provide certain ecological functions. Vegetation structure refers to the growth form of the dominant vegetation, such as whether the wetland is dominated by trees, shrubs, emergent herbaceous plants, graminoids (grasses, rushes, and sedges), or floating aquatic plants, as well as the horizontal and vertical spatial distribution of vegetation within the wetland.

Wetlands were mapped following provincial standards (RIC 1998) for the EAC application using terrestrial ecosystem mapping (TEM) at a 1:5,000 scale with field surveys identifying wetlands to class and association (see Section 5.5 in LNG Canada Development Inc. [2014a]). Wetlands were classified according to the Canadian *Wetland Classification System* (NWWG 1997) and *Wetlands of British Columbia* (Mackenzie and Moran 2004). Additional details about the methods and results of wetland mapping are contained in the Vegetation Technical Data Report (TDR) for the Project (LNG Canada Development Inc. 2014a).

The following field surveys were conducted by wildlife ecologists during the baseline studies to determine the presence and abundance of wetland-associated wildlife; additional information about the wildlife survey methods and results are contained in the Wildlife TDR for the Project (LNG Canada Development Inc. 2014b):

- Wildlife habitat surveys were conducted as part of the TEM verification program in August and September 2012 and September 2013. This information supports the wildlife habitat suitability ratings that inform the habitat suitability models.
- Breeding bird fixed-radius point count surveys were completed for songbirds in May, early June, and late June 2013.
- Raptor and wetland bird call-playback surveys, and raptor nest surveys, were completed in May and June 2013 and 2014.
- Marbled murrelet surveys and habitat assessments were completed in late May, early June, early July, and late July 2014 and 2015.
- Amphibian transects and intensive site surveys were conducted in wetland and riparian areas in conjunction with breeding bird surveys in May and June 2013.
- Large mammals transect surveys were conducted in May, June, August, and September 2013 (e.g., grizzly bears).
- Incidental observations of wildlife or wildlife sign, important habitat features (e.g., wildlife trees), and wildlife movement corridors were also recorded opportunistically outside structured surveys.

The spatial data files of the Project footprint were overlaid on the baseline TEM to determine the direct losses of wetland area associated with construction of infrastructure and fisheries offsetting measures. The surveys of freshwater and estuarine fish habitats conducted in support of the Freshwater and Estuarine Fish and Fish Habitat Technical Data Report (LNG Canada Development Inc. 2014c) and *Fisheries Act* authorization applications provided additional information about the hydrological connections between watercourses and wetlands within the local study area (LSA). This information was used to determine changes in hydrology that could potentially extend to wetland functions beyond the Project footprint.

A direct loss of wetland extent represents the equivalent loss of associated wetland functions. Section 5.5 of the EAC application provides details about the methods of the effects assessment pertaining to wetlands. This wetland compensation plan includes updates to the area of wetland loss based on the most-recent spatial files of the Project footprint.

Wetland compensation measures have been identified in consultation with MFLNRORD, Haisla Nation, the Canadian Wildlife Service of Environment and Climate Change Canada, Kitimat Rod & Gun Club, District of Kitimat, and members of the Pacific Bird Habitat Joint Venture.

This plan includes the specific measures proposed to achieve no net loss of wetland ecological functions, the general terms and conditions for implementation (i.e., components, schedule and location), and recommended monitoring requirements for compliance and performance. The residual loss of wetland functions from the Project are considered and the compensation measures to be implemented for ecologically important wetlands are the specific focus.

1.5. Consultation

Consultation with potentially affected Aboriginal groups, specifically Haisla Nation, and local environmental organizations has been conducted and will continue until the wetland compensation is implemented. Consultation specific to the Wetland Compensation Plan occurred during public consultation in November 2014 and Haisla consultation in April 2015. Haisla Nation was consulted in May 2017 on the revised approach to the plan and they have been engaged on a regular (monthly) basis throughout 2018. Consultation with MFLNRORD has occurred through meetings in July 2015 and then more recently at least quarterly from mid-2016 until the present. Continued consultation with MFLNRORD will occur until implementation. Consultation meetings with Environment and Climate Change Canada and the Canadian Wildlife Service occurred in February 2014, June 2015, January 2016, and October 2019. Consultation with the Metis Nation of British Columbia occurred in November 2019.

2. WETLAND RESOURCES

2.1. Wetland Extent

Wetlands occupy approximately 94.3 ha within the Project footprint (Table 2-1; LNG Canada 2015). Five wetland classes (estuarine, fen, marsh, swamp, and open shallow water) are represented within the Project footprint (Table 2-1; Figure 2-1). Among the 5 wetland classes are 13 wetland site associations. Section 3.2.3 of the Vegetation TDR (LNG Canada Development Inc. 2014a) provides additional details about each wetland community. Table 2-1 provides the area of wetlands within the Project footprint by structural stage and according to whether the infrastructure would affect wetlands permanently or temporarily, as well as within those areas with partial effects such as the tree clearing areas and fish habitat offsetting measures.

Table 2-1 Wetland Extent in the Project Footprint

Biogeoclimatic Variant, Wetland Class, and Association	Map Code	Ecosystem Name	Structural Stage	Ecologically Important (Y/N)	Component of Project Footprint				Total Wetland Extent
					Infrastructure with Permanent Footprint (LNG facility, WAC, stockpile)	Infrastructure with Temporary Footprint (temporary construction access road, water intake pipelines)	Tree Clearing Area	Fish Habitat Offset Construction	
Estuarine									
CWHvm1/Ed01	TH[a]	tufted hairgrass—meadow barley	2	Y	0.3	0.1	1.2	0.4	2.0
CWHvm1/Ed02	TD[a]	tufted hairgrass—Douglas' aster	2	Y	1.2	0.3	2.1	2.3	5.8
CWHvm1/Em05	LY[a]	Lyngbye's sedge	2	Y	8.5	0.0	0.0	0.1	8.6
CWHvm1/Em06	LD[b]	Lyngbye's sedge—Douglas' water-hemlock	2	Y	1.0	< 0.1	0.4	0.6	2.1
CWHvm1/Ed00	DW	dune wildrye—Pacific hemlock-parsley	2	Y	< 0.1	0.0	0.0	0.0	<0.1
CWHvm1/Ed00	DW		3	Y	0.2	0.0	0.1	0.0	0.3

Table 2-1 Wetland Extent in the Project Footprint

Biogeoclimatic Variant, Wetland Class, and Association	Map Code	Ecosystem Name	Structural Stage	Ecologically Important (Y/N)	Component of Project Footprint				Total Wetland Extent
					Infrastructure with Permanent Footprint (LNG facility, WAC, stockpile)	Infrastructure with Temporary Footprint (temporary construction access road, water intake pipelines)	Tree Clearing Area	Fish Habitat Offset Construction	
Fen									
CWHvm1/Wf01	BK	Water sedge - beaked sedge	2	N	< 0.1	< 0.1	0.1	0.0	0.1
CWHvm1/Wf52	SG[a]	sweet gale—Sitka sedge	3	Y	0.7	0.2	0.7	0.7	2.1
Marsh									
CWHvm1/Wm05	CT[b]	cattail	2	Y	1.7	0.2	1.3	0.7	3.8
CWHvm1/Wm50	PP[b]	Sitka sedge—hemlock-parsley	2	Y	2.2	0.7	1.1	0.4	4.4
Shallow Open Water									
CWHvm1/00	OW	open water	n/a	N	1.5	0.0	0.0	< 0.1	1.5

Table 2-1 Wetland Extent in the Project Footprint

Biogeoclimatic Variant, Wetland Class, and Association	Map Code	Ecosystem Name	Structural Stage	Ecologically Important (Y/N)	Component of Project Footprint				Total Wetland Extent
					Infrastructure with Permanent Footprint (LNG facility, WAC, stockpile)	Infrastructure with Temporary Footprint (temporary construction access road, water intake pipelines)	Tree Clearing Area	Fish Habitat Offset Construction	
Swamp									
CWHvm1/14	RC	western redcedar—Sitka spruce—skunk cabbage	4	N	1.2	0.0	0.0	0.0	1.2
CWHvm1/14	RC		5	N	23.6	0.2	0.0	5.5	29.2
CWHvm1/14	RC[c]		6	Y	0.9	< 0.1	0.0	0.3	1.3
CWHvm1/14	RC[c]		7	Y	5.2	0.0	0.3	0.4	5.9
CWHvm1/Ws50	PS	pink spirea (hardhack)—Sitka sedge	3	N	7.1	1.3	0.4	4.5	13.3
CWHvm1/Ws51	SW[a]	Sitka willow—Pacific willow—skunk cabbage	3	Y	9.6	0.0	0.6	2.4	12.6
Total[d]					**64.8**	**2.9**	**8.1**	**18.3**	**94.3**
Total Ecologically Important Wetlands[d]					**31.4**	**1.4**	**7.6**	**8.4**	**49.0**

Table 2-1 Wetland Extent in the Project Footprint

Biogeoclimatic Variant, Wetland Class, and Association	Map Code	Ecosystem Name	Structural Stage	Ecologically Important (Y/N)	Component of Project Footprint				Total Wetland Extent
					Infrastructure with Permanent Footprint (LNG facility, WAC, stockpile)	Infrastructure with Temporary Footprint (temporary construction access road, water intake pipelines)	Tree Clearing Area	Fish Habitat Offset Construction	

NOTES:

[a] Red-listed wetland

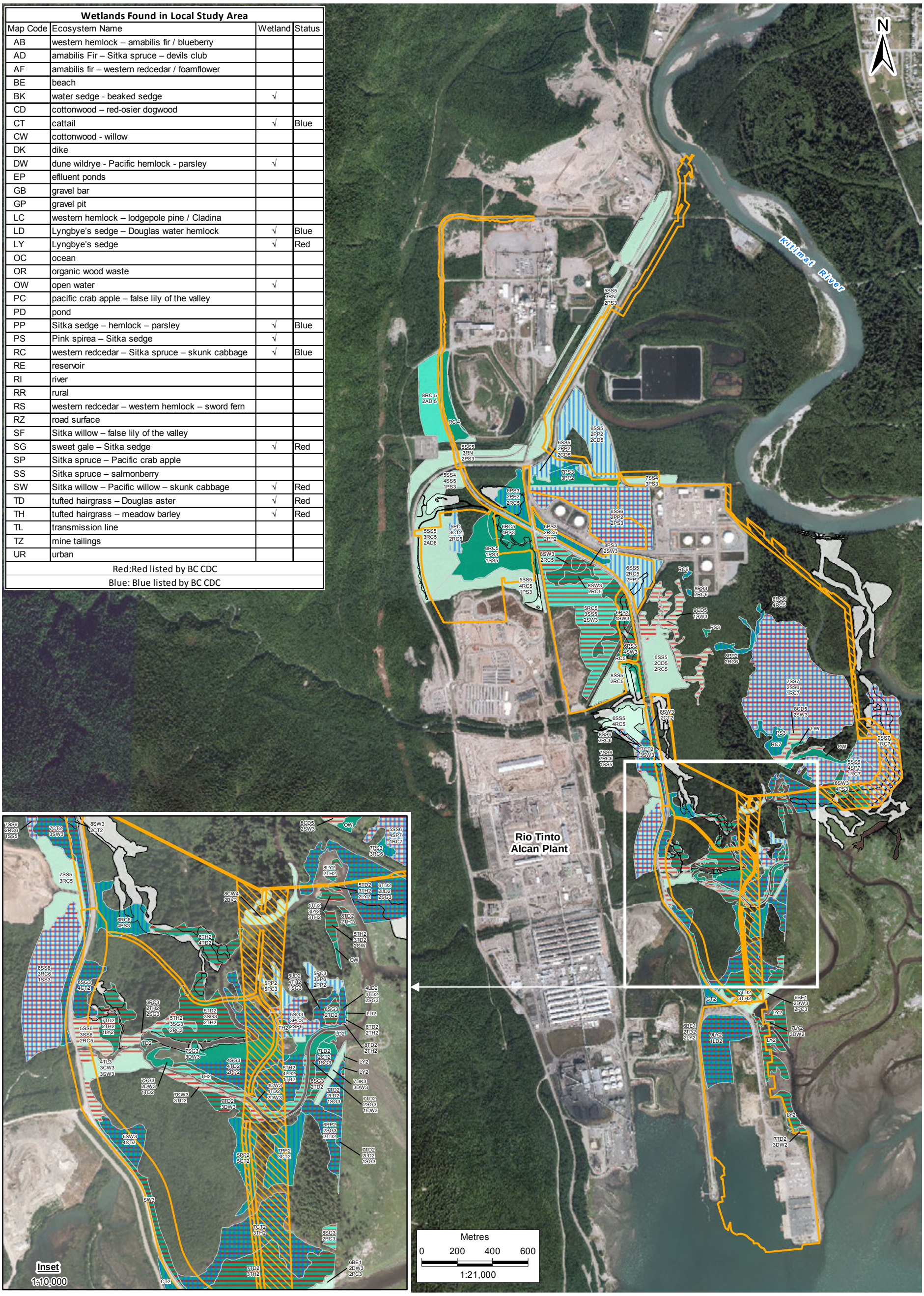
[b] Blue-listed wetland

[c] Blue-listed forested community occurrence, if structural stage is 6 or 7; not a blue listed occurrence if structural stage less than 6.

[d] Totals may not add up due to rounding.

n/a = "not applicable;" water does not have a structural stage attribute assigned.

Wetlands Found in Local Study Area			
Map Code	Ecosystem Name	Wetland	Status
AB	western hemlock – amabilis fir / blueberry		
AD	amabilis Fir – Sitka spruce – devils club		
AF	amabilis fir – western redcedar / foamflower		
BE	beach		
BK	water sedge - beaked sedge	√	
CD	cottonwood – red-osier dogwood		
CT	cattail	√	Blue
CW	cottonwood - willow		
DK	dike		
DW	dune wildrye - Pacific hemlock - parsley	√	
EP	effluent ponds		
GB	gravel bar		
GP	gravel pit		
LC	western hemlock – lodgepole pine / Cladina		
LD	Lyngbye's sedge – Douglas water hemlock	√	Blue
LY	Lyngbye's sedge	√	Red
OC	ocean		
OR	organic wood waste		
OW	open water	√	
PC	pacific crab apple – false lily of the valley		
PD	pond		
PP	Sitka sedge – hemlock – parsley	√	Blue
PS	Pink spirea – Sitka sedge	√	
RC	western redcedar – Sitka spruce – skunk cabbage	√	Blue
RE	reservoir		
RI	river		
RR	rural		
RS	western redcedar – western hemlock – sword fern		
RZ	road surface		
SF	Sitka willow – false lily of the valley		
SG	sweet gale – Sitka sedge	√	Red
SP	Sitka spruce – Pacific crab apple		
SS	Sitka spruce – salmonberry		
SW	Sitka willow – Pacific willow – skunk cabbage	√	Red
TD	tufted hairgrass – Douglas aster	√	Red
TH	tufted hairgrass – meadow barley	√	Red
TL	transmission line		
TZ	mine tailings		
UR	urban		
Red:Red listed by BC CDC			
Blue: Blue listed by BC CDC			



Project Footprint

- LNG Facility and Supporting Infrastructure
- Tree Clearing
- Fish Habitat Offsets

- Blue-listed Ecological Communities At-risk
- Red-listed Ecological Communities At-risk

Wetland Ecosystem (% of Polygon)

- Less than 50%
- Between 50% and 80%
- Greater than 80%

Ecosystem Label
e.g. 5SH7

5 = decile
SH = map code
7 = structual stage

WETLAND COMPENSATION PLAN

WETLAND DISTRIBUTION IN THE PROJECT FOOTPRINT

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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PROJECTION: UTM 9	DRAWN BY: LT
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DATE: 30-AUG-19	FIGURE NO: 2-1

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2.2. Wetland Functions

Wetlands provide three primary ecological functions that are beneficial to local and regional ecosystems: hydrological, biogeochemical, and habitat.

2.2.1. Hydrological Functions

Hydrological functions include the capacity of a wetland to store, moderate, and release water in a watershed (i.e., providing groundwater recharge, flood flow alteration, or base flow augmentation). These functions of a wetland are driven by its hydrogeomorphic setting, its basin form, and its water balance; these properties determine the water quantity and velocity moving through the system (Hanson et al. 2008; Hruby et al. 1999).

The wetlands in the Project footprint and vicinity have the potential to absorb the energy (velocity) and volume of major flooding events from the Kitimat River by allowing the flood flows to spread out across the relatively flat terrain and encounter the roughness provided by herbaceous and woody vegetation structure. Historical diking in this area has reduced the potential of these wetlands to absorb energy, however, flood attenuation still applies. Fens, swamps, and marshes (both freshwater and estuarine) also have the potential to attenuate peak flows of storm events prior to discharging to receiving water bodies; however, in this instance, the actual opportunity to provide this function is limited since the receiving water body immediately downstream is the ocean. During the summer months, the wetlands (all classes) have the potential to augment baseflows in smaller watercourses. Wetlands in the Project footprint are not likely to contribute to groundwater recharge considering their position in the watershed and proximity to the marine environment in Kitimat Arm.

2.2.2. Biogeochemical Functions

Biogeochemical functions refer to the capacity of the wetland to improve water quality or store carbon. The wetlands in the Project footprint have the potential to improve water quality by retaining suspended sediments and absorbing excess nutrients (nitrogen). They also have the potential to store carbon in soils and biomass, which contributes to maintenance of the global carbon cycle and its role in global climate regulation.

2.2.3. Habitat Functions

Habitat functions refer to the ways wetlands contribute to biological productivity and diversity. The key wildlife habitat functions associated with the wetlands within the Project footprint (LNG Canada Development Inc. 2014a) include provision of the following:

- Breeding and foraging habitat for western toad (*Anaxyrus boreas*; blue-listed, *Species at Risk Act* [SARA] Schedule 1-special concern)
- Spring/summer foraging habitat for grizzly bear (*Ursus arctos*; blue-listed, COSEWIC-special concern)
- Foraging habitat for great blue heron (*Ardea herodias* ssp. *fannini*; blue-listed, SARA Schedule 1-special concern)
- Breeding and foraging habitat for rusty blackbird (*Euphagus carolinus*; blue-listed, SARA Schedule 1-special concern)
- Foraging habitat for western screech owl (*Megascops kennicottii* ssp. *kennicottii*; blue-listed, SARA Schedule 1 – special concern)
- Breeding and foraging habitat for a wide suite of migratory birds
- Foraging and roosting habitat for little brown myotis (*Myotis lucifugus*; SARA Schedule 1– endangered), along with seven other bat species detected during passive acoustic monitoring.
- Contributing to habitat diversity, as indicated by supporting five red-listed and four blue-listed wetland communities at risk (Table 2-1)

2.3. Wetlands Subject to the No Net Loss Goal of the Policy

Wetlands considered in this wetland compensation plan are ecologically important wetlands in accordance with the Policy, whose functions may be permanently lost or altered as a result of Project activities. Ecologically important wetlands within the Project footprint (Environment Canada [2014]; Appendix 1) include provincially red and blue-listed wetland communities, and estuarine wetlands.

Red and blue-listed wetlands are tracked by the BC Ministry of Environment's Conservation Data Centre. These ecological communities are not necessarily listed due to rarity or restricted distribution. They may be listed due to their inherent sensitivity to disturbance, or time required to recover from disturbance (i.e., ecological resilience).

The forested wetland communities (swamps) that are currently in a structural stage less than six (i.e., younger than mature or old forest) are not considered occurrences of provincially red- or blue-listed communities for the purposes of this Project's assessment; only mature or climax species compositions are considered occurrences of ecological communities at risk (see Vegetation TDR for additional information).

Estuarine class wetlands are indicated in the TEM and include estuarine meadows (Ed), estuarine marshes (Em), and the CWHvm1/Ed00 dune-wildrye Pacific hemlock-parsley community, which is considered an additional estuarine association by MacKenzie and Moran (2004) (Table 2-2).

Therefore, provincially listed forested wetland communities with a structural stage equal to or greater than six, non-forested provincially listed wetland communities, and all estuarine communities are considered ecologically important wetlands for the purposes of this plan. The no net loss goal of the Policy will be applied to these wetlands.

Project activities with the potential to result in permanent loss or alteration of wetland functions include:

- Clearing and site preparation within the LNG facility, workforce accommodation centre, module haul road, stockpile, and other infrastructure
- Tree clearing of forested ecologically important wetlands in safety zones, for example around the flare derrick and along the LNG loading lines.
- Construction of fish habitat offsets located adjacent to the LNG facility, workforce accommodation centre, and other infrastructure.

Project activities that do not have the potential to result in permanent loss or alteration of wetland functions include:

- Construction of a temporary access road along the LNG loading lines corridor using temporary forestry road building techniques as described in the *Forest Road Engineering Guidebook* (BC Ministry of Forests 2002).
- Installation of the water supply pipelines
- Any isolated tree removals required in the tree clearing areas in non-forested wetlands
- Restoration or enhancement of wetlands for fish habitat offsetting, for example through increasing water levels by changing culvert elevations, increasing the complexity of habitat features and creating cover by installing large woody debris, restoring salt marsh vegetation by removing large accumulations of driftwood, or re-establishing connectivity in tidal areas by removing historic dykes.

Table 2-2 provides a summary of wetlands subject to the no net loss goal of the Policy with the potential to be affected by Project activities.

Table 2-2 Wetlands Subject to the No Net Loss Goal of the Policy

Biogeoclimatic Variant, Wetland Class, and Association	Map Code	Ecologically Important Wetland Name	Structural Stage	Area of Lost or Altered Wetland Function (ha)			
				Permanent Infrastructure	Tree Clearing Area	Fish Offset Construction Extent	Total
Estuarine							
CWHvm1/Ed01	TH[a]	tufted hairgrass—meadow barley	2	0.3	0	0.4	0.7
CWHvm1/Ed02	TD[a]	tufted hairgrass—Douglas' aster	2	1.2	0	2.3	3.4
CWHvm1/Em05	LY[a]	Lyngbye's sedge	2	8.5	0	0.1	8.6
CWHvm1/Em06	LD[b]	Lyngbye's sedge—Douglas' water-hemlock	2	1.0	0	0.6	1.6
CWHvm1/Ed00	DW	dune wildrye—Pacific hemlock-parsley	2	< 0.1	0	0.0	< 0.1
CWHvm1/Ed00	DW		3	0.2	0	0.0	0.2
Fen							
CWHvm1/Wf52	SG[a]	sweet gale—Sitka sedge	3	0.7	0	0.7	1.3
Marsh							
CWHvm1/Wm05	CT[b]	cattail	2	1.7	0	0.7	2.4
CWHvm1/Wm50	PP[b]	Sitka sedge—hemlock-parsley	2	2.2	0	0.4	2.6
Swamp							
CWHvm1/14	RC[b]	western redcedar -Sitka spruce—skunk cabbage	6	0.9	0.0	0.3	1.3
CWHvm1/14	RC[b]		7	5.2	0.3	0.4	5.9
CWHvm1/Ws51	SW[a]	Sitka willow—Pacific willow—skunk cabbage	3	9.6	0	2.4	12.0
Total				**31.4**	**0.3**	**8.4**	**40.1**

NOTES:

[a] Red-listed wetland

[b] Blue-listed wetland

[c] Totals may not add up due to rounding

Three wetland types located in the Project footprint (see Table 2-1), CWHvm1/Wf01 water sedge—beaked sedge fen (BK), CWHvm1/00 shallow open water (OW), and CWHvm1/Ws50 pink spirea—Sitka sedge swamp (PS), are not red- or blue-listed communities, or estuarine wetlands; therefore, the no net loss goal of the Policy will not be applied to these wetlands.

Within the tree clearing areas, forested wetlands and their associated functions would be lost due to the removal of trees, although their understory vegetation and hydric soil conditions would remain. Non-forested wetlands (shrub or herb-dominated) and their associated functions would not be lost in the tree-clearing areas because vegetation and soils will remain intact during any isolated tree removals.

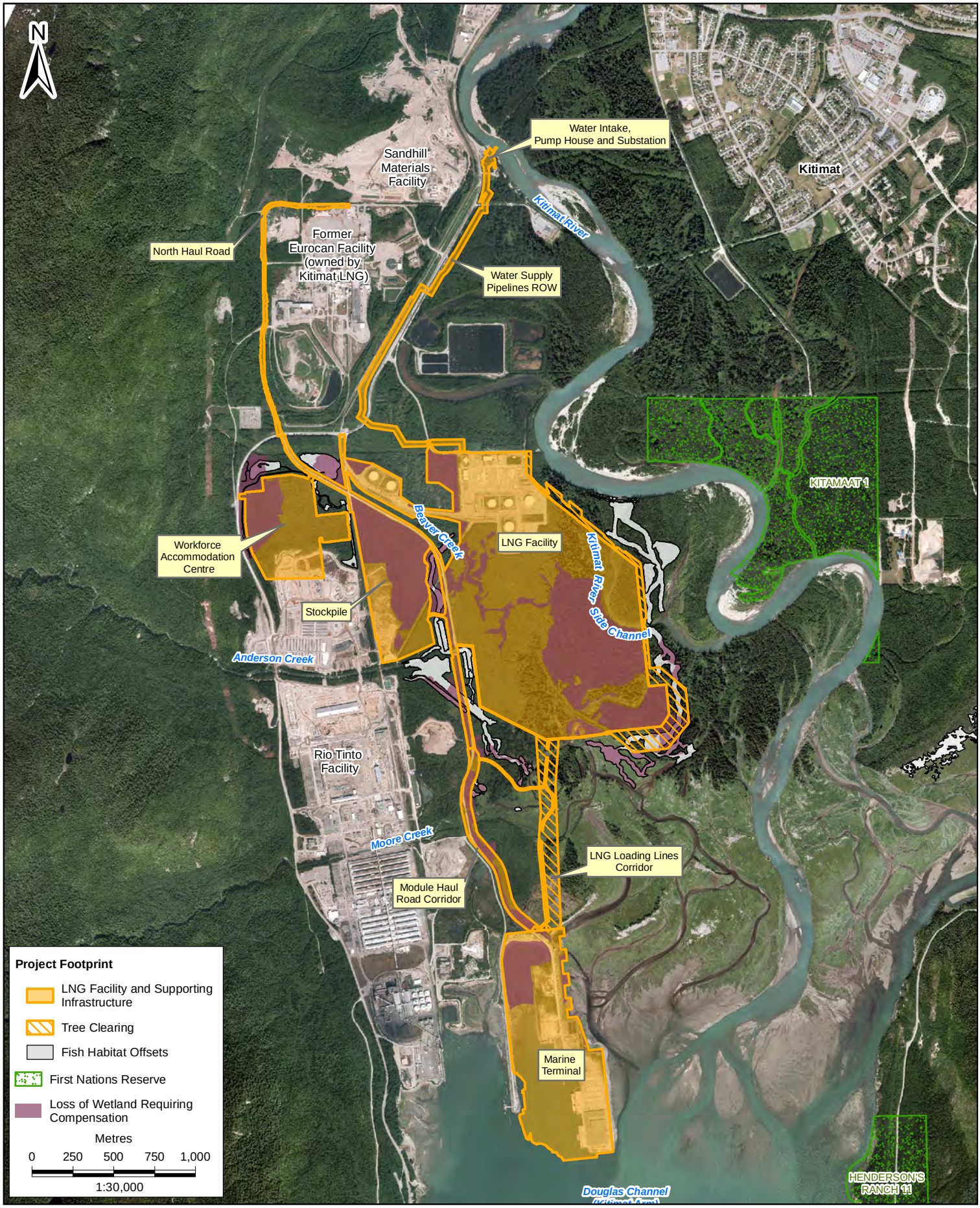
Construction of fish habitat offset measures generally involves tree clearing, grubbing and removal of topsoil, excavation and grading of new creek channels and wetlands, placement of gravels in new creek channels, installation of fish habitat complexing structures, and riparian restoration activities. These activities have the potential to affect existing functions provided by wetlands within the construction extents. Once functional, the fish habitat offsets will create watercourses and off-channel wetlands contributing to the productivity of local fisheries, which will contribute to wetland habitat functions for wildlife species that feed on fish. This plan conservatively includes the construction extents for fish habitat offsets located adjacent to the LNG facility and supporting infrastructure that are located within wetlands among the areas representing a loss of wetland functions (Table 2-2) and later examines the wetland gains resulting from the fish habitat offsetting designs (Section 4.1.1).

A relatively small area of ecologically important wetlands (1.4 ha) would be temporarily affected by construction of an access road along the LNG loading line and installation of water intake pipelines (Table 2-1) The temporary construction access road will be built and maintained in-place for up to three years. These areas would be restored after the temporary construction access road is decommissioned and the water pipeline installed; therefore, do not represent permanent loss of wetland functions.

Wetland functions associated with approximately 40.1 ha of ecologically important wetlands will be lost or altered within the Project footprint (Table 2-2). This area is composed of the following ecologically important wetland categories (some of which are both estuarine and provincially red- or blue-listed, and thus contribute to the sum of both categories):

- Estuarine (14.6 ha)
- Red-listed wetlands (26.0 ha)
- Blue listed wetlands (13.8 ha)

The three ecological communities with the largest areas of loss include the Sitka willow—Pacific willow-skunk cabbage swamp (12.0 ha), Lyngbye's sedge estuarine marsh (8.6 ha), and western redcedar—Sitka spruce—skunk cabbage swamp (7.2 ha), (Table 2-1 and Figure 2-2).



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WETLAND COMPENSATION PLAN

WETLAND LOSSES
SUBJECT TO THE NO NET LOSS GOAL OF THE FEDERAL POLICY

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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3. FRAMEWORK FOR WETLAND COMPENSATION

Planning wetland compensation that meets the Policy requires consideration of the following factors:

- Need for compensation (i.e., consideration of the mitigation hierarchy of avoidance, minimization of adverse effects, and lastly, compensation [Lynch-Stewart et al. 1996])
- Use of a functions assessment to evaluate the net effects
- Determination of the location, type, and amount of compensation required

3.1. Mitigation Hierarchy

Compensation is considered the third element of the mitigation hierarchy, following avoidance and minimization of adverse effects (Lynch-Stewart et al. 1996). As per the federal conditions (CEA Agency 2015), the mitigation hierarchy has been considered and followed with respect to wetland functions in the Project footprint. Complete avoidance of wetlands is the preferred alternative when wetlands are designated as ecologically or socio-economically important to a region (Lynch Stewart et al. 1996).

Due to the extent of wetlands in the Project footprint, feasible alternatives to the location or configuration of the Project design and placement that would completely avoid wetlands could not be identified, however, the Project footprint was reconfigured during the EAC amendment application and *Fisheries Act* authorization process to avoid a large wetland complex associated with Beaver Creek. The management of the Project will further reduce effects on wetlands adjacent to the Project footprint by maintaining the existing hydrology of adjacent wetlands to the extent possible. Mitigation measures will be implemented to allow tidal flow-through the LNG loading line by means of raised infrastructure and breaks. These breaks will also allow stream and surface flow to continue. Potentially adverse effects on wetlands should be limited through application of an Environmental Management Plan within the EAC application for the Project, which describes drainage and erosion control techniques that will be developed to maintain the hydrology of remaining wetlands and protect water quality.

LNG Canada commits to mitigation measures described in the Project's EAC application and provided in the Summary of Mitigation Measures document (LNG Canada Development Inc. 2015) to reduce effects on wetland function, including:

- The approved clearing boundaries will be clearly delineated (flagged) prior to site preparation to keep clearing activities within the designated Project footprint (Mitigation 5.5-1).
- Incorporate traditional use plants, where appropriate and technically feasible, in wetland compensation measures and reclamation of temporary construction areas (Mitigation 5.5-3). In addition to the Project's EAC commitments, LNG Canada commits access to those wetland compensation sites where traditional use plants have been incorporated to Aboriginal people for the purposes of gathering traditional use plants whenever possible.
- Any temporary workspace will be reclaimed as soon as practicable as per measures stated in the Environmental Management Plans (Mitigation 5.5-4).
- An Erosion and Sediment Control Plan will be developed and implemented to manage surface water and avoid sedimentation in adjacent vegetation communities (Mitigation 5.5-5).
- An Invasive Plant Management Plan will be incorporated into the Project's EMP that will describe the control of invasive species. Where invasive species have been discovered on site, action will be implemented as soon as possible to eradicate them (Mitigation 5.5-6).
- Design of the LNG loading line corridor will consider and incorporate, where practicable, ways to maintain tidal flow and wildlife passage (Mitigation 5.5-8).
- A Surface Water Management Plan will be developed to address stormwater collection, treatment, and disposal during construction and operation (Mitigation 5.5-9).
- Develop and implement a Wetland Compensation Plan to address loss of wetland habitat functions for breeding and foraging terrestrial mammals, amphibians, and birds (Mitigation 5.5-10).

Section 14.3.3 in the EAC application reports the measures to mitigate potential effects to harvesting-related Aboriginal interests, including to traditional use resources that rely on, or occupy, wetlands within, or in the vicinity of, the Project footprint. The relevant mitigations are provided in the above list of mitigation measures.

This wetland compensation plan addresses the remaining unavoidable adverse effects (i.e., residual effects) on applicable wetlands that may occur following implementation of avoidance and minimization measures.

3.2. Assessing Wetland Functions

The first factor in developing a compensation plan for unavoidable effects on wetlands is to determine the wetland functions that may be affected by the Project. It is helpful to examine the wetlands within the context of the regional landscape and relative location to other wetlands. Landscape context provides a sense of the opportunities for displaced wildlife species to meet their life-history requirements in other suitable habitat. Examining the functions provided by other wetlands within the landscape provides a sense of how well the wetland under consideration performs select functions relative to wetlands in the landscape with the same or different classes. This information becomes particularly important if the proposed compensation entails creation, restoration, or enhancement of a different class of wetland that may perform select functions better (e.g., the ability of a freshwater marsh compared to a bog for providing foraging habitat for migratory shorebirds). Assessing the wetland functions provided by the proposed compensatory wetlands provides the ability to assess the net residual effect on wetland functions.

Development of this compensation plan incorporated an assessment of wetland functions for wetlands within the Project footprint and LSA following methods outlined in Section 1.4. The wetland functions provided by wetlands within the Project footprint are presented in Section 2.2.

3.3. Wetland Compensation Location, Type, and Amount

Select functions are best replaced in as close as possible to the affected wetlands (e.g., supplementing baseflow within the same watershed). Other functions may be served by compensatory wetlands located farther away from the Project without diminishing the effectiveness of compensation for replacing particular functions (e.g., atmospheric carbon capture and sequestration).

It is generally assumed that restoration, enhancement, or creation (listed here in order of their preferred implementation) of the same wetland class as the potentially affected wetlands would best address loss of functions of the affected wetland. However, since some wetland classes provide select functions better than others, compensatory wetlands of a different class can provide increased function in some cases (e.g., fish and wildlife habitat functions of a riparian forested swamp compared to these functions in a sedge fen; the former supports greater fish habitat function).

Occasionally, compensatory wetlands can address strategic conservation goals for a region (e.g., when compensation includes protection, restoration, or creation of a rare or at-risk wetland type following the loss of a common or degraded wetland type). Because the goal of achieving no net loss of wetland functions is part of a nationwide Policy, rather than a project-specific goal, it allows for such strategic decision-making regarding wetland conservation and management within a regional or provincial context. Preservation of high-quality well-functioning wetlands that face demonstrable threat of further degradation can preserve ecological functions within critical areas that may otherwise be lost. Some wetland classes cannot be feasibly created in a practical timeframe (e.g., peatlands), in which case wetland compensation may require rehabilitation of degraded wetlands of the same class, or creation, restoration, or enhancement of wetlands of a different class.

The area of compensatory habitat is determined by considering the risk of temporal loss or partial failure of the compensatory wetland habitat. Temporal loss refers to the time delay between effects occurring on the wetland and the successfully functioning compensatory wetlands. During the delay, there is a temporary loss of functions, unless compensation precedes effects. Compensation ratios are often used to try to offset the potential temporal loss or partial failure of the compensatory wetland by compensating for more area or function than is affected. Although there are no federal or provincial statutes or regulations in BC concerning the ratio to use, the Canadian Wildlife Service of Environment and Climate Change Canada recommends a minimum 2:1 ratio (wetland functions replaced: wetland functions lost) (Environment Canada 2014). In addition, federal condition 4 for this Project requires the loss of functions within ecologically important wetlands to be compensated at a 2:1 ratio.

Effectiveness monitoring of wetland compensation sites is typically used to determine the success and persistence of the compensatory wetland functions and to guide adaptive management actions, such as: controlling invasive plant species, altering the natural water flow to ensure soil-water saturation or appropriate water level, or planting additional wetland plants. Federal condition 4.5 requires that LNG Canada conduct monitoring of the compensatory wetland sites to verify that lost habitat is being restored at or on those sites, in Year one, and in Years three, five, and ten following the enhancement or creation of the compensating wetlands (CEA Agency 2015).

3.4. Wetland Monitoring for Unanticipated Loss of Wetland Function

Monitoring will be conducted prior to and during construction to detect potential unanticipated loss of wetland functions in accordance with the requirements set out in federal condition 4 (CEA Agency 2015). Where any unanticipated loss of function occurs, additional mitigation measures will be developed and applied. Where unanticipated residual losses occur in ecologically important wetlands, these areas will be compensated for in the same manner as the compensation for the lost wetland functions outlined in this plan (see Section 4).

4. WETLAND COMPENSATION PLAN FOR THE PROJECT

This wetland compensation plan aims to replace the ecological functions associated with ecologically important wetlands located within the Project footprint where effects cannot be fully avoided or minimized by applying mitigation measures. It follows the requirement of the EAC condition to preferentially select opportunities for wetland restoration over enhancement, and wetland enhancement over creation, where feasible. It addresses the requirement of the federal condition to identify compensation sites as close to Kitimat as possible, reflecting similar wetland types and functions to those that are lost.

Approximately 49.0 ha of ecologically important wetlands occur within the Project footprint; however, the potential effects within portions of this area vary. Ecological functions will be retained within 7.3 ha of ecologically important wetlands in the tree clearing areas, where the vegetation structure consists of herbaceous or shrub dominated wetlands (Table 2-1 and Table 2-2). Approximately 1.4 ha of ecologically important wetlands will be temporarily disturbed during construction for the temporary construction access road and water intake pipeline but restored following road decommissioning and completion of construction of the water intake pipeline (Table 2-1). Therefore, ecological functions associated with approximately 40.1 ha of ecologically important wetlands require compensation to achieve the no net loss goal of the Policy (Table 2-2). Of these 40.1 ha, 31.4 ha would be permanently lost within the footprints for the LNG facility, workforce accommodation centre, and supporting infrastructure, and 0.3 ha would be lost within the tree clearing areas (though the understory and hydric soils would persist within tree clearing areas). Applying the recommended 2:1 compensation ratio to these areas of ecologically important wetland losses results in a requisite 63.4 ha of wetland compensation to achieve the no net loss goal of the Policy.

To support the *Fisheries Act* authorizations that the Project has received since this Wetland Compensation Plan was submitted to the EAO in 2015, a gross area of approximately 60 ha of fish habitat offsets are required, which include restoration and enhancement of existing wetlands and creation of new freshwater and estuarine wetlands. Construction of these fish habitat offsets will result in the alteration of approximately 8.4 ha of ecologically important wetlands (Table 2-2). Since ecological functions would not be entirely lost within the fish habitat offsetting areas, a 1:1 compensation ratio is recommended for the areas of ecologically important wetlands, which would result in the need for 8.4 ha of wetland compensation (Table 2-2).

The estimated total area of wetland compensation required is therefore 71.8 ha (Figure 2-2).

4.1. Wetland Compensation Measures

Table 4-1 provides a summary of the wetland compensation measures proposed as part of this wetland compensation plan, which include the following:

- Restoration, enhancement, and creation of wetlands as part of the fish habitat offsets constructed under the *Fisheries Act* authorizations for the Project (47.8ha)
- Conservation allowances to secure, restore, and enhance wetlands as close to Kitimat as feasible (24 ha)

Table 4-1 Summary of Wetland Compensation Measures

Compensation Measure	Area (ha)	Source and Notes
Estuarine enhancement	4.2	Estuarine fish habitat creation through increased depths: FAA2 (23,838 m^2) FAA3 (2,737 m^2) Estuarine fish habitat enhancement through dyke removal to improve connectivity between the Kitimat River and estuarine tidal channels, and installation of large woody debris to improve cover and habitat complexity within estuarine marshes and tidal channels: FAA2 (15,300 m^2)

Table 4-1 Summary of Wetland Compensation Measures

Compensation Measure	Area (ha)	Source and Notes
Freshwater wetland enhancement and creation	18.2	Freshwater fish habitat creation through pond excavations: FAA1 (17,700 m^2 perennial pond/wetland) FAA2 (129,314 m^2 pond/wetland) FAA3 (1,757 m^2 perennial pond/wetland) Increased extent and duration of flooding from increase in culvert elevation: FAA3 (33,000 m^2)
Salt marsh construction	17.1	Construction of salt marsh in Minette Bay Marine FAA (91,000 m^2)
Salt marsh construction	0.9	Construction of salt marsh at Hospital Beach Rio Tinto FAA
Salt marsh restoration	7.4	Removal of large accumulations of driftwood Marine FAA (23,700 m^2) FAA2 (50,000 m^2)
Conservation allowance	24.0	Securement, restoration, and/or enhancement of wetlands located within the Kitimat Arm and as close to Kitimat as feasible
Total	**71.8**	

NOTES:

FAA1=*Fisheries Act* authorization for the Workforce Accommodation Centre (15-HPAC-00918)

FAA2 = *Fisheries Act* authorization for the LNG Facility (16-HPAC-00220)

FAA3 = *Fisheries Act* authorization for Supporting Infrastructure (16-HPAC-01079)

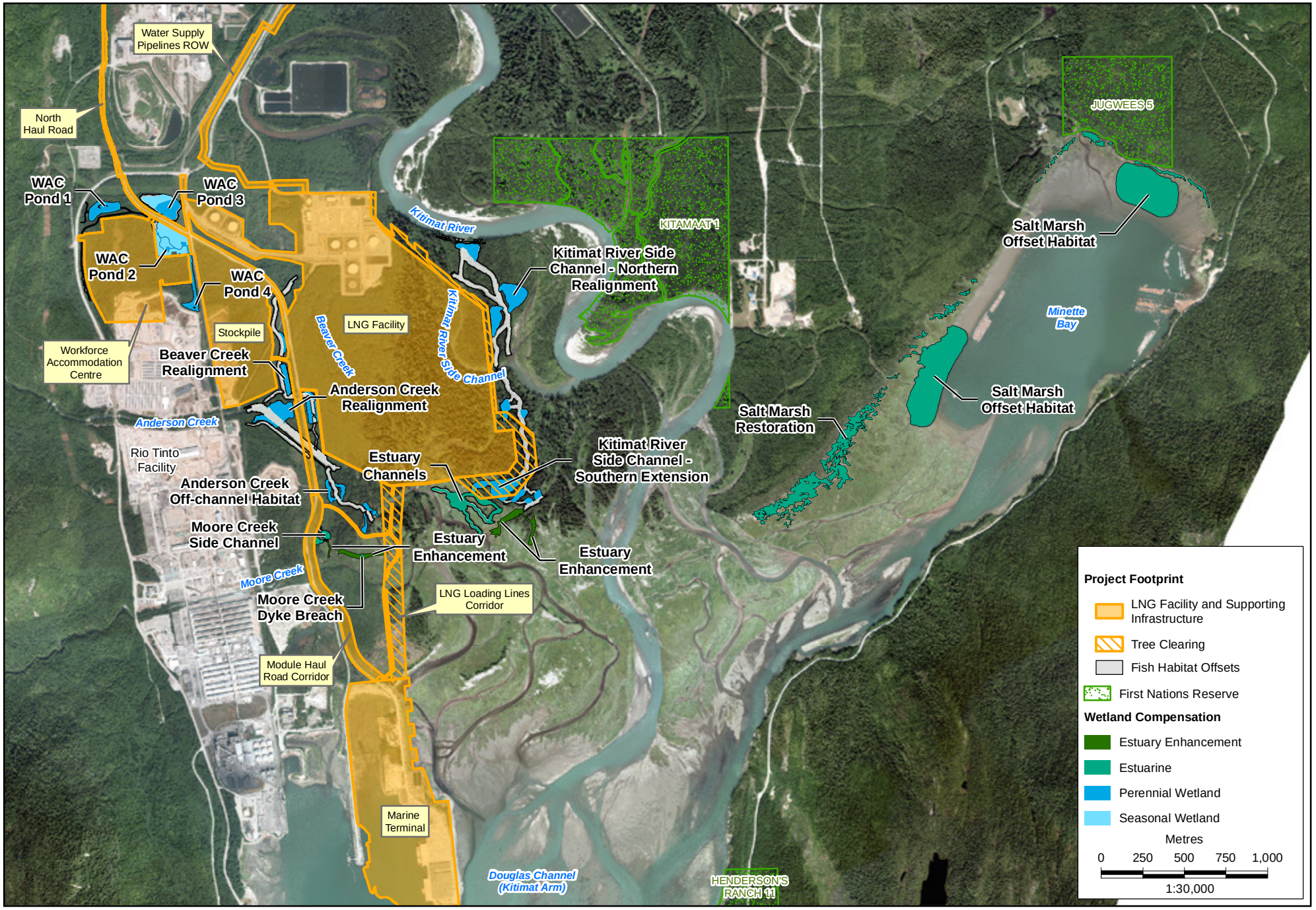
Marine FAA = *Fisheries Act* authorization for the Marine Terminal (15-HPAC-00585)

Rio Tinto FAA = *Fisheries Act* authorization for the Rio Tinto Terminal A Extension Project (17-HPAC-00076)

4.1.1. Wetland Compensation through Fish Habitat Offsetting

Fish habitat offsetting for freshwater and marine fisheries components of the Project will provide wetland restoration, enhancement, and/or creation totaling an area of approximately 39.8 ha. Implementation of fish habitat offsetting measures in authorizations 15-HPAC-00918, 16-HPAC-00220, and 16-HPAC-01079 (FAA1, FAA2, and FAA3), includes the restoration, enhancement and/or creation of approximately 27.4 ha of wetlands within the estuary (Table 4-1, Figure 4-1). Fish habitat offsets contained in these three authorizations consist of both conversion of terrestrial areas to wetlands (e.g., dyke removal), as well as enhancements of existing wetlands to improve their habitat functions to support various life stages of fish, for example through increasing the depth and duration of water, or through improvement of habitat connectivity or habitat complexity. Some enhancement measures entail conversion of relatively higher-drier wetland types to wetter types (i.e., from estuarine meadows to estuarine marshes, or from treed swamps to herbaceous marshes). Enhancements to provide increased habitat functions for fish will provide improved habitat functions for wildlife and migratory birds that feed on fish.

Implementation of fish habitat offsetting measures in authorization 15-HPAC-00585 (Marine FAA) for this Project and 17-HPAC-00076 (Rio Tinto FAA) for the Terminal A Extension will contribute to wetland compensation by establishing approximately 17.1 ha of new estuarine marsh and restoring an additional 2.4 ha of estuarine marsh within nearby Minette Bay and creating approximately 0.9 ha salt marsh near Hospital Beach (LNG Canada 2018). The restoration and creation of estuarine marsh habitat in Minette Bay and Hospital Beach will provide a similar wetland type and functions to that which will be removed from the Project footprint (e.g., Lyngbye's sedge marsh).



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WETLAND COMPENSATION PLAN

WETLAND COMPENSATION LOCATIONS

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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4.1.2. Wetland Compensation Through Conservation Allowances

The remaining balance of compensatory wetland area is approximately 24 ha, which will be provided through conservation allowances to secure, restore, and enhance wetlands located within the District of Kitimat.

LNG Canada conducted a systematic search for wetland areas to conserve that meet the following criteria:

- Size—wetland complexes that included at least 24 ha of wetlands
- Location—as close to Kitimat as possible
- Type—contains similar wetland types to that which would be lost within the Project footprint, including blue-listed swamps
- Attributes to support key habitat functions of wetlands within the Project footprint:
    - Seasonally-ponded surface water surrounded by mature, moist woodlands that are relatively close to other open water bodies for amphibian breeding and dispersal
    - Sedge-dominated wetlands that could provide foraging habitat for grizzly bear, owls, bats, and migratory birds
    - Mature forest stands and snags that could provide nesting habitat for owls, bats, and some species of migratory birds
    - Riparian shrub thickets that could provide protective cover, nesting, and foraging habitat for rusty blackbird and some species of migratory birds
- Condition (opportunities for wetland restoration or enhancement, adjacent to roads or cut blocks and facing imminent threat of disturbance or development)

The Kalum PEM and Freshwater Atlas data sets were queried, and aerial photographs were assessed to identify candidate conservation allowance areas. Six areas were identified that met the above criteria (Figure 4-2 and Figure 4-3). The MFLNRORD, with input from the Kitimat Rod and Gun Club, identified four potential conservation allowance areas located to the northwest of the District of Kitimat. LNG Canada identified two additional potential conservation allowance areas: District Lot 95 (DL95), located adjacent to Minette Bay, and an area between the Kitimat Golf Course and Hirsch Creek. Each candidate conservation allowance area was evaluated in the field and mapped at 1:5,000 scale (or larger) by wetland ecologists to confirm the presence, type, condition, and spatial extent of wetlands in each area. The six areas were then screened for potential land use constraints by examining intersecting land tenures. The six candidate wetland conservation allowance areas contain a combined total of 56.3 ha of wetlands, which is more than enough to achieve the requisite 24 ha of wetland securement, restoration or enhancement component of this plan. The distribution and type of wetlands within each area is provided in Table 4-2.

District lot (DL) 95 contains 30.8 ha of wetlands, of which 19.8 ha are red listed wetland associations, 9.2 ha are blue-listed, and 23 ha are estuarine (some of which are also either red- or blue-listed). Therefore, DL95 contains almost entirely ecologically important wetlands (as defined in the provincial and federal conditions) and enough wetland area to meet the conservation allowance objective of this plan. LNG Canada plans to secure DL95 for this purpose.

The remaining five candidate conservation allowance areas include 25.5 ha of wetlands, of which 0.1 ha are red listed wetland associations and 13.9 ha are blue listed wetland associations. They are presented here as additional options that have been reviewed and that could be considered if additional area were to be required in the future.

Table 4-2 Wetland Types and Areas within Candidate Conservation Allowance Areas

Candidate Conservation Allowance Area	Wetland Association Code	Wetland Association Common Name	Area (ha) d
DL95	Ed02	tufted hairgrass—Douglas' aster estuarine meadow [a, c]	11.6
	Em06	Lyngbye's sedge—Douglas' water-hemlock estuarine marsh [b, c]	6.2
	Em05	Lyngbye's sedge estuarine marsh [a, c]	3.8
	Wf52	sweet gale—Sitka sedge fen [a]	3.3
	Ws54	western redcedar—western hemlock –skunk cabbage swamp [b]	1.6
	Ed00	dune wildrye—Pacific hemlock-parsley estuarine meadow [c]	1.5
	Wm50	Sitka sedge—hemlock-parsley marsh [b]	1.4
	Ws52	red alder—skunk cabbage swamp [a]	1.1
	00	shallow water wetland	0.4
Total			**30.8**
Goose Creek Pond	Wm50	Sitka sedge—hemlock-parsley marsh [b]	2.6
	00	shallow water wetland	1.4
	Wm02	swamp horsetail—beaked sedge marsh [b]	0.5
Total			**4.6**
Kitimat Backchannels	Ws50	pink spirea—Sitka sedge swamp	4.1
	00	shallow water wetland	3.2
	Wm50	Sitka sedge—hemlock-parsley marsh [b]	2.0
	Wm02	swamp horsetail—beaked sedge marsh [b]	1.2
Total			**10.6**

Candidate Conservation Allowance Area	Wetland Association Code	Wetland Association Common Name	Area (ha) d
North of Powerlines	Wb50	Labrador tea—bog laurel—peat-moss bog [b]	6.5
	Ws50	pink spirea—Sitka sedge swamp	1.6
	00	shallow water wetland	0.9
	Ws54	western redcedar—western hemlock—skunk cabbage swamp [b]	<0.1
Total			**9.0**
Site 4	Ws50	pink spirea—Sitka sedge swamp	0.1
	Wb50	Labrador tea—bog laurel—peat-moss bog [b]	0.1
	Wf51	Sitka sedge—peat-moss fen [a]	0.1
Total			**0.3**
Hirsch Creek	Wm50	Sitka sedge—hemlock-parsley marsh [b]	0.5
	Ws54	western redcedar—western hemlock –skunk cabbage swamp [b]	0.5
Total			**1.0**

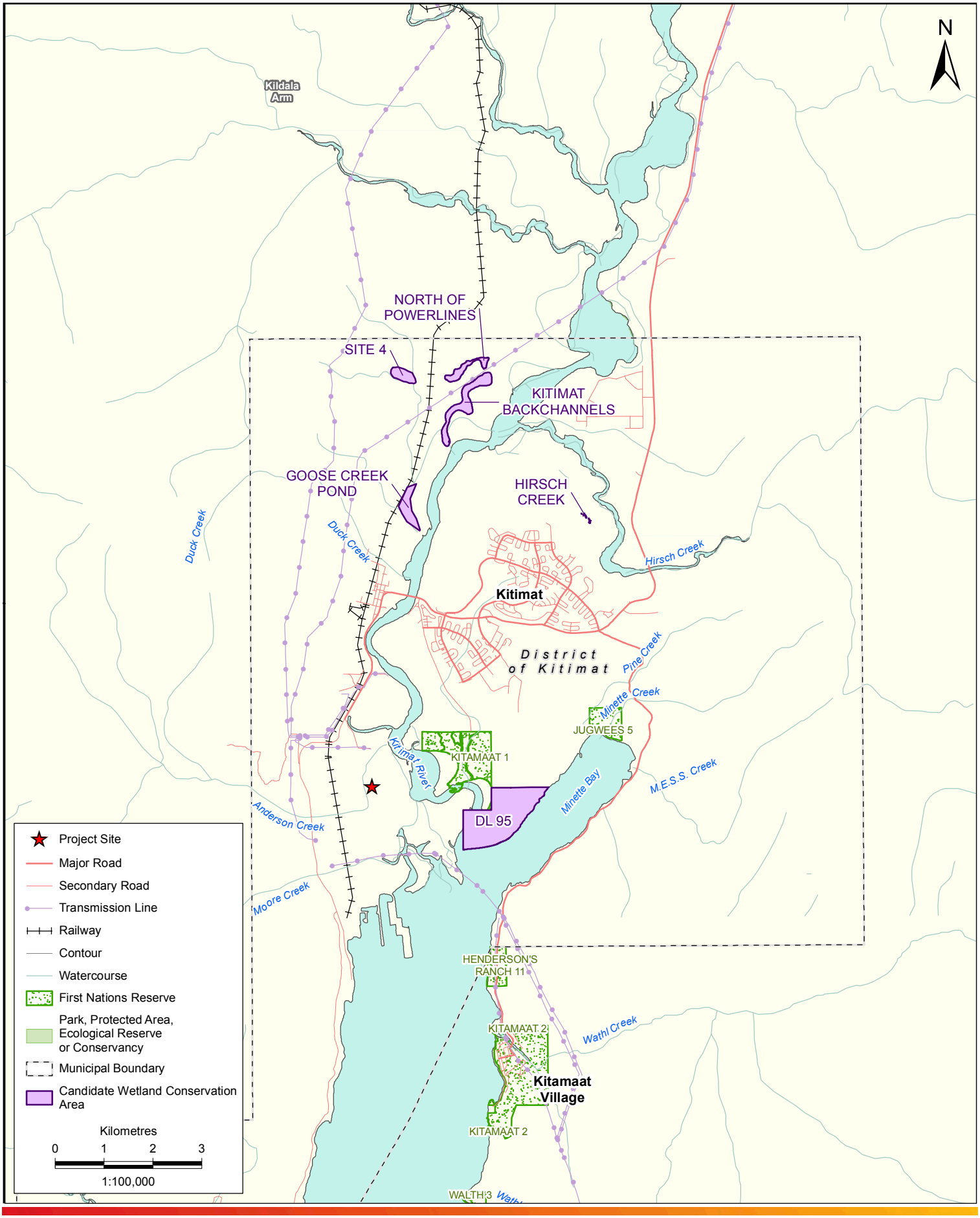
NOTES:

[a] red listed ecological community

[b] blue listed ecological community

[c] estuarine wetland

[d] Totals may not add up due to rounding.



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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA LOCATIONS

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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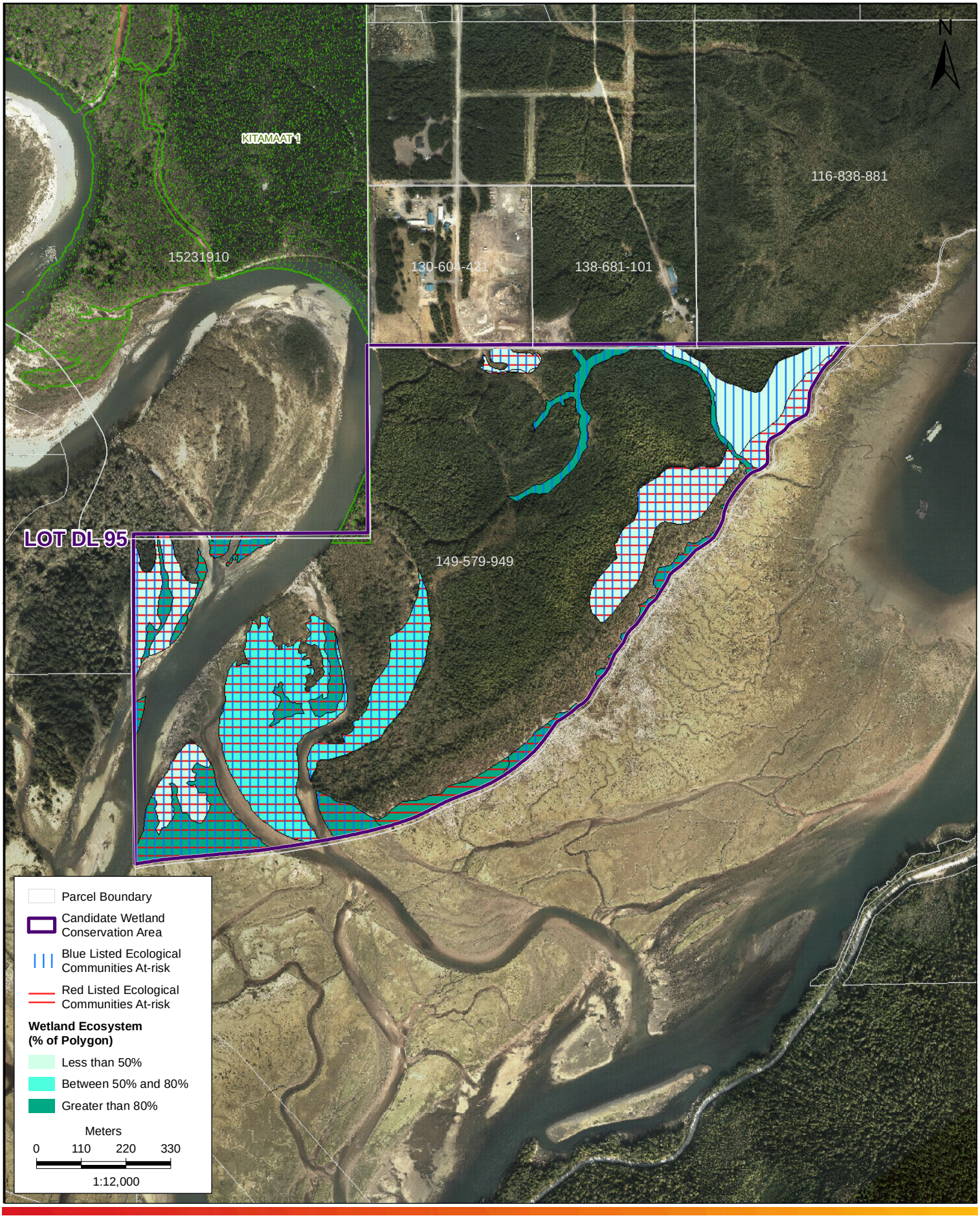

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA: LOT DL 95

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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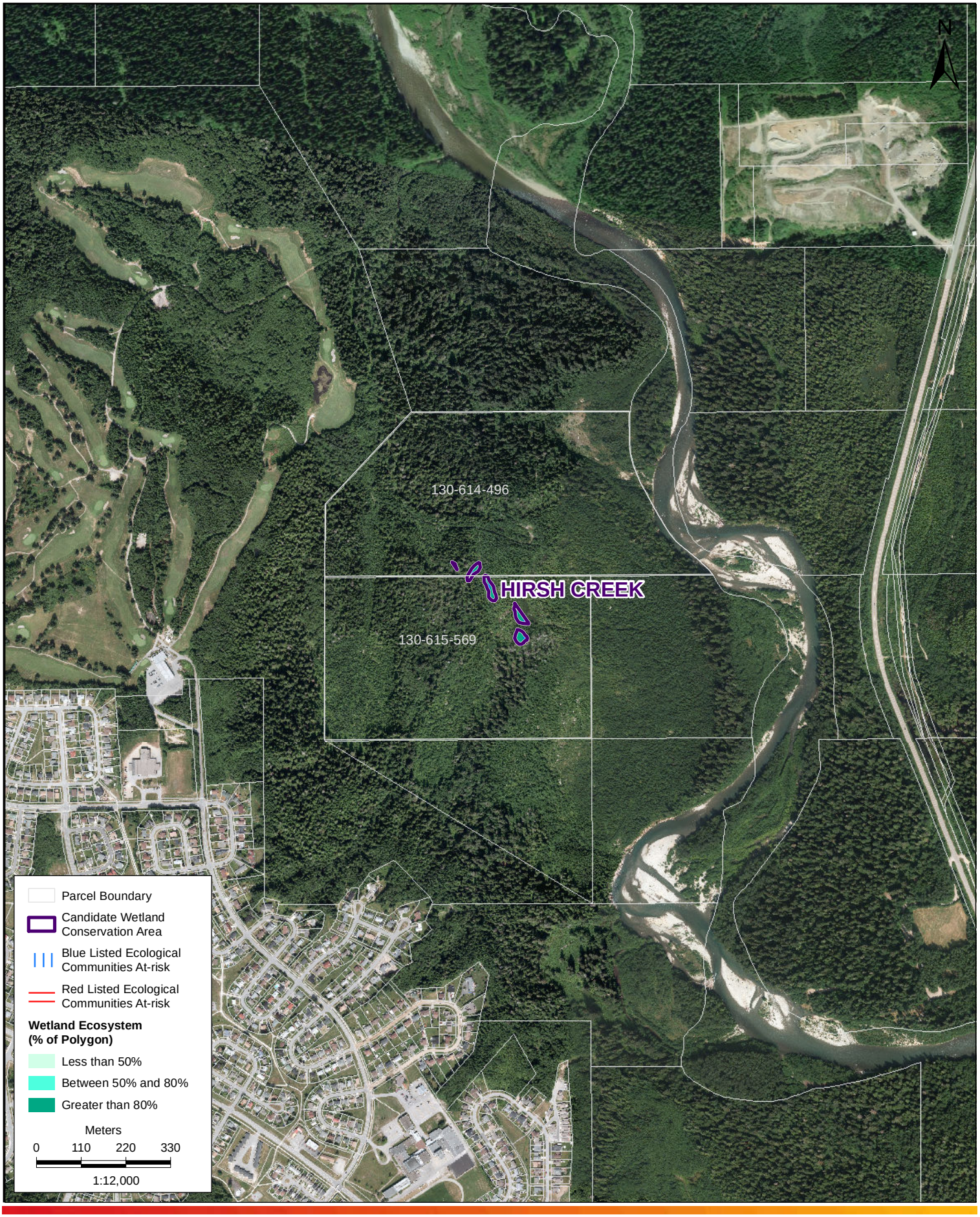

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA: HIRSH CREEK

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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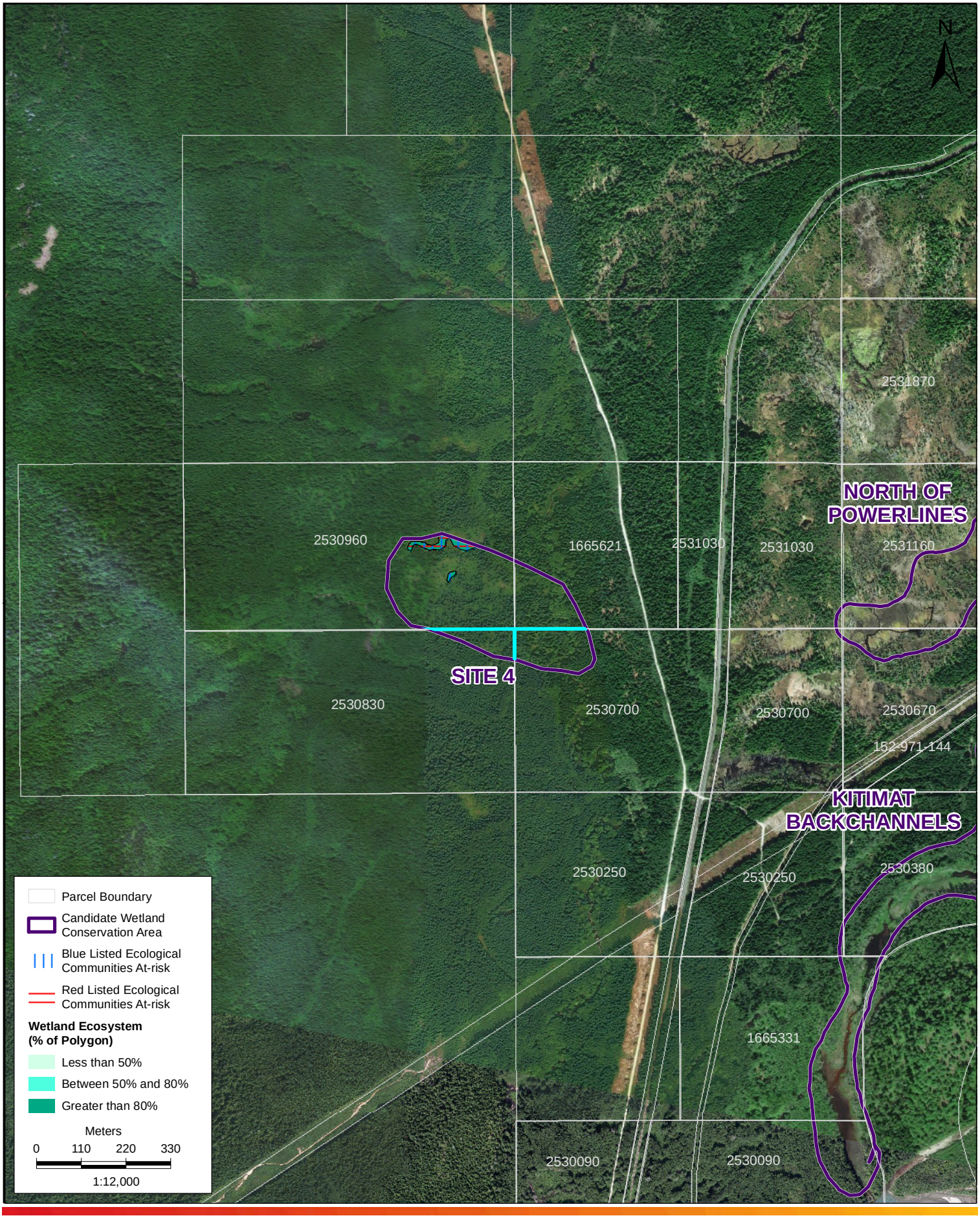

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA: SITE 4

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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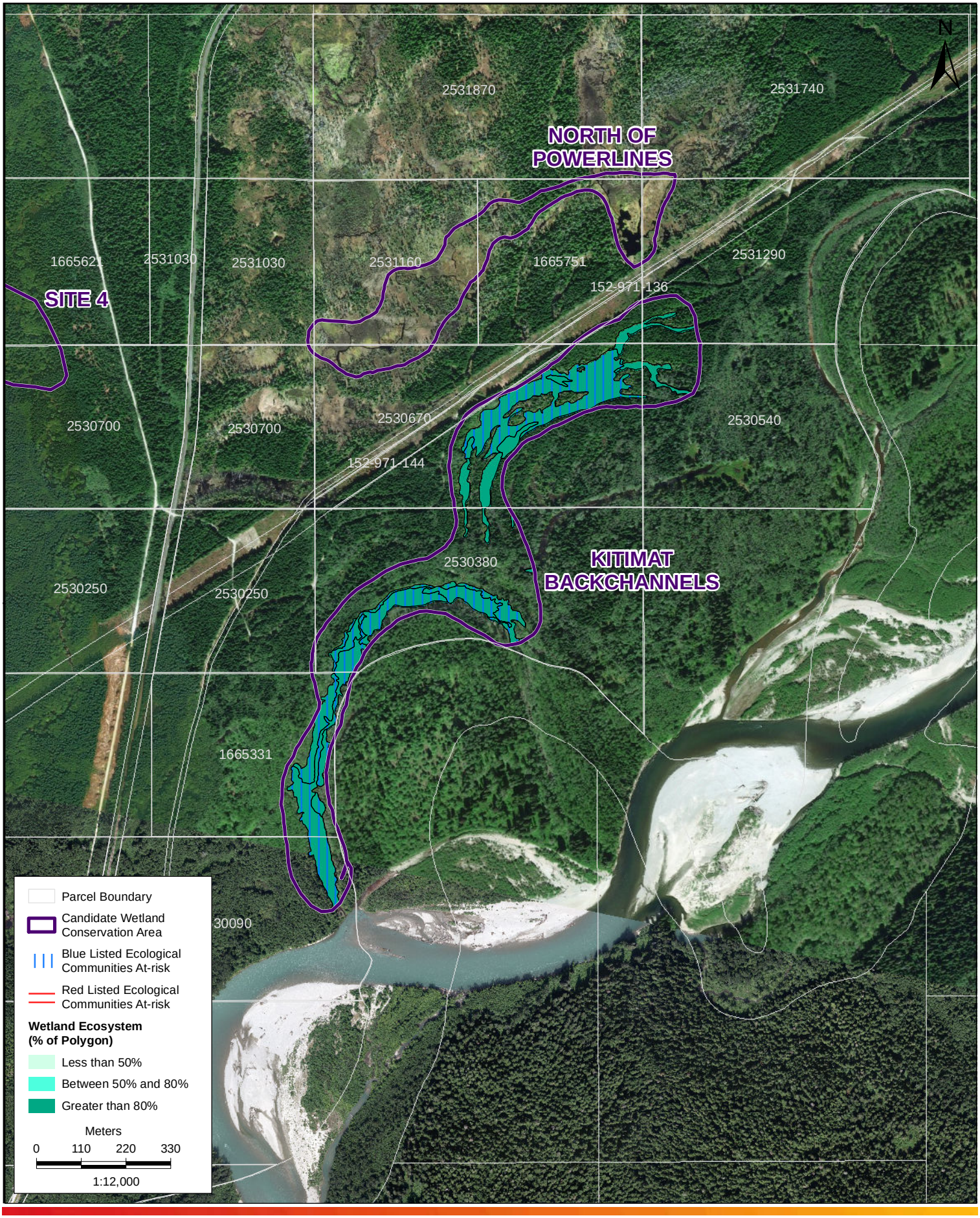

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA: KITIMAT BACKCHANNELS

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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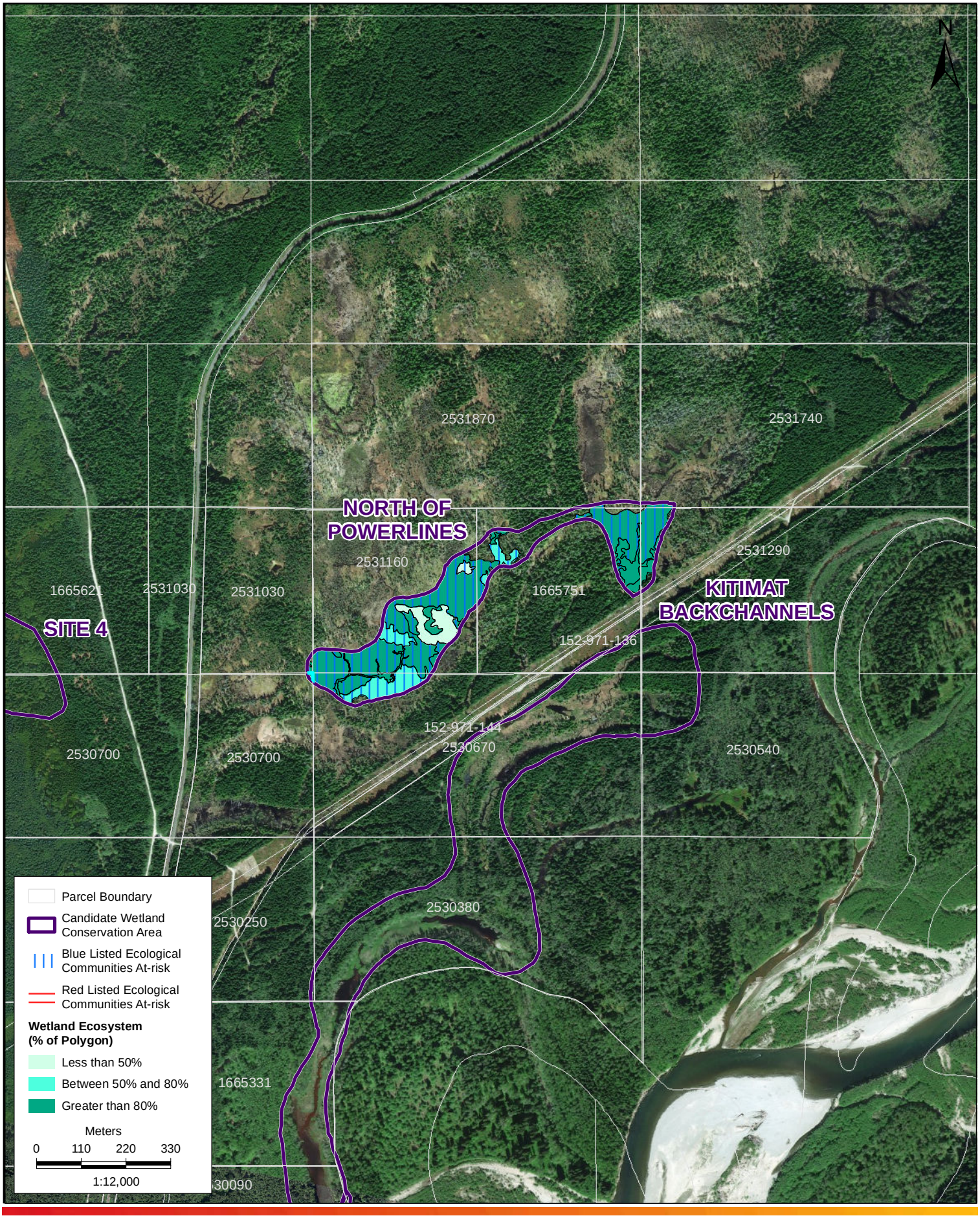

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA: NORTH OF POWERLINES

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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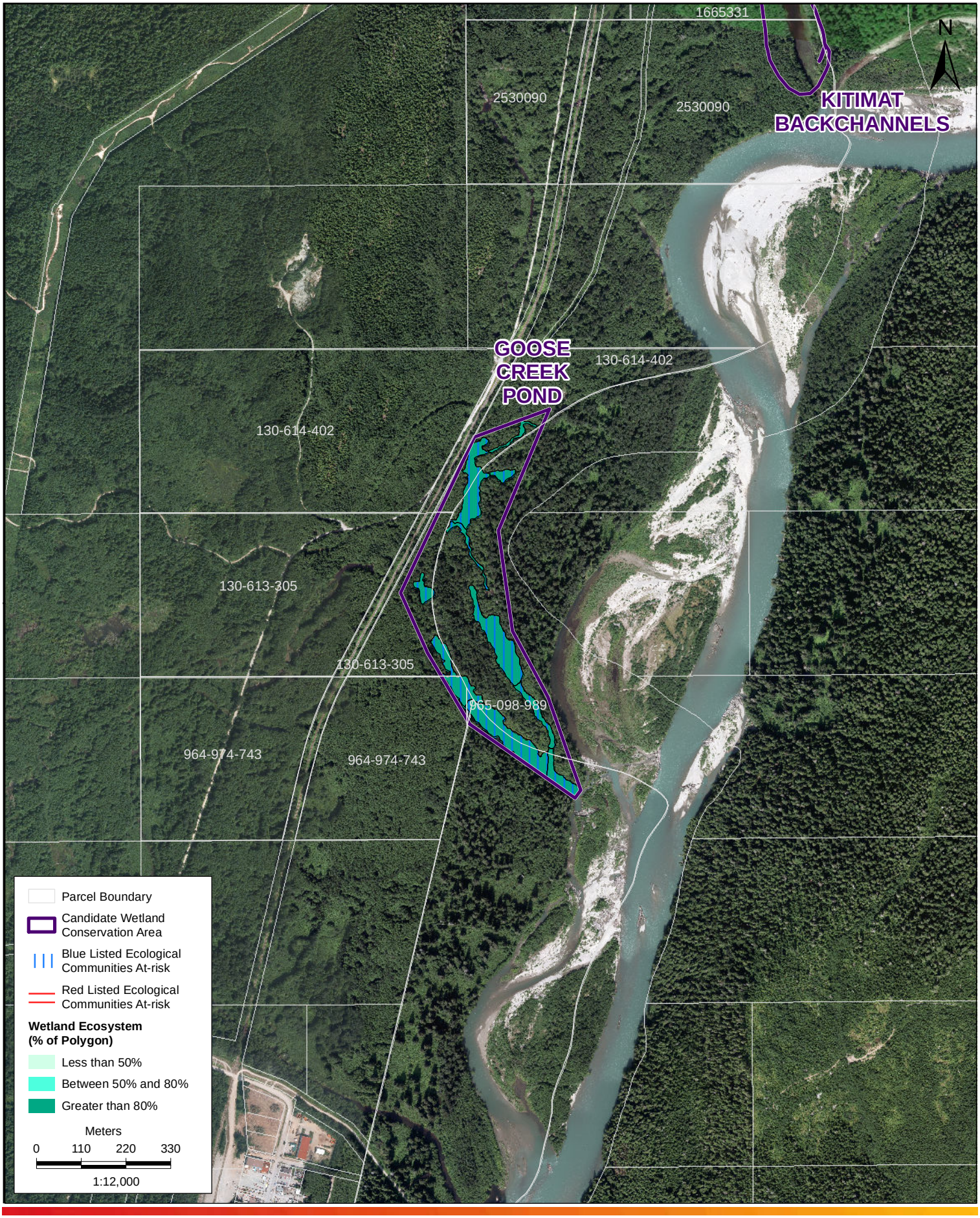

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WETLAND COMPENSATION PLAN

CANDIDATE WETLAND CONSERVATION ALLOWANCE AREA:
GOOSE CREEK POND

LNG CANADA EXPORT TERMINAL
KITIMAT, BRITISH COLUMBIA

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Based on review of the publicly available spatial data, a narrow portion of DL95 appears to intersect with a Section 15 Reserve along the shoreline (natural boundary), although the legal description of this Reserve does not appear to include DL95. This is likely a discrepancy in the publicly available spatial data of the boundaries of DL95 and the Section 15 Reserve. Section 15 Reserves typically set aside Crown land considered to be of critical importance. In this instance, the Reserve was established for fish and wildlife habitat protection purposes in Minette Bay.

A Section 17 designated use covers all of Douglas Channel/Kitimat Arm, including DL95 and each of the other candidate conservation allowance areas. Section 17 designated uses typically identify a portion of Crown land for a particular use or for the conservation of natural or heritage resources in the public interest. This designation may be compatible with the intended use as wetland conservation allowance area.

Feedback from the EAO indicates that Crown land may be acceptable as a conservation area if it does not overlap lands reserved from disposition under Section 15 or 16 of the Land Act, consistent with MFLNRORD *Directive 2016-03-15 Offsite Environmental Mitigation Policy* (pers. comm. M. Van Doorn, EAO, 2018). Private land used for these purposes would also be acceptable and not subject to Reserves or Designated Uses under the *Land Act*.

The identified candidate wetland conservation allowance areas offer opportunities to address the conservation design elements outlined in Environment Canada's Operational Framework for Use of Conservation Allowances (Environment Canada 2012), including the following:

- Equivalency: The identified candidate conservation allowance areas includes comparable wetland types such as provincially listed wetlands and similar wetland classes and/or associations to those wetlands located within the Project footprint. The identified candidate conservation allowance areas have the potential to provide comparable wetland functions to the wetlands prospectively affected in the Project footprint.

- Additionality: Proposed securement would provide greater protection than existing legislation and regulations, particularly for forested wetlands and wetland buffers. Enhancement measures would add to the habitat functions currently provided by the identified candidate conservation allowance areas.
- Location: Identified candidate wetland conservation allowance areas have been sought as close to Kitimat as possible.
- Timing: The timing of implementation of securement and enhancement of candidate wetland conservation allowance areas is subject to lease and/or sale agreements between LNG Canada, District of Kitimat, and MFLNRORD, but could proceed concurrent with construction, or within 5-years of construction (as stipulated in CEAA condition 4.3).
- Duration: The duration of securement and enhancement of candidate conservation areas would be in-perpetuity through either a fee-simple purchase or 30-year lease subject to renewal at the midpoint of each successive 30-year term.
- Accountability: Accountability would be formalized in multiple ways such as:
    - A formalized detailed implementation plan subject to review and approval by regulators
    - The land purchase or tenure agreement and conservation covenant (if required)
    - Agreement between LNG Canada and possibly an ENGO or local government, if necessary or preferred, that could hold the lease, title, and/or covenant, and steward the land for the long term.

Except for the Hirsch Creek site, which has signs of nearby timber harvesting activity, the remaining candidate conservation allowance areas are mostly intact with limited opportunities for restoration. Enhancement measures to increase wildlife habitat functions such as construction of amphibian breeding ponds; or installation of snags, nest boxes, or communal roosts could be considered on a site-by-site

basis, once the decision has been made about which of these sites will be included among the wetland compensation measures for the project to achieve the requisite area.

LNG Canada anticipates that the EAO, ECCC/CWS, and MFLNRORD will provide review of the proposed compensation measures and monitoring plan in consultation with potentially affected Aboriginal groups, the District of Kitimat, and local environmental groups, as appropriate. Based on this input and other considerations, LNG Canada has identified securement, restoration, and/or enhancement of DL95 to provide the requisite 24 ha wetland conservation allowance area. The remaining candidate conservation areas remain as additional options, if they should be required in the future.

4.2. Wetland Balance

The goal of the wetland compensation plan is to replace the ecological functions provided by ecologically important wetlands within the Project footprint to sustain the productive capacity of affected wetland-associated plants, wildlife, and ecological communities within the Pacific Coast region and offset adverse effects on wetland functions associated with the Project. Table 4-3 summarizes the habitat balance between potentially affected wetland functions and wetland benefits in the compensation plan.

Effects on wetlands will be limited to the Project footprint. Wetlands adjacent to the Project may experience a shift in species composition as a result of project related activities; however, it is not anticipated that these wetlands will be lost (i.e., become uplands) or cease to provide wetland functions, based on the mitigation measures outlined in the EAC application for the Project. Pre- and post-construction monitoring will be implemented to detect potential unanticipated loss of wetland functions in wetlands beyond the Project footprint. If monitoring detects a loss of wetland functions beyond the Project footprint, further measures will be discussed with the EAO and ECCC/CWS at that time.

Table 4-3 Wetland Functions Habitat Balance

Wetlands Functions Lost	Compensation Component	Wetland Functions Replaced	Area Benefitted
• Habitat for 40.1 ha of ecologically important wetlands, including approximately 26.0 ha that are red-listed, 13.8 ha that are blue-listed, and 14.6 ha of which are estuarine • Breeding and dispersal habitat for amphibians • Foraging and nesting habitat for bird species, including migratory birds and SARA-listed species • Breeding, foraging and denning habitat for wetland-associated mammals • 1.3 ha of peat soils (fen) providing atmospheric carbon storage	• Restoration, enhancement, or construction of 47.8 ha of fish habitat offsets contributing to wetland functions within the Kitimat River Estuary associated with the *Fisheries Act* authorizations for the Project • Securement and restoration, enhancement, or creation of 24 ha of comparable wetlands through conservation allowance within Kitimat Arm and as close to Kitimat as feasible	• Habitat for red- and blue-listed wetlands and estuaries • Breeding and dispersal habitat for amphibians • Foraging and nesting habitat for bird species, including migratory birds and SARA-listed species • Breeding, foraging and denning habitat for wetland-associated mammals • Replacement of lost biomass (i.e., carbon storage)	• 71.8 ha

4.3. Wetland Compensation Monitoring Plan

LNG Canada has developed a monitoring plan as part of this wetland compensation plan. This monitoring plan consists of both compliance monitoring components (to confirm that compensatory habitats are constructed in accordance with the wetland compensation plan), and effectiveness monitoring components (to ensure that restored, enhanced, and/or created wetlands are functioning as intended after construction; see Appendix 2). Effectiveness monitoring is intended to guide adaptive management actions to promote the long-term performance of compensatory wetland habitat. Effectiveness monitoring will occur in year one, and in years three, five, and ten after compensation at the site/s is completed as per federal condition 4 (CEA Agency 2015).

4.4. Summary

The Project footprint will affect approximately 94.3 ha of wetlands, of which 49.0 ha are ecologically important wetlands (provincially listed, estuarine, or both) subject to the no net loss goal of the Federal Policy on Wetland Conservation. Ecological functions will be retained within approximately 8.9 ha of the 49 ha of ecologically- important wetlands, resulting in 40.1 ha of ecologically important wetlands subject to provincial condition 10 and federal condition 4.

These wetlands support the following ecological functions:

- Habitat for at-risk wetland communities (approximately 26 ha are red-listed and 14 ha are blue-listed)
- Breeding and foraging habitat for western toad (blue-listed, Species at Risk Act [SARA] Schedule 1-special concern)
- Spring/summer foraging habitat for grizzly bear (blue-listed, COSEWIC-special concern)
- Foraging habitat for great blue heron *fannini* subspecies ((blue-listed, SARA Schedule 1-special concern)
- Breeding and foraging habitat for rusty blackbird (blue-listed, SARA Schedule 1-special concern)

- Foraging habitat for western screech owl (blue-listed, SARA Schedule 1—special concern)
- Breeding and foraging habitat for a wide suite of migratory birds
- Foraging and roosting habitat for little brown myotis (SARA Schedule 1—endangered), along with seven other bat species detected during passive acoustic monitoring
- Atmospheric carbon storage

LNG Canada has committed to the following wetland compensation measures to offset the loss of wetland functions associated with the Project:

- Implementation of fish habitat offsetting measures outlined in the Fisheries Act Authorizations for the Project that will restore, enhance, and/or create 47.8 ha of fish habitat offsets within the Kitimat estuary, providing similar habitat functions to the freshwater and estuarine wetlands within the Project footprint.
- Securement and restoration or enhancement of 24 ha of comparable wetlands through a conservation allowance in the District of Kitimat
- A wetland compensation monitoring plan to document compliance and performance of compensatory wetlands
- Incorporation of traditional use plants where appropriate and technically feasible in wetland compensation measures and access to those sites to Aboriginal people for the purposes of gathering traditional use plants whenever possible.

These commitments will be conducted in accordance with provincial condition 10 and federal condition 4.

Overall, the proposed compensation plan is expected to result in no net loss of wetland functions within the applicable terms of the Policy.

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LNG Canada. 2015. Summary of Mitigation Measures. Available at: http://a100.gov.bc.ca/appsdata/epic/documents/p398/d38461/1430926933735_WRS9VK1CL1wndnnXDrdqhBqmF0k3LjjpVv906NqyJGh0N7zMjK1H!-91937584!1430926594509.pdf

APPENDIX 1. FEDERAL POLICY ON WETLAND CONSERVATION: GUIDANCE FOR APPLICATION AND IMPLEMENTATION IN ENVIRONMENTAL ASSESSMENT (2014 AND 2019)

FEDERAL POLICY ON WETLAND CONSERVATION

GUIDANCE FOR APPLICATION AND IMPLEMENTATION IN ENVIRONMENTAL ASSESSMENT

(A) The key policy objectives of the Federal Policy on Wetland Conservation (the Wetland Policy) relevant to federal environmental assessment can be found in Strategy 2 *Managing Wetlands on Federal Lands and Waters and in Other Federal Programs.* These include:

> ***Commit all federal departments to the goal of no net loss of wetland functions (i) on federal lands and waters, (ii) in areas affected by the implementation of federal programs where the continuing loss or degradation of wetlands has reached critical levels, and (iii) where federal activities affect wetlands designated as ecologically or socio-economically important to a region. Due to local circumstances where wetland losses have been severe, in some areas no further loss of any remaining wetland area may be deemed essential*** **(Government of Canada 1991).**

(B) The Wetland Policy applies to federal departments addressing the potential loss of wetlands and wetland functions. Projects and activities of the Government of Canada are subject to the Policy, including those projects and activities considered under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) For projects on non-federal lands and waters, such losses are evaluated (1) in terms of the scope of any federal permits, licenses, authorizations and other instruments under federal jurisdiction which may be applicable, and (2) where the associated wetland functions support areas of federal jurisdiction (for Environment Canada, for example, these include migratory birds and species at risk). N.B. Although the Policy applies broadly to all wetlands in Canada, the 'no-net-loss of wetland functions' goal of the Policy does not apply to wetlands in the absence of federal jurisdiction as noted in (1) and (2) above.

(C) The Wetland Policy is underpinned by a 'no net loss of wetland functions' objective, and as such, necessitates a consideration of all wetland functions which could be impacted. For Environment Canada, functions of particular interest include those supporting migratory birds and species at risk. To inform the applicability of the Wetland Policy, Environment Canada recommends that proponents describe the natural processes of potentially impacted wetlands (physical, chemical, and biological) and perform an assessment of the potential impacts and mitigation.

Hanson et al. (2008) '*Wetland Ecological Functions Assessment: An Overview of Approaches*' (http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection_2010/ec/CW69-5-497-eng.pdf) should be reviewed before undertaking a wetland functions assessment.

(D) The Wetland Policy is applied on a regional basis to reflect current conditions. The Policy applies to natural, degraded, and artificial wetlands. In British Columbia, for example, the geographic areas where the documented continuing loss or degradation of wetlands has reached critical levels are defined as:

- *Lower Mainland / Fraser Valley region*
- *East Vancouver Island and Gulf Islands*
- *Okanagan Valley*

In British Columbia, wetlands designated as ecologically or socio-economically important to a region are defined as:

- *Areas of Continental or Regional Significance to Waterfowl within the three Joint Venture planning boundaries of British Columbia*
- *Estuaries as identified by the Pacific Estuary Conservation Program*
- *All eelgrass (Zostera subspecies) beds*
- *Red- and blue-listed wetland ecological communities*

With respect to the two definitions provided above, Environment Canada's Canadian Wildlife Service (Pacific and Yukon) will provide more detailed guidance to project proponents as and when requested. It should also be noted that the Policy states that 'no further loss of any remaining wetland area' may be deemed essential in areas where wetland losses have been severe.

For a spatial representation of the areas described above, refer to Appendix I. For a list of the mapped units, refer to Appendix II.

(E) Three mitigation strategies should be used to achieve a no net loss of wetland functions for the three situations identified above. In order of application, these strategies[1] are:

(1) Avoidance of impacts;
(2) Minimization of unavoidable impacts; and,
(3) Compensation for unavoidable impacts.

Due in part to the broader wetland policy objective of promoting the conservation of Canada's wetland functions, now and in the future, and given the important role that wetlands play in sustaining populations of migratory birds and SARA-listed species, in addition to the foregoing no net loss considerations of the Wetland Policy, Environment Canada strongly recommends that avoidance and minimization of impacts to ecological wetland functions be carefully considered in project design.

It is important to note that application of the Wetland Policy is separate and distinct from a significance evaluation under the *Canadian Environmental Assessment Act, 2012*. The Wetland Policy is based on a no net loss of wetland functions, whereas the significance evaluation under the Act uses threshold-based criteria. The Wetland Policy applies to all wetland types, regardless of size; to all impact types, whether small or large, short duration or long, or direct or indirect. Specifically, the no net loss goal applies to the temporary loss of wetland functions. Monitoring programs need to be sufficiently robust to ensure effective implementation of mitigation measures and successful recovery of wetland functions.

(F) The Wetland Policy applies to CEAA 2012 to the extent of the application of federal jurisdiction (see (B) above). With reference to section 5 of CEAA 2012, the relevant sections for consideration include 5(1)(a), 5(1) (b), and 5(2)(a). With relation to section 5(1)(a), there must be link between

[1] For more information on the mitigation hierarchy, refer for example to the Federal Policy on Wetland Conservation Policy Implementation Guide for Federal Land Managers (1996), available through the following web link: http://www.ec.gc.ca/nature/default.asp?lang=En&n=132ADBFC-1&parent=0C1743A2-4D49-4183-AC5F-1DE909D2FEB1

areas of federal jurisdiction as described under (B). It is recommended that Environment Canada's *Operational Framework for Use of Conservation Allowances* (http://www.ec.gc.ca/ee-ea/default.asp?lang=En&n=DAB7DD13-1&printfullpage=true) also be reviewed in relation to wetlands and other habitat types.

Environment Canada's Canadian Wildlife Service recommends that a Wetland Compensation Plan (WCP) be submitted with an Environmental Impact Statement for review in the environmental assessment process. The WCP should, amongst other things:

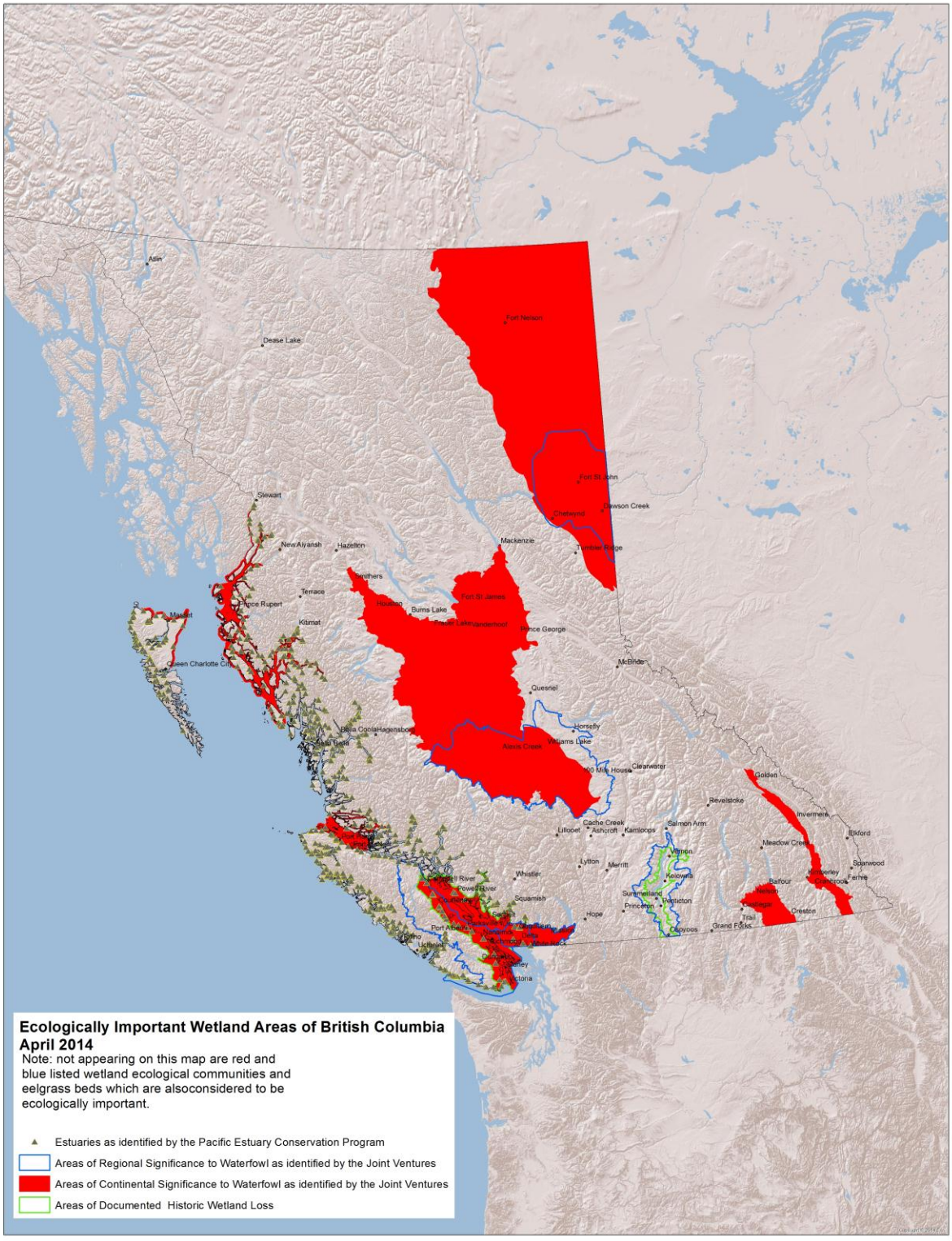
i. Describe the baseline condition of the wetland ecological communities and functions the Project would impact and the functions gained at the compensation site(s)
ii. Describe how the Project applied the mitigation hierarchy including efforts to avoid impacts, and identify residual effects
iii. Describe the process of selecting proposed compensation site(s) and associated baseline condition(s)
iv. Identify the compensation ratio
v. Identify the success criteria
vi. List the parties and responsibilities for implementation
vii. Provide the monitoring schedule, parameters, plans, and analysis

At a minimum, a compensation ratio of 2:1 is used; however, this ratio varies on a project-by-project basis. Consultation with the Canadian Wildlife Service is recommended to ensure the appropriate ratio is identified. In order of priority, the Canadian Wildlife service recommends wetland restoration over enhancement and enhancement over creation.

(G) In summary, Environment Canada advises proponents that the Wetland Policy applies to all federal departments and agencies when addressing the loss of wetlands. It will be used to inform the environmental assessment process and will be considered by Environment Canada when assessing the appropriate measures to be taken to mitigate the adverse environmental effects of the Project under CEAA 2012, the Canadian Environmental Protection Act, the Migratory Birds Convention Act, the International River Improvements Act and the Species at Risk Act.

(H) It is important to note that the identification of ecologically important wetlands and areas where losses of wetlands have reached critical levels is ongoing. As more data is made available and analyzed, the advice and associated mapping will be periodically updated to ensure that the Wetland Policy is implemented in a consistent and transparent manner.

Appendix I


Ecologically Important Wetland Areas of British Columbia
April 2014
Note: not appearing on this map are red and blue listed wetland ecological communities and eelgrass beds which are alsoconsidered to be ecologically important.
Estuaries as identified by the Pacific Estuary Conservation Program
Areas of Regional Significance to Waterfowl as identified by the Joint Ventures
Areas of Continental Significance to Waterfowl as identified by the Joint Ventures
Areas of Documented Historic Wetland Loss
Atlin
Dease Lake
Fort Nelson
Fort St John
Dawson Creek
Chetwynd
Stewart
New Aiyansh
Hazelton
Mackenzie
Tumbler Ridge
Smithers
Terrace
Prince Rupert
Houston
Burns Lake
Fort St James
Prince George
Masset
Kitimat
Queen Charlotte City
McBride
Quesnel
Bella Coola
Hagensborg
Williams Lake
Alexis Creek
Horsefly
Clearwater
Golden
Revelstoke
Invermere
Cache Creek
Ashcroft
Kamloops
Salmon Arm
Lillooet
Lytton
Merritt
Whistler
Squamish
Hope
Princeton
Penticton
Kelowna
Vernon
Meadow Creek
Sparwood
Fernie
Kimberley
Cranbrook
Balfour
Creston
Trail
Grand Forks
Osoyoos
Port Alberni
Victoria

Appendix II

Areas of Continental Significance to Waterfowl

North American Waterfowl Management Plan. *North American Waterfowl Management Plan 2012: People Conserving Waterfowl and Wetlands*. 2012.

North Coast

Nearshore areas (to 3 km) off of the Queen Charlotte Lowland Ecosection, including estuaries

Estuaries and waters of the Hecate Lowland Ecosection, from the US border to Aristazabel Island out to 3 km off of the outer islands

North Island Straits Area

Estuaries and waters of the Queen Charlotte Strait Ecosection

Georgia Basin

Nanaimo Lowland Ecosection
Strait of Georgia Ecosection
Fraser Lowland Ecosection
Georgia Lowland Ecosection
Southern Gulf Islands Ecosection

Central Interior

Bulkley Basin Ecosection
Nechako Lowland Ecosection
Nazko Upland Ecosection
Western Chilcotin Upland Ecosection
Chilcotin Plateau Ecosection
Fraser River Basin Ecosection
Cariboo Basin Ecosection

Creston

Southern Columbia Mountains Ecosection

Kootenay

East Kootenay Trench Ecosection
Upper Columbia Ecosection

Peace

Northern Alberta Upland Ecoregion
Hay-Slave Lowland Ecoregion
Muskwa Plateau Ecoregion
Central Alberta Upland Ecoregion
Southern Alberta Upland Ecoregion
Peace River Basin Ecoregion

Areas of Regional Significance to Waterfowl

Harrison, B. et al. *Canadian Intermountain Joint Venture Implementation Plan: Wetlands and Associated Species.* 2010. Joint Venture Technical Committee.

Harrison,B. et al. *Pacific Coast Joint Venture Implementation Plan.* (in progress). Joint Venture Technical Committee.

Cariboo-Chilcotin

Earlier version of ecosectional boundaries, including all or part of:
Chilcotin Plateau Ecosection
Cariboo Basin Ecosection
Fraser River Basin Ecosection
Cariboo Plateau Ecosection
Quesnel Lowland Ecosection

Okanagan

Okanagan watershed

East Coast Vancouver Island

Georgia Basin watershed including waters of the Strait of Georgia (to centre line), and including Port Alberni.

Fraser Delta

Western portion of Fraser Lowland Ecosection to centre line of Strait of Georgia, eastern boundary to portion of Surrey including Serpentine and Nicomekl watersheds.

Fraser Valley

Eastern portion of Fraser Lowland Ecosection including remainder of Surrey

Estuaries as identified by the Pacific Estuary Conservation Program

Ryder, J., J. Kenyon, D. Buffett, K. Moore, M. Ceh and K. Stipec. 2007. *An Integrated Biophysical Assessment of Estuarine Habitats IN British Columbia to Assist Regional Conservation Planning.* Canadian Wildlife Service Technical Report #476.

Eelgrass

Hutchinson, I., A. Campbell Prentice, and G. Bradfield. Aquatic *plant resources of the Strait of Georgia .* in The Ecology and Status of Marine and Shoreline Birds in the Strait of Georgia, British Columbia. Proceedings of a symposium sponsored by the Pacific Northwest Bird and Mammal Society and the Canadian Wildlife Service, Sidney, BC. 11 December 1987.

Butler, R.W. and K. Vermeer. *Overview and recommendations: Important bird habitats and the need for their preservation.* in The Ecology and Status of Marine and Shoreline Birds in the Strait of Georgia, British Columbia. Proceedings of a symposium sponsored by the Pacific Northwest Bird and Mammal Society and the Canadian Wildlife Service, Sidney, BC. 11 December 1987.

Wright, N. 2002. *Eelgrass Conservation for the B.C. Coast: A Discussion Paper*. Prepared for the BC Coastal Eelgrass Stewardship Project, funded in part by Environment Canada and the Bullitt Foundation.

Areas of Documented Historic Wetland Loss

1) Boyle, C.A., L. Lavkulich, H. Schreier, E. Kiss. 1997. *Changes in land cover and subsequent effects on Lower Fraser Basin ecosystems from 1827 to 1990.* Environmental Management . 21:185-196.

2) Moore, Kathleen, Peggy Ward and Katrina Roger. 2004. *"Urban and Agricultural Encroachment onto Fraser Lowland Wetlands - 1989 to 1999." In* T.W. Droscher and D.A. Fraser (eds). Proceedings of the 2003 Georgia Basin/Puget Sound Research Conference. CD-ROM or Online. Available: http://www.psat.wa.gov/Publications/03_proceedings/start.htm [February 2004]

3) Province of British Columbia, Government of Canada. 1978. *Fraser River Estuary Study - Habitat*.

4) Moore, K.E. 1990. *Urbanization in the Lower Fraser Valley, 1980-1987.* Technical Report Series No. 120. Canadian Wildlife Service, Environment Canada. 12 pp.

5) Kistritz, R.U., K.J. Scott, C.D. Levings. 1996. *Changes in fish habitat in the Lower Fraser River analyzed by two wetland classification systems*. Pages 19-40 in C.D. Levings and D.J.H. Nishimura (eds.), Created and restored sedge marshes in the Lower Fraser River and estuary: an evaluation of their functioning as fish habitat. Canadian Technical Report of Fisheries and Aquatic Sciences 2126. Science Branch, Department of Fisheries and Oceans.

6) Levings, C.D. and R.M. Thom. 1994. *Habitat Changes in Georgia Basin: Implications for Resource Management and Resoration.* in R.C.H Wilson, R.J. Beamish, F. Aitkens and J. Bell (eds.) Review of the Marine Environment and Biota of Strait of Georgia, Puget Sound and Juan de Fuca Strait: Proceedings of the BC/Washington Symposium on the Marine Environment, January 13 & 14, 1994. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1948.

7) Metro Vancouver. 2010. *Lower Fraser Wetland Loss: Wetland Loss to Human Encroachment in the Fraser Lowlands from 1999 – 2009, and Comparison to Loss from 1989 – 1999*. Metro Vancouver.

8) Fraser River Action Plan. 1998. *Wild, Threatened, Endangered, and Lost Streams of the Lower Fraser Valley: Summary Report.* Fisheries and Oceans Canada.

9) Axys Environmental Consulting. 2005. *Redigitizing of Sensitive Ecosystems Inventory Polygons to Exclude Disturbed Areas – Summary Report.* Report prepared for the Canadian Wildlife Service.

10) Lea, T. 2008. Historical (pre-settlement) ecosystems of the Okanagan Valley and Lower Similkameen Valley of British Columbia – pre-European contact to the present. Davidsonia 19(1): 3-36.

11) Environment Canada. 2002. *South Okanagan-Similkameen Conservation Program: A prospectus.*

12) British Columbia Ministry of Environment Lands and Parks. 1998. *Habitat Atlas for Wildlife at Risk: South Okanagan and Lower Similkameen.*

Georgia Basin
Nanaimo Lowland Ecosection
Strait of Georgia Ecosection
Fraser Lowland Ecosection
Southern Gulf Islands Ecosection

Okanagan

South Okanagan Basin Ecosection
North Okanagan Basin Ecosection

FEDERAL POLICY ON WETLAND CONSERVATION
GUIDANCE FOR APPLICATION AND IMPLEMENTATION IN ENVIRONMENTAL ASSESSMENT

Introduction

The Government of Canada plays an important role in initiatives to restore and protect wetlands[1]. Canada is a signatory to the Ramsar Convention, an international treaty focusing on conservation of wetlands of international importance. A major obligation under the Convention is implementation of principles, proposed in 1987 by Canada, for the wise use of wetlands. The Convention notes the "wise use" of wetlands is defined as their "sustainable utilization for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem". The federal government has also developed the *Federal Policy on Wetland Conservation*[2] (FPWC); this is a government-wide policy approved by federal Cabinet and adopted in 1991. The objective of the FPWC is to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future.

Environment and Climate Change Canada (ECCC) provides expertise and lead role in support of FPWC implementation, which seeks to maintain the functions and values derived from wetlands throughout Canada through a primary emphasis on impact avoidance. Wetlands are a particular priority for ECCC because of their importance to the maintenance of migratory bird populations for which the Department has a responsibility under the *Migratory Birds Convention Act (MBCA),* and for protection of species at risk for which it has a responsibility under the *Species at Risk Act,* as well as the provision of ecological services.

ECCC's advice is therefore guided by the FPWC, by its leadership role under the Ramsar Convention, and by its responsibilities under the MBCA and *Species at Risk Act* (SARA). ECCC recognizes the importance of considering cumulative effects and tailors expected outcomes for wetlands to the level of effects experienced in the area.

Technical Considerations

(A) The key policy objectives of the Federal Policy on Wetland Conservation (the Wetland Policy) relevant to federal environmental assessment can be found in Strategy 2 *Managing Wetlands on Federal Lands and Waters and in Other Federal Programs.* These include:

> ***Commit all federal departments to the goal of no net loss of wetland functions (i) on federal lands and waters, (ii) in areas affected by the implementation of federal programs where the continuing loss or degradation of wetlands has reached critical levels, and (iii) where federal activities affect wetlands designated as ecologically or socio-economically important to a region. Due to local circumstances where wetland losses have been severe, in some areas no further loss of any remaining wetland area may be deemed essential*** **(Government of Canada 1991).**

(B) The Wetland Policy should be considered by the Government of Canada through federal departments when addressing the potential loss of wetlands and wetland functions. Projects and

[1] For guidance on wetland classification, refer to National Wetlands Working Group. 1997. *The Canadian Wetland Classification System, 2nd ed..* Wetlands Research Centre, University Waterloo, Waterloo, Ontario. 68 p. CW66-156/1997.
[2] Available through the following link: https://www.ec.gc.ca/tho-wlo/default.asp?lang=En&n=5CD88C2D-1

activities of the Government of Canada are subject to the Policy, including those projects and activities considered under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). For projects on non-federal lands and waters, wetland and function loss are evaluated in terms of ***the scope of any federal permits, licenses, authorizations and other instruments[3] under federal jurisdiction applicable to the project*.**

The no net loss goal of wetland functions should be considered in the context of the CEAA 2012 to the extent of the application of federal jurisdiction (as described in (B) above). In relation to section 5 of CEAA 2012, the relevant sections are 5(1)(a), 5(1) (b), and 5(2)(a).

It is important to note that although the Wetland Policy can be considered broadly to all wetlands in Canada, the Policy's no net loss of wetland functions goal should be considered specifically to wetlands linked to areas of federal jurisdiction, these being:

- Federal lands
- Federal waters
- On non-federal lands, as described above **(B)** and in **(D)** below

(C) The Wetland Policy is underpinned by a 'no net loss of wetland functions' goal , and as such, necessitates a consideration of all wetland functions potentially adversely effected. Therefore, Environment and Climate Change Canada's Canadian Wildlife Service (CWS) recommends that proponents describe the natural processes of wetlands (physical, chemical, and biological) potentially directly and indirectly impacted are described in the Environmental Impact Assessment for review during the environmental assessment process.

The wetland functions overview guidance by Hanson et al. (2008) titled '*Wetland Ecological Functions Assessment: An Overview of Approaches*' (http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection_2010/ec/CW69-5-497-eng.pdf) should be reviewed before undertaking a wetland functions assessment. This document offers guidance on the types of wetland function assessments available (at the time of publication). It is important to be aware, however, that it is not in and of itself an approach to conducting wetland functions.

In relation to migratory birds and species at risk specifically, ECCC offers the following general guidance:

Surveys to assess for the presence, abundance, density, and distribution of migratory birds and species at risk (SARA-listed, and COSEWIC assessed) in relation to potentially impacted wetlands and associated riparian areas. Surveys should meet appropriate standards (e.g. Resource Information Standards Committee standards (RISC)), be species or bird group specific as appropriate, and be conducted during the appropriate times of the year. Surveys for species at risk should assess species individually (typically an indicator approach is not appropriate for species at risk). Surveys should not be limited to species or groups of species that are wetland-obligate, but rather should include any species known to use wetland habitats as part of its lifecycle. Data should be sufficiently robust to

[3] Some examples of federal instruments (permits, licences, authorizations, etc) include: Section 52 Certificate of Public Convenience and Necessity under the *National Energy Board Act*; Section 35(2) Authorization under the *Fisheries Act*; Section 127 Permit for Disposal at Sea under the *Canadian Environmental Protection Act, 1999*; Section 5(1) Permit under the *Navigable Waters protection Act*; and, Section 28(2) Permit under the *Indian Act*.

identify which wetland classes are important to which species (and for how many) on which to assess recovery and direct compensation.

(D) The no net loss goal of the Wetland Policy should be considered on a regional basis to reflect current conditions. In relation to current conditions, it should be considered to natural, degraded, and artificial wetlands.

In British Columbia, the geographic areas where the documented continuing loss or degradation of wetlands has reached critical levels are defined as:

- *Lower Mainland / Fraser Valley region*
- *East Vancouver Island and Gulf Islands*
- *Okanagan Valley*

In British Columbia, wetlands designated as ecologically important to a region are defined as:

- Areas of Continental or Regional Significance to Waterfowl within the three Joint Venture planning boundaries of British Columbia
- Estuaries as identified by the Pacific Estuary Conservation Program
- All eelgrass (Zostera subspecies) beds
- Red- and blue-listed wetland ecological communities

With respect to the two definitions provided above, CWS can provide more detailed guidance as and when requested. It should also be noted that the Policy states that 'no further loss of any remaining wetland area' may be deemed essential in areas where wetland losses have been severe. CWS can provide guidance in relation to the aforesaid on a project-by-project basis.

For a spatial representation of the regions and wetland types described above, refer to Appendix I. For a list of the mapped units, refer to Appendix II.

(E) The mitigation hierarchy should be used to achieve a no net loss of wetland functions for the three situations identified above. CWS recommends the hierarchy be applied in the following order, i.e. from most to least preferred:

(1) Avoidance of impacts;
(2) Minimization of unavoidable impacts; and,
(3) Compensation for unavoidable impacts.

Due in part to the broader wetland policy objective of promoting the conservation of Canada's wetland functions, now and in the future, and given the important role that wetlands play in sustaining populations for a variety of migratory bird and SARA-listed species, CWS recommends that avoidance of the loss of ecological wetland functions be emphasized early in the design phase of project proposals.

Consideration of the Wetland Policy is separate and distinct from a significance evaluation under CEAA 2012. The Wetland Policy is based on a no net loss of wetland functions, whereas the significance evaluation under the Act applies threshold-based criteria.

The Wetland Policy should be considered for all wetlands and wetland types in Canada, regardless of size. The no net loss goal should be considered to wetlands regardless of size in specific areas, and to specific types of wetlands throughout British Columbia, as described in (D) above. The no net loss goal should be considered in the context of all adverse effects, whether small or large, of short or long duration, and whether the effects are direct or indirect. Further, the no net loss goal should be considered to temporary losses[4] of wetland functions.

Monitoring programs are recommended to be scientifically robust, including of sufficient duration[5], so that the mitigation measures applied can be quantitatively assessed for overall effectiveness. Monitoring results may direct that mitigation be adjusted to ensure that compensation objectives are fully met.

(F) Whether in relation to the no net loss goal under the FPWC or a significance evaluation under CEAA 2012, CWS recommends that a Wetland Compensation Plan (WCP) be submitted with an Environmental Impact Statement for review during the environmental assessment process. The WCP should, amongst other things:

i. Describe the baseline condition of the wetland ecological communities and functions the Project would directly and indirectly adversely affect;
ii. Describe how the Project applied the mitigation hierarchy in €, including how efforts to avoid impacts were emphasized;
iii. Identify and describe any residual adverse effects;
iv. Describe the process of selecting proposed compensation site(s) and associated baseline condition(s);
v. Describe the functions that would be gained at the compensation site(s);
vi. Identify the compensation ratio;
vii. Identify measurable success criteria;
viii. List the parties and responsibilities for implementation; and
ix. Provide the monitoring schedule, parameters, plans, and analysis.

The CWS identifies a compensation ratio of 2:1 as the general national standard. Variances from this ratio will arise in project-specific instances, and the appropriateness of these should be demonstrated by the proponent through consultation with the CWS. In order of priority, wetland restoration is preferred over enhancement and enhancement over creation. In some situations, it may be determined that protection of existing functioning wetland habitat is sufficient to address project impacts. Additional considerations in the development of a WCP (amongst others) include:

- That compensation sites be located as close to impact sites as is technically feasible
- That replacement wetlands represent the same wetlands types and functions as those at the impact sites

[4] In the general case, CWS defines 'temporary' as equal to or less than 5 years.
[5] In the general case, CWS defines 'duration' as the period that reflects the life of the project. Because mitigation measures to address specific impacts can vary considerably across projects, the appropriate period of monitoring will be determined on a project-by-project basis. Consistency will be sought wherever it is scientifically feasible to do so. For additional guidance on scientific methods in support environmental assessment, refer to the following document: Hanson, A., I. Goudie, A. Lang, C. Gjerdrum, R. Cotter, and G. Donaldson. 2009. A framework for the scientific assessment of potential project impacts on birds. Canadian Wildlife Technical Report Series No. 508. Atlantic Region.

- That compensation measures be incorporated to account for the time lag in availability of habitat and functions between when the adverse effects occur to when they have been fully replaced.

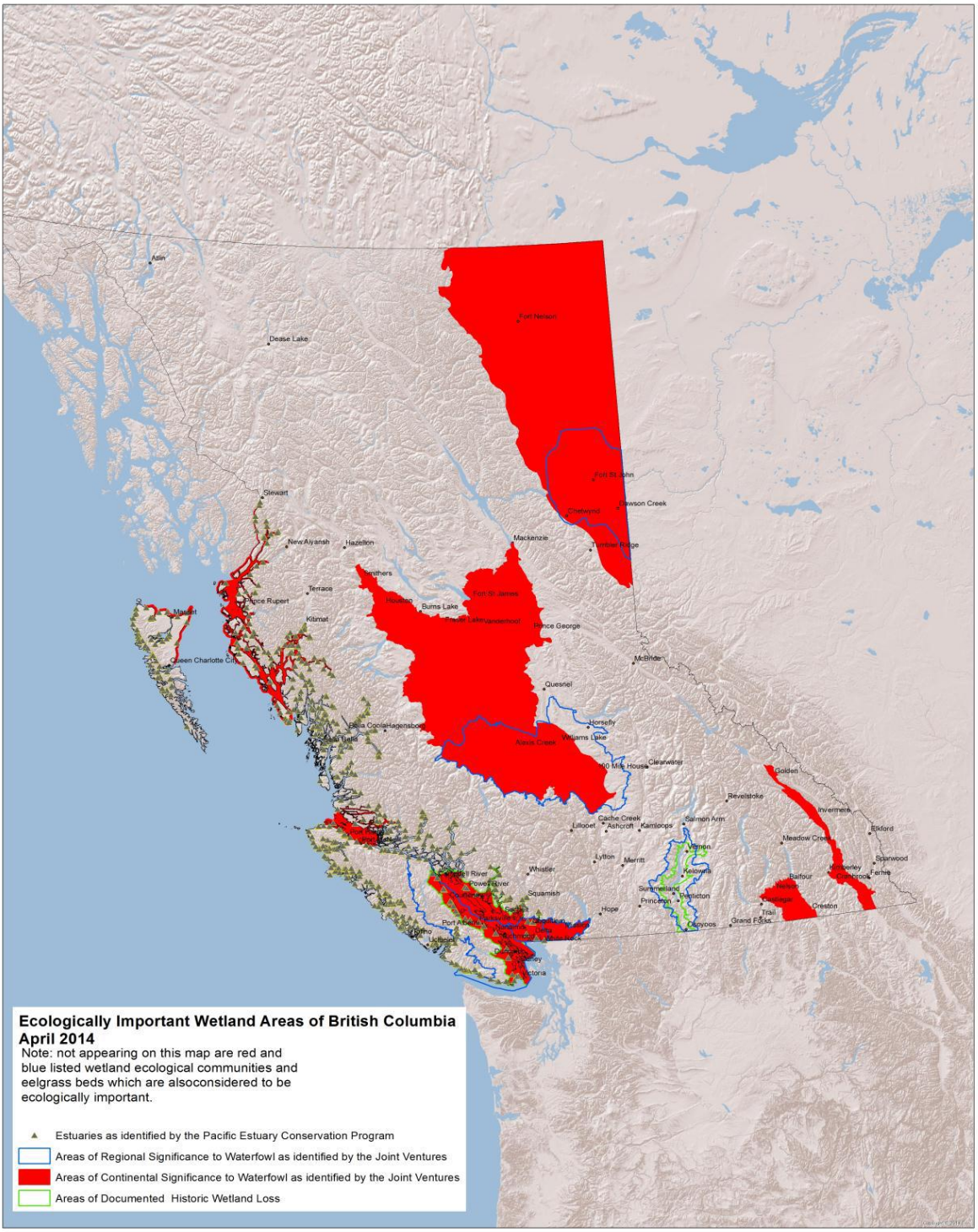
For guidance regarding wetland offsetting, proponents are referred to Environment and Climate Change Canada's *Operational Framework for Use of Conservation Allowances* (http://www.ec.gc.ca/ee-ea/default.asp?lang=En&n=DAB7DD13-1&printfullpage=true).

Closing

In summary, CWS advises proponents that the Wetland Policy no net loss of wetland functions goal should be considered by the Government of Canada, including therefore all federal departments and agencies, when addressing potential wetland losses. The no net loss goal is used to inform the environmental assessment process, including by CWS when providing expert advice on appropriate measures to be taken to avoid or mitigate the adverse environmental effects of a project subject to CEAA 2012, the SARA and the MBCA.

The identification and mapping of ecologically important wetlands and areas where losses of wetlands have reached critical levels is ongoing. As more data is made available and analyzed, CWS guidance will be periodically updated to ensure that the Wetland Policy is implemented in a consistent, objective, and transparent manner.

Appendix I


Ecologically Important Wetland Areas of British Columbia
April 2014
Note: not appearing on this map are red and blue listed wetland ecological communities and eelgrass beds which are alsoconsidered to be ecologically important.
Estuaries as identified by the Pacific Estuary Conservation Program
Areas of Regional Significance to Waterfowl as identified by the Joint Ventures
Areas of Continental Significance to Waterfowl as identified by the Joint Ventures
Areas of Documented Historic Wetland Loss
Atlin
Dease Lake
Fort Nelson
Fort St. John
Dawson Creek
Chetwynd
Stewart
New Aiyansh
Hazelton
Mackenzie
Tumbler Ridge
Smithers
Terrace
Prince Rupert
Houston
Burns Lake
Fort St. James
Prince George
Masset
Kitimat
Queen Charlotte City
McBride
Quesnel
Bella Coola
Hagensborg
Horsefly
Williams Lake
Alexis Creek
100 Mile House
Clearwater
Golden
Revelstoke
Invermere
Cache Creek
Ashcroft
Kamloops
Salmon Arm
Lillooet
Lytton
Merritt
Vernon
Kelowna
Meadow Creek
Sparwood
Whistler
Squamish
Summerland
Penticton
Princeton
Hope
Trail
Castlegar
Nelson
Balfour
Creston
Grand Forks
Cranbrook
Ferne
Port Alberni
Victoria

Appendix II

Areas of Continental Significance to Waterfowl

North American Waterfowl Management Plan. *North American Waterfowl Management Plan 2012: People Conserving Waterfowl and Wetlands*. 2012.

North Coast
Nearshore areas (to 3 km) off of the Queen Charlotte Lowland Ecosection, including estuaries
Estuaries and waters of the Hecate Lowland Ecosection, from the US border to Aristazabel Island out to 3 km off of the outer islands
North Island Straits Area
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Georgia Basin
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Nechako Lowland Ecosection
Nazko Upland Ecosection
Western Chilcotin Upland Ecosection
Chilcotin Plateau Ecosection
Fraser River Basin Ecosection
Cariboo Basin Ecosection
Creston
Southern Columbia Mountains Ecosection
Kootenay
East Kootenay Trench Ecosection
Upper Columbia Ecosection
Peace
Northern Alberta Upland Ecoregion Hay-Slave Lowland Ecoregion
Muskwa Plateau Ecoregion
Central Alberta Upland Ecoregion
Southern Alberta Upland Ecoregion
Peace River Basin Ecoregion

Areas of Regional Significance to Waterfowl

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Cariboo-Chilcotin

Earlier version of ecosectional boundaries, including all or part of:
Chilcotin Plateau Ecosection
Cariboo Basin Ecosection
Fraser River Basin Ecosection
Cariboo Plateau Ecosection
Quesnel Lowland Ecosection
Okanagan
Okanagan watershed
East Coast Vancouver Island
Georgia Basin watershed including waters of the Strait of Georgia (to centre line), and including Port Alberni.
Fraser Delta
Western portion of Fraser Lowland Ecosection to centre line of Strait of Georgia, easternboundary to portion of Surrey including Serpentine and Nicomekl watersheds.
Fraser Valley
Eastern portion of Fraser Lowland Ecosection including remainder of Surrey

Estuaries as identified by the Pacific Estuary Conservation Program

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Georgia Basin
Nanaimo Lowland Ecosection
Strait of Georgia Ecosection
Fraser Lowland Ecosection
Southern Gulf Islands Ecosection
Okanagan
South Okanagan Basin Ecosection
North Okanagan Basin Ecosection

APPENDIX 2. WETLAND COMPENSATION EFFECTIVENESS MONITORING PLAN

Appendix 2: Wetland Compensation Effectiveness Monitoring Plan

April 2020 Rev b

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1. INTRODUCTION

LNG Canada Development Inc. (LNG Canada) is proposing to construct and operate a liquefied natural gas (LNG) export facility in the District of Kitimat, British Columbia (the Project). The Project was subject to a substituted environmental assessment to address the requirements of both the BC *Environmental Assessment Act* and the *Canadian Environmental Assessment Act, 2012*. On June 17, 2015, the Project received both provincial and federal approvals of its environmental assessment, subject to conditions. Provincial condition 10 and federal condition 4.3 require the development of a Wetland Compensation Plan to mitigate the loss of wetland functions associated with the Project. LNG Canada developed the initial Wetland Compensation Plan in July 2015. The Plan was subsequently updated in May 2018 to reflect compensation elements that advanced between 2015 and 2018 and revised again in 2019 as part of this submission.

This Wetland Compensation Effectiveness Monitoring Plan (the Effectiveness Monitoring Plan) has been developed to address the requirements of Federal condition 4.5. Federal condition 4.5 requires a follow-up program to verify that the compensation wetland sites are fulfilling the ecological functions of the wetlands that they are replacing (see Table 1-1 in the Wetland Compensation Plan for full text of the relevant provincial and federal conditions). This Effectiveness Monitoring Plan identifies the management objectives, monitoring methods, and performance criteria associated with the various components of the Wetland Compensation Plan, including:

- Offsetting measures to be completed in accordance with the four *Fisheries Act* authorizations for the Project that also contribute to wetland compensation for the Project
- Proposed wetland conservation allowance areas

The details of this Effectiveness Monitoring Plan will continue to be developed through consultation and review with the BC Environmental Assessment Office (EAO), Canadian Wildlife Service of Environment and Climate Change Canada (ECCC/CWS), BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), and Haisla Nation.

2. MANAGEMENT GOAL AND MONITORING OBJECTIVES

The overall management goal of the Wetland Compensation Plan is to achieve no permanent net loss of ecological functions associated with ecologically important wetlands due to Project construction and operations. The objectives of this Effectiveness Monitoring Plan are to verify that the compensation wetland sites are fulfilling the functions of the wetlands that they are replacing and to inform corrective actions if the compensation wetlands are not fulfilling those functions.

The Wetland Compensation Plan identifies the ecological functions associated with potentially affected wetlands and uses the results of the Project's effects assessment to characterize the potential loss of identified wetland functions. This Effectiveness Monitoring Plan is intended to assess the same suite of ecological functions that were identified within potentially affected wetlands, within the compensatory wetlands. The suite of ecological functions that are the focus of the Wetland Compensation Plan and this Effectiveness Monitoring Plan are as follows:

- Hydrologic functions including attenuation of peak flows and baseflow augmentation
- Biogeochemical functions including water quality improvement and carbon capture and sequestration

- Habitat functions including supporting red- and blue-listed wetland communities at risk; habitat for wildlife species listed on Schedule 1 of the *Species at Risk Act* such as: western toad (*Anaxyrus boreas*) breeding; grizzly bear (*Ursus arctos*) spring/summer foraging; great blue heron (*Ardea herodias ssp. fannini*) foraging; rusty blackbird (*Euphagus carolinus*) breeding; western screech-owl *Megascops kennicottii* ssp. *kennicottii*) foraging; little brown myotis (*Myotis lucifugus*) foraging and roosting; and foraging, nesting, and stopover habitat for wetland-associated migratory birds such as waterfowl, shorebirds, and songbirds.

3. MONITORING METHODS

There are two sets of proposed monitoring methods that align with the components of the Wetland Compensation Plan and requirements of the federal conditions, as follows:

1. Effectiveness monitoring for the restoration, enhancement, and creation of wetlands as part of the fish habitat offsets constructed under the *Fisheries Act* authorizations for the Project (39.8 ha)
2. Effectiveness monitoring for conservation allowances to secure, restore, and enhance wetlands located on provincial crown land in Kitimat Arm (32.6 ha)

See Table 4-1 of the Wetland Compensation Plan for a summary of the wetland compensation measures and list of *Fisheries Act* authorizations contributing to wetland compensation. See Figure 4-1 of the Wetland Compensation Plan for the locations of wetland compensation measures and Figures 4-2 and 4-3 for the locations of candidate wetland conservation allowance areas.

3.1. Monitoring for Wetland Compensation Associated with Fish Habitat Offsets Constructed under the *Fisheries Act* Authorizations for the Project

Each of the four *Fisheries Act* authorizations issued for the Project has its own corresponding effectiveness monitoring program pertaining to fish habitat offsets. These include:

- Workforce Accommodation Centre Effectiveness Monitoring Program for Offset Habitats. Version 2, January 2018 (LNG Canada 2018)
- LNG Facility Effectiveness Monitoring Program for Offset Habitats. Revision 2 July 2017 (LNG Canada 2017a)
- LNG Facility Supporting Infrastructure Effectiveness Monitoring Program for Offset Habitats. Version 2, September 2017 (LNG Canada 2017b)
- Marine Terminal Effectiveness Monitoring Program for Offsetting Habitats, June 2015 (LNG Canada 2015)

These effectiveness monitoring programs for fish habitat offsets include collection of data that are also relevant to assessing wetland functions, and relevant data will be incorporated into this Effectiveness Monitoring Plan for consistency and efficiency. For example:

- Indicators of physical stability and hydraulic function in the fish habitat offsetting effectiveness monitoring programs will inform the assessment of wetland hydraulic functions
- Indicators of water quality in the fish habitat offsetting effectiveness monitoring programs will inform the assessment of wetland biogeochemical functions
- Indicators of riparian/marsh vegetation cover and structure in the fish habitat offsetting effectiveness monitoring programs will inform the assessment of wetland habitat functions

Physical stability and hydraulic function will be assessed by surveying cross sections of each watercourse/wetland and measuring minimum and maximum water depths throughout the year. Water quality will be assessed using field measurements of water temperature, dissolved oxygen (DO), pH, conductivity (salinity), and turbidity. The effectiveness monitoring programs for fish habitat offsets include measuring riparian/marsh vegetation cover by strata (tree/shrub/herb) and density of trees and shrub. These methods will be adjusted slightly to also include measures of cover by plant species to support wetland compensation effectiveness objectives.

Within saltmarsh restoration areas, vegetation cover will be measured where large woody debris has been removed and compared to reference sites. Within the saltmarsh creation sites, the following parameters will be measured and recorded: the physical topography of the marsh plain and tidal channels (width, depth and slope); surface water level and water table depth; surface and pore water quality parameters such as salinity, temperature, DO, pH; soil organic matter and moisture; sediment accretion rates; marsh plant species, richness and cover; and invertebrate species richness and abundance.

See the fish habitat offsetting effectiveness monitoring programs associated with each *Fisheries Act* authorization for additional details about these methods.

Reference sites selected as part of the fish habitat offsetting effectiveness monitoring programs will be used as ancillary data within this Wetland Compensation Effectiveness Monitoring Plan.

To augment the effectiveness monitoring associated with the fish habitat offsetting and address the remaining key wetland habitat functions, the following methods will be used:

- Ecosystem plots will be surveyed to classify the wetland associations (i.e., plant communities) and their structural stage at each reference and compensation wetland (BC MELP 2010). This will confirm whether red- or blue-listed wetland communities are present (or becoming re-established) and contributes to confirming compliance.
- Methods of measuring vegetation cover along transects as part of the effectiveness monitoring for fish habitat offsets will be adjusted to collect cover by plant species within the proposed transects.
- Delineation of compensatory wetland extent (which contributes to confirming compliance)

- Wildlife habitat suitability ratings will be assigned to reference and compensation wetlands for the following species and/or faunal groups: western toad breeding and foraging ; grizzly bear spring/summer foraging; great blue heron foraging; rusty blackbird breeding; western screech-owl foraging; little brown myotis foraging and roosting; waterfowl breeding, foraging, and stopover; shorebird breeding and stopover; and wetland-associated songbird community breeding.

Each of these categories of survey will follow established Resource Inventory Committee Standard methods for BC (RIC 1997, 1998a, 1998b, 1999a, 1999b).

Federal condition 4.5 requires that monitoring of compensatory wetlands be conducted in year one, and in years three, five and ten following the enhancement or creation of the compensatory wetlands. The timing of wetland effectiveness monitoring will be aligned with the timing of the fish offset effectiveness monitoring as feasible.

3.2. Monitoring for Wetland Compensation Associated with Conservation Allowances

Candidate Conservation Areas will be surveyed to classify wetlands, assess vegetation species cover, assess wildlife habitat functions, assess threats to existing wetlands and identify opportunities for habitat enhancement.

Indicators of physical stability, hydraulic function, water quality and habitat functions will be recorded within the candidate conservation areas in a manner that is comparable to the wetland compensation associated with fish habitat offsets constructed under the *Fisheries Act* authorizations for the Project (see Section 3.1).

Consistent with the requirements of federal condition 4.5, monitoring of wetland conservation allowance areas will be conducted in year one, three, five and ten following the securement of the conservation allowances.

4. SCHEDULE

Federal condition 4.5 requires that monitoring of compensatory wetlands be conducted in year one, and in years three, five, and ten following the enhancement or creation of the compensatory wetlands. The precise schedule will be aligned with the sequence of construction and completion of fish habitat and wetland compensation measures. Completion of fish habitat and wetland compensation measures will span at least three years (2018-2020); therefore, the first year of effectiveness monitoring will be staggered according to the completion date at each location (*construction schedule still being drafted*).

5. SUCCESS CRITERIA

The success criteria in the effectiveness monitoring programs for the fish habitat offsets have been reviewed to inform the selection of success criteria for this Effectiveness Monitoring Plan. Table 5-1 through Table 5-3 summarizes the success criteria from the effectiveness monitoring programs pertaining to fisheries habitat offsets that apply to wetland compensation:

Table 5-1 Physical Stability and Hydraulic Function Monitoring Success Criteria

Measurable Parameter(s)	Success Criteria
Bank stability	85% or more of pond and wetland habitat shows no sign of bank slumping that negatively affects the functionality of the wetland/pond habitat
Water depth	Low flow depths are within 75% of design depths in non-drought years for channels and ponds

Table 5-2 Biogeochemical Functions-Water Quality Monitoring Success Criteria

Measurable Parameter(s)	Success Criteria
water temperature, dissolved oxygen, pH, conductivity (salinity), and turbidity	Canadian Council of the Ministers of the Environment's water quality guidelines for aquatic life, or water quality is comparable to the reference sites (based on confidence intervals or traditional statistics (e.g., Student's t-test). Specifically, water quality should not deteriorate, compared to the upstream reference sites, with distance from the beginning of the offset habitat.

Table 5-3 Riparian/Marsh Vegetation Cover Criteria

Measurable Parameter(s)	Success Criteria
Native vegetation richness and cover	There is an increasing trend of native vegetation cover for each vegetation community within each offset area within the 10-year wetland effectiveness monitoring period (to be achieved through both natural colonization and planted trees and shrubs).

For saltmarsh restoration and/or creation areas the following success criteria apply:

Table 5-4 Success Criteria for Saltmarsh Restoration and Creation Areas

Measurable Parameter(s)	Success Criteria
Physical (structural) stability	Final elevations are stable and within the range capable of supporting salt marsh habitat; slopes provide positive drainage during the ebbing tide limiting the formation of extensive salt pannes and pools; Increasing annual trend of marsh vegetation frequency and/or cover during the wetland effectiveness monitoring period; The success of the constructed salt marshes will be determined based on their similarity to the reference marshes at the end of the monitoring program. Monitoring results for the reference sites will be used to determine the range of conditions for natural salt marsh habitats in the Kitimat River estuary. The constructed marshes will be considered successful if, at the end of the wetland effectiveness monitoring program, the values of the parameters at the constructed marshes are within 20% of the range of values measured at the reference marshes (i.e., ± 20% of the upper and lower bounds of the natural range). On an annual basis, the constructed salt marshes will be considered successful if conditions are moving toward conditions observed at the reference marshes.
Vegetation establishment (species-richness and cover)	
Surface water level and water table depth	
Surface and pore water quality parameters (salinity, temperature, DO, pH)	
Soil organic matter and moisture	
Sediment accretion rates	
Invertebrate species richness and abundance	

In addition to the above-listed success criteria, the following success criteria will also apply to the compensation wetlands associated with fish habitat offsetting:

- Invasive plant species cover at each compensation wetland area will be maintained or decrease during the wetland effectiveness monitoring period
- Wildlife habitat suitability ratings will be maintained or improve for each compensation area per species or faunal group during the 10-year wetland effectiveness monitoring period

In addition to the above-listed success criteria, the following additional success criteria will be applied to the candidate conservation area(s):

- The condition of confirmed occurrences of blue-or red-listed wetland communities will not degrade during the 10-year wetland effectiveness monitoring period and characteristic plant species assemblage and structural stage will be maintained during the wetland effectiveness monitoring period.

6. REPORTING

A Wetland Compensation Effectiveness Monitoring Report will be completed by the end of each monitoring year (i.e., Years 1, 3, 5, and 10), and will summarize the results for each component of the Wetland Compensation Plan, including: the restoration, enhancement, and creation of wetlands as part of the fish habitat offsets constructed under the *Fisheries Act* authorizations for the Project and conservation allowances to secure, restore, and enhance wetlands located on provincial crown land within Kitimat Arm.

Management recommendations will be provided at the end of each monitoring year to guide corrective actions to address any performance criteria that are not trending towards success.

After Year-10 of the Wetland Compensation Effectiveness Monitoring period, a final report will be issued with findings based on the overall performance success of the compensation wetlands and wetland mitigation measures.

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