APPENDIX 8-E

Addendums for Environmental Protection and Monitoring Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-E.4: Conceptual Whale Tail Pit Offsetting Plan

AGNICO-EAGLE MINES: MEADOWBANK DIVISION

CONCEPTUAL FISH HABITAT OFFSETTING PLAN: WHALE TAIL PIT

JUNE 2016

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EXECUTIVE SUMMARY

The habitat evaluation procedure (HEP) that was used to quantify habitat losses and offsets for Whale Tail Pit is based on the procedure used for the 2012 NNL assessment for the Meadowbank Mine and incorporates refinements that have been introduced during subsequent work between 2014 and 2016 to develop offsetting measures for Phaser Lake.

Changes to fish habitat will occur during the operations and post-closure phases of Whale Tail Pit. During the operations phase of the project there will be habitat losses due to enclosure of existing habitat within dikes and dewatering or isolation of portions of Whale Tail Lake and some of its tributary lakes and connecting watercourses, but there will also be habitat gains as a consequence of flooding terrestrial areas. Much smaller habitat losses will also occur in Mammoth Lake during operations as a result of diking and enclosure and in Nemo Lake due to the construction of a freshwater intake. The net effect of these changes will be an increase of approximately 67 ha in the area of aquatic habitat and an increase of approximately 61 habitat units. These numbers do not take into account the changes in and connecting channel habitat but those are small relative to the terrestrial area that is flooded. Overall, due to the increase in habitat area, it is expected that there will be no reduction in fish productive capacity during the operations phase of the project.

Post-closure, most of the area affected during operations will revert to baseline conditions. The dikes will be breached, dewatered areas will be reflooded and isolated areas will be reconnected. The largest change from baseline conditions to post-closure is the creation of the pit. It has been assumed that the flooded pit will become meromictic and that the area over the meromictic portion will have no fish habitat value. Therefore, although the pit will increase the surface area of Whale Tail Lake by approximately 19.6 ha, the number of habitat units present will decrease by 10.443, relative to the baseline condition. Offsetting measures will be required to address these reductions. Without offsetting, reductions of 0.005 and 0.019 habitat units are estimated for Mammoth Lake and Nemo Lake, respectively.

It is anticipated that the offsetting will include both in-kind and out-of-kind habitat enhancement, habitat creation, and possibly complementary measures. On-site habitat enhancement will include capping the pit sill and infrastructure such as roads and jetties with coarse substrate as well as shoal creation prior to reflooding the dewatered area. Habitat creation will include excavation where the perimeter of the pit intersects land. Raising the post-closure water level is also being evaluated as a method of creating habitat post-closure. Out-of-kind offsetting measures being considered include enhancing the connection between Mammoth Lake and Whale Tail Lake and creating or enhancing habitat off-site, possibly on the Meadowbank River near the haul road crossing. It is estimated that the offsetting concepts presented in this report could provide, in total, approximately 21.15 habitat units. Thus, incorporating approximately half of this total would achieve a 1:1 ratio of offsetting:losses. The final offsetting plan will be developed with input from local stakeholders and Fisheries and Oceans Canada.

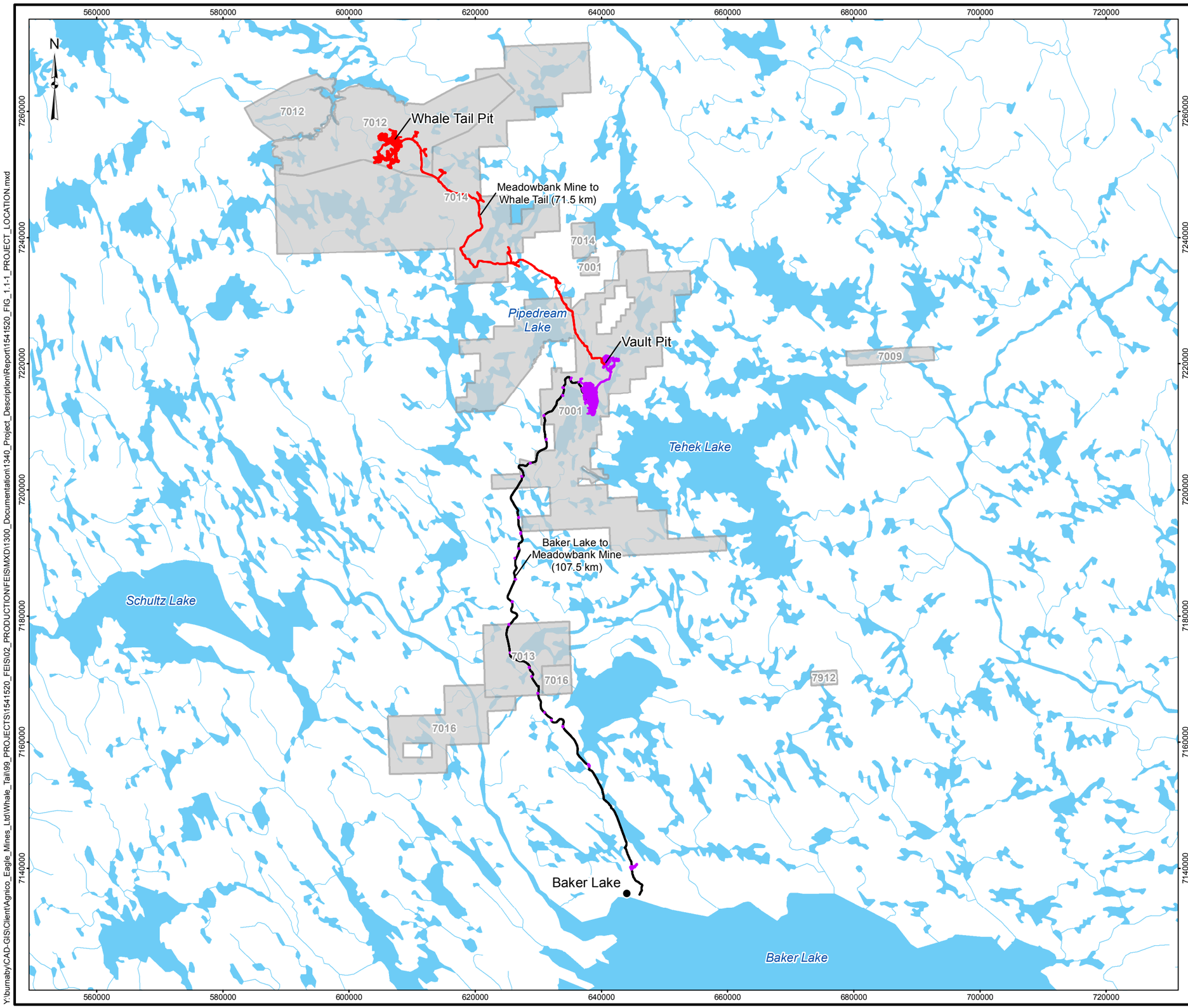
SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited: Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit, a satellite deposit on the Amaruq property, in continuation of mine operations and milling of the Meadowbank Mine. The Amaruq Exploration property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Figure **1.1**).

1.1 GOAL

The main goal of this document is to characterize the fish habitat in areas that will be directly altered by the Whale Tail Pit mining operations under baseline conditions and predicted conditions during the operations and post-closure scenarios for the Whale Tail Pit. Options being considered to offset residual serious harm to fish that would occur as a result of mining activities at Whale Tail Pit are also introduced.

The approach to quantifying harm and offsetting (previously compensation) builds upon the methods developed for the Meadowbank mine site from 2012 through 2015. Offsetting (at the time, "compensation") options were previously proposed for losses associated with Phaser Lake (and other areas) in the 2012 Meadowbank no-net-loss plan (NNLP) after researching techniques and projects implemented at other northern mines, holding workshops and site visits with the local Hunter's and Trapper's Organization, Kivalliq Inuit Association and the DFO Habitat and Science & Research Departments, and reviewing the literature for information on effectiveness of compensation. The offsetting concepts specific for Whale Tail Pit were discussed with community groups during TK workshops held in Baker Lake in February 2016; follow-up workshops will be held in the fall of 2016 during the authorization phase of the project.



REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

PROJECT LOCATION AND CLAIM BOUNDARIES

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	24 Mar. 2016		
CHECK	JR	09 May 2016	**FIGURE 1.1-1**	
REVIEW	LY	09 May 2016		

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1.2 HYDROLOGIC SETTING

The hydrologic setting of the Whale Tail pit is shown in Figure 1.2. The lakes were assigned alpha-numeric codes to facilitate discussion, with the letter designating the subwatershed and, within each branch, the number increasing in an upstream direction. The primary study area is in the headwaters of subwatershed A, which bifurcates at lake A12 and drains via two different series of lakes and connecting channels to a large lake downstream, labelled DS1. Lake A17 is referred to as Whale Tail Lake. Lake A16 is referred to as Mammoth Lake and lake C38, in the subwatershed immediately north of the Whale Tail Pit, is referred to as Nemo Lake.

There was only an interstitial flow connection during the 2015 spring freshet between three of the larger tributary lakes (A56, A60 and A65) and Whale Tail Lake. This was also the case for lakes A43 and A45 that drain to Mammoth Lake. The connection between Whale Tail and Mammoth Lake had only interstitial flow once spring flows subsided and water levels fell. This was also the case in a number of the connecting channels downstream from Mammoth Lake.

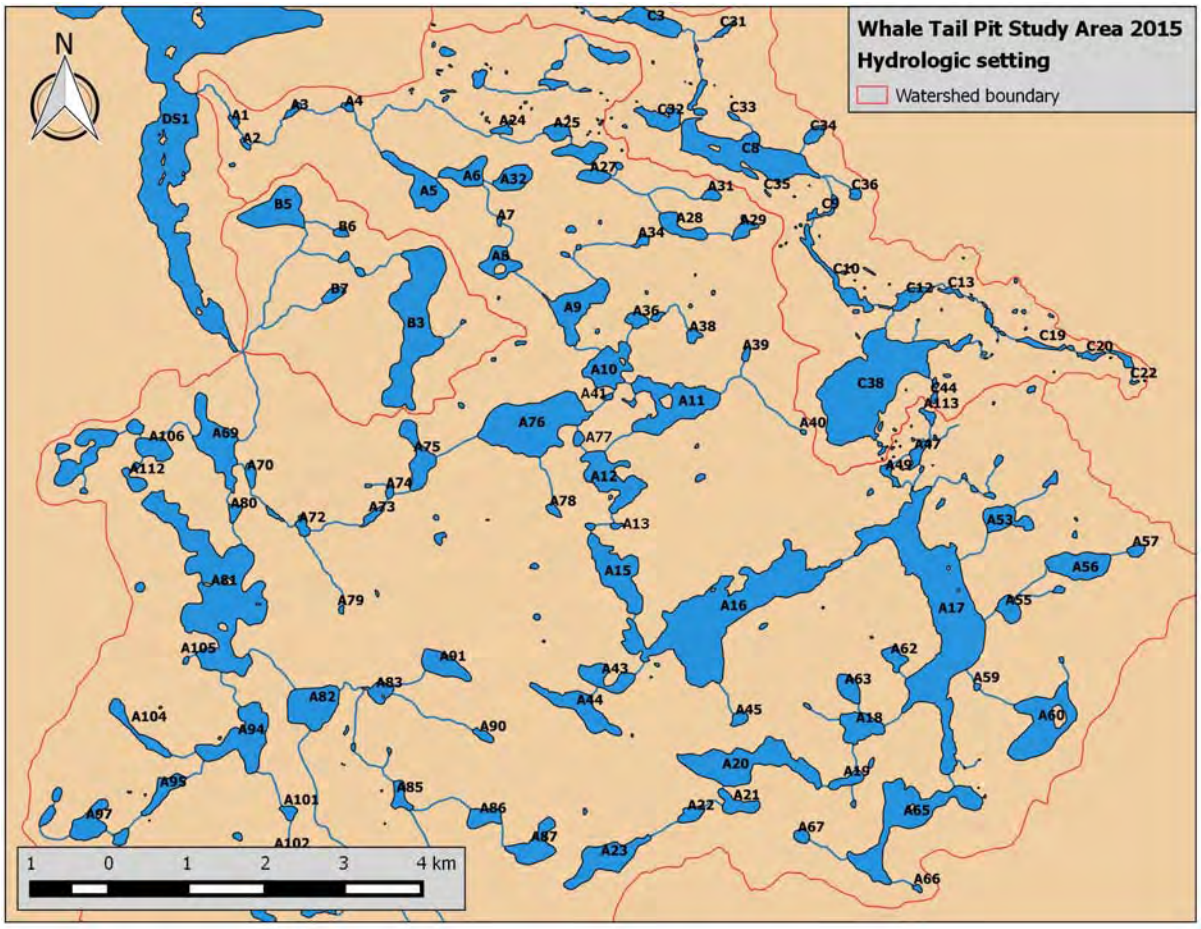


Figure 1.2. Hydrologic setting and lake identification codes. Mammoth Lake is A16**.** Whale Tail Lake is A17. Nemo Lake is C38.

1.3 WHALE TAIL AREA FISH COMMUNITY

Base-line fisheries investigations conducted in Mammoth Lake, Whale Tail Lake, and tributary streams and lakes in 2014 and 2015 are described in C. Portt and Associates (2015) and summarized here. Individuals of six fish species were captured during the 2014 and 2015 sampling (Table 1.1). These were comprised of four large-bodied species (Lake Trout, *Salvelinus namaycush;* Arctic Char, *Salvelinus alpinus*; Round Whitefish, *Prosopium cylindraceum*; Burbot, *Lota lota*) and two small-bodies species (Slimy Sculpin, *Cottus cognatus*; Ninespine Stickleback, *Pungitius pungitius*). Lake Trout were the most abundant species in gill net catches and were captured in Mammoth, Whale Tail and Nemo Lakes and in seven of the smaller lakes. Round Whitefish were captured in Mammoth and Whale Tail Lakes and in two of the smaller lakes. Arctic Char were captured in Whale Tail Lake and in three of the smaller lakes. The Arctic Char are presumed to be land-locked, given the distance to a marine environment.

Table 1.1. Fish species captured in the waterbodies that will be directly altered by diking or flooding at the Whale Tail pit. X indicates that the species has been captured and ns indicates that the waterbody was not electofished. . A blank indicates that it has not. "ns" indicates that the waterbody has not been sampled with either gill nets

Waterbody	Lake Trout	Arctic Char	Round Whitefish	Burbot	Ninespine Stickleback	Slimy Sculpin
A18					X	X
A19					X	X
A20	X		X			
A22	X	X			X	X
A45					X	
A47		X			X	
A49						X
A53	X	X			X	
A55	X			X		X
A62	X				ns	ns
A63	X					X
A65	X		X		X	X
A113					X	
Mammoth Lake	X		X		X	X
Nemo Lake	X				ns	ns
Whale Tail Lake	X	X	X		X	X

Netting catch per unit effort was low for all species. In Mammoth, Whale Tail and Nemo Lakes combined, average catch per unit effort in gill nets, calculated as the number of individuals captured per hour of soak time using a standard AEM gill net, was 0.5, 0.1 and 0.01 for Lake Trout, Round Whitefish and Arctic Char, respectively. Large mesh hoop nets set between June 19 and July 13, 2015, in areas where there was thought to be potential for fish movement between lakes caught one Lake Trout and one Arctic Char in 3000 hours of soak time. In total, electrofishing 1,978 m of lake shoreline resulted in the capture of 145 Ninespine Stickleback, 55 Slimy Sculpin, 2 juvenile Arctic Char and 3 juvenile salmonids, either Arctic Char or Lake Trout, which were not identified to species. There were, however, several isolated or nearly isolated small lakes and ponds in which no fish were captured. Most of these were located north of Whale Tail Lake.

Electrofishing effort on study area tributaries during the 2015 field season totalled 24,709 electroseconds and 3,569 m. The most abundant species in the catches was Ninespine Stickleback (n=469) followed by Slimy Sculpin (n=237). Low numbers of juvenile Arctic Char (n=13), juvenile Lake Trout (n=8), as well as one juvenile each of Round Whitefish and Burbot were captured in the tributaries. Juvenile Arctic Char were captured by electrofishing in five of the tributaries to Whale Tail Lake and juvenile Lake Trout were captured in three.

Large minnow traps set in tributaries caught 9 Slimy Sculpin and 1 juvenile Round Whitefish in 2640 hours of soak time.

Although regionally present, no Arctic Grayling (*Thymallus arcticus*) or Arctic Cisco (*Coregonus artedii*) have been observed or captured in the study area.

SECTION 2 • HABITAT EVALUATION PROCEDURE

The habitat evaluation procedure (HEP) that was used to quantify habitat losses and offsets for Whale Tail Pit in this report is based on the procedure used for the 2012 NNL assessment for the Meadowbank Mine and incorporates refinements that have been introduced during subsequent work between 2014 and 2016 to develop offsetting measures for Phaser Lake.

The HEP involves the classification of habitat into ten habitat types, based on depth and substrate. Suitability of each habitat type is ranked between 0-1 for each of four life functions (spawning, nursery, foraging, overwintering) for each fish species that is (or is predicted to be) present. The area of each habitat type (in hectares) is multiplied by a habitat suitability index (HSI) and a series of weights (a species weight, a life-function weight and an access weight) and summed in order to derive a value in habitat units (HUs) that describes both the quality and quantity of habitat. These calculations are made for the baseline (natural, or baseline) condition and for predicted conditions during the operations and post-closure phases of the project.

The changes in HUs among phases depend on the changes (losses or gains) in the area of the habitat types (10 types, by substrate and depth) that are lost and gained, and the suitability of each habitat type for each fish species. HUs for offsetting measures that involve altering habitat or access can be calculated using the same procedure.

The HEP model is described in further detail below.

2.1 HEP MODEL

The HEP model used here can be described, for each fish species (spp 1-n) as:

$$\mathbf{HU}_{\text{spp 1-n}} = \sum_{\text{HT 1-10}} \left(\sum_{\text{sp,nu,fo,ow}} (\mathbf{HT}_{\text{1-10}} \times \mathbf{HSI}_{\text{sp,nu,fo,ow}} \times \mathbf{life\ function\ weight} \times \mathbf{species\ weight}) \right]) \times \mathbf{access\ factor} \times \mathbf{habitat\ co\text{-}factor}$$

Where HT_{1-10} = area (ha) of habitat types 1 through 10

$HSI_{sp,nu,fo,ow}$ = habitat suitability index for each life function:

- sp = spawning use
- nu = nursery use
- fo = foraging use
- ow = overwintering use

2.1.1 Habitat Type Area (HT_{1-10})

The foundation of the HEP is the delineation of "habitat types" – the method by which habitat areas are grouped, and thereby mapped. The Meadowbank HEP model for Whale Tail Pit uses 10 habitat types, which are based on various combinations of substrate and depth. Habitat types 1-9 are applied to natural habitat for various combinations of substrate type and depth zone (Table 2.1). Habitat type 10 is applied to all non-backfilled pit areas (currently assumed to be the entire Whale Tail pit), independent of depth. The potential for a chemocline to develop and cause meromixis has not yet been evaluated but, for the purposes of the model, it has been conservatively assumed that meromixis will occur. Consequently, substrate has no relevance for habitat type 10.

Table 2.1. Physical characteristics of the habitat types proposed for the Whale Tail Lake HEP. Note that habitat type 10 is applied to all non-backfilled pit areas, independent of depth and substrate characteristics.

Habitat Type	Depth Zone	Substrate
1	0-2 m	Fine
2	0-2 m	Mixed
3	0-2 m	Coarse
4	2-4 m	Fine
5	2-4 m	Mixed
6	2-4 m	Coarse
7	>4 m	Fine
8	>4 m	Mixed
9	>4 m	Coarse
10 (pit area)	all	na

*Habitat type 10 is applied to all non-backfilled pit areas independent of depth. Substrate in pits is assumed to be coarse but has no relevance to suitability (see Section 2.1.2).

In order to calculate the extents of each habitat type, depth zones and substrate were mapped for the entire Whale Tail Pit site, for baseline, operations and post-closure scenarios. The area (in ha) for each habitat type was determined by overlaying depth and substrate layers. All habitat type area calculations and mapping were completed by Dougan and Associates using standard GIS methods consistent with AEM (2012) and Phaser Lake offsetting plan.

2.1.2 Habitat Suitability Index ($HSI_{sp,nu,fo,ow}$)

The habitat suitability term represents the relative quality of each habitat type for each life function of each fish species present in the region. In the case of this HEP, the life functions spawning, nursery, foraging and overwintering were considered. Habitat suitability for each life function is indicated through a ranking of 0, 0.25, 0.5, 0.75 or 1. HSIs for all fish species and habitat types used in this HEP are shown in Table 2.2, and their derivation is further described in AEM (2012).

It has been conservatively assumed that habitat type 10 will provide no fish habitat, although the mixolimnion might provide habitat for pelagic fish.

Table 2.2. HSI values for the Whale Tail Region fish species (sp=spawning, nu=nursery, fo=foraging, ow=overwintering). *Habitat type 10 is applied to all non-backfilled pit areas. Neither Lake Cisco (*Coregonus artedii*) or Arctic Grayling (*Thymallus arcticus*) have been captured in any of the Whale Tail area lakes.

Habitat Type	Depth	Substrate	Arctic Char				Lake Trout				Round Whitefish			
			SP	NU	FO	OW	SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.25	0	0	0.25	0.25	0	0	0.25	0.75	0
2	<2 m	Mixed	0	0.25	0.25	0	0	0.5	0.5	0	0	0.75	0.5	0
3	<2 m	Coarse	0	0.5	0.5	0	0	1	0.75	0	0	0.75	0.5	0
4	2-4 m	Fines	0	0.5	0.5	0.75	0	0.5	0.5	0.75	0	0.25	1	0.75
5	2-4 m	Mixed	0.5	0.75	0.75	0.75	0.5	0.75	0.75	0.75	0.5	0.75	0.75	0.75
6	2-4 m	Coarse	1	1	1	0.75	1	1	1	0.75	1	1	0.75	0.75
7	>4 m	Fines	0	0.25	0.5	1	0	0.25	0.5	1	0	0.25	1	1
8	>4 m	Mixed	0.5	0.5	0.75	1	0.5	0.5	0.75	1	0.25	0.25	0.5	1
9	>4 m	Coarse	1	0.5	1	1	1	0.5	1	1	0.75	0.5	0.5	1
10*	mixolimnion	Coarse	0	0	0	0	0	0	0	0	0	0	0	0

Habitat Type	Depth	Substrate	Burbot				Slimy Sculpin				Ninespine Stickleback			
			SP	NU	FO	OW	SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.25	0	0	0	0.25	0	1	1	1	0
2	<2 m	Mixed	0	0.75	0.5	0	0.25	0.25	0.5	0	0.5	0.5	0.75	0
3	<2 m	Coarse	0	1	0.5	0	1	1	1	0	0	0.25	0.75	0
4	2-4 m	Fines	0	0.25	0.25	0.75	0	0	0.25	0.75	0	0	0.5	0.75
5	2-4 m	Mixed	1	0.5	0.75	0.75	0.25	0.25	0.5	0.75	0	0	0.25	0.75
6	2-4 m	Coarse	0.75	0.5	1	0.75	0.75	0.75	1	0.75	0	0	0.25	0.75
7	>4 m	Fines	0	0	0.25	1	0	0	0	1	0	0	0	1
8	>4 m	Mixed	1	0	0.75	1	0	0	0.25	1	0	0	0	1
9	>4 m	Coarse	0.75	0.25	1	1	0.5	0.5	0.5	1	0	0	0	1
10	mixolimnion	Coarse	0	0	0	0	0	0	0	1	0	0	0	0

Habitat Type	Depth	Substrate	Lake Cisco				Arctic Grayling			
			SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.5	0	0	0.25	0	0
2	<2 m	Mixed	0	1	1	0	0	0.25	0.25	0
3	<2 m	Coarse	0	1	1	0	0	0.5	0.25	0
4	2-4 m	Fines	0	0.25	0.75	0.75	0	0	0.5	0.75
5	2-4 m	Mixed	0.25	0.5	1	0.75	0	0	1	0.75
6	2-4 m	Coarse	0.75	0.75	0.75	0.75	0	0	1	0.75
7	>4 m	Fines	0	0	0.75	1	0	0	0.5	1
8	>4 m	Mixed	0.5	0.25	1	1	0	0	1	1
9	>4 m	Coarse	1	0.25	0.75	1	0	0	1	1
10	mixolimnion	Coarse	0	0	0	0	0	0	0	0

2.1.3 Life Function Weight

This HEP values all life functions equally, with a weight of 0.25 each assigned for spawning, nursery, foraging and overwintering.

2.1.4 Species Weight

The overall species weights used in this method sum to 1 across species. The species weights for various Meadowbank offsetting plans are comprised of a biomass weighting and a fishery value weighting:

Species weight = (biomass weight/2) x (fishery weight/2)

As a refinement of this approach, it is proposed that an aboriginal fishery value be included in this calculation for the Whale Tail pit offsetting calculations, with the species weights calculated as:

Species weight = (biomass weight/3) x (fishery weight/3)x (aboriginal value/3)

The aboriginal value would be determined in consultation with the community and these consultations have not yet taken place. Therefore, the calculations in this conceptual offsetting plan only incorporate biomass weight and fishery weight.

2.1.4.1 Biomass Weight

For applications of this method at the Meadowbank site lakes, the proportional biomass observed in fish-outs of lakes that have been drained has been used as the biomass weights with a minor portion (1%) of the total biomass assigned to each of the small-bodied species that are present, but which are not captured during the gill nets that are used for the fish-outs. These are considered to be the best available estimates of relative biomass for the larger Whale Tail lakes as well, given the geographic proximity to Meadowbank and the similar suite of fish species present. The relative biomass from the Vault Lake fish-out, with 1% of total biomass assigned to slimy sculpin and ninespine stickleback (Table 2.3) have been used in these calculations. The biomass weight could be revised based on the relative biomass values for Whale Tail Lake after the fish –out of the dewatered basin.

Table 2.3. Biomass, fishery and overall species weights for each Whale Tail pit fish species.

Species	Biomass Weight	Fishery Weight	Overall Species Weight
Arctic char	0.053	0.063	0.0580
Lake trout	0.613	0.735	0.6736
Round whitefish	0.298	0.202	0.2502
Burbot	0.016	0.000	0.0082
Slimy sculpin	0.010	0.000	0.0049
Ninespine stickleback	0.010	0.000	0.0049

2.1.4.2 Fishery Weight

DFO's Fisheries Protection Policy Statement (DFO, 2013) indicates that the goal of the current Fisheries Act is to manage threats to the sustainability and productivity of Canada's commercial, recreational and aboriginal (CRA) fisheries. According to Section 2(1) of the Fisheries Act, CRA fisheries are defined as:

- Commercial, in relation to a fishery, means that fish is harvested under the authority of a licence for the purpose of sale, trade, or barter.
- Recreational, in relation to a fishery, means that fish is harvested under the authority of a licence for personal use of the fish or for sport.
- Aboriginal, in relation to a fishery, means that fish is harvested by an Aboriginal organization or any of its members for the purpose of using fish as food, for social or ceremonial purposes, or for purposes set out in a land claims agreement entered into with the Aboriginal organization.

No commercial fisheries are present in the Project area. Traditional knowledge reports (e.g. Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site - Baseline Traditional Knowledge Report – December 2014) generally indicate little fishing has historically occurred in the Project lakes area, but the Whale Tail Lakes are conservatively assumed to support an Aboriginal fishery. While in theory a recreational fishery (i.e. fishing under a sport license issued to persons who are not beneficiaries of the Inuit Land Claims Agreement) could occur anywhere in Nunavut, use of the Project lakes for this purpose has not been reported. However, the fishery weights derived from catch surveys used here (as explained below) are expected to reflect the combined value of each species for both recreational and Aboriginal fishing purposes. The same approach was applied to the Meliadine Lake ecotype for the Meliadine Project (Fisheries Screening Assessment and Offsetting Plan - Meliadine Gold Project, Nunavut. Golder Associates; June 2015).

Fishery weights were calculated based on information about local fishing practices by residents of Baker Lake collected through annual surveys from 2007 – 2013 (see 2013 Meadowbank Annual Report, Appendix G13, 2013 Hamlet of Baker Lake Harvest Study – Creel Results). The fishery weights are the relative proportion of the total number of fish kept accounted for by each of the kept species. The proportion of the creel that was composed of Lake Whitefish (*Coregonus clupeaformis*) in the Baker Lake creek was assigned to Round Whitefish for the calculation and the proportion of the Baker Lake creek that was comprised of Arctic Grayling (0.001) not included in the calculations. When compared to creel information from some other communities, there is a greater importance of Lake Trout compared to Arctic Char for the local Aboriginal fishery of Baker Lake. A review of traditional knowledge reports (Meadowbank Gold Project - Baseline Traditional Knowledge Report – October, 2005; Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site - Baseline Traditional Knowledge Report – December 2014) confirms the general results of these surveys.

2.1.5 Access Factor

In a workshop conducted in February, 2012 (The Basic Concepts of No Net Loss Accounting - February, 2012) Dr. Charles K. Minns suggested the use of an access factor when fish assemblages are expected to change in the offsetting scenario. According to this concept, the access factor is 1 for any species present in the habitat area, and 0 for any species not present. Each species receives an access factor in both the loss and gain calculations. Therefore, the opening of access to a habitat area for a species (that did not have access previously), results in an increase of habitat units. Similarly, the loss of access results in a loss of habitat units. These gains or losses may be complete (i.e. affect all species), or partial (only some species are affected). Note that presence or absence of a species in loss calculations is based on surveys in the affected habitat area, whereas presence or absence in an offsetting scenario where access is altered is anticipated and would need to be confirmed after access is altered, as part of compensation monitoring.

Table 2.4. Access factor theoretically applied to each species for habitat loss and gain calculations, based on presence/absence (or anticipated presence/absence, for offsetting projects).

Scenario	Access Factor	
	Losses	Gains
Species Present	1	1
Species Not Present	0	0

Typically, the access factors applied are based on the observed presence/absence of each species during baseline monitoring studies (AEM, 2012, 2013, 2016). The fish species captured during base line studies in 2014 and 2015 in the Whale Tail area lakes that will be directly affected by the project are presented in Table 1.1. In some lakes no fish were captured and in others only small-bodied fish were captured. To be conservative, for the conceptual level calculations in this report it has been assumed that all six of the fish species that were captured in one or more of the Whale Tail lakes have access to all of the lakes that will be directly affected by the project. Additional field investigations are planned to further assess presence/absence in lakes where fewer species or no fish, were captured. If confidence is developed that some or all species are absent from certain waterbodies an access factor of zero may be applied in subsequent iterations of the offsetting calculations.

2.1.6 Habitat Co-factor

The habitat co-factor represents any changes to non-mapped habitat quality (thermal, hydrological, biological or chemical regimes) that will occur in the fish habitat in question as a result of impacts or offsetting. The use of this factor is suggested by Dr. Ken Minns, and his suggested values as presented in a workshop for DFO in February, 2012 (see Section 2.1.5), are shown in Table 2.5.

Table 2.5. Habitat co-factor for various pre- and post-compensation scenarios, according to Minns, 2012.

Change in regime	Description	Baseline conditions factor	Post-closure factor
Degradation (expected)	Thermal, hydrologic, chemical and/or biological regime shifts away from preferred state for fish habitat	1	> 0 and < 1
No change	-	1	1
Enhancement (anticipated or proposed)	Thermal, hydrologic, chemical and/or biological regime expected to shift towards preferred state for fish habitat	> 0 and < 1	1

SECTION 3 • CHANGES IN HABITAT

The proposed approach to mining the Whale Tail Pit is to build three dikes in order to isolate the pit area. The area within those dikes would be dewatered to allow mining to occur. When mining is completed, the dikes would be breached, allowing the pit to flood and water elevations to return to baseline conditions. The proposed sequence of changes are shown in Figures 3.1 to 3.4.

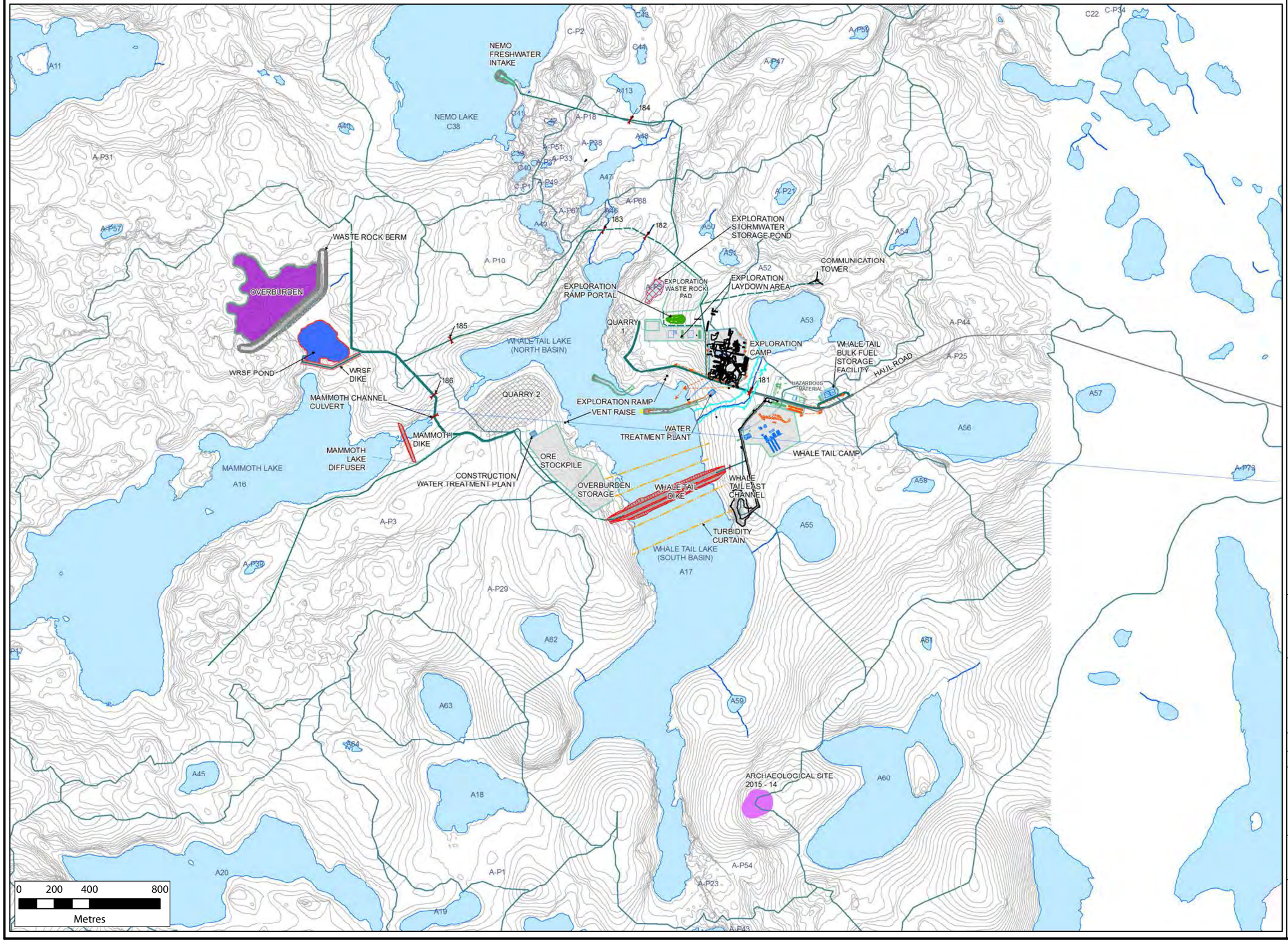
3.1 CHANGES FROM EXISTING CONDITIONS DURING THE OPERATIONS PHASE

The area to be enclosed by dikes and dewatered during mine operations includes the northern basin of Whale Tail Lake and a small portion at the east end of Mammoth Lake as well as the watercourse between those two lakes. There is a surface connection between the two lakes via this watercourse during the spring and early summer when water levels are high but only interstitial flow later in the year when water levels are lower. No fish were captured in hoop nets set in this connecting channel between June 19 and July 13, 2015.

An area to the north of Whale Tail Lake that includes a number of small lakes and ponds which currently drain to Whale Tail Lake would be isolated by the north dike. In this area, referred to as the north-east pond, the water level would be allowed to rise, resulting in the flooding of some terrestrial areas. This area would drain to Nemo Lake. It has been assumed that fish from outside would not have access to the north-east pond and it has also been assumed, at this time, that due to the limited amount of deep habitat, fish may not survive the winter in this pond. Therefore it has not been assigned any habitat value during the operations phase.

South of the Whale Tail Dike that bisects Whale Tail Lake, the water level would rise to 156 masl. This would result in the flooding of terrestrial areas so that a number of lakes that are now discrete and connected to each other or to Whale Tail Lake (South Basin) by watercourses (lakes A55, A65, A62, A63, A18, A19, A20, A21 and A22) would become contiguous. This larger contiguous waterbody is referred to in this document as *the expanded Whale Tail Lake (South Basin)*. This area would drain to Mammoth Lake via a connecting channel constructed between the expanded Whale Tail Lake and Lake A45 and a connecting channel between Lake A45 and Mammoth Lake. A watercourse already exists between Lake A45 and Mammoth Lake; it has not yet been determined if it will be necessary to modify that connection.

A number of existing watercourses would be flooded during the operations phase; others, within the diked area, would be dewatered. Lake A53, east of Whale Tail Lake, currently drains to the portion of Whale Tail Lake that would be dewatered. A new watercourse would be constructed to convey this flow to Whale Tail Lake south of the Whale Tail Dike. In addition to the alterations within the Whale Tail Lake and Mammoth Lake drainages, a water intake jetty would be constructed in Nemo Lake.



Legend

- BULK FUEL STORAGE FACILITY
- CAMP FEATURE
- CONSTRUCTION WATER TREATMENT PLANT
- EXPLORATION LAYDOWN AREA
- EXPLORATION CAMP
- EXPLORATION WASTEROCK PAD
- MAMMOTH DIKE
- MRSF POND
- NEMO FRESHWATER INTAKE
- ORE STOCKPILE ; ORE STOCKPILE
- OVERBURDEN
- OVERBURDEN STORAGE
- PROJECT FEATURES - BLUE
- QUARRY 1
- QUARRY 2
- RAMP
- STORM WATER STORAGE POND
- WASTE ROCK BERM
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL DIKE
- WRSF DIKE

Whale Tail
Project Infrastruction 2018

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PROJECT: DA14-053-06 Whale Tail Surveys 2016

CLIENT: Agnico Eagle

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UTM Zone 17 NAD83

DATE: JUNE 2016

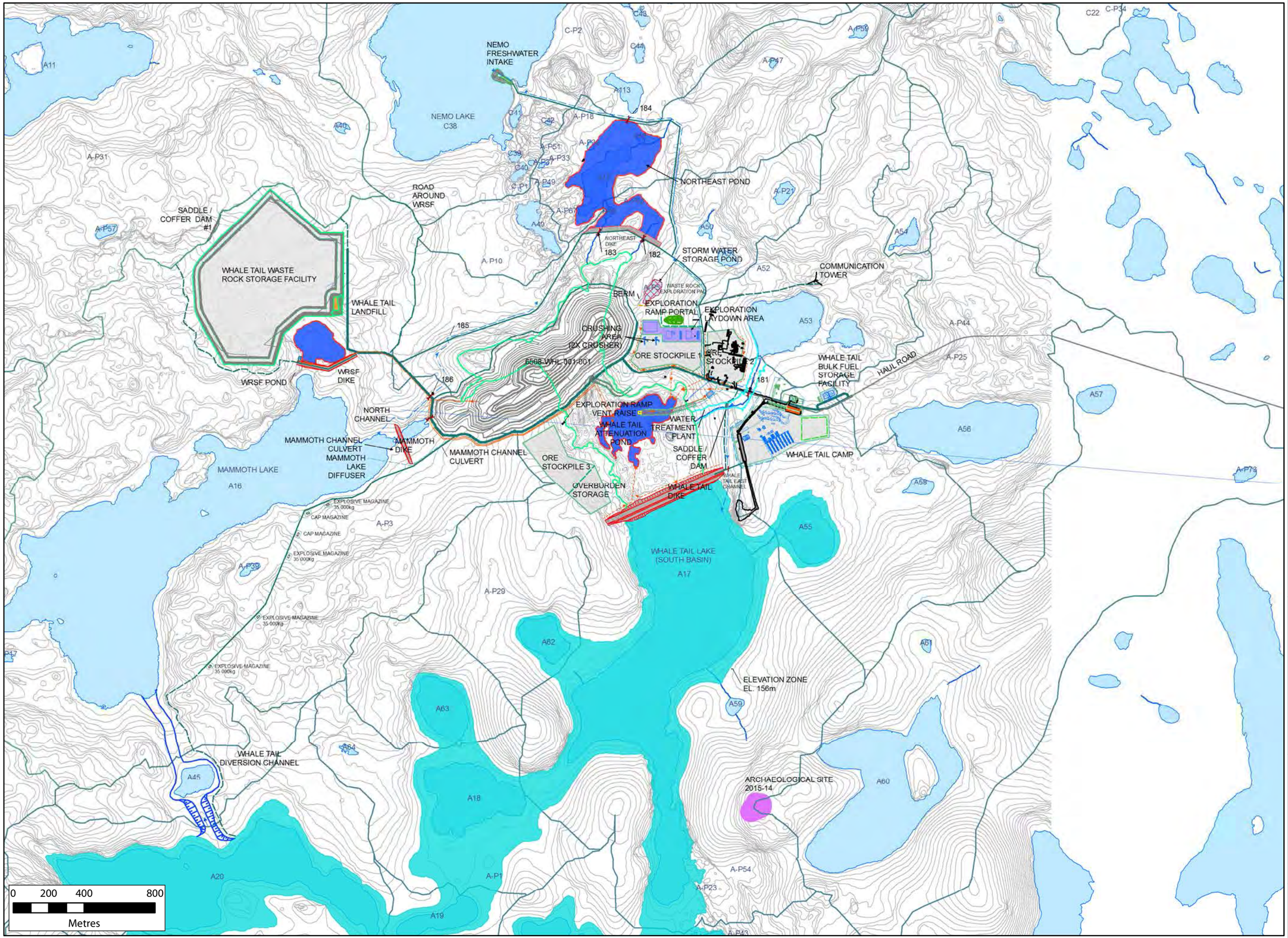
SCALE: 1:20,000

DRAWN BY: LC

CHECKED BY: C. Portt

Figure:

3.1



Legend

- OPEN PIT
- CAMP AREA
- CAP MAGAZINE
- EXPLORATION LAYDOWN AREA
- EXPLORATION RAMP
- EXPLOSIVE MAGAZINE
- DIKE
- NEMO FRESHWATER INTAKE
- POND
- OPEN PIT
- ORE STOCKPILE
- PROJECT FEATURES - BLUE
- PROJECT FEATURES - BLACK
- PROJECT FEATURES - GREEN
- PROJECT FEATURES - GREY
- PROJECT FEATURES - ORANGE
- RAMP
- STORM WATER STORAGE POND
- WASTE ROCK EXPLORATION PAD
- WASTE ROCK STORAGE FACILITY
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL LAKE

Whale Tail
Project Infrastruction 2019

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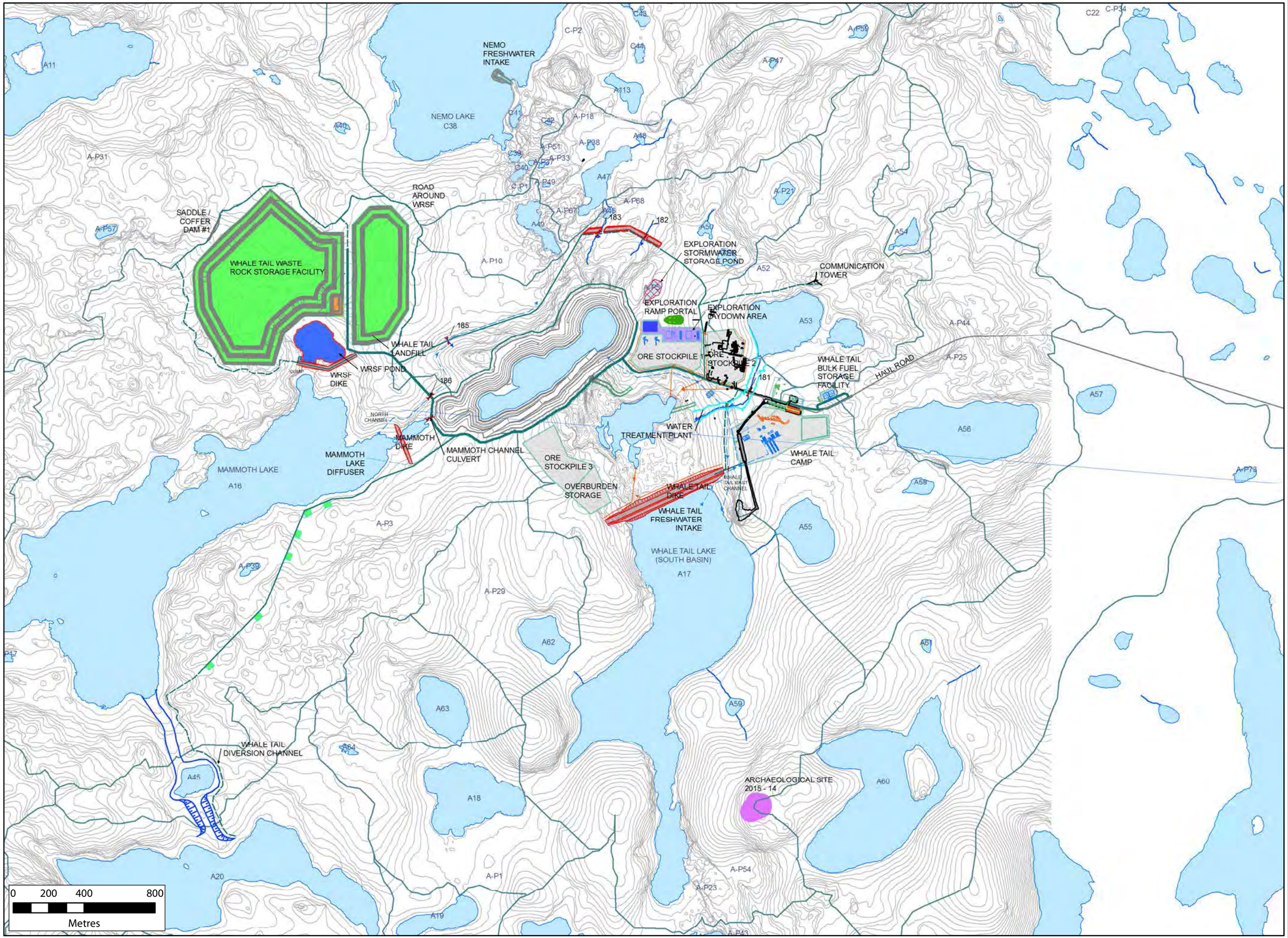
Figure:

3.2



Legend

- CAMP AREA
- CLOSED FACILITY
- EXPLORATION LAYDOWN AREA
- EXPLORATION RAMP
- DIKE
- NEMO FRESHWATER INTAKE
- POND
- OPEN PIT
- ORE STOCKPILE
- OVERBURDEN STORAGE
- PROJECT FEATURES - BLUE
- PROJECT FEATURES - GREY
- RAMP
- STORM WATER STORAGE POND
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL LANDFILL

OPEN PIT

Whale Tail
Project Infrastruction 2022

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Figure:

3.3

NEMO FRESHWATER INTAKE
NEMO LAKE
C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY
CLOSED LANDFILL
WRSF POND
WRSF DIKE
WATER TREATMENT PLANT
MAMMOTH CHANNEL CULVERT
MAMMOTH DIKE
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE
A16
CLOSED FACILITY
HAUL ROAD
WHALE TAIL LAKE (SOUTH BASIN)
A17
ARCHAEOLOGICAL SITE 2015 - 14
181
182
183
185
A-P10
A-P29
A-P1
A-P3
A-P5
A-P18
A-P21
A-P25
A-P33
A-P38
A-P39
A-P44
A-P47
A-P49
A-P50
A-P51
A-P54
A-P57
A-P67
A-P68
A-P73
A11
A18
A20
A45
A52
A53
A54
A55
A56
A57
A58
A59
A60
A62
A63
A64
0 200 400 800
Metres

Legend

- CLOSED FACILITY
- DIKE
- MAMMOTH DIKE
- NEMO FRESHWATER INTAKE
- PROJECT FEATURES - BLUE
- WATER TREATMENT PLANT
- WHALE TAIL DIKE
- WRSF DIKE
- WRSF POND

Whale Tail
Project Infrastruction 2029

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PROJECT: DA14-053-06 Whale Tail Surveys 2016

CLIENT: Agnico Eagle

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Figure:

3.4

3.2 CHANGES FROM EXISTING CONDITIONS FOLLOWING MINE CLOSURE

Based on current Whale Tail Pit mining plans, it is assumed that the dikes would be breached and water levels would return to pre-mine elevations following mine closure by 2029 and, therefore, the aquatic habitats would revert to their pre-mine condition with the following exceptions:

1. The area of Whale Tail Lake will be increased by 19.57 ha as a consequence of terrestrial areas being excavated as part of the pit.
2. The portion of Whale Tail Lake that was excavated as part of the pit will be much deeper than it was prior to mine development (and is classed as Habitat Type 10).
3. The Whale Tail Dike will be breached but not removed following mine closure. Therefore it will continue to occupy a portion of what was previously Whale Tail Lake. (For the purposes of habitat calculations, it has been assumed that a 100 m wide breach will be created in the Whale Tail Dike that bisects Whale Tail Lake).
4. The Mammoth Dike that isolates the eastern end of Mammoth Lake will be reduced in height, so that it is in the 0 m – 2 m depth range.
5. The North-east Dike will be breached at the locations where watercourses existed pre-construction, so that the watercourses are re-established and the lakes and ponds are reconnected to Whale Tail Lake through approved access road culverts.
6. The channel connecting the expanded Whale Tail Lake to Lake A45 will revert to terrestrial habitat.
7. The outlet of Lake A45 will be restored to its pre-construction elevation (if it was modified).
8. The watercourse connecting Lake A53 to WhaleTail Lake will be restored to its original channel.
9. The jetty for the freshwater intake in Nemo Lake will remain in its operations phase condition.

3.2.1 Habitat Area and Habitat Units Calculation

The depth zones in the study area lakes for the baseline (existing) condition are shown in Figure 3.5. Substrate zones (fines, mixed, coarse) for the study area lakes under baseline conditions are shown in 3.6. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps and are shown in Figure 3.7. Lake shorelines for the baseline are based on the CANVEC mapping. For Nemo Lake, the substrate and depth were only determined for the area in the immediate area where the freshwater intake jetty will be constructed.

For the operations phase, the extent of flooding was calculated based on a 156 masl elevation for the expanded Whale Tail Lake and the depth was calculated based on that elevation and using the contour mapping and bathymetry provided by Agnico Eagle. The substrate for the flooded terrestrial areas was assigned based on the ecological land classification community types, as shown Table 3.1. The dike side slopes and the freshwater jetty in Nemo Lake will have coarse substrate. No depth or substrate have been

assigned yet to the constructed channel connecting the expanded Whale Tail Lake to Lake A45 or to the connection between Lake A45 and Mammoth Lake and these have not been included in the operations phase habitat area calculations thus far. Lake A45 has also not been included in those calculations, pending determination of the depth at which it will be maintained.

Table 3.1. Substrate category assigned to flooded terrestrial areas based on the terrestrial ecological land classification community types that are present under baseline conditions.

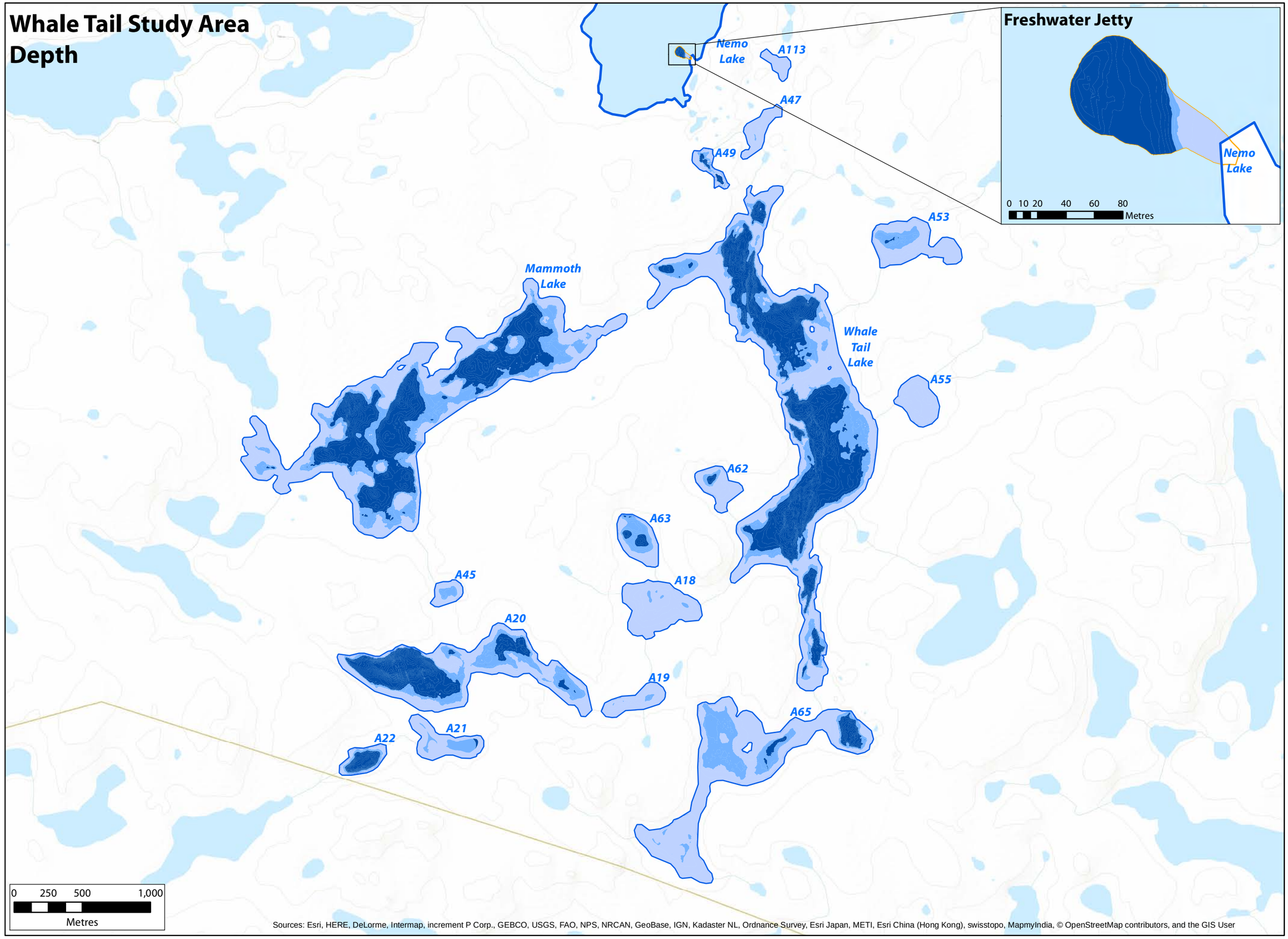
Substrate category	ELC Community Type
Coarse	Boulder/gravel
	Lichen/rock
Fine	Graminoid tundra
	Wet graminoid
	Sand
Mixed	Graminoid/Shrub tundra
	Heath tundra
	Heath upland
	Heath upland/rock complex
	Lichen tundra
	Shrub tundra
	Shrub/heath tundra

The depth zones in the study area lakes for the operations phase are shown in Figure 3.8. Substrate zones (fines, mixed, coarse) for the study area lakes under baseline conditions are shown in 3.9. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps and are shown in Figure 3.10.

The depth and substrate following closure and reflooding of the pit, in the absence of any measures to offset for harm to fish habitat, are shown in Figure 3.11 and Figure 3.12 respectively. Based on current Whale Tail Pit mine plans, for these calculations it was assumed that the substrate within the area that was dewatered, except for the pit and the portions of the Whale Tail Dike that remains, would revert to the same depth and substrate categories that were present under base-line conditions. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps; the entire pit area was assumed to be habitat type 10. The post-closure extents of habitat types 1-10 are shown in Figure 3.13.

Changes will also occur to a number of tributary watercourses or connecting channels between lakes, that will either be converted to lake habitat due to flooding, or dewatered during the operations phase (Figure 3.14). The lengths of existing stream habitat that will be affected, with the exception of changes due to the increase in flow in watercourse A45-A16, are shown in Table 3.3. The increases in stream habitat resulting from the creation of the new alignment of watercourse A53-A17 and the creation of watercourse A20-A45 have not been determined, and none of the changes in stream habitat have been included in the calculations of habitat area and habitat units that follow.

Whale Tail Study Area
Depth



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Depth Zone

- < 2 m
- 2 - 4 m
- > 4 m

Whale Tail Depths
Baseline Conditions

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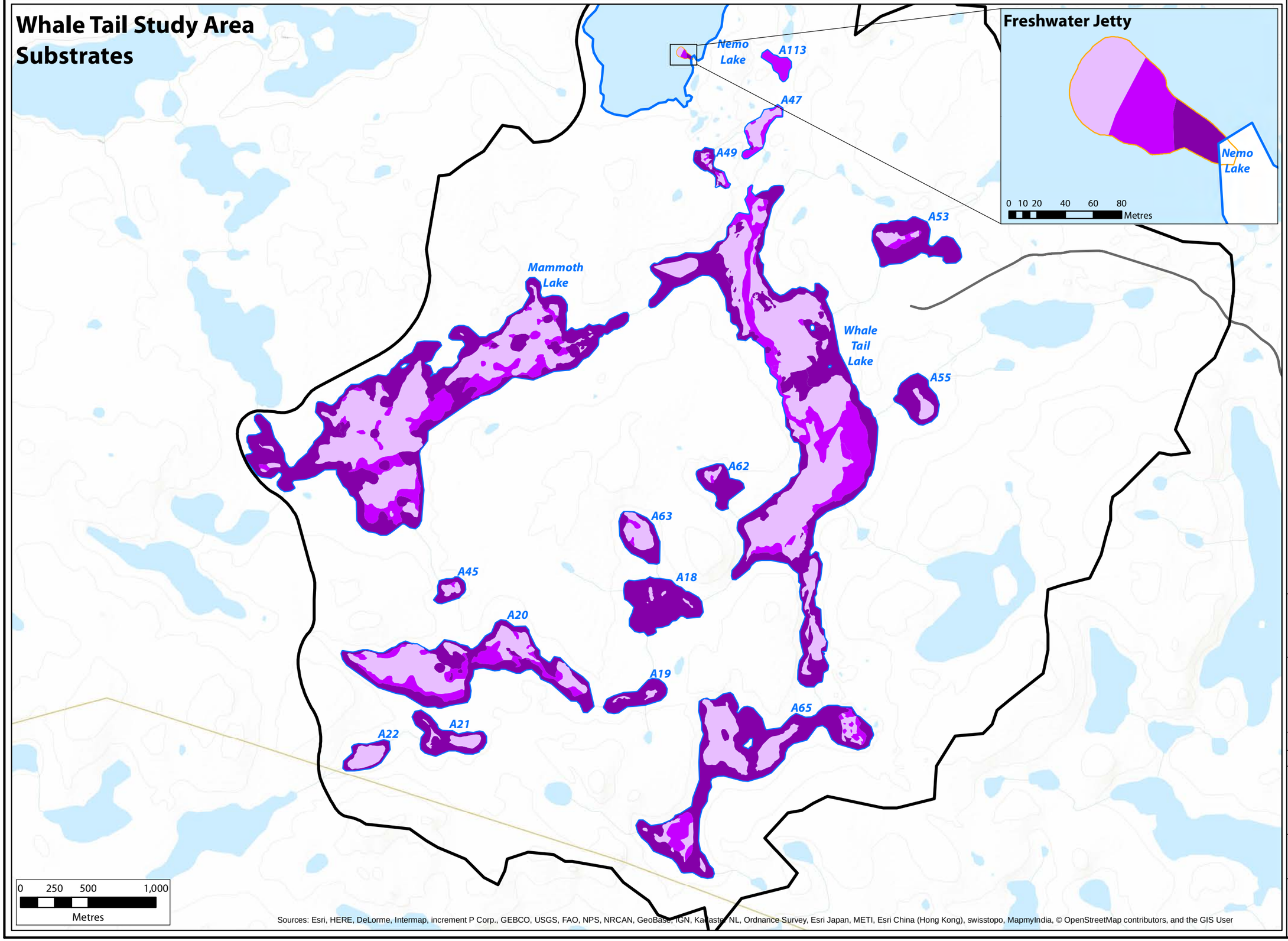
FIGURE:

3.5

Whale Tail Study Area
Substrates



Freshwater Jetty

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Substrate

- Fines
- Mixed
- Coarse

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Whale Tail Substrates
Baseline Conditions

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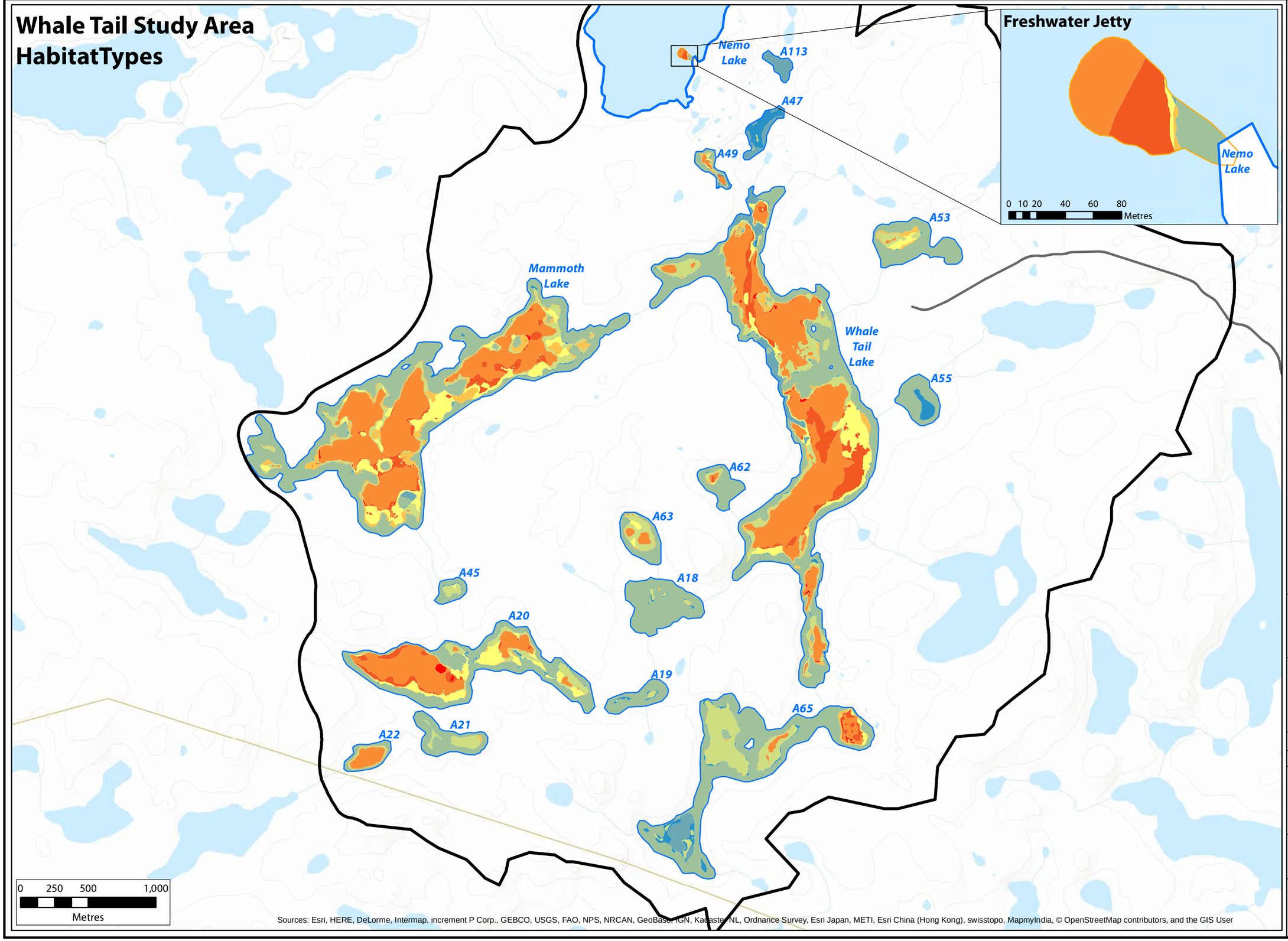
FIGURE:

3.6

Whale Tail Study Area
HabitatTypes



Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Habitat Type

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Habitat Type	Criteria	
	Depth Zone	Substrate
1	<2 m	Fines
2	<2 m	Mixed
3	<2 m	Coarse
4	2-4 m	Fines
5	2-4 m	Mixed
6	2-4 m	Coarse
7	> 4 m	Fines
8	> 4 m	Mixed
9	> 4 m	Coarse

Whale Tail Habitat Types
Baseline Conditions

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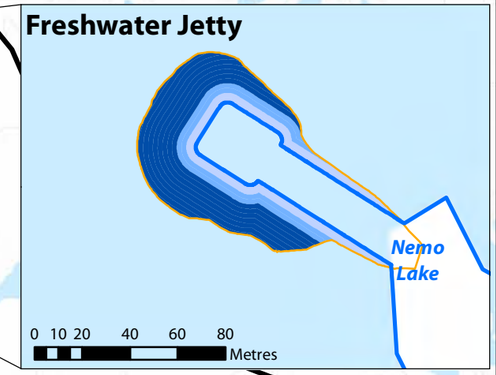
FIGURE:

3.7

Whale Tail Study Area
Depth



0 250 500 1,000
Metres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Legend

- Dike
- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake (during operations)
- Dewatered Lake Basin
- Freshwater Jetty

Depth Zone

- < 2 m
- 2 - 4 m
- > 4 m

Note:
Diversion channel water depth to be determined. Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Depths
During Operations

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FIGURE:
3.8