Appendix E.8

Final (Revised) – Extended Phase II Environmental Site Assessment
Beaver Dam Project Property - March 8, 2021
Completed for the Updated 2021 Beaver Dam Mine EIS

FINAL (Revised) – EXTENDED PHASE II ENVIRONMENTAL SITE ASSESSMENT – BEAVER DAM PROJECT PROPERTY

181 Beaver Dam Mines Road, Marinette, NS

March 8, 2021

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Note to Reader:

The current report titled: "**Final (Revised) – Extended Phase II Environmental Site Assessment – Beaver Dam Project Property"** was re-issued from the Final version dated February 11th, 2021 due to the inclusion of "Final" report versions for the Phase I and Phase II Environmental Site Assessments for Beaver Dam found in Appendix G.

Executive Summary

At the request of Atlantic Mining NS Inc. (AMNS), Stantec Consulting Ltd. (Stantec) conducted an Extended Phase II Environmental Site Assessment (ESA) of the proposed Beaver Dam Project property (the Site) located in Marinette, Nova Scotia (NS).

The Extended Phase II ESA was completed as part of project feasibility due diligence which is underway as part of an Environmental Assessment for the potential re-development of the gold mine at the Site (the Project). The purpose of the Extended Phase II ESA is to assess soil, sediment, and surface water conditions with respect to historical mining operations including tailings and waste rock disposal areas identified in our Phase I ESA, and to complete further environmental assessment at the Site following our previous Limited Phase II ESA. The Extended Phase II ESA's objectives include the following:

- Address changes in the proposed configuration of the pit and associated mine infrastructure since the initial Phase II ESA screening was completed.
- Address potential concerns arising from regulators during the Project permitting process.

Stantec conducted field activities as part of the Extended Phase II ESA between July 20 and 28, 2020. Stantec conducted a visual assessment of the Site, excavated and collected soil samples from 65 test pits, collected sediment samples at 13 locations, and collected surface water samples at five locations.

The area of the proposed open pit appears to be largely reworked ground surrounding a historical settling pond. Suspected tailings were observed within the proposed open pit area near the historical settling pond, north of Crusher Lake between the lake and the proposed road, and to the north of the proposed road near the historical Mill Shaft Pit area (proposed topsoil/sub-soil stockpile [TSSP] area). Several trenches and pits with nearby suspected waste rock were located within the proposed pit area, to the south and east of the pit area, north of Crusher Lake between the lake and the proposed road, and to the north of the proposed road near the historical Mill Shaft Pit area (proposed TSSP area). These trenches and pits are suspected to be historical mine workings.

Based on the information gathered and on observations made during this assessment and the Limited Phase II ESA, Stantec provides the following conclusions related to potential environmental contamination associated with historical gold mining operations:

- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 Environmental Quality Standards (EQS) were identified in 72 of the 95 test pit locations. Some of these locations are considered non-impacted and are potentially indicative of background soil concentrations.
- Twenty-nine of the 65 test pits advanced during the Extended Phase II ESA work in 2020 are classified as likely impacted by historical tailings or waste rock based on field observations, arsenic levels, and proximity to historical site features.
- Arsenic in soil at levels considered to represent impacts from historical mining operations intersects with areas of proposed Site infrastructure, including the proposed open pit.

- Concentrations of arsenic in sediment exceeding the applicable Interim Sediment Quality Guideline (ISQG) and Tier 1 EQS were identified in 10 of 13 sample locations; nine of those locations also had concentrations exceeding the Probable Effect Level (PEL). Concentrations of cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, strontium, and/or zinc exceeded guidelines at 12 of 13 sample locations. One sediment sample was analysed for petroleum hydrocarbons (PHC) based on hydrocarbon odour, and modified total petroleum hydrocarbons (TPH) exceeded the applicable Tier 1 EQS.
- Concentrations of arsenic in surface water exceeding the Tier 1 EQS were identified in two of nine sampling locations. Concentrations of aluminum, cadmium, chromium, and/or iron exceeded guidelines at all sampling locations and may represent background conditions.

The statements made in this Executive Summary are subject to the same limitations as Section 6.0 and are meant to be read in conjunction with the remainder of this report.

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Stantec Consulting Ltd., 2019. Limited Phase II Environmental Site Assessment – Beaver Dam Property, 181 Beaver Dam Mines Rd., Marinette, NS. Prepared for Atlantic Mining NS Corporation. August 23, 2019. (Stantec 2019b)

Referenced Geology Maps: Keppie, J. D. (compiler). 2000. "Geological Map of the Province of Nova Scotia, Nova Scotia Department of Natural Resources, Minerals and Energy Branch. Map ME 2000-1" and Stea, R. R., Conley, H., and Brown, Y. (compiler). 1992. "Surficial Geology of the Province of Nova Scotia, Nova Scotia Department of Natural Resources, Minerals and Energy Branch. Map 92-3."

Abbreviations

AMNS	Atlantic Mining NS Inc.
AMO	Abandoned Mine Openings
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
BV	Bureau Veritas
CCME	Canadian Council of Ministers of the Environment
CRM Group	Cultural Resource Management Group
EQS	Environmental Quality Standard
ESA	Environmental Site Assessment
ISQG	Interim Sediment Quality Guideline
LGSP	Low-Grade Stockpile
MDMER	Metals and Diamond Mining Effluent Regulations
mbgs	metres below ground surface
NAG	Non-Acid Generating
NS	Nova Scotia
NSE	Nova Scotia Environment
NSP	Nova Scotia Power
PAG	Potentially Acid Generating
PEL	Probable Effect Limit
PHC	Petroleum Hydrocarbons
PID	Property Identification (numbers)
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
SP	Stockpile
SS	Sediment Sample
SW	Surface Water (sample)
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
TSSP	Top-Soil/Sub-Soil Stockpile
US EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

1.1 GENERAL

At the request of Atlantic Mining NS Inc. (AMNS), Stantec Consulting Ltd. (Stantec) conducted an Extended Phase II Environmental Site Assessment (ESA) of the proposed Beaver Dam Project property (the Site) located in Marinette, Nova Scotia (NS).

The Extended Phase II ESA was completed as part of project feasibility due diligence which is underway as part of an Environmental Assessment for the potential re-development of the gold mine at the Site (the Project). The purpose of the Extended Phase II ESA is to assess soil, sediment, and surface water conditions with respect to historical mining operations including tailings and waste rock disposal areas identified in our Phase I ESA (Stantec 2019a), and to complete further environmental assessment at the Site following our previous Limited Phase II ESA (Stantec 2019b). The Extended Phase II ESA's objectives include the following:

- Address changes in the proposed configuration of the pit and associated mine infrastructure since the initial Phase II ESA screening was completed, and
- Address potential concerns arising from regulators during the Project permitting process.

1.2 SITE DESCRIPTION

1.2.1 Subject Property and Surrounding Land Use

The Site is located in a rural forested area near Marinette, a region of Halifax Regional Municipality, NS. The Site is located 7 km northeast of Route 224 along Beaver Dam Mine Road which is a gravel road located approximately 17 km north-northwest of Sheet Harbour, Nova Scotia. The general Site location is shown on Drawing No. A-1, Appendix A.

The Site consists of portions of several properties owned by Northern Timber Nova Scotia Corp., with Property Identification Nos. (PIDs) including:

- PID 40200990, Grant 13245
- PID 40201014, Grant 15833
- PID 40201022, Grant 13818
- PID 41202359, Grant not listed
- PID 40201071, Grant not listed
- PID 40201006, Grant 14028
- PID 40201030, Grant 9805
- PID 41202334, Grant not listed
- PID 40469405, Grant not listed
- PID 40201048, Grant not listed
- PID 00541656. Grant 10271

- PID 41480039, Grant not listed
- PID 40201063, Grant (portion of) 13245
- PID 41202342, Grant (portion of) 13245
- PID 40091613, Grant not listed
- PID 40200966, Grant 12271
- PID 40200958, Grant 12232

Toward the western end of the proposed development, the property crosses a portion of provincial Crown land. This Crown land property (PID 40219925) is a large parcel that surrounds the main mine development area and portions of the Project boundary cross along the edges of this property.

The proposed mine and operations footprint covers a large lower portion of PID 00541656 and several others to the south, bounded by the Cameron Flowage (part of the Killag River) to the east, Crusher Lake to the west, and the approximate property lines of PID 40201030 and 41202334 to the south.

The locations of the proposed open pit and ancillary mining infrastructure as well as the mine development area are shown on Drawing No. A-1, Appendix A. The proposed open pit partially encompasses the area of historical mine workings and is located immediately south of the Cameron Flowage in the vicinity of the former Austin shaft and northwest of the historical settling pond.

There are no permanent buildings in use on the Site. The site hosts old mine workings, waste rock piles, dam structures, access roads, abandoned cabins and several hunting blinds. The Site is industrial in nature; Stantec is not aware of any plans to change this land use in the foreseeable future.

Surrounding land use is summarized in Table 1.

Table 1 Adjoining Properties – Current Land Use

Direction	Current Land Use	Current Occupant
North	Undeveloped, forested	None
South	Undeveloped, forested	None
East	Undeveloped, forested and lime station on the Killag River	None – the lime station is to the east off the access road near the Killag River (outside the mine footprint)
West	Undeveloped, forested	None

1.2.2 Site Infrastructure and Services

The property is not currently serviced, being in a rural portion of the province. Evidence of historical mining was present during site visits undertaken in 2019 and 2020, including apparent building foundations, waste rock piles, laydown areas, and an old mining excavation. In the centre of the proposed open pit extending to the east is the remains of a historical two-stage settling pond and associated earthen dam from the 1980s. The dam has the remains of a control structure with a discharge to Cameron Flowage, part of the Killag River. The ruins of an old cabin are located north of Crusher Lake in the vicinity of Forge Hill (shown on Drawing No. A-1, Appendix A). To the north of Crusher Lake at least

two abandoned hunting blinds were identified during the site visits. On the northeast corner of Crusher Lake there was a cluster of informal abandoned cottages consisting of four buildings that appear to be in a state of disrepair. (Stantec 2019a)

Based on a review of the Nova Scotia Well Logs Database, there are no potable water wells on the Site (Nova Scotia Environment 2019). The mapping does illustrate numerous drill locations from the various exploration drilling programs that have been conducted on the Site surface. Stantec did identify monitoring well clusters on the Site during the July 2019 site visit (Stantec 2019b). Adjacent to the wells were coils of plastic tubing suggesting that they have been sampled in the past. Since the wells were located in clusters they are likely drilled to different depths. No reports for these wells were provided to Stantec and groundwater data was not reviewed or included in this report.

1.2.3 Topography and Regional Drainage

Based on available topographic maps and the observed site topography, the Site is located in an area of low topographic relief around an elevation of 140 metres (m) with scattered drumlins reaching 160 m. The surfaces of the Site consist of a combination of open wetland, rock piles and woodland. There are a number of boggy and forested areas within the property. (FSSI Consultants (Aust) Pty. Ltd. 2015)

Vegetation consists of spruce, fir, and some hardwood. Logging has been widely carried out more recently including clear cutting in the immediate area of the Project proposed footprint. Constructed or remains of various dams along local water ways, surface mining and excavation of numerous mine shafts/pits are located at the Site (discussed in Section 1.2.3.1, below).

Stormwater is anticipated to drain by infiltration and/or overland flow. Locally, water in the eastern portion of the Site is directed toward an artificial historical settling pond with the remains of a dam which is maintaining the water level in the pond. Overflow from the historical settling pond is directed into the Killag River and Cameron Flowage.

Based on an available topographic map and the observed site topography, regional undisturbed surface drainage (anticipated shallow groundwater flow direction) appears to be to the north toward Crusher Lake, then via an unnamed brook to Mud Pond with eventual outflow into Killag River and Cameron Flowage. It should be noted that the direction of the shallow groundwater flow in limited areas can also be influenced by the presence of underground mine workings and is not necessarily a reflection of regional or local groundwater flow or a replica of the Site or area topography.

1.2.3.1 Abandoned Mine Openings (AMOs)

Based on information provided by McCallum Environmental Ltd. (McCallum), there are seventeen Abandoned Mine Openings (AMOs) in the Beaver Dam Project area. The majority of these AMOs are located in the area of the proposed open pit development with a smaller cluster of AMOs to the west near Forge Hill. During Stantec's site visit, field staff encountered an estimated additional fifteen apparent openings several hundred meters from the proposed open pit area, located north of Crusher Lake and to the south of the proposed open pit in the woods. Given the overgrown nature of the area, it is not

unreasonable that some AMOs were not identified by DNR or others and hence may not have been mapped. Given the age and potential hazards associated with these features, Stantec has not conducted any assessment of them to determine the depth or exact size of these apparent AMOs.

1.2.4 Surficial and Bedrock Geology

The Project property lies largely within the sandstone turbidites and slate: continental rise prism (in places metamorphosed to schist and gneiss) of the Goldenville Formation, with some granitoid in the west (Keppie 2000). The Beaver Dam deposit is hosted in the southern limb of a north-dipping overturned anticline that hosts the vein gold mineralization. Based on available surficial geology maps, the native surficial soils of the Site consist of glacial till (Stea 1992): organic deposits (bogs and swamps), hummocky ground moraine, stony till plain, and silty drumlin.

The referenced geology maps are included in Appendix G, along with drawings showing the bedrock and surficial geology at the Project property (Drawings No. G-1 and G-2).

1.3 PREVIOUS ENVIRONMENTAL REPORTS

Environmental investigations previously conducted at the Site by Stantec and others include the following, which were reviewed by Stantec as part of the Limited Phase II ESA (Stantec 2019b) and this report:

- Report Nova Scotia Department of Mines and Energy on Environmental Assessment of Beaver Dam Exploration, Beaver Dam, Nova Scotia. Prepared for Seabright Resources Inc. by Jacques Whitford (now Stantec), report dated June 27, 1986, File No. M1285. Department of Natural Resources File No. PR 86-005. (Jacques Whitford 1986)
- Appendix N.1 Archaeological Assessment Beaver Dam Mine Site - part of the Beaver Dam Mine Project - Revised Environmental Impact Statement, Marinette, Nova Scotia. Prepared by Cultural Resources Management Group Limited for Conestoga-Rovers & Associates. Dated March 2015, CRM Project No. 2014-0015-01. (CRM 2015)
- Stantec Consulting Ltd., 2019. Draft – Phase I Environmental Site Assessment, Beaver Dam Property, 181 Beaver Dam Mines Rd., Marinette, NS. Prepared for Atlantic Mining NS Corporation. August 6, 2019. (Stantec 2019a)
  - Included in Appendix G.
- Stantec Consulting Ltd., 2019. Draft – Limited Phase II Environmental Site Assessment – Beaver Dam Property, 181 Beaver Dam Mines Rd., Marinette, NS. Prepared for Atlantic Mining NS Corporation. August 23, 2019. (Stantec 2019b)
  - Included in Appendix G.

The Limited Phase II ESA drew the following summarized conclusions (Stantec 2019b):

- Possible tailings were visually observed in the stratigraphy of eight of the 29 test pits excavated as part of field activities completed between July 10 and 11, 2019 within the Project area. Of the twelve test pits located within or adjacent to the proposed open pit area, four had possible tailings: in the vicinity of the Austin shaft, north of the historical settling pond (shown on Drawing No. A-1, Appendix A). Four of the test pits with possible tailings were located north of Crusher Lake near historical mine workings and stamp mill operations. These locations match the suspected sites observed in Lidar data. Note that visual observation of possible tailings is not necessarily indicative of elevated arsenic concentrations at that location.
- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 EQS were identified in 25 of the 29 test pit locations. The highest concentrations of arsenic are localized in the area north of the Austin shaft and settlement pond area with the Cameron Flowage located directly east. Concentrations of arsenic exceeding the applicable Tier 1 EQS were also identified in areas where waste rock was used to re-grade the site (historical exploration camps south of the Austin shaft), and areas of historical stamp mills such as Crusher Lake and Forge Hill.
- Two test pits were also conducted at the bottom of the historical settling pond near the dam structure (TP19-02 and -03) and samples form these locations exceeded the Tier 1 EQS for arsenic. Six test pits directly south of the proposed pit and downgradient of historical operations between Beaver Dam Mine Road and the Killag River also exceeded the Tier 1 EQS.
- Concentrations of arsenic detected in soil samples collected from test pits TP19-16, -17 and -18, which were located outside the footprint of the proposed open pit and not downgradient of the historical settling pond, did not exceed the Tier 1 EQS and are potentially indicative of background soil concentrations.
- Possible waste rock was visually observed at four of the 29 test pit locations. One of these test pits was located adjacent to the Austin shaft and adjacent mine workings (TP19-01), one was located adjacent to the dam area of the settlement pond bordering the Killag River (TP19-03), and two test pits were located in the identified waste rock near the historical M.E.X. pit (TP19-07 and -08). Tailings and waste rock appear to be located largely within the Project area.
- Concentrations of aluminum and iron exceeding the applicable NSE Tier 1 EQS were identified in all the surface water samples analyzed. Concentrations of chromium only exceeded in a duplicate sample taken at SW19-04 downgradient in the Killag River. Cadmium in three of the four samples exceeded the applicable NSE Tier 1 EQS. The detected concentrations of metals did not exceed the applicable Metals and Diamond Mining Effluent Regulations (MDMER) Authorized Limits in any of the samples.
- Concentrations of arsenic in surface water exceeded in only one sample taken near the dam structure within the historical settling pond (SW19-01), shown on Drawing No. A-7.

1.4 POTENTIAL SOURCES OF ENVIRONMENTAL IMPACTS

Table 2 provides a summary of potential sources of environmental impacts as identified in the Draft Phase I ESA (Stantec 2019a):

Table 2 Potential Sources of Environmental Impacts

Location	Potential Concern
Apparent Tailings	Potential elevated arsenic and mercury levels in tailings.
Waste Rock	Waste rock: potentially arsenic containing and having acid generating potential.

1.5 REGULATORY FRAMEWORK

1.5.1 Provincial Environmental Quality Standards (EQS)

Nova Scotia Environment (NSE) released its *Contaminated Sites Regulations* on July 6, 2013 which provide the requirements for notification of contaminated sites, as well as the basis for determining the appropriate numerical remediation levels, or ongoing site exposure management measures, applicable to a contaminated site (Nova Scotia Environment 2013). The overall regulatory goals for remediation are to manage contamination to reduce related risks to acceptable levels for humans and the environment (i.e., ecology). These goals may be met by a variety of means acceptable to NSE, from cleanup at the conservative generic (Tier 1) level, to cleanup based on site-specific conditions (Tier 2), to long-term exposure management of site contamination through engineered, physical or administrative controls.

Tier 1 Environmental Quality Standards (EQS) are substance generic environmental quality standards that may be used for remediation levels. These standards represent a standardized level of risk for contributing pathways, based on land use and other factors. Use of the Tier 1 EQS for remediation is a conservative and typical application of cleanup standards. The Tier 1 EQS consider human health and ecological effects where applicable.

1.5.1.1 Soil Tier 1 EQS

Analytical results for soil have been compared to the applicable Tier 1 EQS for an industrial site with non-potable groundwater use and coarse-grained soil (standards for coarse-grained soil are more conservative than standards for fine-grained soil). For metals, the Tier 1 EQS for a potable and non-potable site are equivalent.

1.5.1.2 Sediment Tier 1 EQS

Analytical results for sediment have been compared to the Tier 1 EQS as well as to the Canadian Sediment Quality Guidelines, discussed in Section 1.5.2 below. Tier 1 EQS for sediment are largely identical to the Canadian probable effect levels (PEL, discussed in Section 1.5.2 below) with the exception of antimony, iron, manganese, nickel, and strontium, for which Tier 1 EQS exist but federal guidelines do not.

Based on field observations, one sediment sample was also analysed for petroleum hydrocarbons (PHC). Hydrocarbon results were compared to the Tier 1 EQS. No federal guidelines exist for hydrocarbons in sediment.

1.5.1.3 Surface Water Tier 1 EQS

Analytical results for surface water have been compared to the Tier 1 EQS for freshwater and to the Metals and Diamond Mining Effluent Regulations (MDMER), discussed in Section 1.5.3 below.

1.5.2 Canadian Sediment Quality Guidelines

The Canadian Council of Ministers of the Environment (CCME) have developed interim sediment quality guidelines (ISQG) for the protection of aquatic life (CCME 1999). They have also developed or compiled probable effect levels (PEL) above which adverse biological effects are usually or always observed. The PEL is less stringent than the ISQG for all metals.

Analytical results for sediment have been compared to the applicable ISQG and PEL for a freshwater environment. For metals, ISQG and PEL are only available for arsenic, cadmium, chromium, copper, lead, mercury, and zinc.

1.5.3 Metals and Diamond Mining Effluent Regulations (MDMER)

The MDMER (SOR/2002-222) regulates maximum authorized limits of concentrations of selected prescribed deleterious substances in active mine effluent in its Schedule 4, including arsenic, copper, lead, nickel, and zinc, within the monthly mean of samples, composite samples, and grab samples (SOR/2002-222 2020).

For comparison to a potential future discharge point(s), analytical results for surface water have been compared to the applicable MDMER maximum authorized concentrations for new or re-opening mines on or after June 1, 2021 (Table 1, Schedule 4 of the regulation) (SOR/2002-222 2020).

1.5.4 Summary of Regulatory Framework

Table 3 provides a summary of applicable standards and guidelines considered in this assessment.

Table 3 Summary of Regulatory Framework

Media	Metals
Soil	Tier 1 EQS for Soil (coarse-grained soil, industrial land use, potable or non-potable site)
Sediment	Tier 1 EQS for Sediment (freshwater)
	CCME ISQG for the Protection of Aquatic Life (freshwater)
	CCME PEL for the Protection of Aquatic Life (freshwater)
Surface water	Tier 1 EQS for Water (freshwater)
	MDMER Maximum Authorized Concentrations

1.6 OBJECTIVES

The objective of the Extended Phase II ESA is to complete further environmental assessment at the Site following our initial Limited Phase II ESA (Stantec 2019b) via assessment of soil, surface water and sediment conditions. Environmental assessment is with respect to historical mining operations including tailings and waste rock disposal areas identified in our Phase I ESA (Stantec 2019a).

1.6.1 Scope of Work

The scope of this Extended Phase II ESA consists of the following:

- Collection of soil samples to delineate arsenic previously detected in 2019 in soil in the area of the proposed open pit footprint to better define the areas of historical tailings that may be disturbed during redevelopment or will require long-term management.
  - The proposed scope of work initially included delineation of mercury as well as arsenic; however, mercury has not been identified at the Site at levels exceeding Tier 1 EQS as discussed in Section 3.3.1 below.
- Collection of soil samples to conduct the initial screening of the revised mine infrastructure areas, including the various stockpiles and crusher pad not previously assessed in the initial Phase II ESA screening (Stantec 2019b).
- Collection of sediment and surface water samples from Crusher Lake, Cameron Flowage and the on-site historical settling pond from the previous mine operations, within the proposed development area of the Site, for trace metals analysis by Bureau Veritas (BV) laboratory.
- Establishment of site-specific sediment and soil quality criteria based on results collected in 2019 and during the current program in comparison to publicly available “baseline” information collected near the Project area.
- Preparation of a final report consolidating the initial Phase II ESA data and new screening and delineation data.

2.0 FIELD INVESTIGATION

2.1 RATIONALE

2.1.1 Soil Sampling Program Rationale

Soil sample locations were selected with the following rationale:

- Locations were chosen to further delineate the arsenic previously detected in 2019 in the area of the proposed pit. Stantec used a grid to assess areas around and between areas that Stantec considered to have been impacted with arsenic based on 2019 soil analytical results and field observations, and to screen newly identified areas.
- Locations were also chosen to screen the revised proposed mine infrastructure areas.

Soil sample locations were modified in the field based on access and observations (e.g., thick vegetation, observed waste rock). Soil sample locations are shown on Drawing No. A-2, Appendix A.

2.1.2 Sediment and Surface Water Sampling Program Rationale

Sediment samples were collected from water bodies with the potential to have been impacted by historical mining operations: Crusher Lake, Cameron Flowage, and the on-site historical settling pond. Selected surface water samples were also collected for comparison of chemical components.

Based on field observations (strong hydrocarbon odour and location within the historical settling pond area), one location (SS20-03B, shown on Drawing No. A-3) was sampled and analysed for hydrocarbons (Table C-3, Appendix C).

2.2 METHODOLOGY

Stantec conducted field activities as part of the Extended Phase II ESA between July 20 and 28, 2020. Stantec conducted a visual assessment of the Site, excavated and collected soil samples from 65 test pits, collected sediment samples at 13 locations, and collected surface water samples at five locations. Test pit, sediment, and surface water sample locations are shown on Drawing No. A-2 to A-4, respectively, in Appendix A.

All samples were collected following strict Stantec sampling procedures. Samples were uniquely labelled other than two samples which were mistakenly both labeled TP20-29 on chain of custody forms; the sample collected on July 20 within the proposed road area was renamed TP20-29 (1) and the sample collected on July 23 within the proposed PAG (potentially acid generating) Stockpile area was renamed TP20-29 (2) within this report. Sample control was maintained through use of chain of custody forms. All samples were collected in laboratory-supplied containers and preserved in insulated coolers. Appropriate sampling quality assurance and quality control (QA/QC) procedures were adhered to at all times.

2.2.1 Soil Sampling

A total of 65 test pits (i.e., TP20-01 to TP20-65, including both TP20-29 (1) and TP20-29 (2), and TP20-100 to TP20-104; excluding TP20-24, TP20-28, TP20-42, TP20-56, and TP20-103 which could not be excavated due to either access or stratigraphy) were excavated between July 20 and 28, 2020. Test pit locations are shown on Drawing No. A-2, Appendix A. The test pits were manually excavated by Stantec personnel using a hand-held shovel and metal bar or a Dutch auger. Stantec personnel monitored the test pit excavation, maintained detailed logs and photographic records of the subsurface conditions encountered, and obtained representative soil samples. Test pit logs are included in Appendix B.

The test pits were advanced to depths generally ranging from 0.2 metres below ground surface (mbgs) to 0.8 mbgs, at which point refusal of the hand-held shovel, bar or a Dutch auger was encountered. TP20-05 and TP20-15 were advanced to between 0.10 and 0.19 mbgs due to gravel, cobbles, or boulders in the area. Representative bulk soil samples were collected from the test pits. One soil sample was collected from each test pit apart from TP20-22 and TP20-101, where two soil samples were collected based on an observed soil horizon change; no samples were collected from TP20-11 due to gravel/cobbles.

The soil samples were examined in the field for evidence of impacts (visual or olfactory), placed in new laboratory-supplied glass jars, placed on ice, and submitted to BV. Based on site observations and past results, the soil samples were submitted for laboratory analysis of available (acid extractable) metals.

2.2.2 Sediment Sampling

Sediment sample locations were limited: the bottoms of Site water bodies were often too rocky, vegetated, or loose to permit sample collection. A total of 13 sediment samples plus one field duplicate (i.e., samples at SS20-01 to SS20-16, excluding SS20-10, -12, and -13 where samples could not be collected) were collected between July 28 and 29, 2020. Sediment sample descriptions are included in Appendix B.

Sediment samples were collected at depths ranging from 0.3 to 1.5 m below the water body floor, at which point refusal of the hand-held sampling equipment was generally encountered, and/or the water depth was too great to continue with the hand-held sampling equipment. Several sample locations were noted to be open at depth (i.e., refusal was not encountered): SS20-01, SS20-02B, and SS20-05 (within the historical settling pond). The majority of samples were collected using a hand-held shovel, Dutch auger, or sludge judge from either a boat or the shoreline. A Petit Ponar was also used in deep water locations but proved ineffective in collecting a proper sediment sample due to the presence of a thick organic layer inhibiting the penetration of the Ponar grab in the underlying substrate.

The sediment samples were examined in the field for evidence of impacts (visual or olfactory), placed in new laboratory-supplied glass jars, placed on ice, and submitted to BV. Based on site observations and past results in other media, the sediment samples were submitted for laboratory analysis of available (acid extractable) metals.

2.2.3 Surface Water Sampling

A total of five surface water samples were collected (i.e., SW20-01 to SW20-05). SW20-01 and SW20-02 were collected within Cameron Flowage, SW20-03 within the Killag River to the northwest of Cameron Flowage, SW20-04 within the Killag River to the east of Cameron Flowage, and SW20-05 within Crusher Lake.

2.3 LABORATORY ANALYSES

Sixty-seven soil samples plus six field duplicates were submitted to BV for analysis of available (acid-extractable) metals. Thirteen sediment samples plus one field duplicate were submitted for analysis of available (acid-extractable) metals, and one for petroleum hydrocarbons. Five surface water samples were submitted for analysis of available (acid-extractable) metals.

Analytical results are presented in Appendix C. The laboratory analysis schedule completed as part of this investigation is presented in Table 4.

Table 4 2020 Laboratory Analysis Schedule

Parameter	Sample Media		
	Soil	Sediment	Surface Water
Metals	67 + 6 Fld-Dup	13 + 1 Fld-Dup	5
Petroleum Hydrocarbons	0	1	0

Notes:
The methodologies utilized by BV in analysis of the soil, sediment, and surface water samples are presented on the analytical report in Appendix D.
Fld-Dup = field duplicate QA/QC sample.

3.0 RESULTS

3.1 GENERAL OBSERVATIONS

The Site is largely forested. The area of the proposed open pit appears to be largely reworked ground surrounding a historical settling pond. Suspected tailings were observed within the proposed open pit area near the historical settling pond, north of Crusher Lake between the lake and the proposed road, and to the north of the proposed road near the historical Mill Shaft Pit area (proposed topsoil/sub-soil stockpile [TSSP] area). Several trenches and pits with nearby suspected waste rock were located within the proposed pit area, to the south and east of the pit area, north of Crusher Lake between the lake and the proposed road, and to the north of the proposed road near the historical Mill Shaft Pit area (proposed TSSP area). These trenches and pits are suspected to be historical mine workings.

General observations are recorded in photographs in Appendix E, including views of historical mine workings, tailings, waste rock, and water bodies.

3.2 SUBSURFACE CONDITIONS

3.2.1 Stratigraphy

3.2.1.1 Test Pit Soil

Test pit logs are included in Appendix B.

Soil stratigraphy is discussed in terms of the test pits' classification as impacted or non-impacted by historical mining activities as discussed and summarized in Section 4.1.1, below.

Thirty-six of the 65 test pits advanced during the Extended Phase II ESA work in 2020 are classified as non-impacted by historical tailings or waste rock. The stratigraphy at these non-impacted locations generally consists of:

- surface
- 0.00 to 0.25 m of organic material or rootmat
- 0.1 to 0.6 m of likely native soil, type varying with location:
  - most widespread: grey, brown, or reddish-brown silty sand, often with some gravel and/or cobbles, sometimes with roots. TP20-29 (2), -31, -35, -43, -62, and -64 (scattered throughout the Site) contain a grey to brown grey fine silt layer.
  - TP20-34 and -51: dark brown silt with gravel
  - TP20-46 and -47: grey silt with organics
  - TP20-48: reddish brown silty clay
- refusal at 0.2 to 0.8 mbgs

Fifteen of the 65 test pits are classified as impacted by historical tailings. The stratigraphy at these impacted locations was generally like the unimpacted locations with the addition of a layer of up to 0.65 m of distinct grey sand, gravelly sand, or silt (suspected tailings).

Fourteen of the 65 test pits are classified as impacted by historical waste rock. The stratigraphy at these impacted locations was generally like the unimpacted locations with the addition of a layer of up to 0.62 m of gravel and/or cobbles, often infilled with brown or orange-brown sand (suspected waste rock).

3.2.1.2 Sediment

Sediment samples were collected under water ranging from 0.3 to 1.8 m deep.

Stantec field staff observed possible tailings within two of 16 sediment investigation locations: SS20-03B (within the historical settling pond) and SS20-09 (within Crusher Lake). At these locations, sediment generally consisted of suspected tailings (grey sand, gravelly sand, or silt) underlying 0.1 to 0.2 m of organics.

Stantec field staff did not observe possible tailings within 14 of 16 sediment investigation locations. Of these samples:

- Nine (SS20-01, -02B, -04, and -5 within the historical settling pond, and SS20-10, -11, -12, -13, and -16 within the middle or mouth of Crusher Lake) generally consisted of organic material with occasional fine sediments or sandy silt.
- Four (SS20-07 and -08 within the Killag River, and SS20-14 and -15 near the shoreline of Crusher Lake) consisted of gravelly sand, gravel, cobbles, and/or boulders, with or without organic material.
- SS20-06 (within Cameron Flowage) consisted of 0.15 m of organics and cobbles overlying 0.20 m of grey-brown sand and gravel.

Sediment descriptions are included in Appendix B.

3.2.2 Groundwater Observations

The majority of the test pits were dry or moist. Water was observed in TP20-11, -18, -20, -39, -40, -62, -64, and -102, generally near Crusher Lake, Cameron Flowage, or other water bodies in the northern half of the Site. Water was not observed in test pits within the proposed open pit area or in the southern half of the Site.

3.2.3 Free Phase Petroleum Hydrocarbons

Free liquid phase petroleum hydrocarbons (i.e., free product) were not observed on soil in the test pits or on soil samples collected during the investigation.

A strong petroleum hydrocarbon odour was noted within the sediment at SS20-03B, where a sample was collected for analysis of petroleum hydrocarbon parameters. Results are presented in Section 3.3.2, below.

3.3 ANALYTICAL RESULTS

3.3.1 Soil Analytical Results

Laboratory analysis for available (acid extractable) metals was conducted on 67 soil samples originating from 65 test pits, plus six field duplicate samples, collected in 2020. Results from 29 soil samples originating from 29 test pits collected and previously reported as part of the Limited Phase II ESA activities (Stantec 2019b) are also included in the data set and discussed throughout this report.[1] Results of the laboratory analysis of soil samples are presented on Drawing No. A-5, Appendix A and Table C-1, Appendix C and summarized in Table 5 below:

Table 5 Summary of Soil Contamination (2019-2020)

Standard Exceedances	Tier 1 EQS	Exceeding (Samples)	Exceeding (Test Pits)
Arsenic	31 mg/kg	73 of 96 samples*	72 of 94 test pits*
Other Metals	Various	None	None

Notes:
Numbers of exceedances do not include field duplicate samples.
*There are more soil samples than test pit locations as two soil samples, rather than one, were collected from two of the test pits.

Levels of arsenic ranged from non-detected to 3,900 mg/kg.

Lead and mercury have been associated with historical mining activities in Nova Scotia, including at the Fifteen Mile Stream site as reported by Stantec (Stantec 2020a). Levels of lead and mercury in soil at the Project site were relatively elevated but did not exceed applicable Tier 1 EQS. The maximum identified lead concentration was 200 mg/kg versus a Tier 1 EQS of 740 mg/kg, and the maximum identified mercury concentration was 40 mg/kg versus a Tier 1 EQS of 99 mg/kg.

3.3.2 Sediment Analytical Results

Laboratory analysis for available (acid extractable) metals was conducted on 13 sediment samples plus one field duplicate sample. Results of the laboratory analysis of sediment samples are presented in Drawing No. A-6, Appendix A and Table C-2, Appendix C. Based on field observations (strong petroleum hydrocarbon odour), the sediment sample SS20-03B was also analysed for petroleum hydrocarbons (PHC): benzene, toluene, ethylbenzene, and total xylenes (BTEX), and modified total petroleum hydrocarbons (TPH), with results presented on Table C-3, Appendix C.

[1] Samples collected during Limited Phase II ESA activities have been renamed to indicate the year of collection more clearly as shown on Table C-1, Appendix C. For example, the sample previously reported as SA1 (collected from a test pit in 2019) has been renamed to TP19-01 and referred to as such throughout this report.

Levels of arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, strontium, and zinc exceeded guidelines at one or more sample locations. Results for other metals were below criteria where available (antimony and nickel below Tier 1 EQS only; no other ISQG or PEL available). These results are summarized in Table 6:

Table 6 Summary of Sediment Contamination (2020)

Criteria Exceedances	Criteria (mg/kg)			Exceeds ISQG	Exceeds PEL	Exceeds Tier 1 EQS
	ISQG	PEL	Tier 1 EQS			
Arsenic	5.90	17.00	17	10 of 13	9 of 13	9 of 13
Cadmium	0.60	3.50	3.5	3 of 13	1 of 13	1 of 13
Chromium	37.30	90.00	90	2 of 13	0 of 13	0 of 13
Copper	35.70	197.00	197	3 of 13	0 of 13	0 of 13
Iron	-	-	43,766	-	-	2 of 13
Lead	35.00	91.30	91.3	4 of 13	2 of 13	2 of 13
Manganese	-	-	1,100	-	-	1 of 13
Mercury	0.17	0.486	0.486	4 of 13	2 of 13	2 of 13
Selenium	-	-	2	-	-	1 of 13
Strontium	-	-	1	-	-	11 of 13
Zinc	123.00	315.00	315	3 of 13	1 of 13	1 of 13
Antimony and nickel	-	-	25 and 75	-	-	0 of 13
Modified TPH	-	-	25 (fuel oil) 43 (lube oil)	-	-	1 of 1
BTEX	-	-	1.2, 1.4, 1.2, 1.3	-	-	0 of 1

Notes:

[1] Strontium exceedances of Tier 1 EQS exclude concentrations below the laboratory's reportable detection limits (RDL) where the RDL exceeds the EQS.

Numbers of exceedances do not include field duplicate samples.

Arsenic in sediment ranged from 3.1 mg/kg to 2,800 mg/kg, with the highest concentration at SS20-07, located upstream within the Killag River approximately 800 m north-northwest of the proposed open pit, which also had cadmium, iron, lead, and manganese above applicable criteria. Arsenic exceeded ISQG at all locations other than SS20-09, -15, and -16, which were collected at the east end of Crusher Lake.

Sample SS20-03B contained modified TPH at a concentration of 2,800 mg/kg with a hydrocarbon resemblance to the weathered fuel oil and lube oil fractions. This sample location also included arsenic, cadmium, copper, lead, strontium, and zinc above applicable criteria, including the highest observed levels of cadmium, lead, strontium, and zinc of all 2020 sediment samples.

3.3.3 Surface Water Analytical Results

Laboratory analysis for total metals was conducted on five surface water samples collected in 2020. Results from four surface water samples collected and previously reported as part of the Limited Phase II ESA activities (Stantec 2019b) are also included in the data set and discussed throughout this report.[2] Results of the laboratory analysis of surface water samples are presented in Drawing No. A-7, Appendix A and Table C-4, Appendix C.

Levels of aluminum, arsenic, cadmium, chromium, and iron exceeded Tier 1 EQS at one or more sample locations. Results for other metals were below criteria where available. Results did not exceed MDMER Maximum Authorized Concentrations. These results are summarized in Table 7:

Table 7 Summary of Surface Water Contamination (2019-2020)

Criteria Exceedances	Criteria		Exceeds Tier 1 EQS	Exceeds MDMER*
	Tier 1 EQS	MDMER[1]		
Aluminum	5	-	9 of 9	0 of 9
Arsenic	5.0	200	2 of 9	0 of 9
Cadmium	0.010	-	7 of 9	0 of 9
Chromium	1.0	-	1 of 9	0 of 9
Iron	300	-	9 of 9	0 of 9
Other metals	Various	Various	0 of 9	0 of 9

Notes:

*The MDMER Maximum Authorized Concentrations applicable to grab samples (for new or reopening mines on or after June 1, 2021) are included in this table. Other MDMER applicable to monthly mean of samples or composite samples are included in Table C-4, Appendix C.

Numbers of exceedances do not include field duplicate samples.

Arsenic in surface water ranged from below detection limits to 45 µg/L, with the Tier 1 exceedances of 32 and 45 µg/L located at SW19-01 and SW20-02, both located at or near the outflow of the historical settling pond.

3.3.4 Field Duplicate QA/QC

Where field duplicates were collected (at six locations for soil and one location for sediment), Stantec calculated relative percent differences (RPDs) between the chemical concentrations detected in the samples and their field duplicates. Tabulated RPDs for soil and sediment are included in Table C-5 and C-6, respectively, in Appendix C.

[2] Samples collected during Limited Phase II ESA activities have been renamed to indicate the year of collection more clearly as shown on Table D-4, Appendix D. For example, the sample previously reported as SW1 (collected in 2019) has been renamed to SW19-01 and referred to as such throughout this report.

Soil sample RPDs were under 60%, the acceptable limit for soil blind field duplicates (Bureau Veritas 2020).

Sediment RPDs were also under 60%. BV has not recommended an acceptable limit for sediment blind field duplicates.

These results do not indicate quality issues which would affect Stantec's reliance upon the analytical data.

3.3.5 Summary of Exceedances

The Extended Phase II ESA identified concentrations of arsenic in soil, petroleum hydrocarbons in sediment, and various metals in sediment and surface water exceeding the applicable standards and/or guidelines. The distributions of these contaminants are shown on Drawing Nos. A-5 to A-7 in Appendix A. Discussion of these exceedances is included in Section 4.0, below.

4.0 DISCUSSION

4.1 SOIL CONTAMINATION

4.1.1 Impact Classification

Based on field observations, including visible tailings within test pits and their proximity to Site features such as historical mining infrastructure/features (i.e., trenches, waste rock piles, stamp mill foundations, etc.), Stantec classified the test pit locations from both 2019 and 2020 as either non-impacted or impacted by historical mining activities. Of the impacted locations, Stantec further classified them as likely impacted by historical mine tailings or by mine waste rock. This impact classification assisted Stantec in our assessment of background levels and delineation, discussed below.

Soil impact classifications are highlighted on Table C-1, Appendix C and summarized in Table 8:

Table 8 Summary of Soil Impact Classification

Impact Classification at Proposed Mine Infrastructure Areas Based on Field Identification	Non-Impacted Test Pits	Impacted Test Pits	
		Tailings	Waste Rock
Crusher pad	2 of 2	0 of 2	0 of 2
LG (low grade) stockpiles	2 of 2	0 of 2	0 of 2
NAG (non-acid generating) stockpiles	4 of 4	0 of 4	0 of 4
Open pit	4 of 23*	6 of 23† [764]	13 of 23‡ [346]
Organic material stockpiles	6 of 6	0 of 6	0 of 6
PAG (potentially acid generating) stockpiles	2 of 2	0 of 2	0 of 2
Roadways and water management ditches	6 of 9	1 of 9 [230]	2 of 9 [125]
Settling pond	3 of 3	0 of 3	0 of 3
Till stockpiles	6 of 7	1 of 7 [130]	0 of 7
TSSPs (top-soil/sub-soil stockpiles)	4 of 6	1 of 6 [2,800]	1 of 6 [44]
Areas outside of proposed infrastructure	12 of 31	15 of 31 [294]	4 of 23 [104]

Notes:

[ ] The value in brackets represents the mean arsenic concentration (mg/kg) in the soil samples within this proposed mine infrastructure area and impact classification.

* Non-impacted test pits within the proposed open pit were either on the extreme northern edge of the footprint (TP19-10), observed to be composed of natural soil deposits in the field (TP20-34, TP20-35, and TP20-58) and/or contained low concentrations of arsenic (TP20-58).

† Tailings-impacted test pits within the proposed open pit are largely near the central historical settling pond. This includes the highest identified concentration of 3,900 mg/kg at TP19-28.

‡ Waste rock-impacted test pits were identified throughout the re-worked area composing the majority of the proposed open pit.

Sample photographs of observed suspected tailings and waste rock are included below, as well as in the photolog in Appendix E.

Photograph A **Suspected Tailings from TP20-63**

Photograph B **Suspected Waste Rock at Surface of TP20-27**

4.1.2 Background Levels

Some samples from non-impacted areas of the Site include arsenic concentrations higher than the Tier 1 EQS. Arsenic concentrations within non-impacted soil samples represent potential data on background levels in the Site area soil (i.e., arsenic in soil related to geology and not to historical mining activities).

Table 9 presents statistical metrics calculated using the non-impacted soil concentrations, compared to the Tier 1 EQS. Statistical calculations, including distribution and outlier testing, were conducted using the United States Environmental Protection Agency's (US EPA) ProUCL statistics software package for environmental applications (United States Environmental Protection Agency 2016). Detailed methodology on statistical methods used, including distribution and outlier testing, is included in Appendix F.

Table 9 Statistics from Background Non-Impacted Data Set

Concentration (mg/kg)	Tier 1 EQS	Maximum	Mean	Median	75th Percentile	95th Percentile
Arsenic	31	270	75.34	43.5	112.5	228.0

Arsenic levels below the 95th percentile value (228 mg/kg) of the background non-impacted data set were considered to represent arsenic not related to historical mining activities. Delineation based on this value, as well as on field observations, is shown on Drawing No. A-5, Appendix A.

4.1.3 Contamination and Delineation Near Proposed Mine Infrastructure

Impacts above the calculated background value, considered to represent arsenic related to historical mining activities, were identified within the proposed open pit and to its east at the east end of the historical settling pond, as well as in the area of the proposed TSSPs to the north and northwest of the proposed open pit, and intersecting proposed roadways and water management ditches.

This level of impacted soil was also identified within an area spanning the proposed till stockpile and organic material stockpile; however, despite its high levels of arsenic which could affect soil management in this area, soil in this area was field-identified as non-impacted and may represent naturally elevated levels.

This level of impacted soil was also identified around the stream north of the suspected tailings at Crusher Lake (no proposed mine infrastructure in this area).

Proposed infrastructure in other areas may disturb soil or sediment with arsenic concentrations that naturally exceed the guidelines. This will be an important factor during construction for the management of soil and for the disturbance of sediments that may be mobilized on or off-site.

Historical mining-related arsenic contamination in soil identified during the Limited Phase II ESA and Extended Phase II ESA is horizontally delineated other than to the northeast of the proposed open pit near the Cameron Flowage, as shown by dashed lines on Drawing No. A-5, Appendix A.

Identified contamination is not vertically delineated given refusal of hand-held tools during sampling events. Bedrock may limit vertical soil contamination. Stantec has previously reviewed reports on historical Nova Scotia gold mines identifying tailings several metres thick.

4.2 SEDIMENT AND SURFACE WATER CONTAMINATION

Contamination consisting of arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, strontium, zinc, and modified TPH is present in sediments as shown on Drawing No. A-6, Appendix A. Sediment contamination is un-delineated horizontally and vertically.

Sediment sample locations are either located within the footprints of proposed Project infrastructure, or within the general Project area but outside of specific proposed infrastructure areas. Sediment contamination can be divided into five sub-categories:

- Within proposed Project infrastructure footprints (5 samples in area of proposed open pit):
  - Historical settling pond (SS20-01, -02B, -03B, -04, and -05): Arsenic levels range from 110 to 570 mg/kg. Other metals contamination: all identified exceeding substances other than iron and manganese. Modified TPH (weathered fuel and lube oil hydrocarbon fractions) also exceeded Tier 1 EQS here, at SS20-03B.

- Outside of proposed Project infrastructure footprints (8 samples):
  - Central Crusher Lake (SS20-11 and -14): Arsenic levels range from 7.1 to 65 mg/kg. Other metals contamination: selenium, mercury, strontium.
  - Eastern Crusher Lake near stream outflow (SS20-09, -15, and -16): Arsenic levels are below ISQG and PEL, and there is no other metals contamination other than strontium.
  - Eastern Killag River/Cameron Flowage (SS20-06 and -08): Arsenic levels range from 38 to 42 mg/kg. Other metals contamination: cadmium, iron, strontium, and zinc.
  - Northwestern Killag River (SS20-07): Arsenic level is 2,800 mg/kg. Other metals contamination: cadmium, iron, lead, manganese.

The sediment data collected to date suggests widespread arsenic contamination in the Site area mainly due to historical gold mining activities and from local geology, with relatively low levels of arsenic and other metals within Crusher Lake, consistently high levels within the historical settling pond, and the highest levels along the Killag River to the northwest.

The sediment data set is limited and would benefit from further sampling events. Stantec understands that confirmatory sediment sampling will be undertaken during Project construction as described in the Beaver Dam Historical Tailings & Waste Rock Management Plan (Draft) (Stantec 2020b).

Surface water data shows consistent levels of aluminum, cadmium, and iron throughout Site water bodies. Arsenic is elevated in surface water at SW19-01 and SW20-02, both located at or near the outflow of the settling pond.

4.2.1 Background Levels

Sufficient sediment and surface water samples to establish a background data set have not been collected at the Site. Therefore, establishment of a background level for metals in sediment via statistical methods has not been undertaken as part of this assessment.

It is unclear whether the current sediment data set at the Site captures representative background levels of metals: SS20-07, the furthest upstream sample, contains the highest observed level of arsenic. Arsenic generally appears present at elevated levels in sediments at the Site and surrounding areas.

Surface water data shows consistent levels of aluminum, cadmium, and iron throughout Site water bodies, likely representing background levels of these substances.

5.0 CONCLUSIONS

Based on the information gathered and on observations made during this assessment and the Limited Phase II ESA (Stantec 2019b), Stantec provides the following conclusions related to potential environmental contamination associated with historical gold mining operations:

- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 EQS were identified in 72 of the 95 test pit locations. Some of these locations are considered non-impacted and are potentially indicative of background soil concentrations.
- Twenty-nine of the 65 test pits advanced during the Extended Phase II ESA work in 2020 are classified as likely impacted by historical tailings or waste rock based on field observations, arsenic levels, and proximity to historical site features.
- Arsenic in soil at levels considered to represented impact from historical mining operations intersects with areas of proposed Project infrastructure, including the proposed open pit.
- Concentrations of arsenic in sediment exceeding the applicable ISQG were identified in 10 of 13 sample locations; nine of those locations also had concentrations exceeding the Tier 1 EQS and PEL. Concentrations of cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, strontium, and/or zinc in sediment exceeded guidelines at 12 of 13 sample locations. One sediment sample was analysed for PHC based on hydrocarbon odour, and modified TPH exceeded the applicable Tier 1 EQS. Sediment sample locations were restricted to areas of Crusher Lake, the Killag River, and the historical settling pond.
- Arsenic, cadmium, chromium, copper, lead, mercury, selenium, strontium, zinc, and PHC in sediment within the historical settling pond intersects with proposed Project infrastructure (the proposed open pit area). A management plan for these sediments is described in the Beaver Dam Historical Tailings & Waste Rock Management Plan (Draft) (Stantec 2020b).
- Concentrations of arsenic in surface water exceeding the Tier 1 EQS were identified in two of nine sampling locations. Concentrations of aluminum, cadmium, chromium, and/or iron exceeded guidelines at all sampling locations and may represent background conditions.

6.0 CLOSURE

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

Closure
March 8, 2021

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

This report was prepared by Gillian Manley, P.Eng., and reviewed by Eric Arseneau, MES, Don Carey, M.Sc., P.Eng., and Patrick Turner, B.Sc., P.Eng.

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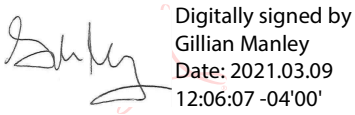

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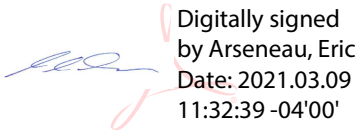

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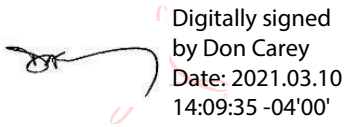

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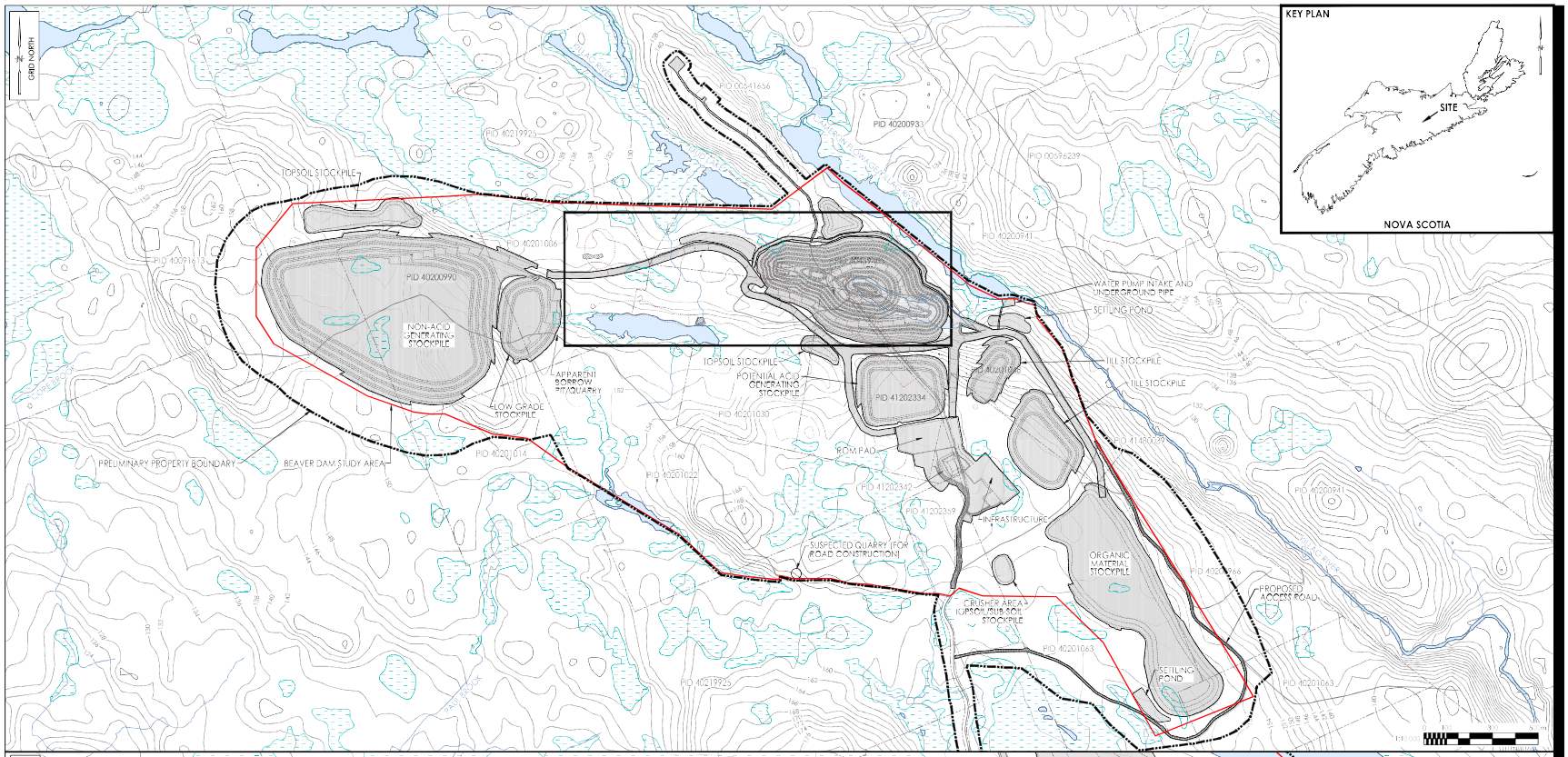
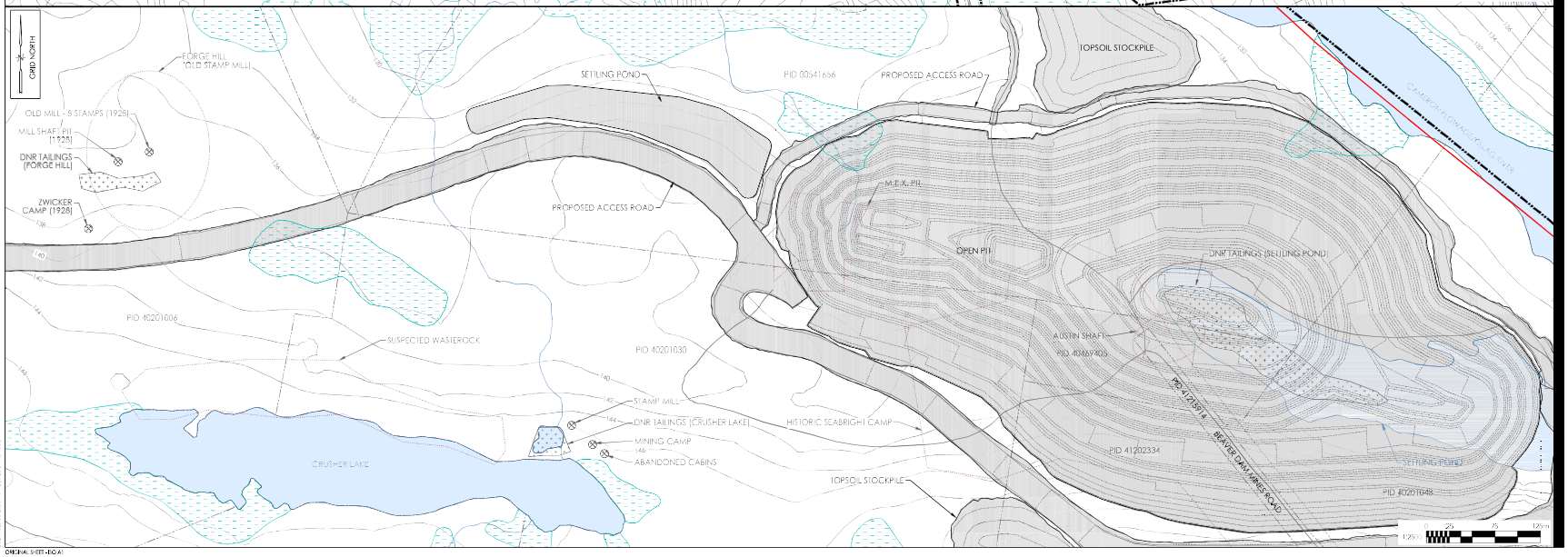
APPENDIX A

Drawings

Drawing No. A - 1 - Project Location
Drawing No. A - 2 - Soil Sample Locations (2019 and 2020)
Drawing No. A - 3 - Sediment Sample Locations (2020)
Drawing No. A - 4 - Surface Water Sample Locations (2019 and 2020)
Drawing No. A - 5 - Arsenic Concentrations Compared to NSE Tier 1 EQS (Industrial Land Use) and Potential Extent of Arsenic in Soil Related to Historical Mining Operations
Drawing No. A - 6 - Metals and PHC Concentrations in Sediment Compared to NSE Tier 1 EQS and Canadian Sediment Quality Guidelines
Drawing No. A - 7 - Metals Concentrations in Surface Water Compared to NSE Tier 1 EQS





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Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, MCCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 10527-0000-G-101, REV D, 07/DEC/2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.09
Revision		By	Appd.	YY.MM.DD
B	FINAL	EA	MF	21.02.XX
A	FOR REVIEW	EA	MF	20.11.09
Issued		By	Appd.	YY.MM.DD
File Name: 121619250.2300.99(_A-1_REV1		JL	EA	GM	21.02.09
		Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

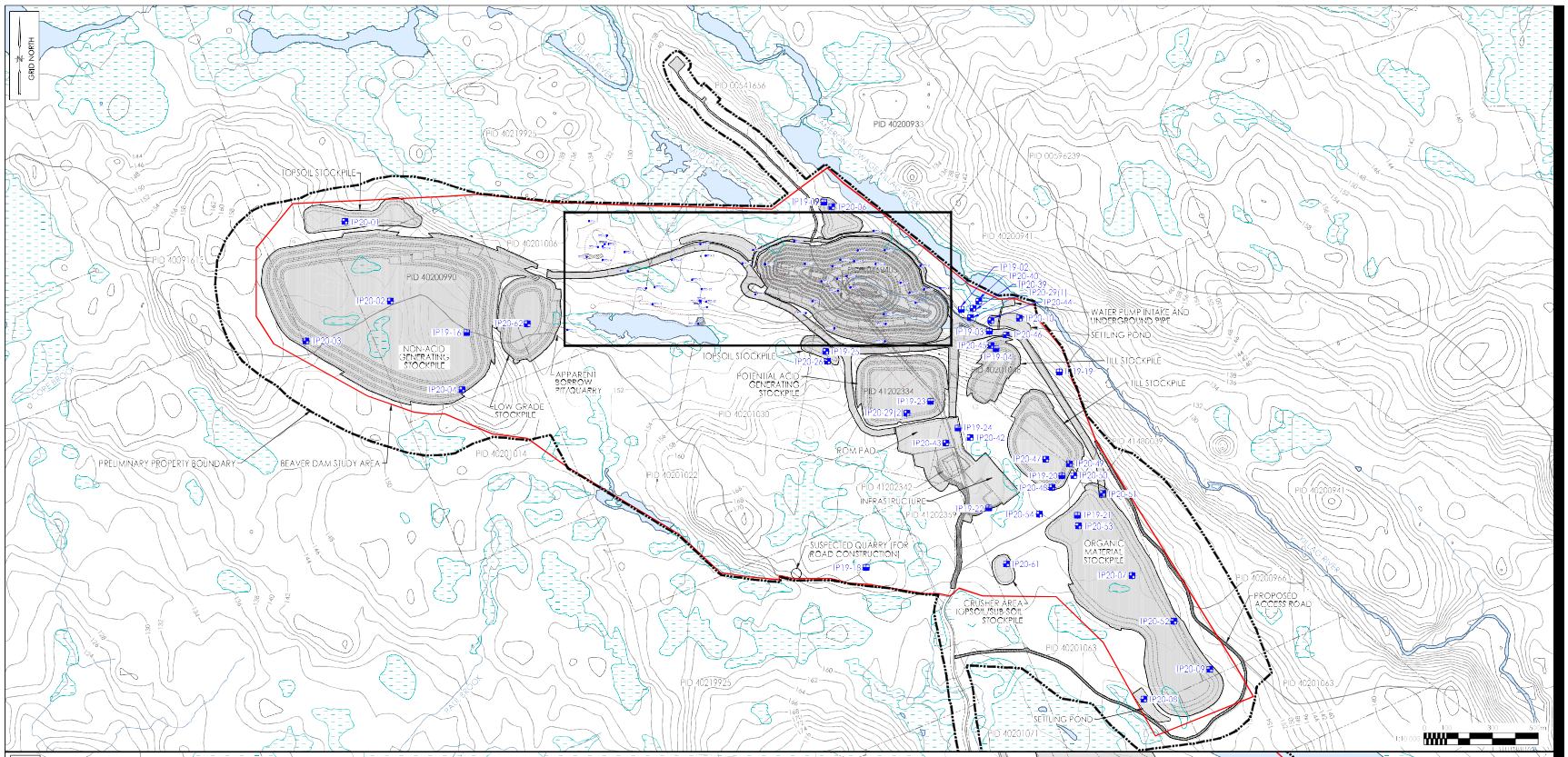
HALIFAX COUNTY, NS

Title

PROJECT LOCATION

Project No.	Scale	
121619250	AS SHOWN	
Drawing No.	Sheet	Revision
A-1	1 of 7	1

ORIGINAL SHEET - ISO A1



Stantec

Stantec Consulting Ltd.
845 Prospect Street
Fredericton NB
Tel. 506.452.7000
www.stantec.com

Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION
- TEST PIT LOCATION (2019)
- TEST PIT LOCATION (2020)

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, MCCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 10522-0000-G-101, REV. D, 07/DEC/2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.08
Revision		By	Appd.	YY.MM.DD
B	FINAL	EA	MF	21.02.XX
A	FOR REVIEW	EA	MF	20.11.09
Issued		By	Appd.	YY.MM.DD
File Name: 121619250.2300.99L_A-2_REV1		JL	EA	GM	21.02.08
		Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

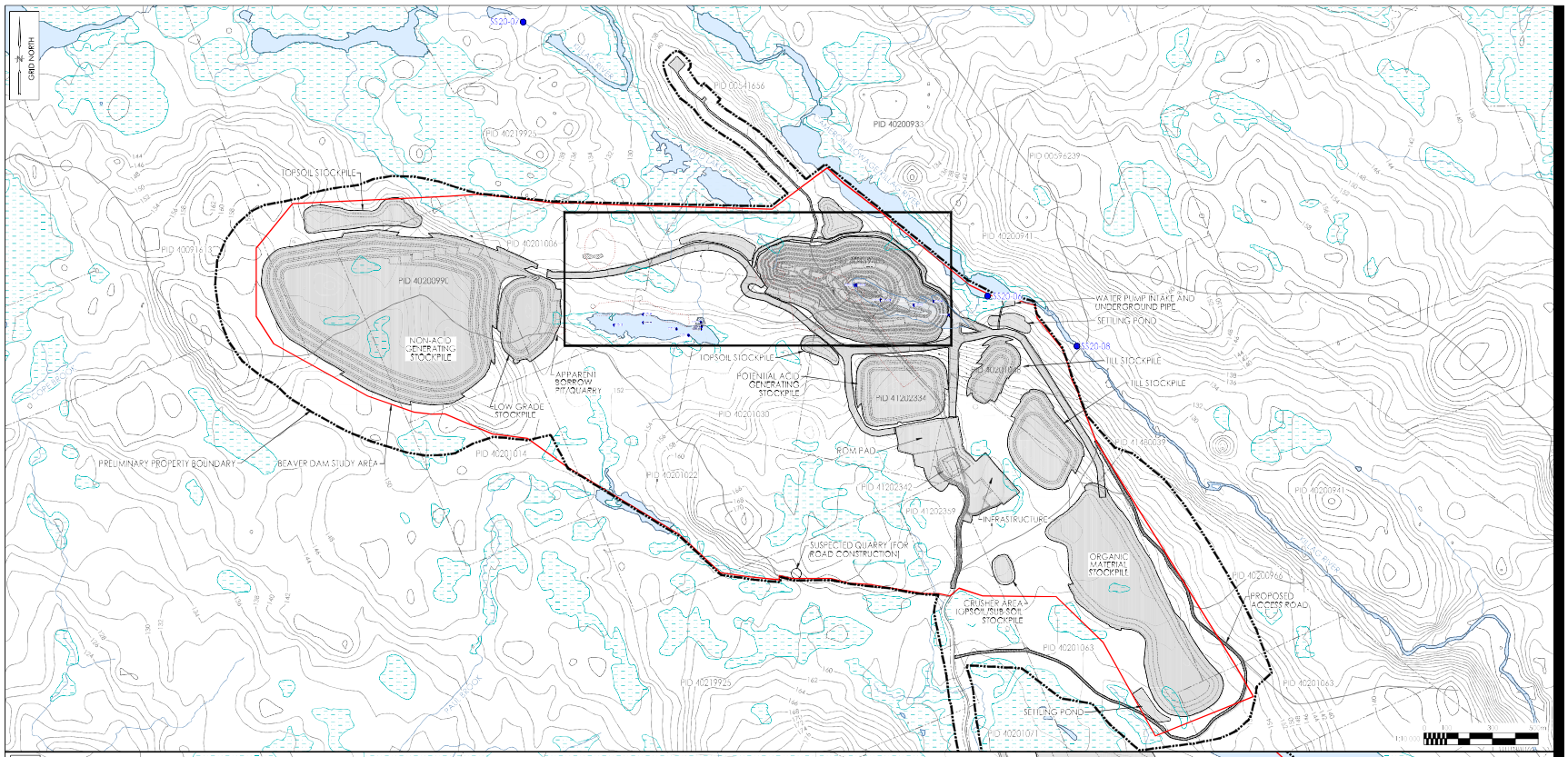
HALIFAX COUNTY, NS

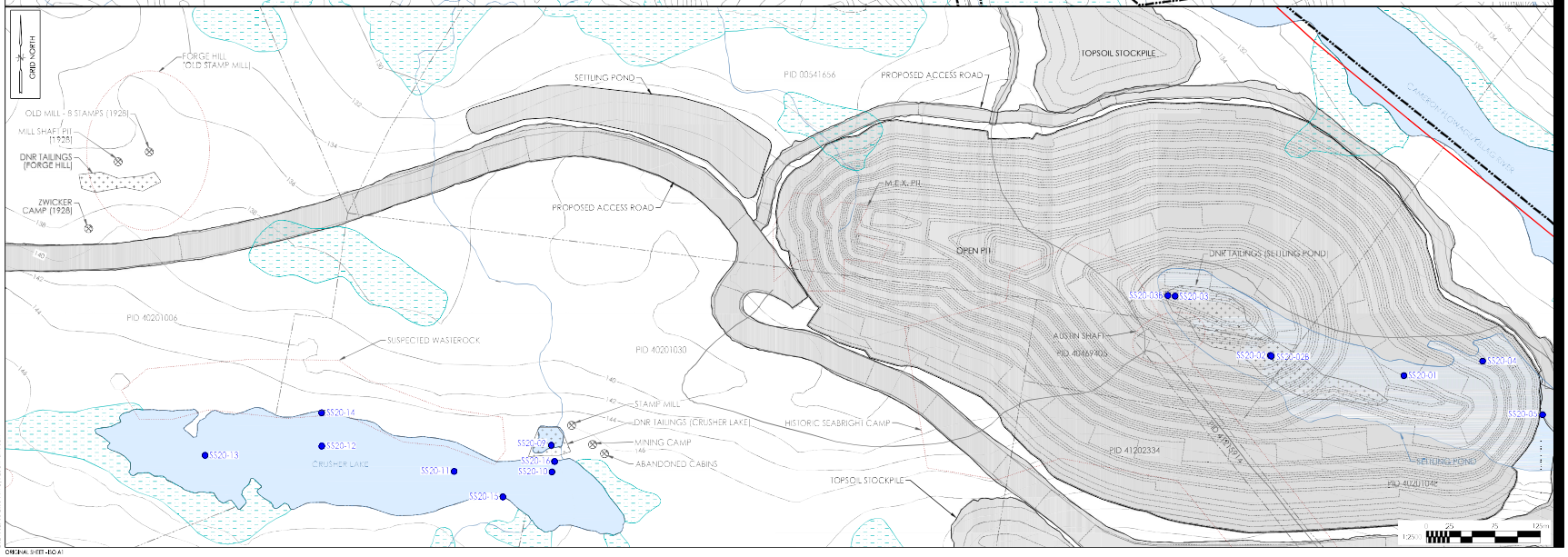
Title

SOIL SAMPLE LOCATIONS (2019 AND 2020)

Project No.	Scale	
121619250	AS SHOWN	
Drawing No.	Sheet	Revision
A-2	2 of 7	0

ORIGINAL SHEET - ISO A1





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Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION
- SEDIMENT SAMPLE LOCATION (2020)

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, MCCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 10522-0000-G-101, REV.D, 07/DEC/2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.08
Revision		By	Appd.	YY.MM.DD
B	FINAL	EA	MF	21.02.XX
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File Name: 121619250.2300.99(_A-2_REV1		JL	EA	GM	21.02.08
		Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

HALIFAX COUNTY, NS

Title

SEDIMENT SAMPLE LOCATIONS (2020)

Project No.	Scale	
121619250	AS SHOWN	
Drawing No.	Sheet	Revision
A-3	3 of 7	0

ORIGINAL SHEET - ISO A1