

Phase I Environmental Site Assessment

Mooseland Mine Site

Nova Scotia Lands Inc.

60680169

October 2022



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October 7, 2022

Project #
60680169

Subject: Phase I Environmental Site Assessment – Mooseland Mine Site

Dear Mr. MacPhee:

AECOM Canada Ltd. (AECOM) is pleased to present this Phase I Environmental Site Assessment (ESA) Report associated with the Mooseland Mine Site, located in Mooseland, Nova Scotia to Nova Scotia Lands Inc. (NSLI).

If you have any questions about the information presented within this report, please do not hesitate to contact me directly.

Sincerely,
AECOM Canada Ltd.

Rory McNeil
P.Eng. Project Manager
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Encl.

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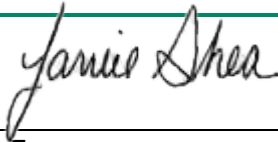
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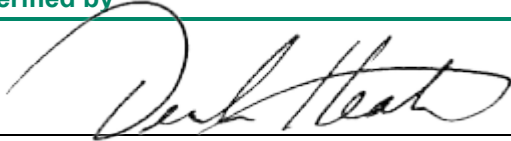
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Mooseland Mine Site

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Executive Summary

AECOM Canada Ltd. (AECOM) was retained by Nova Scotia Lands Inc. (NSLI) to complete a Phase I Environmental Site Assessment (ESA) for the former Mooseland Mine Site located at 3630 Mooseland Road, Mooseland, Nova Scotia (associated Parcel Identifier Number (PID): 41019332). As requested by NSLI, the area of focus for the Phase I ESA is limited to the historic mining Crown land area within the PID 41019332 (hereafter referred to as the "Site").

The objective of the Phase I ESA is to identify any areas of potential environmental concern (APECs) related to the past or current use of the Site and adjacent properties with an emphasis on the usage, handling and storage of hazardous materials / chemicals that may have impacted soil and/or groundwater quality. A secondary objective of the ESA is to make recommendations to address any APECs identified during this study.

The Phase I ESA was conducted in accordance with the Nova Scotia Environment (NSE) Contaminated Sites Regulations (July 2013) and the NSE Phase I Environmental Site Assessment Protocol (PRO-300) and in conformance with Canadian Standards Association (CSA) guideline for conducting Phase I ESAs (CSA Standard Z768-01 (R2016)).

Based on the results of the Phase I ESA, AECOM identified the following key information:

1. The Site is located in an area of historic mining activity in the Mooseland gold district. Mining and milling activities have been carried out intermittently in the area between 1861 and 1934, during which 120 kg of gold was reported to be recovered from 8217 tonnes of crushed rock. Since then, sporadic exploration has continued. The most serious effort made was by Acadia Minerals and Hecla Mining in the late 1980s, with the drilling of 135 boreholes, and the sinking of a 400-foot shaft. In 2003, Azure Resources Corporation optioned the Mooseland property and in late 2003 and early 2004, the company established a decline and carried out bulk sampling of the Little North and Cummings belts.
2. The surrounding area on the west, east, and south sides of the Site appeared to be resource forest area and undeveloped, and Tangier River is located north and adjacent to the Site. The closest building to the Site is the Saint Thomas Anglican Church which is located over 1.2 km from the Site. It is also noted that there appears to be a local fishing area located in Tangier River, downstream and approximately 1.3 km from the Site called "Hawbolts Farm Pool". No additional details were able to be found related to this fishing area. Based on a review of topographic maps, it appears there is a mine located approximately 1.75 km northwest of the Site. Based on a review of the results of the ERIS search, within 250 m of the Site there appears to be a number of abandoned mine openings, one contaminated site, a number of drill holes, mineral occurrences, and water wells.
3. Current structures located on-site during the time of the site visit include the following:
 - Quonset Hut:
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open. No back wall - the back of the hut is open and attached to a steel structure.
 - Insulated: no
 - Contents: garbage / waste
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
 - Notes: currently attached to steel structure noted below.
 - Quonset Hut (insulated):
 - Building details: concrete slab with metal (steel) walls and roof
 - Insulation: yes - yellow insulation (potential asbestos containing material)
 - Contents: wooden boxes old core samples
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
 - Quonset Hut (newer):
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open.
 - Insulated: no

- Contents: wooden boxes - newer core samples
- Location: cleared area at the end of the road off 3630 Mooseland Road – adjacent to waste rock area. On other side of the road from the other Quonset Huts.
- Notes: this newer storage area may belong to Atlantic Gold.
- Steel structure:
 - Building details: steel structure
 - Insulated: not applicable
 - Contents: not applicable
 - Location: attached to Quonset Hut that is currently storing garbage / waste
 - Notes: potential that this structure was a headframe over a mine shaft for two separate compartments. The houses at the top likely protected pulleys of hoists, there were no wire ropes present.
- Small plywood structure (possible former pump house):
 - Building details: plywood structure with roof. Piping entering the structure.
 - Insulated: no
 - Contents: empty
 - Location: located near a ponded water area, which is potentially the former Hecla Mine Shaft, that was located to the southeast of area where the Quonset huts are located
 - Notes: piping entering the back of the structure

The three former stamp mills that were known to be located on-site were not identified at the time of the site visit.

1. A sparsely vegetated tailings deposit was noted along the western bank of the Tangier River. Well oxidized sandy tailings were noted near former stamp mill. Waste rock was noted throughout the Site.
2. At the time of the site visit, various debris and waste (consisting of garbage, wood, tubing, metal, drill rods, tires etc.) were littered intermittently throughout the Site, as well as stored in one of the Quonset huts located next to the former stamp mill.
3. Historical soil samples collected at the Site reportedly show elevated concentrations of arsenic and mercury present in the tailings on-site. Based on previous reporting completed for the Site, it was noted that the total area considered to be potentially impacted consisting of 34,093 square meters (8.5 acres), with an estimated 8,217 tonnes of tailings.
4. Based on previous environmental reports and results from the ERIS database report, it is noted that former mine shafts are located on-site in various areas. There are four (4) former mine shafts located in the area of tailings along the Tangier River, as well as multiple mine shafts in the area along Sluice Brook. Signage was noted throughout the Site to warn the public of “hazardous open holes”. The ponded water area located southeast of the Quonset huts is potential to be former Hecla mining shaft.

Based on the results of the Phase I ESA, AECOM recommends the following:

Solid Waste Management:

1. A survey of all debris and solid waste should be conducted prior to disposal. Insulation should be sampled to see if it contains asbestos.
2. All debris and other solid wastes should be removed from the Site and disposed in compliance with Provincial and Municipal legislation. Characterization of the waste should take place prior to or concurrently with removal.

Potential Environmental Contamination:

1. A Phase II ESA program should be conducted to investigate potential environmental contamination of soil, surface water and groundwater on the Site as a result of historical gold mining operations and the waste generated during that time. The Phase II ESA should focus on known areas of concern such as known tailings areas, waste storage areas, former stamp mill areas, pond/ former shaft areas and any known waste discharge locations. It is expected that the primary Contaminants of Concern (COC) will be heavy metals (arsenic and mercury).

Additional items to be considered include the following:

Physical Hazards:

1. In addition to debris and solid waste, a survey of manmade structures identified on-site (steel structure (potential headframe)), Quonset huts, former pump house) should be conducted to identify those that require remedial actions. If determined that the manmade structure should be removed, the materials should be disposed of in compliance with Provincial and Municipal legislation.
2. A survey of former mine shafts should be conducted to identify those that require remedial actions to address physical hazards such as excessive drops and/or falls.

A detailed Phase II field program memo has been developed for the Site. This memo includes a proposed field program to address the areas of concern identified in this Phase I ESA. The Phase II field program memo has been submitted under a separate submission.

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1. Introduction

1.1 Purpose

AECOM Canada Ltd. (AECOM) was retained by Nova Scotia Lands Inc. (NSLI) to complete a Phase I Environmental Site Assessment (ESA) for the former Mooseland Mine Site located at 3630 Mooseland Road, Mooseland, Nova Scotia (associated Parcel Identifier Number (PID): 41019332). The general location of the property is shown on **Figure 1, Appendix A**. As requested by NSLI, the area of focus for the Phase I ESA is limited to the historic mining Crown land area within the PID 41019332 (hereafter referred to as the "Site"). The approximate property boundary associated with Property Online for PID 41019332, as well as the Phase I ESA area of focus is presented on **Figure 2, Appendix A**. Areas of potential concern identified during the Phase I ESA, including waste rock, tailings, and former mining infrastructure, is presented on **Figure 3, Appendix A**.

The objective of the Phase I ESA is to identify any areas of potential environmental concern (APECs) related to the past or current use of the Site and adjacent properties with an emphasis on the usage, handling and storage of hazardous materials / chemicals that may have impacted soil and/or groundwater quality. A secondary objective of the ESA is to make recommendations to address any APECs identified during this study.

The Phase I ESA was conducted in accordance with the Nova Scotia Environment (NSE) Contaminated Sites Regulations (July 2013) and the NSE Phase I Environmental Site Assessment Protocol (PRO-300) and in conformance with Canadian Standards Association (CSA) guideline for conducting Phase I ESAs (CSA Standard Z768-01 (R2016)).

This report describes the objectives of the Phase I ESA, the methodology employed to achieve those objectives and the findings of the investigation. This assessment is based on a review of existing conditions, reported pre-existing conditions, and observed operations at the subject property and adjacent properties.

1.2 Scope of Work

The Phase I ESA objectives were achieved through a scope of work which included:

- Review of Historical Records:
 - Property records available through Service Nova Scotia and Municipal Relation's Property Online;
 - Regulatory Agency records (Nova Scotia Environment – NSE);
 - EcoLog Environmental Risk Information Services (ERIS) search;
 - Aerial Photos;
 - Topographic maps; and
 - Previous environmental reports provided to AECOM by NSLI.
- Complete a site visit to assess the Site to observe current conditions and uses of the Site and adjacent properties; and
- Interviews (where required) with persons knowledgeable about the Site.

Conclusions reached in this report are based upon the assessment performed and are subject to limitations set forth in **Sections 1.3, 1.4, and 1.5** below.

1.3 Study Limitations

As with any due diligence assessment, there is a certain degree of dependence upon oral information provided by persons knowledgeable of the Site, which is not readily verifiable through visual observations or supported by any available written documentation. AECOM shall not be held responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed by facility or site representatives at the time this assessment was performed. In addition, the findings and opinions expressed in this report are subject to certain conditions and assumptions, which are noted in the report. Any party reviewing the findings of the report must carefully review and consider all such conditions and assumptions. This report and all field data and notes were gathered and/or prepared by AECOM in accordance with the agreed upon scope of work and generally accepted engineering and scientific practice in effect at the time of AECOM's assessment of the Site. The statements, findings and opinions contained in this report are only intended to give approximations of the environmental conditions at the Site.

This report was prepared pursuant to an agreement between NSLI and AECOM and is for the exclusive use of the NSLI. No other party is entitled to rely on the conclusions, observations, specifications, or data contained herein without first obtaining AECOM's written consent and provided any such party signs an AECOM-generated Reliance Letter. A third party's signing of the AECOM Reliance Letter and AECOM's written consent are conditions precedent to any additional use or reliance on this report.

The passage of time may result in changes in technology, economic conditions, site variations, or regulatory provisions, which would render the report inaccurate. Reliance on this report after the date of issuance as an accurate representation of current site conditions shall be at the user's sole risk.

1.4 Site-Related Limiting Conditions

At the time of the site visit, the following site-related conditions were noted:

- AECOM personnel noted hazardous conditions, including open holes former mine shafts. Due to safety concerns and risks these areas were not closely examined at the time of the site visit.
- AECOM personnel noted metal cans and metal/plastic containers located inside one (1) Quonset hut location and in the wooded area southeast of the area where the Quonset huts are located. The contents of these are not known and were not investigated during the time of the site visit due to associated safety concerns and risks.
- The Site visit was done in early spring, therefor limited snow cover may have existed in some areas, however the majority of the Site was not snow covered.
- The subject property studied is a smaller subsection of the overall PID and therefor the Phase I only applies to the smaller subsection as indicated in the report and in the figures.

1.5 Data Gaps / Data Failure

The following data gaps are noted:

- A request was made to Nova Scotia Environment (NSE) to complete an environmental registry search for the Site. The results of this search have not been received yet. AECOM will include this information in the Final Report.
- The person identified for the Phase I ESA interview is currently on sick-leave and was not available to complete an interview. As such, no interview was completed as part of this ESA.

2. Site Description

2.1 Subject Properties Description

The former Mooseland Mine Site is a historic mine site located at the civic address of 3630 Mooseland Road in Mooseland, NS (PID: 41019332), which is approximately 24 km north of Tangier, NS. This PID is in a remote location, which spans 349.6 hectares (864.0 acres). This parcel of land is almost entirely undeveloped, except for a roadway (Mooseland Road) running through it (northwest to southeast), and sparse historical mining-related infrastructure (where the Site is situated). Vegetation consists of a mixture of forest and shrubland. The Site is accessible by vehicle along Mooseland Road.

At the time of the site visit, a small plywood structure with piping (possible former pump house), and three Quonset huts (steel dome buildings) with what appears to be former mining infrastructure (steel structure) was noted. The steel structure is potentially a headframe over a mine shaft; however, further investigation is required. Based on a review of previous environmental reports, it was noted that three (3) stamp mills, one located at the head of the tailings area near Tangier River, and two located on the western and eastern sides of Sluice Brook) were present on the PID, as shown on **Figure 3, Appendix A**. However, during the time of the site visit, these former stamp mills were not identified.

Tailings and waste rock were also present and scattered throughout the Site, and various debris and waste (consisting of garbage, wood, tubing, metal, drill rods, tires etc.) were littered intermittently throughout the Site, as well as stored in one of the Quonset huts. Limited fencing structures surrounding the waste rock were also noted to be present within the area of the Quonset huts.

Former mine shafts are located on-site in various areas and signage was noted throughout the Site to warn the public of “hazardous open holes”. A ponded area was noted southeast of the Quonset huts which might be the former Hecla mining shaft. A large ponded body of water is located approximately 200 m northwest of the Quonset huts, which may be a flooded former mine shaft.

2.2 Historical Land Use

The Site is located in an area of historic mining activity in the Mooseland gold district. Mining and milling activities have been carried out intermittently in the area between 1861 and 1934. During this time period, approximately 120 kg of gold was reportedly recovered from 8217 tonnes of crushed rock (Parsons et al. 2003). Since then, sporadic exploration has continued within this district. The most serious mining effort was made by Acadia Minerals and Hecla Mining in the late 1980s, with the drilling of 135 boreholes, and the sinking of a 400-foot shaft (Horne et al. 2004). In 2003, Azure Resources Corporation optioned the Mooseland property and in late 2003 and early 2004, the company established a decline and carried out bulk sampling of the Little North and Cummings belts (A “belt” refers to a stratigraphic interval hosting two or more distinct veins; “veins” refer to distinct sheet-like bodies of minerals within a rock). According to a 2003 environmental geochemistry investigation: “*Surface and underground exploration in the Mooseland district has continued to the present day including the sinking of a 400-foot shaft in the late 1980s*” (Parsons et al. 2003).

2.3 Site Buildings and Structures

Abandoned, historical mining-related infrastructure is present on-site and includes the following:

- Quonset Hut: **Photos #1, 3, 7, 8 – Appendix B**.
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open. No back wall - the back of the hut is open and attached to a steel structure.

- Insulated: no
- Contents: garbage / waste
- Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
- Notes: currently attached to steel structure (noted below).
- Quonset Hut (insulated): **Photos #18 – Appendix B.**
 - Building details: concrete slab with metal (steel) walls and roof
 - Insulation: yes - yellow insulation (potential asbestos containing material)
 - Contents: wooden boxes old core samples
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
- Quonset Hut (newer): **Photo #9 – Appendix B.**
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open.
 - Insulated: no
 - Contents: wooden boxes - newer core samples
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area. On other side of the road from the other Quonset Huts.
 - Notes: this newer storage area may belong to Atlantic Gold – AECOM was told by Atlantic Gold that they are completing minor work at the Site (removing historic core samples)
- Steel structure: **Photos #1, 3 – Appendix B.**
 - Building details: steel structure
 - Insulated: not applicable
 - Contents: not applicable
 - Location: attached to Quonset Hut that is currently storing garbage / waste
- Notes: potential that this structure was a headframe over a mine shaft for two separate compartments. The houses at the top likely protected pulleys of hoists, there were no wire ropes present.
Small plywood structure (possible former pump house): **Photos #17 – Appendix B.**
 - Building details: plywood structure with roof. Piping entering the structure.
 - Insulated: no
 - Contents: empty
 - Location: located near a ponded water area, which is potentially the former Hecla Mine Shaft, that was located to the southeast of area where the Quonset huts are located
 - Notes: piping entering the back of the structure

The three former stamp mills that were historically known to be located on-site were not identified at the time of the site visit.

2.4 Physical Setting

2.4.1 Regional Topography

On the Site itself, elevation ranges between approximately 90-110 meters above sea level (masl), with a typical elevation of approximately 100 masl. Elevation tends to slope northeast towards the Tangier River where it flattens with a relatively consistent elevation of approximately 90 masl. Topography for the Site and surrounding area is presented in **Figure 1, Appendix A.**

2.4.2 Regional Geology

Bedrock in the area is of Cambro-Ordovician age, belonging to the Meguma group which comprises the southern half of Nova Scotia's land mass (Patterson 1993). The Meguma group is subdivided into two primary formations: the Goldenville and Halifax formation (Patterson 1993). The basal part is the Goldenville formation, which is overlain by the Halifax formation (Prime and White 2007), except in some areas where it is exposed at the surface.

In the Mooseland Gold District, an anticline of the Goldenville Formation is exposed at the surface (Malcolm 1929, Horne et al. 2004). Generally, the Goldenville formation is primarily composed of metasandstone, with some interbedded metasilstone and slate, and in some cases, layering of sheets of rock is clearly visible (Prime and White 2007). The colour of the rock varies from medium grey to green-grey (Prime and White 2007). Low levels of sulphides (typically <1%) are common, usually in the form of isolated pyrite crystals (Prime and White 2007).

Gold-bearing deposits in the Mooseland Gold District have been described as intensely folded and metamorphosed sediments which are impure quartzites and narrow bands of interbedded slates (Mawpley 1938). Quartz that is present varies in color but tends to be glass white to grey (Mawpley 1938). Large and small arsenopyrite crystals are common and occur mostly in impure quartzites or slate (Mawpley 1938). Horne et al. (2004) provides the results of a detailed qualitative geological investigation of the major belts in Mooseland including the Cummings Belt, the Bismark Belt, the Little North Belt, and the Irving Belt.

2.4.3 Regional Hydrogeology/ Hydrology

Site-specific hydrogeologic information was not identified during the course of this assessment. Groundwater flow is expected to follow the regional topography, towards the Tangier River (northeast), located adjacent to the Site. However, the current groundwater flow direction and depth in the vicinity of the Site cannot be confirmed without site-specific groundwater monitoring well data.

Site-specific hydrology information includes the following water bodies, tributaries, wetlands, etc. that are either present on-site or in the vicinity of the Site. Hydrologic features are presented on [Figure 1, Appendix A](#).

- Tangier River is located adjacent (northeast) to the Site and flow direction is towards the southeast.
- A tributary leading into Tangier River is located northwest of the Site.
- Wetland areas are present on-site, as well as north, northwest, and east of the Site.
- Sluice Brook is located on-site and originates from Sluice Lake. Topographic maps indicate that Sluice Brook flows northeast into a wetland area on-site, and eventually into Tangier River.
- A ponded body of water is located on-site southeast of the Quonset huts. This ponded area may be the former Hecla mining shaft.
- A large ponded body of water located approximately 200 m northwest of the Quonset huts which may potentially be a flooded former mine shaft.

A search of water wells present on-site, and within a 250 m radius of the Site, was completed as part of the ERIS database search. The search results found that there are 4 water wells present on-site, and one water well was identified approximately 247.8 m from the Site. These results are further discussed in [Section 5.2](#).

2.5 Adjacent Land Use

The surrounding area on the west, east, and south sides of the Site appeared to be resource forest area and undeveloped, and Tangier River is located north and adjacent to the Site. The closest building to the Site is the Saint Thomas Anglican Church which is located over 1.2 km from the Site. It is also noted that there appears to be a designated fishing area located in Tangier River, downstream and approximately 1.3 km from the Site called "Hawbolts Farm Pool". No additional details were able to be found related to this fishing area.

Based on a review of topographic maps, it appears there is a mine located approximately 1.75 km northwest of the Site. Based on a review of the results of the ERIS search, within 250 m of the Site there appears to be a number of abandoned mine openings, one contaminated site, a number of drill holes, mineral occurrences, and water wells. Further detail is presented in [Section 5.2](#).

3. Site Visit

Mr. David Bugden with AECOM's Halifax, Nova Scotia office visited the Site on March 21, 2022. Weather conditions during the time of the site visit was overcast with clouds turning to light snow showers, temperature ranged from -1 to 2°C.

The site visit methodology consisted of walking over accessible areas of the Site and surrounding adjacent properties. The following sections summarize the results of the site visit and site photographs are presented in [Appendix B](#).

The area of focus for the Phase I ESA is limited to an area of historic mining Crown land on PID 41019332. This area is highlighted on [Figure 2, Appendix A](#). Areas of concern identified during the Phase I ESA, including waste rock, tailings, and former mining infrastructure, is presented on [Figure 3, Appendix A](#).

3.1 Issues of Low Environmental Concern

Table 1 below summarizes the issues of low environmental concern that were identified at the time of the site visit.

Table 1: Issues of Low Environmental Concern

Issue	Comment
Aboveground Storage Tanks (ASTs)	These items were not observed on-site at the time of the site visit.
Underground Storage Tanks (USTs)	
Lead and Lead-Based Materials	
Polychlorinated Biphenyls (PCBs)	
Ozone-Depleting Substances (ODSs)	
Pesticides/Herbicides	
Urea Formaldehyde Foam insulation (UFFI)	
Asbestos-Containing Materials (ACMs)	One of the Quonset huts that currently stores old core samples was insulated with what appeared to be yellow insulation. This insulation could potentially contain asbestos.
Chemicals	There is potential for there to be unidentified chemicals present within the metal / plastic storage containers identified in the Quonset hut and wooded area.
Mercury and Mercury-Containing Materials	It is noted that elevated concentrations of mercury are present within the tailings on-site based on previous reporting and sampling completed by previous consultants in 2003.
Wastewater Emissions	There is no known infrastructure on-site that would generate air or wastewater discharges. No air or wastewater emissions were noted at the time of the site visit. A ponded area was noted southeast of the Quonset huts which might be the former Hecla mining shaft. It is unsure if this would be a result of wastewater discharges from former activities that took place on the Site.
Air Emissions	
Radon	Based on the Nova Scotia Department of Health's Potential Occurrence of Radon Gas In Nova Scotia map, significant radon gas production at the Site is not suspected. AECOM is unaware if uranium was sampled for during historical sampling events (radon is a radioactive decay product of uranium).
Noise and Vibration	No known areas of noise or vibration were observed on or in the surrounding area of the Site at the time of the site visit.
Mould	There did not appear to be mould present on-site at the time of the site visit.
Radioactive Materials	No sources of radioactive materials or equipment were observed on-site during the time of the site visit. AECOM is unaware if uranium and other radioactive elements were sampled for during historical sampling events.
Electromagnetic Fields (EMFs)	High-tension transmission lines were not observed on-site during the time of the site visit. Electromagnetic fields do not appear to be a concern. No testing for electromagnetic fields was completed in association with this assessment.
Waste Management	Solid waste is located at various locations across the Site (wooded areas), as well as in one of the Quonset huts located next to the former stamp mill. The nature of the waste is discussed in Section 3.4 . No obvious hazardous wastes were observed on-site at the time of the site visit.

3.2 Spills and Stained Areas

Arsenic staining was noted coming from well oxidized tailings that were located along the edge of Tangier River near the former stamp mill (**Photo 12 – Appendix B**), as well as oxidizing waste rock to the southeast of the area where the Quonset huts are located (**Photo 15 – Appendix B**) No additional spills or stained areas were noted at the time of the site visit. No odours were noted on site that may be related to potential contamination.

3.3 Stressed Vegetation

Stressed vegetation was noted in the area of the well oxidized tailings that were located along the edge of Tangier River near the former stamp mill, as well as the waste rock pile located next to the Tangier River (**Photos 11–13 Appendix B**). No additional areas of stressed vegetation were noted at the time of the site visit.

3.4 House Keeping

At the time of the site visit, various debris and waste (consisting of garbage, wood, tubing, metal, drill rods, tires etc.) were littered intermittently throughout the Site, as well as stored in the one of the Quonset huts. **Table 2** below summarizes areas of waste disposal noted during the time of the site visit.

Table 2: Locations of Waste/Debris

Location	Description	Photos (Appendix B)	Approximate Coordinates	
			North	West
Quonset hut + outside of Quonset huts	Pile of scrap metal, ventilation tubing, wooden slats with core samples, former barrels, rubber tubing	Photos #6-9	44°56'09" N	62°46'24" W
Along the road that leads to the Quonset huts.	Corrugated metal piping, rock cores and rubber tire left outside exposed to elements.	Photo #10	44°56'10" N	62°46'27" W
Wooded Area – southeast of the area where the Quonset huts are located	Metal bins	Photo #16	44°56'02" N	62°46'26" W

Notes:

- please note that GPS coordinates are approximations

3.5 Former Gold Mining Areas

During the time of the site visit it was noted that abandoned historical mining-related infrastructure is still present on-site including Quonset huts, steel structure attached to Quonset hut, small plywood structure (possible former pump house) and associated waste and debris. Tailings from historical mining activities were discharged into Sluice Brook, or directly into the Tangier River and were noted on-site. Waste rock was noted in multiple locations on-site in piles and scattered throughout the Site, as described below in **Section 3.5.1**.

3.5.1 Tailings and Waste Rock

Tailings and waste rock were noted during the time of the site visit. A sparsely vegetated tailings deposit was noted along the western bank of the Tangier River. Well-oxidized sandy tailings were noted near former stamp mill. Waste rock was noted throughout the Site. **Table 3** below summarizes the areas of tailings and waste rock on-site.

Table 3: Locations of Tailings and Waste Rock

Location	Description	Observed Environmental Effects	Photos (Appendix B)	Coordinates	
				North	West
Adjacent to Quonset huts	Waste rock pile	Sparse vegetation	Photos #2, 4	44°56'33" N	62°46'22" W
Next to Tangier River	Waste rock pile	Stressed vegetation	Photo #11	44°56'08" N	62°46'12" W
Next to Tangier River	Area of vegetated tailings	Stressed vegetation	Photo #12,13	44°56'08" N	62°46'12" W
Next to Tangier River	Well-oxidized sandy tailings – orange staining	Orange staining, stressed vegetation	Photo #12	44°56'08" N	62°46'12" W
Southeast of Quonset huts	Waste rock pile	Slight orange staining, sparse vegetation	Photo #15	44°56'05" N	62°46'26" W

Notes:
- please note that GPS coordinates are approximations

Historical soil samples collected at the Site reportedly show elevated concentrations of arsenic and mercury present in the tailings on-site. Based on previous reporting completed for the Site, it was noted that the total area considered to be potentially impacted consists of 34,093 square meters (8.5 acres), with an estimated 8,217 tonnes of tailings.

3.5.2 Former Mine Shafts

Based on previous environmental reports and results from the ERIS database report, it is noted that former mine shafts are located on-site in various areas. There are four (4) former mine shafts located in the area of tailings along the Tangier River, as well as multiple mine shafts in the area along Sluice Brook. Signage was noted throughout the Site to warn the public of “hazardous open holes” (Photo 14 - Appendix B). The ponded water area located southeast of the Quonset huts might be the former Hecla mining shaft (Photo 5 - Appendix B). A large ponded body of water is located approximately 200 m northwest of the Quonset huts, which may potentially be a flooded former mine shaft.

3.6 Subsurface Utilities

Subsurface utilities were not identified as part of the Phase I ESA.

3.7 Hydraulic Lifts

No hydraulic lifts were identified as part of the Phase I ESA.

3.8 Chemical Inventories

No chemical storage was identified as part of the Phase I ESA.

3.9 Oil Water Separators

No oil water separators were identified as part of the Phase I ESA.

3.10 Vehicle or Equipment Maintenance Areas

No vehicle or equipment maintenance areas were identified as part of the Phase I ESA.

3.11 Liquid Discharge Areas

No liquid discharge areas were identified as part of the Phase I ESA.

3.12 Water Supply Locations

No water supply locations were identified as part of the Phase I ESA.

3.13 Structures Used for Previous Environmental Activity

No structures used for previous environmental activity were identified as part of the Phase I ESA.

3.14 Previous Remedial Excavation and Soil Removal

No previous excavation or soil removal was identified as part of the Phase I ESA.

4. Site and Area History

4.1 Aerial Photographs

A review of aerial photographs for the years 1931, 1935, 1948, 1966, 1982, 2004, 2012 and 2019 obtained from the Nova Scotia Geomatics Centre, National Air Photo Library, and Google Earth was conducted to develop an understanding of the history of the development of the subject property and the surrounding properties (within 250 m). Information obtained from the aerial photograph review is summarized in **Table 4** below and copies of the aerial photographs are presented in **Appendix C**.

The 2004, 2012, and 2019 photos were taken from google maps and as a result parts of the areal photographs were taking at different times resulting a line through the photograph in which each side has different levels of detail, colour, and saturation. As a result, some of the colours and site conditions may appear different on in the photos than in real life. The line occurs in the 2012, and 2019 photographs. The 2012 photograph line occurs far from site and does not impact the assessment of the site or the areas immediately next to it. The line in the 2019 photograph runs through the middle of site and makes it more difficult to determine if a site condition has changed between photos significantly or the colours are exaggerated. The photographs earlier than 1982 are black and white.

Table 4: Summary of Aerial Photographs

Year	Site	Surrounding Properties			
		North	South	East	West
1931	<ul style="list-style-type: none"> The photo is in black and white There appears to be a structure located at the main mine entrance. 	<ul style="list-style-type: none"> There are two objects near the tailings area. It is either a structure or general laydown area, however resolution makes it unclear Possible sedimentation at the end of the northwest road fork. Possible tailings or natural sediment. Unable to confirm 	<ul style="list-style-type: none"> There appears to be road leading to a circular collection (either a pile of rocks or a structure). The materials collect in a circle around the center of the collection. It does appear to be connected to the main road. It is a possible mine entrance or a small laydown area 	<ul style="list-style-type: none"> There does not appear to be any development to the east of the site. There are clearings to the far end to the Northeast are likely a part of the community of Mooseland. 	<ul style="list-style-type: none"> There does not appear to be any development to the west of site with the exception of a road leading to the area north of the site, which forks to travel north and east ending at points Northwest and directly north of the site respectively.
1935	<ul style="list-style-type: none"> The photo is in black and white and appears to be too saturated to identify any major changes to site besides tree presence The shadow of the structure from the 1931 photo can be seen A truck can be seen on the site (shape and shadow). 	<ul style="list-style-type: none"> There appears to be a significant amount of contrast in the water. It seems to be concentrated at the end of the northwest road. 	<ul style="list-style-type: none"> The area around the collection does not appear to have changed. It has not expanded nor shrunk. It is possible it is an entrance to the mine. Unable to confirm if it is still connected to the main road, but there does not appear to be evidence of traffic through it recently 	<ul style="list-style-type: none"> There does not appear to be any development to the east of site, but the photograph ends shortly to the east of the site. The Mooseland community is located to the Northeast 	<ul style="list-style-type: none"> There are bright spots which could indicate a clearing, but the photo is too saturated to confirm. The 1931 photos show similar clearings in the same area and appear natural

Year	Site	Surrounding Properties			
		North	South	East	West
1948	<ul style="list-style-type: none"> It appears work has occurred around and through the main site laydown area as trees are sparser. However, it could be unrelated to work to the mine (storm or logging work) 	<ul style="list-style-type: none"> There appears to be some forest clearing on the north road towards the north outfall beside river. Possible future development or logging 	<ul style="list-style-type: none"> The area shown in the 1931 and 1935 photos appears to be closed off. It is no longer clearly connected to the road and trees have begun to grow into the area 	<ul style="list-style-type: none"> There is a small clearing on the southern side of the road east from site, but unclear if related to the mine (operations or exploratory) or if another party 	<ul style="list-style-type: none"> There does not appear to be any development to the west of site except for a road leading to the area north of the site
1966	<ul style="list-style-type: none"> Trees are growing throughout the site area and are obstructing the view of the ground. 	<ul style="list-style-type: none"> The tailings areas appear to be slowly flowing into the river. The more southern area appears to have developed a river delta. Trees have overgrown the area with the exception of the tailings areas. 	<ul style="list-style-type: none"> No clear evidence of the area mentioned in the other photographs exist. There are significantly more clearings with white lines within and tire marks leading in and out. It's possible that the trees in the area are being logged. 	<ul style="list-style-type: none"> Some gravel clearings on the southern side of the road have been developed, but are significantly east of site 	<ul style="list-style-type: none"> There does not appear to be any development to the west of site except for a road leading to the area north of the site. However, it has started to become obscured by trees
1982	<ul style="list-style-type: none"> First photo in colour. There is a clearing in the former site; however, the reason for this clearing is unknown. There appears to be a pile of fallen trees in the northern part of the site 	<ul style="list-style-type: none"> The tailings a river delta is visible underwater from the sky and connects the outfall areas. More northern tailings area has some vegetation but remains mostly clear. 	<ul style="list-style-type: none"> There appears to be a second clearing of sorts across the street within the same area as the previous clearing, however it could be from the logging industry 	<ul style="list-style-type: none"> Tailings appear to be present in the river indicated by a change of colour to the East and a significant presence is to the northeast 	<ul style="list-style-type: none"> There does not appear to be any development to the west of site except for a road leading to the area north of the site. However, it has become obscured by trees The photo ends shortly after the road
2004	<ul style="list-style-type: none"> All further photos were sourced from Google Earth. A settling pond has been built to the northwest of the site area. The site has a new laydown area and reshaped to accommodate this work. A possible mine entrance is located to the southeast of the site and potentially in the center as well 	<ul style="list-style-type: none"> The delta is no longer visible however it appears that some of the sediment has accumulated pushing the shore further out The wet area in the tailings pond appears to have changed from a straight path to a wider shallower footprint 	<ul style="list-style-type: none"> There are two water bodies that appear to be isolated in the area of the precious noted clearing. Possible mine entrance. There are near-grid-like clearings to the south off the road. Possibly logging industry work 	<ul style="list-style-type: none"> There have been no developments to the east of the site. The town of Mooseland is to the Northeast 	<ul style="list-style-type: none"> No major development to the west of the site. A road network appears to have developed to the Southwest along the road, but is far from site and not likely related

Year	Site	Surrounding Properties			
		North	South	East	West
2012	No visible change from the 2004 photograph	Does not appear to be different from 2004	Does not appear to be different from 2004	Does not appear to be different from 2004	Does not appear to be different from 2004
2019	<ul style="list-style-type: none"> ▪ The 2004 laydown area appears to be mostly removed and trees have overgrown the area. ▪ The area to the southeast appears to be flooded. Possibly a mineshaft for the laydown area ▪ The pond located in the center may be another. 	<ul style="list-style-type: none"> ▪ There are a number of brown spots in the forest around the tailings areas. ▪ The sediment in the more north tailings area appears to have washed out and is now a part of German Lake rather than flowing into it 	<ul style="list-style-type: none"> ▪ The area to the south appears to have been fully cleared of trees. Tire marks are visible. Likely logging ▪ There are a number of smaller waterbodies near the road. Possible entrances for the mine; however, most have not been uncovered before and it's unclear which would be naturally occurring from this level of review 	<ul style="list-style-type: none"> ▪ It appears that the trees have been cleared from the areas surrounding the road since the last photograph. Possibly a result of logging 	<ul style="list-style-type: none"> ▪ Significant discolouration observed within the forest area.

4.2 Interviews

The person identified (Ernie Hennick) for the Phase I ESA interview is currently on sick-leave and not available to complete an interview. No others were identified as potential interviewees. Due to the age of the historic mining activity on the Site, it is unlikely anyone involved in the project would be available for interviewing. As such, No interviews were completed as part of the Phase I.

5. Database and Records Review

5.1 Land Titles

Land titles were reviewed via NS Property Online database. A listing of the most recent deeds available for review is provided in **Table 5** below. A summary of the documents obtained from NS Property Online database is included in **Appendix D.1**.

Table 5: History of Ownership

PID Number	Title Number	From	Owner
41019332	<ul style="list-style-type: none"> ▪ 114553465 - 2019 EASEMENT/RIGHT OF WAY ▪ 97053574 Book 8113 Page 252 – 2010 ECT 43 - NOTICE OF REGISTRATION 	<ul style="list-style-type: none"> ▪ Jun 03, 2019 ▪ Oct 22, 2010 	<ul style="list-style-type: none"> ▪ Her Majesty the Queen in Right of the Province of Nova Scotia ▪ NS Department of Natural Resources

5.2 ERIS Search

A site-specific report was ordered from EcoLog ERIS Ltd., an environmental database and information services company, which provides environmental and historical information compiled from government and private source records. The report included a search of forty-five (45) databases for the Site and adjacent properties within a 250 m radius of the site. The entire property boundary, as shown on Property Online, was defined as the “Property Project” for this ERIS report.

The ERIS search results showed information was available for the Site and surrounding properties for the following databases:

Project Property (“Site”):

- Abandoned Mine Openings – 99
- Drill Holes – 133
- Mineral Occurrences – 3
- Water Well Information – 4

Surrounding Properties (250 m radius):

- Abandoned Mine Openings – 11
- Contaminated Sites – 1
- Drill Holes – 56
- Mineral Occurrences – 1
- Water Well Information – 1

A summary of the information obtained within the databases is provided below. A copy of the ERIS report is provided in **Appendix D.2**.

Abandoned Mine Openings (ABMN): This is a listing of over 7000 abandoned mine opening in the province of Nova Scotia and includes information such as name of mine, shaft id, mineral, location, type, original depth, designated hazard, and last time the shaft was visited, geographic coordinates are available for all records. This data was obtained from the NS Ministry of Natural Resources, Minerals and Energy Branch.

- A search of the ABMN database, dated Mar 31, 2020 has found that there are 110 ABMN site(s) within approximately 250 m of the Site.
- On the Site itself, there is noted to be 99 abandoned mine openings associated with the following: Mooseland Mining Syndicate Big South Lead Shaft, Beneficiary Gold Mining Company Furnace Lead Shaft, G. H. Hilchey Cut, John Morrell Shaft, Cummings Shaft, John Morrell Cut, Fraser Shaft, Peter Joe Cut, Wallace (Wall) Jackson Irving Belt Shaft, Humber Gold Mining Company Shaft, W. Yeadon Shaft, Azure Resources Corporation Decline, Arlington Gold Mining Company Shaft, Wallace (Wall) Jackson Shaft, Hecla Mining Company of Canada Ltd. Main Shaft, and Mooseland Gold Mining Company Stemshorn Shaft
- Within 250 m of the Site, there is noted to be 11 abandoned mine openings associated with the following: Mooseland Gold Mining Company Stemshorn Shaft

Contaminated Sites (CS): A list of contaminated sites provided by the Contaminated Sites Program at Nova Scotia Environment. Nova Scotia has provincial requirements for the reporting, management and cleanup of contaminated sites. Nova Scotia Environment makes no representations or warranties on the accuracy or completeness of the information provided.

- A search of the CS database, dated Jul 31, 2021, has found that there are 1 CS site(s) within approximately 250 m southeast of the Site.
- There was a contaminated site located at 294.5 m southeast from the Site - 2 Island Drive, River Lake-Incident. The status of the report is closed. No further information was provided.

Drill Holes (DRL): The Mineral Resource Branch (MRB) of the NS Department of Natural Resources (NSDNR) was searched for information on drill holes. This database contains information on diamond drill holes in Nova Scotia, most of which were drilled for the purpose of mineral and petroleum exploration. Information for over 20,000 drill hole records includes: location (place, northings and eastings), depth of hole, exploration company, year drilled, licensee, and mineralization.

- A search of the DRL database, dated 1900-Feb 2016 has found that there are 189 DRL site(s) within approximately 250 m of the Site.
- On the Site itself, there is noted to be 133 drilled holes associated with the following companies: Acadia Mineral Ventures, Mackinnon R P NSgold Gillick R E Robert E Gillick And Associates D R, Mackinnon R P NSgold Royminetech International, Rogers D P, Hecla Mining, Brichant A L Belgo-Canadienne Mining Holding Company, and Azure Resources Globex Mining Enterprises Covey, G, Albert, C P.
- Within 250 m of the Site, there is noted to be 56 drilled holes associated with the following companies: Acadia Mineral Ventures, Hecla Mining, Mackinnon R P NSgold Gillick R E Robert E Gillick And Associates D R, and Mackinnon R P NSgold Roy D Minetech International.

Mineral Occurrences (MNR): The Nova Scotia mineral occurrence database provides information on documented metallic and industrial minerals. Data is provided regarding the geographical location of each occurrence, occurrence number and name, commodity type, mineral characteristic and status. Please note the following disclaimer: NSDNR has long maintained separate card-file inventories of the province's mineral occurrences. Unfortunately, these inventories are lacking in that they are incomplete, fraught with erroneous data and do not include many mineral occurrences discovered since the mid 1970's. Since 1993, the database has undergone considerable clean up, but one should not conclude that the database houses information on all mineral occurrences in the province.

- A search of the MNR database, dated 1800-Feb 2016 has found that there are 4 MNR site(s) within approximately 250 m of the Site.
- On the Site itself, there is noted to be 3 mineral occurrences associated with the following: Mooseland Au District
- At a distance of 186.6 m from the Site, one mineral occurrence was identified which is associated with the Mooseland Au District

Water Well Information System (WWIS): This database is taken from the Well Log Database Management System compiled by the Nova Scotia Department of the Environment. The Well Logs database logs all wells dug or drilled in the province. There are approximately 65,000 records but none of the records have coordinates. This is a comprehensive database with information such as: well owner, location, yield, use, depth, status, well type, and stratigraphy. Note: The well location may be the actual location of the well or the well driller address.

- A search of the WWIS database, dated 2000-Jul 2018 has found that there are 5 WWIS site(s) within approximately 250 m of the Site.
- On the Site itself, there is noted to be 4 water wells.
- At a distance of 247.8 m from the Site, there appears to be 1 water well noted.

5.3 Previous Environmental Reports

Previous environmental reports were provided to AECOM by NSLI. A summary of the reports is provided below, and the reports that have relevant information for the Site are included in [Appendix D-3](#).

5.3.1 Mill Village and Mooseland Gold Districts Mines Report, prepared by NS Department of Public Works and Mines (1929)

This is a compilation of information concerning the two gold districts of the Province of Nova Scotia. It contains a record of data obtained from the Annual Reports of the Department of Mines for the Mill Village and Mooseland Gold Districts. The Mill Village gold district is not relevant to conditions near Mooseland, as it is approximately 170 km southwest of the Mooseland gold district. The authors provide a timeline of describing historical activities that took place on the Mooseland Gold District between 1872 and 1911. The timeline can be summarized as follows:

- 1872: Mr. J Irving expanded and developed a mine owned by the Humber Gold Mining Company. Stopping was done along the Irving lead above the water level over a length of 180 feet, the Furnace lead was re-opened, and the mine shaft on the Furnace lead was sunk an additional 20 feet.
- 1892: G. Stemshaw sunk a mine shaft in a basin 120 feet away from the river (presumably referring to the Tangier).
- 1896: William Yeadon worked on the Cummings belt, with a mine shaft 40 ft. in depth. Additionally, H.G. Stemshaw was prospecting his property and various belts and leads were opened in several locations.
- 1899: Nothing was done at the mine since Dec 1898, when the mill was burned.
- 1900: The Arlington Gold Mining Company built a 10-stamp mill.
- 1902: Preparations were made to pump water out of the Argonaut Company's mine shaft, and to resume operations on the Cummings belt.
- 1911: E.E. Fraser and others worked on a lead located west of the E.E. Fraser mill and about 200 feet west of Mooseland road. Only one crushing comprising 12 tons of material, was made this year.

The author does not make any conclusions, as this report is intended to only provide a record of data.

5.3.2 Gold Fields of Nova Scotia, prepared by Wyatt Malcolm based on the work of E.R. Faribault (1929)

This memoir provides a compilation of geological and historical information regarding numerous gold mining districts in Nova Scotia. The data and facts of this report were gathered from studies conducted by E.R. Faribault. A short excerpt of this document includes geological and historical information pertinent to the Mooseland gold district. Geological information presented in [Section 2.4.2](#) was gathered from this resource, among others. Relevant historical information provided in this report can be summarized as follows:

- The first gold mining operations began in 1861, with a stamp mill consisting of 4 wooden stamps built in 1862. This stamp mill was replaced by a better one built the next year. Due to the difficulty in accessing the district, little progress was made over the next several years.
- In 1866, a “*passable road*” (perhaps referring to Mooseland Rd.) was completed, accompanied by an increase in mining activity in the Mooseland Gold District. Between 1866 and 1868, the Beneficiary Gold Mining Company carried out work on the Furnace, Cumminger, and Specimen leads. Mine shafts were sunk, and stoping was completed.
- In 1869, The Beneficiary Gold Mining Company sold their mining interests to Humber Gold Mining Company. The Irving Belt was discovered this year, and mining operations continued to 1871, with an 8-stamp mill.
- Between 1872 and the early 1880s, tributaries carried out work with the existing mine workings, extending and developing them.
- In 1884, auriferous boulders were found in “North Mooseland”, resulting in prospecting in that area and a discovery of leads. In 1890, the Bismarck lead was discovered, which was worked on by the Mooseland Gold Mining Company the same year. The next year a 5-stamp mill was built. Production between 1891-1894 ranged between 893 to 1355 tons of ore crushed annually. A new 10-stamp mill was built in 1895. The author doesn’t specify the timespan these operations continued in North Mooseland.
- In 1898, the Musgrave areas were purchased by Arlington Gold Mining Company. An old 4-stamp mill was being used for mining of the Lake lead. This mill burned down in December. A new 5-stamp mill was built in 1901. The author doesn’t specify the duration these operations continued.
- A small amount of work was reported in 1910, 1911, and 1914. The author notes that little or nothing had been accomplished in several years leading up to the when this memoir was published (1929).

5.3.3 “Mooseland District” (Unnamed Author, Unknown Date)

This is two short paragraphs of text titled “Mooseland District”. One paragraph has the heading “1932”, and the other has the heading “1933”. The following potentially relevant information regarding the Site and adjacent properties was extracted from this text:

- It appears that a 3-stamp test mill was built in 1932, and an oil-driven compressor and hoist were installed on the shaft of the “South Lead”.
- In 1933, the shaft of the “South Lead” was de-watered to allow for further work, and the 3-stamp test mill was used to process several tons of ore.

5.3.4 Letter regarding the Mooseland district visit on Nov 29, 1934 (Unnamed Author, December 1934).

This 1-page letter describes the state of gold-prospecting in the Mooseland area on November 29, 1934. The author is not identified, and it is unclear for whom, or what organization, this visit was conducted. Besides the indication of potential preparation for mining activities in the Mooseland Gold District, no additional relevant information was presented in the document in relation to the Site or adjacent properties.

5.3.5 Tabular Report on Production by Mills in the Mooseland Area (Unnamed Author, Unknown Date)

This appears to be an excerpt from an unidentified document and provides data on ore crushed and the yield of gold for various mills in the Mooseland Gold District, including the Mooseland Mill, Yeadon’s Mill, Arlington Mill, E.E. Fraser’s Mill, and miscellaneous mills. There is no author, title, or date listed. Below outlines information regarding the activity of the mills up to the unspecified year of the document (the latest date reported in the document is Oct 30, 1913):

- Mooseland Mill: ore-crushing data was reported from 1889 to 1902, during which the mill was intermittently active. The peak amount of ore crushed was reported as approximately 2000 tons in a roughly 1-year span.
- Yeadon's Mill: ore-crushing data was reported at this mill for 1897 and 1898. Over these two years, the mill was reported to have crushed 115 tons of ore.
- Arlington Mill: ore-crushing data was reported for 1898 and 1903, during which the mill was intermittently active, crushing a total of 339 tons of ore over this timespan.
- E.E. Fraser's Mill: ore-crushing data was reported for 1906 and 1908 only, during which the mill was intermittently active. After 1908 the mill appears to have been idle and eventually surrendered its license (some time around after October 30, 1913). The total amount of ore crushed by the mill was reported as 106 tons between 1906 and 1908.
- Miscellaneous Mills: three miscellaneous mills contributed to 109 tons of ore crushed between 1892 and 1899. These mills were identified as the "Musgrave", "Northup Mill", and "McMann Mill" and operated in 1892, 1896, and 1899, respectively.

5.3.6 The Gold District of Mooseland County of Halifax, Nova Scotia, prepared by A.L. Brichant (October 1937)

In 1937, A.L. Brinchant (geologist) conducted gold-prospecting and subsequent reporting for a private entity engaged in a contract to purchase Mooseland mining areas (Jean Bilterijst, engineer). The terms of agreement between the two parties included a joint venture in future mining activities. The investigations included geological characterization and a subsequent analysis of prospective economic gains for exploitation of geological materials potentially containing gold ore. The works included drilling five boreholes (comprising a total of 2920 feet of geological materials) and analyzing geological composition throughout these boreholes. The drilling operations were carried out July 27 to Sept 9, 1937. These boreholes were drilled over an east-to-west distance of 2100 feet on the historical "Musgrave property". The Musgrave property is named after an Englishman who had undertaken mining activities in the area in 1882 (Malcolm 1929). It appears to be a historical name for the area but is not retained in more recent literature.

The author offers the following conclusions:

- *"The part of the stratum which [their field team] investigated at Mooseland shows a minimum of 300,000 tons of ore capable of being exploited economically, which has yet to be determined.*
- *This stratum shows interesting possibilities of extension to the East of the occidental fault.*
- *Beyond the identified belts there are chances of finding others according as the work progresses.*
- *The comparisons with the strata at Seal Harbour as well from geological as from a mineralogical viewpoint enable us to figure on a very low-cost price for the exploitation and treatment of the ore."*

5.3.7 Report on The Mooseland Gold District, Halifax County, Nova Scotia, prepared by A.L. Brichant (dated September 1938)

In continuation of the investigation reported by A.L. Brichant described above, four additional boreholes were drilled in February and March 1938, comprising an additional 2711 feet of drilled geological materials. The splitting and sampling of cores was performed at the Geological Department of Dalhousie University. Synthesizing and interpreting the results from all nine boreholes examined, the author concludes that the drilling investigations assisted in the following:

- Confirming the continuity of two known belts from old workings
- Revealing presence of gold on a wide-spread area of 2100 x 1100 feet to a maximum depth of 550 feet
- Discovering two new belts of great importance
- Elucidating the presumed structure of the subsurface anticline composed of Precambrian sedimentary rocks beneath the historical Musgrave properties

Considering the results of the gold-prospecting conducted, the author recommends further testing by means of underground exploration and milling of material extracted from various belts.

5.3.8 Report on Mooseland by J.B. Mawpley (dated February 1938)

This reports on the results of the summer of 1937 investigations carried out by Brichant (1937). It appears to provide an independent assessment of the data collected during these investigations, perhaps due to the vested interest A.L. Brichant had in the success of the gold-prospecting campaign. The main recommendation was for additional drilling activities to be conducted, due to the lack of certainty regarding economic returns that may be result from future mining activities on the prospected property. This led to the additional drilling discussed in [Section 5.3.7](#).

The report also provides relevant background information regarding regional geology and historical mining production in the Mooseland Gold District. Geological information presented in [Section 2.4.2](#) was gathered from this document, among others. Historical mining production was described as being intermittent from the 1860s to 1903. The author states that after this time, the area had “*attracted little attention till recently*”, indicating a reduction or cessation in mining activities during the period from 1903 to 1938, when this document was written.

5.3.9 Environmental Geochemistry of Tailings, Sediments, and Surface Water Collected from 14 Historical Gold Mining Districts in Nova Scotia, commissioned by the Geological Survey of Canada/Natural Resources Canada, prepared by Parsons et al. (2012)

Environmental geochemistry investigations of Mooseland gold district (and 13 other gold mining districts) were conducted in 2003. In May and October 2003, tailings associated with a historical stamp mill were sampled in seven locations (2-4 replicates at each location, at varying depths of < 1 m) along the west bank of the Tangier River, near the former Mooseland Gold Mining Company Property. These sampling locations are situated in the northeast portion of the Site, with the historical stamp mill located approximately 160 m northeast of the civic address of the Site (3630 Mooseland Rd). Elevated levels of arsenic and mercury were discovered in these samples. Arsenic concentrations ranged from 2580 mg/kg to 256,000 mg/kg, across all sampling locations. Mercury concentrations ranged from 762 µg/kg to 30,000 µg/kg across all sampling locations. The maximum arsenic and mercury concentrations were measured at the sampling location immediately northeast of the former stamp mill associated with the tailings analyzed.

The authors state the following conclusions regarding these analytical results: “*The highest As and Hg concentrations are found in hardpan material, which may represent the oxidized remains of sulphide concentrate. The relatively high As and Hg concentrations in these tailings reflects the inefficiency of these early stamp mills.*”

6. Regulatory Information

6.1 Nova Scotia Environment – Environmental Registry Search

A request was made to NSE to complete an environmental registry search for the Site. The results of this search stated that no information was located through the Environmental Registry with regards to the Site.

A copy of this correspondence has been provided in [Appendix E](#).

7. Summary of Findings

The Phase I ESA was conducted in accordance with the Nova Scotia Environment (NSE) Contaminated Sites Regulations (July, 2013) and the NSE Phase I Environmental Site Assessment Protocol (PRO-300) and in conformance with Canadian Standards Association (CSA) guideline for conducting Phase I ESAs (CSA Standard Z768-01 (R2016)).

The objective of the Phase I ESA is to identify any areas of potential environmental concern (APECs) related to the past or current use of the Site and adjacent properties with an emphasis on the usage, handling and storage of hazardous materials / chemicals that may have impacted soil and/or groundwater quality. A secondary objective of the ESA is to make recommendations to address any APECs identified during this study.

Based on the results of the Phase I ESA, AECOM identified the following key information:

1. The Site is located in an area of historic mining activity in the Mooseland gold district. Mining and milling activities have been carried out intermittently in the area between 1861 and 1934, during which 120 kg of gold was reported to be recovered from 8217 tonnes of crushed rock. Since then, sporadic exploration has continued. The most serious effort made was by Acadia Minerals and Hecla Mining in the late 1980s, with the drilling of 135 boreholes, and the sinking of a 400-foot shaft. In 2003, Azure Resources Corporation optioned the Mooseland property and in late 2003 and early 2004, the company established a decline and carried out bulk sampling of the Little North and Cummings belts.
2. The surrounding area on the west, east, and south sides of the Site appeared to be resource forest area and undeveloped, and Tangier River is located north and adjacent to the Site. The closest building to the Site is the Saint Thomas Anglican Church which is located over 1.2 km from the Site. It is also noted that there appears to be a local fishing area located in Tangier River, downstream and approximately 1.3 km from the Site called "Hawbolts Farm Pool". No additional details were able to be found related to this fishing area. Based on a review of topographic maps, it appears there is a mine located approximately 1.75 km northwest of the Site. Based on a review of the results of the ERIS search, within 250 m of the Site there appears to be a number of abandoned mine openings, one contaminated site, a number of drill holes, mineral occurrences, and water wells.
3. Current structures located on-site during the time of the site visit include the following:
 - Quonset Hut:
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open. No back wall - the back of the hut is open and attached to a steel structure.
 - Insulated: no
 - Contents: garbage / waste
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
 - Notes: currently attached to steel structure noted below.
 - Quonset Hut (insulated):
 - Building details: concrete slab with metal (steel) walls and roof
 - Insulation: yes - yellow insulation (potential asbestos containing material)
 - Contents: wooden boxes old core samples
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area.
 - Quonset Hut (newer):
 - Building details: concrete slab with metal (steel) walls and roof. No front wall – entrance is open.
 - Insulated: no
 - Contents: wooden boxes - newer core samples
 - Location: cleared area at the end of the road off of 3630 Mooseland Road – adjacent to waste rock area. On other side of the road from the other Quonset Huts.
 - Notes: this newer storage area may belong to Atlantic Gold.
 - Steel structure:
 - Building details: steel structure

- Insulated: not applicable
- Contents: not applicable
- Location: attached to Quonset Hut that is currently storing garbage / waste
- Notes: potential that this structure was a headframe over a mine shaft for two separate compartments. The houses at the top likely protected pulleys of hoists, there were no wire ropes present.
- Small plywood structure (possible former pump house):
 - Building details: plywood structure with roof. Piping entering the structure.
 - Insulated: no
 - Contents: empty
 - Location: located near a ponded water area, which is potentially the former Hecla Mine Shaft, that was located to the southeast of area where the Quonset huts are located
 - Notes: piping entering the back of the structure

The three former stamp mills that were known to be located on-site were not identified at the time of the site visit.

1. A sparsely vegetated tailings deposit was noted along the western bank of the Tangier River. Well oxidized sandy tailings were noted near former stamp mill. Waste rock was noted throughout the Site.
2. At the time of the site visit, various debris and waste (consisting of garbage, wood, tubing, metal, drill rods, tires etc.) were littered intermittently throughout the Site, as well as stored in one of the Quonset huts located next to the former stamp mill.
3. Historical soil samples collected at the Site reportedly show elevated concentrations of arsenic and mercury present in the tailings on-site. Based on previous reporting completed for the Site, it was noted that the total area considered to be potentially impacted consisting of 34,093 square meters (8.5 acres), with an estimated 8,217 tonnes of tailings.
4. Based on previous environmental reports and results from the ERIS database report, it is noted that former mine shafts are located on-site in various areas. There are four (4) former mine shafts located in the area of tailings along the Tangier River, as well as multiple mine shafts in the area along Sluice Brook. Signage was noted throughout the Site to warn the public of "hazardous open holes". The ponded water area located southeast of the Quonset huts is potential to be former Hecla mining shaft.

8. Recommendations

Based on the results of the Phase I ESA, AECOM recommends the following:

Solid Waste Management:

1. A survey of all debris and solid waste should be conducted prior to disposal. Insulation should be sampled to see if it contains asbestos.
2. All debris and other solid wastes should be removed from the Site and disposed in compliance with Provincial and Municipal legislation. Characterization of the waste should take place prior to or concurrently with removal.

Potential Environmental Contamination:

1. A Phase II ESA program should be conducted to investigate potential environmental contamination of soil, surface water and groundwater on the Site as a result of historical gold mining operations and the waste generated during that time. The Phase II ESA should focus on known areas of concern such as known tailings areas, waste storage areas, former stamp mill areas, pond/ former shaft areas and any known waste discharge locations. It is expected that the primary Contaminants of Concern (COC) will be heavy metals (arsenic and mercury).

Additional items to be considered include the following:

Physical Hazards:

1. In addition to debris and solid waste, a survey of manmade structures identified on-site (steel structure (potential headframe)), Quonset huts, former pump house) should be conducted to identify those that require remedial actions. If determined that the manmade structure should be removed, the materials should be disposed of in compliance with Provincial and Municipal legislation.
2. A survey of former mine shafts should be conducted to identify those that require remedial actions to address physical hazards such as excessive drops and/or falls.

A detailed Phase II field program memo has been developed for the Site. This memo includes a proposed field program to address the areas of concern identified in this Phase I ESA. The Phase II field program memo has been submitted under a separate submission.

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