

Environmental Assessment Registration
of a Class I Undertaking, Pursuant to Part IV of the Environment Act,
N.S. Reg 52/2005

Project
Asbestos Waste Disposal Facility

Proponent
Arlington Heights C&D Limited

Date: March 2017

Environmental Assessment Prepared by:



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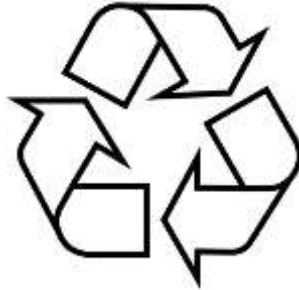


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Executive Summary

Arlington Heights C&D Limited (the Proponent) wishes to continue to operate its existing asbestos disposal facility operations at Arlington Road West, Annapolis County, Nova Scotia. The Proponent is required to register this project as a Class I Undertaking pursuant to the Environment Act, and obtain approval as a term and condition of their existing Industrial Approval.

The Project Area is situated on the north-facing slope of the Annapolis Valley's North Mountain, on lands owned by the Proponent. The Project Area lies in an existing industrial setting adjacent to a construction demolition and debris disposal facility in a rural setting of Annapolis County. The proposed Undertaking site for existing and expansion of continued operations is fallow field, mixed wood forest, and abandoned farmland habitats that together total 6.25 ha.

The proposed Undertaking consists of the receiving and disposal of waste, followed by progressive reclamation of filled disposal cells. The proposed Undertaking is intended to allow for the continuation of asbestos disposal operations at the Arlington Heights C & D Limited facility. Disposal rate is anticipated to remain approximately constant at the current rate of roughly 350 truckloads a year. A project timeline of 15 years is anticipated, but may vary considerably with demand for provincially approved disposal facilities. The progressive reclamation of operational areas over the life of the project will limit disturbed operational area to approximately 1 ha at any point in time.

An extensive range of mitigation measures are proposed to minimize adverse environmental impacts of the project. Taking these measures into account, several residual impacts are anticipated. These include: negative impacts of loss of existing mixed wood and old field habitats, low level operational noise, temporary partial displacement of terrestrial and avian fauna, as well as positive effects of increased grassland area for bird nesting and fall migration forage and the maintenance of employment in rural Nova Scotia. When the negative residual effects are considered within their ecological setting as well as temporal and spatial context, it is concluded that there will be no significant adverse environmental effects arising from the proposed project.

1. Proponent Description

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Proponent Contact: Jennifer Poole
Location of Undertaking: 1481 Arlington Road West, Hampton, NS
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Company President: Valerie F. Poole

Signature of Proponent Signing Officer:

Valerie F. Poole
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Date

Environmental Assessment Registration Document

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Date

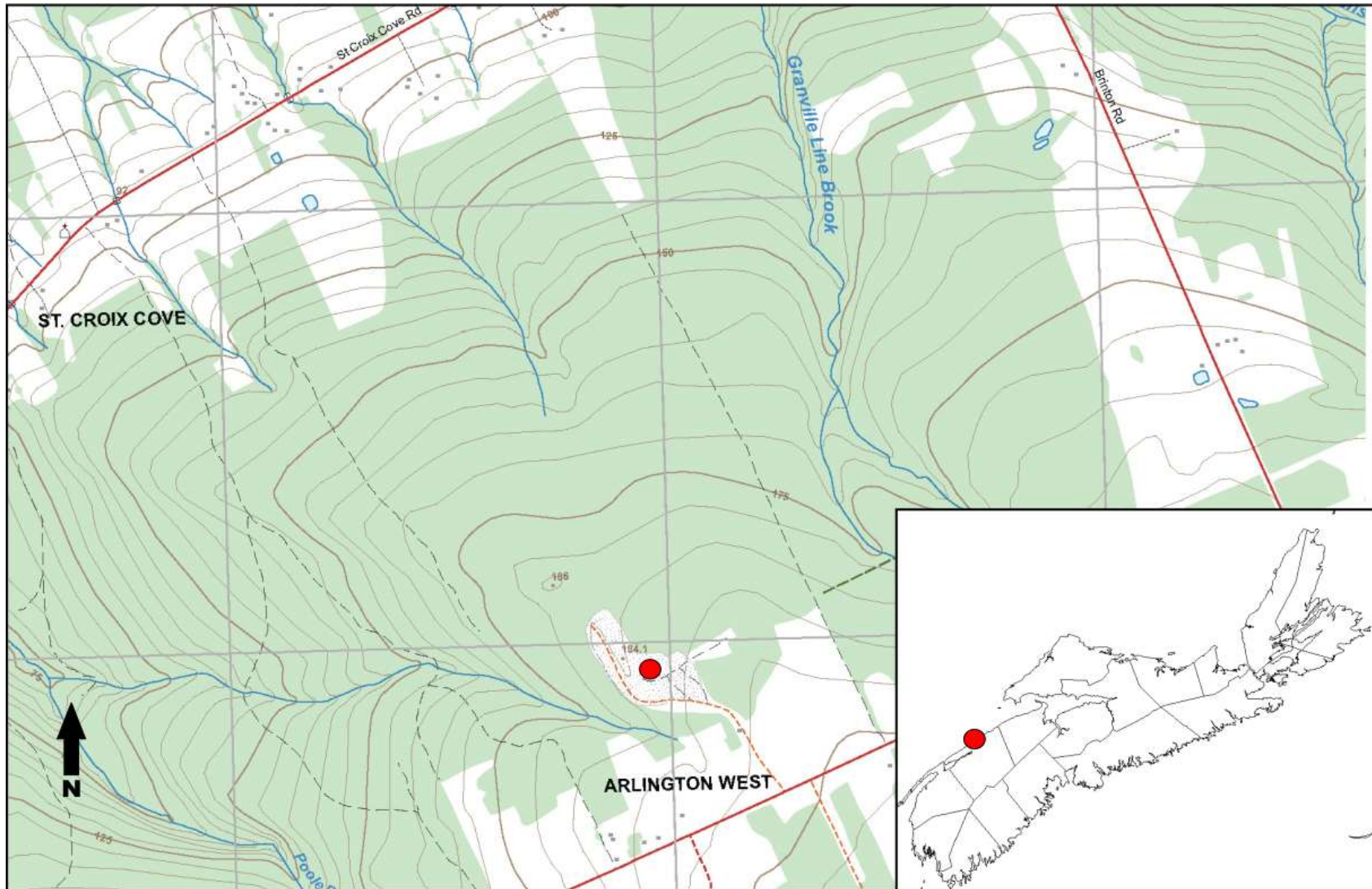


Figure 1: The Arlington Heights C & D Limited proposed asbestos disposal facility is located in Arlington West, Annapolis County, Nova Scotia as indicated by the red dot.

2. The Undertaking

2.1 Name

Asbestos Disposal Facility

2.2 Location

The Project Area is approximately 8 km north of the Town of Bridgetown within the community of Arlington West, Annapolis County (Figure 1). The currently operating asbestos disposal facility is immediately adjacent to the proponent's existing construction and demolition debris disposal site. The asbestos disposal facility is proposed to progressively expand into adjacent Mixed Wood forest and old farm field habitats (Figure 2). The site is located at: 1481 Arlington Road, at UTM 20T 319602 4975656 (NAD83). The area referred to herein as the *Study Area* for this assessment, generally includes the six PID's owned by the proponent (Figure 3) as listed in Table 1, totalling approximately 57 hectares.

Table 1: Arlington Heights C&D Limited study area properties for the proposed asbestos disposal facility.

PID	Owner	Approx. Size (ha)
05127873	Arlington Heights C&D Limited	11
05127881	Arlington Heights C&D Limited	2.4
05127899	Arlington Heights C&D Limited	16.6
05127269	Arlington Heights C&D Limited	4
05127907	Arlington Heights C&D Limited	10
05128160	Arlington Heights C&D Limited	13

3. Scope

The following sections detail the scope of the proposed asbestos disposal facility in terms of physical area, operational activities, purpose, need, and alternatives considered. This section further details the scope of Environmental Assessment (EA) activities undertaken in compiling the registration document.

3.1 Scope of Undertaking

Arlington Heights C&D Limited (AHCD) wishes to continue the construction, operation and reclamation of an Asbestos Disposal Facility established at Arlington West, Annapolis Country, Nova Scotia since 2012. The past, current and future operations are proposed to cover six cells, defined herein as *Phase #* cells, through a phased expansion and reclamation process totalling 6.25 ha, defined herein as the *Project Area*. This Project Area will fall within the six interconnected proponent properties that form the project Study Area of 57 ha and lie immediately adjacent to an industrial construction and demolition debris disposal site owned and operated by the proponent on the same properties since 2004.

The proposed *Undertaking* consists of the continued construction, operation, expansion, reclamation and decommissioning of an asbestos disposal facility. The proposed activities to be undertaken at the site include, but are not limited to:

- i. Installing earthen sedimentation traps covered in geotextiles, and stabilized with clean stone and seeding.
- ii. Constructing drainage ditches to move surface water from the Undertaking into the sedimentation traps, and along preferred drainage paths.
- iii. Grubbing of some or all of an individual Phase cell surface area, and placing grubbing's either in an area for future reclamation use or over the surface of a cap completed previous Phase cell as part of the progressive reclamation.
- iv. Excavation of an area of immediate need within an individual Phase cell to an approximate depth of 4-5m, and placing spoils adjacent to the excavation to be available for immediate cover of disposed asbestos waste.
- v. Receiving, weighing and placing approved asbestos abatement waste material into the recently excavated area of need.
- vi. Covering the waste material within twenty-four hours with a minimum of 25 cm of soil.
- vii. Completing an area of immediate disposal when a height of 2-3m above grade has been reached through the process outlined in v and vi above.
- viii. Completing progressive reclamation of part or all of one Phase cell by placing mineral soil and a topping of salvaged grubbing's across the surface until a total cover not less than 125 cm is achieved, and immediately mulching and seeding the reclaimed surface.
- ix. Completing progressive reclamation of part or all of one Phase cell such that no more than 10,000 m² (1 ha) of completed area (as described in vii above) exists across the entire operation at one time. This equates to the average surface area of one Phase cell for the proposed operation.
- x. Decommissioning of all infrastructure associated with the Undertaking once reclamation is completed and all operations have ceased.

3.2 Purpose and Need for the Undertaking

AHCD Limited is required to register this project as a Class I Undertaking pursuant the Section 49 of the Environment Act, N.S. under the Terms and Conditions of their current Industrial Approval No: 2005-045327-T01. This requirement falls from asbestos being considered a dangerous good as described in the Asbestos Waste Management Regulations, and Schedule A of the Environmental Assessment Regulations, Section E (Waste Management) (1) indicating that, "A facility for storing, processing, treating or disposing of waste dangerous goods that were not produced at the facility, other than facilities operated by, or on behalf of, a municipality or Provincial agency for waste dangerous goods collected only from residential premises." This document is intended to fulfil the primary requirements for the project registration under the legislation.

The federal government recently announced a ban on production and use of all products containing asbestos by 2018¹. Although this limits the long-term future need for asbestos disposal facilities, large volumes of asbestos currently in constructed facilities will need to be removed as facilities are replaced or renovated. This removal will require proper disposal facilities for a number of years or decades. As of April 2015, AHCD was one of seven sites identified by Nova Scotia Environment for the disposal of asbestos (NSE 2017) in the

¹The Canadian Press. 2017. *Federal government moves to ban asbestos by 2018*. Halifax Chronicle Herald. December 15, 2016.

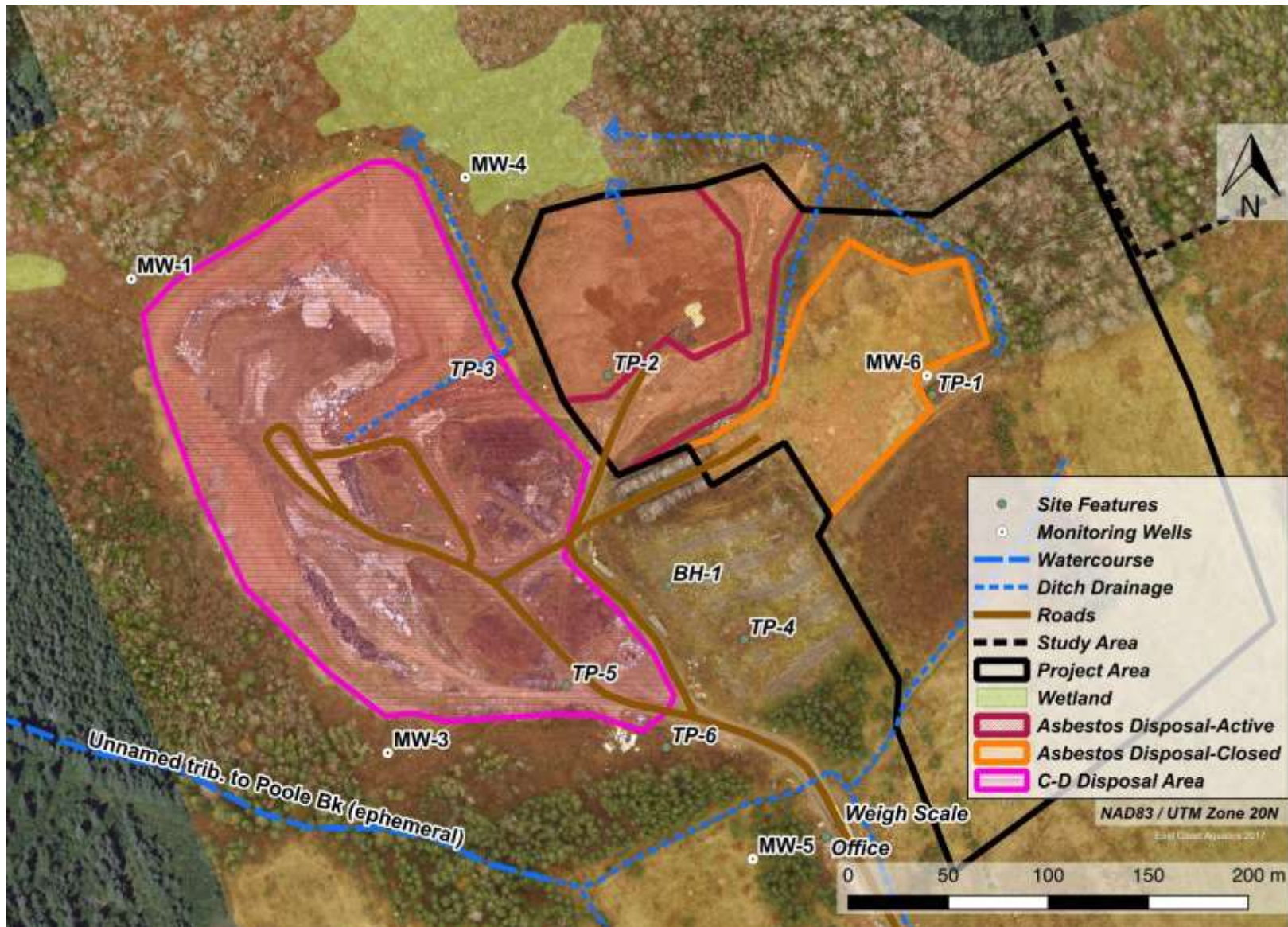


Figure 2: Site overview based on 2017 drone imagery shows the Project Area, including completed and current asbestos disposal cells, and overall boundary of future proposed asbestos disposal operations.

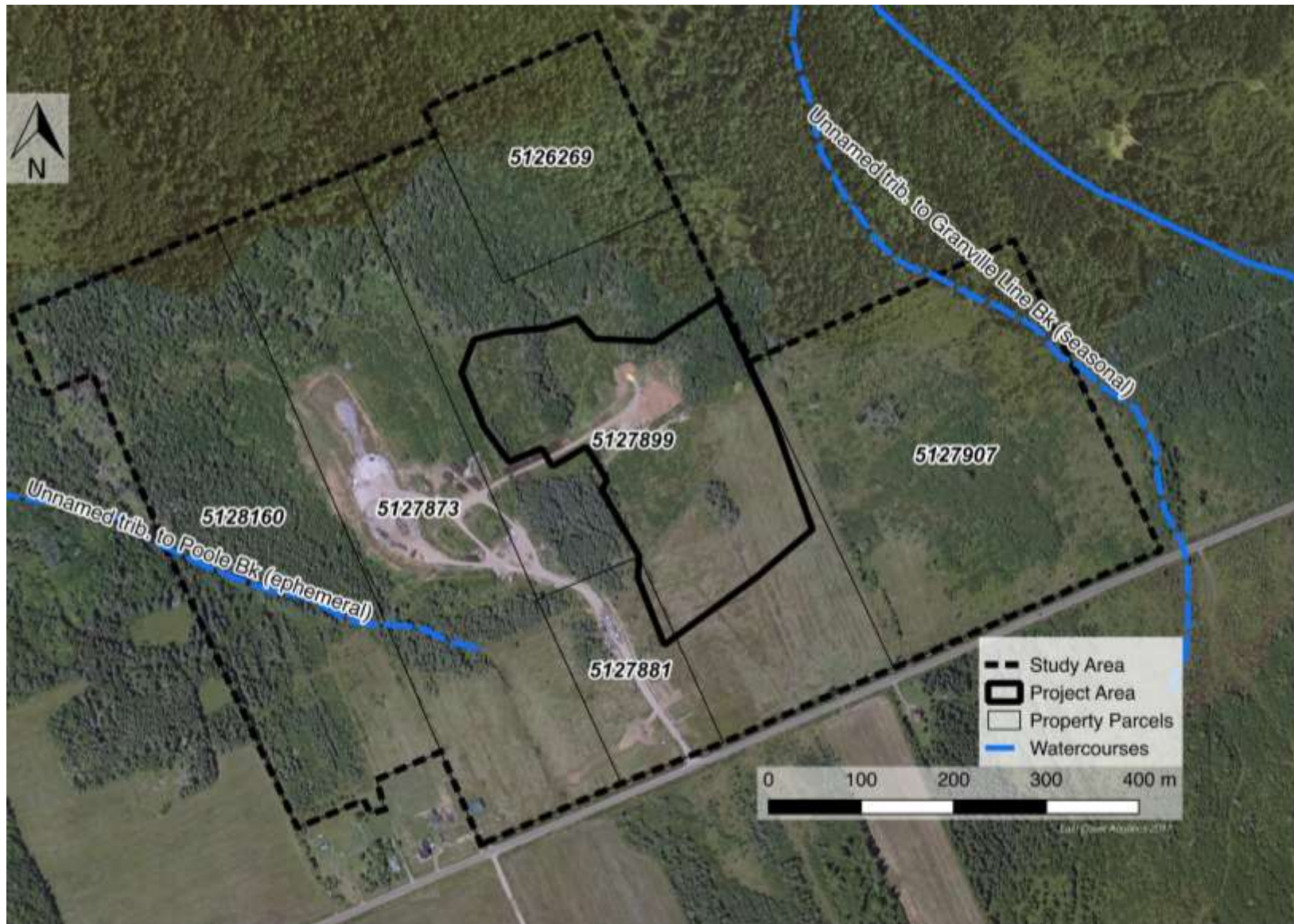


Figure 3: Arlington Heights asbestos disposal facility Study Area, study area properties and PID numbers, and proposed Project Area footprint. Based on 2012 imagery when the C&D site was relatively new and the existing asbestos disposal area was being established.

province². As such they have served an existing and growing asbestos abatement clientele requiring an approved disposal location. AHCD anticipates a continued demand for this service.

The Arlington Heights Construction and Demolition disposal site has been in operation over 10 years, accepting locally generated construction and demolition waste for disposal, including asbestos for the most recent five years. Through creation of new asbestos disposal cells, AHCD will be able to continue to receive properly collected asbestos and ensure safe disposal of this hazardous waste, meeting the demand for such a service from asbestos abatement service providers. Without the proposed expansion, the facility anticipates completion of the currently approved area within about one year at the current use rate.

The purpose of the Project is to allow AHCD Limited to continue operation and expansion of an asbestos disposal facility as part of their construction and demolition debris disposal operation. AHCD Limited, including their existing asbestos disposal facility, is currently operating under an Industrial Approval (2005-045327-T01), issued by Nova Scotia Environment and is effective until August 1, 2017. A copy of the NSE Approval permit is included in Appendix 1. The existing Industrial Approval requires an Environmental Assessment of the current and future proposed asbestos disposal site be conducted and approved by May 01, 2017 as a term of renewal.

3.3 Consideration of Alternatives

The Study Area has been used for asbestos disposal for a period of approximately 5 years, and has been set up with the appropriate signage and infrastructure facilities to handle the disposal of the material. The site has also been set up to allow trucks to safely and efficiently enter the area, weigh the material and dispose of material into the appropriate cells. The parent clay substrate allows for effective construction and capping of asbestos cells used for disposal. The existing site is located on a height of land with minimal drainage features, minimizing the likelihood of water related material movement. The adjacent land has served as a construction and demolition debris disposal facility since 2004. Given these pre-existing and beneficial conditions, alternatives considered for expansion and continued operation of the Undertaking fell within the defined Study Area so as to minimize disturbance of natural lands.

As shown in Figure 2, the cleared area immediately to the west of the existing asbestos disposal area was considered inappropriate given its proposed, permitted, and intended use for future construction and demolition debris (C&D) disposal³. Using the approved C&D area for the Undertaking would have a socioeconomic impact of reducing the business capacity and life of the C&D operation. The area further southwest of the proposed asbestos disposal area and C&D area was considered less favourable given the proximity and topography of the land sloping moderately to a small un-named watercourse that is a tributary to Poole Brook. Such a location would provide challenges to managing water movement and sedimentation control from the Undertaking. This area would also encroach on an adjacent residence, and would have an

² NSE. 2017. Asbestos Waste Disposal Facilities. <http://www.novascotia.ca/nse/waste/asbestos-waste-disposal-facilities.asp> website visited January 19, 2017.

³ Harris, C. T. 2004. *Proposed Construction & Demolition Debris Disposal Site for Melbourne R. Poole & Valerie F. Poole at Arlington West, Annapolis County, NS.* September 10, 2004.

unobstructed view plane from Arlington Road. Together, these factors would increase the risk of adverse environmental effects over the proposed location. The area further south of that currently proposed Project Area was considered less appropriate as it would abut Arlington Road. Although the area would be physically appropriate, the close (5-50m) proximity to human receptors along Arlington Road and an adjacent residence south of Arlington Road was considered a moderate risk to managing adverse environmental effects from the operation. The area further to the east of the proposed Project Area was considered less favourable given the proximity and change in ground slope toward a seasonal un-named tributary to Granville Line Brook, and the unobstructed line of sight to Arlington Road, increasing the risk of adverse environmental effects over the proposed location. Lastly the area north of the existing asbestos disposal area was considered inappropriate for expansion given the existence of a large wetland area that would require alteration and compensation, the forested habitat that would need to be removed, and the need to establish a relatively long access route around the existing operations. This location would be predicted to have a greater impact on flora and fauna, enhanced risk of surface water impacts, and higher implementation and operational costs.

Based on the consideration of alternatives, the Project Area was considered to have the least risk of adverse environmental effects. Risks of various impacts were considered in terms of magnitude, duration and frequency, direct/indirectness, geographic extent, and reversibility.

3.4 Scope of Environmental Assessment

The scope of the environmental assessment has been determined by the proponent and their consultants, East Coast Aquatics Inc. (ECA). The EA follows the various Provincial Guidance documents including those on Wild Species, Climate Change, Proponents Guide, and Consultation with Mi'kmaq. Factors considered in the development of the scope include the components of the proposed Undertaking and current disposal operations, the professional judgement and expert knowledge of the study team, consultations with regulatory officials and Nova Scotia Mi'kmaq, and the findings of the field studies conducted as part of this EA.

This environmental assessment registration seeks to address the potential environmental effects of the proposed Undertaking, through all Project phases and for each of the Valued Environmental Component (VEC's). The evaluation of these VEC's, within the spatial and temporal project boundaries, is utilized to provide an assessment of effects of the Undertaking. The following VEC have been assessed:

- Rare and sensitive Species at Risk and species of conservation concern
- Terrestrial Flora
- Terrestrial Fauna
- Avian Fauna
- Surface Water Resources and Fish and Fish Habitat
- Wetlands
- Groundwater and Geological Resources
- Archaeological and Heritage Resources
- Air Quality
- Noise

- Socio-Economic Environment

4. Public Involvement

The following sections outline the steps taken to involve the public in the development of this Environmental Assessment Registration document for the proposed asbestos disposal facility. It further outlines the nature of public concerns with the AHCD Limited operation over its existing 13-year history, and the additional steps AHCD has undertaken to further address the public concern.

4.1 Methods of Involvement

Copies of the AHCD Asbestos Disposal Facility Environmental Assessment registration document have been distributed for public viewing. Published advertisements regarding the proposed Undertaking and registration document submission were made in the Chronicle Herald and the regional Annapolis County Spectator (Appendix 2) to allow opportunity for Public Review and comment.

In November 2016, information letters were sent to the Chief and Council of Annapolis Valley First Nation and Bear River First Nation, the Native Council of Nova Scotia, Office of Aboriginal Affairs, (Appendix 2) as recommended in the guide for consultation⁴. The purpose of this correspondence was to invite comments and establish a discussion on the proposed Undertaking. The communication letters indicated ECA was inviting comment and concerns for the EA Registration Document for a period of three months. A written response from the Native Council of Nova Scotia (NCNS) was received, noting the NCNS Community's harvesting management regime to exercise its Treaty Rights to harvest gather, fish, and fowl throughout the lands that encompass the Project Area. The NCNS further requested a meeting to learn more about the project and the proponent, and allow the proponent to learn more about the NCNS community and the impacts the project may have on them (Appendix 2). ECA staff met with Council representatives Joshua McNeely and Jessica Seeward of the Maritime Aboriginal Peoples Council on January 17, 2017 at the NCNS Truro Heights, Nova Scotia offices. Discussion centered on off reserve rights to resource use and how that use is managed by the Mi'kmaq, and the general priority to Mi'kmaq of protecting surface and ground water resources. No specific concerns with the proposed project existed according to Mr. McNeely.

4.2 Stakeholder Comments and Steps Taken to Address Issues

As an existing operation, AHCD receives, and addresses, public concerns with the operation of the facility. Table 2 outlines the single concern received over their existing 13-year history of operation, and how that concern was and is managed. A written record of concerns is held on file by the company.

⁴ Office of Aboriginal Affairs. 2012. *Proponents' Guide: The role of proponents in Crown consultation with the Mi'kmaq of Nova Scotia*. November 2012. Second Revision. 12pp.

Table 2: Public concerns brought to the attention of AHCD Limited over their 13 years of operation, how the concerns were operationally mitigated and additional actions taken to address the concerns.

Public Concern	Regular Steps to Limit Concern	Additional Actions to Limit Concern
Noise being heard at a neighboring house	<ul style="list-style-type: none"> • Operations Limited to scheduled Daytime hours. • All equipment equipped with mufflers 	<ul style="list-style-type: none"> • Carried out conversations with neighbor. • Sound measures were conducted and confirmed within specifications.

Given the pre-existing nature of the operation, the record of past public concerns and steps to address those concerns, and the public notice and availability of the registration document, no further direct outreach communication was made to neighboring landowners or the public as part of this EA process.

5. Description of the Undertaking

The Project will entail the continued operation of an asbestos waste management site accepting only waste meeting NSE’s Asbestos Waste Management Regulations made under Section 84 of the Environment Act S.N.S. 1994-95, c. 1 Order in Council 95-292 (April 11, 1995), N.S. Reg. 53/95. More specifically it will include all activities associated with the ongoing acceptance of waste asbestos, disposal, and site reclamation and monitoring in a Phased approach across the proposed site. Asbestos waste, collected from the regulated abatement process by approved contractors, will be received at the facility at an anticipated rate of 350 truckloads per year. The actual amount disposed at the site will vary based on the demand established by annual abatement activities within the Province of Nova Scotia.

5.1 Geographic Location

The Project Area is located on the north-facing slope of the Annapolis Valley’s North mountain within the Fundy Shore Ecoregion and North Mountain Eco district⁵ within Annapolis County. The Universal Transverse Mercator (UTM) coordinates for the center of the proposed Undertaking are: 0320228 4976011 (NAD83). The Project Area lies in a rural area with the community of Hampton 4.8 km west and the community of Port Lorne 3.8 km northeast of the site.

The footprint of the disposal cells is a relatively flat peneplain located on a ridge at the junction of three small watersheds. As shown in Figure 4, the unnamed seasonal tributary to Granville Line Brook is approximately 235 m northeast of proposed Phase 3. The unnamed ephemeral tributary to Poole Brook the closest flowing watercourse located 185 m west of proposed Phase 6 cell. A treed bog wetland, mapped as part of this EA process, is located approximately 5 m north

⁵ NSDNR. 2017. Ecological Land Classification. <https://data.novascotia.ca/Lands-Forests-and-Wildlife/Ecological-Land-Classification-ELC-2007/w3bw-e6yc/data>. Website visited January 11, 2017.

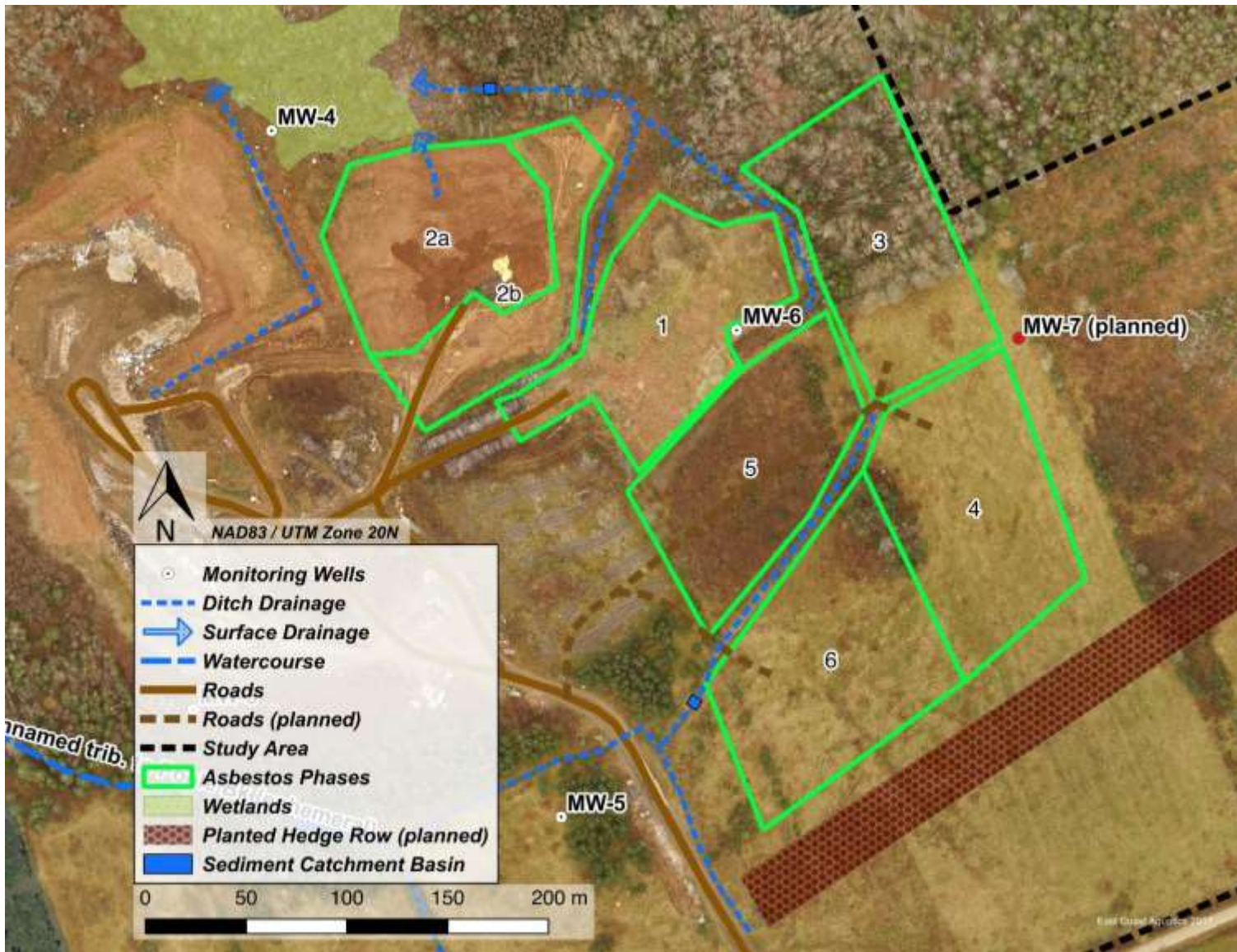


Figure 4: Proposed Arlington Heights asbestos disposal facility site layout indicating the Phased cell locations, some of the five existing and one proposed monitoring well locations, and proposed surface drainage and sediment catchment locations. (Based on 2017 drone imagery).

of the completed portion of the Phase 2 cell. The Study Area is underlain by bedrock of vertical columnar basalt that is typically topped with 4 to 10 m of silty clay. The ground surface is a root mat/topsoil of approximately 30 cm⁶.

5.2 Physical Components

The physical components of the proposed Undertaking include:

- Primary access road from Arlington Road, with lockable steel closure gate.
- Site office.
- Weigh scale.
- Secondary access road(s) to individual proposed cells to allow trucks to unload waste asbestos at the active disposal cell.
- Constructed site drainage system and sediment catches to direct surface water around individual cells and minimize the potential of sediment transport from the site.
- Phased constructed, capped, and reclaimed cells as the Undertaking proceeds.
- Groundwater monitoring wells.
- Active and completed asbestos disposal area signage.
- Proposed berm and hedgerow to establish a visible, sound, and dust barrier to Arlington Road.

Photos of many of these project components are shown in Appendix 3, while the general location of these components is shown in Figure 2 and 4.

5.3 Site Preparation and Construction

In order to minimize sight line between Arlington Road and the proposed future asbestos disposal cells, a berm and hedgerow will be established south of Phase 6 cell. The berm will be constructed of native soils and grubbing's, and will be planted with spruce seedlings and/or tree transplants from the developed Project Area. Early establishment of the hedgerow will maximize the visual barrier to Arlington Road, provide future reduction in sound and dust propagation from the site, and provide additional edge and mixed wood habitat for birds and mammals.

Erosion and sedimentation controls will be implemented and will remain in place throughout the duration of the Project. Maintenance on the erosion and sedimentation control devices will continue until the disturbed areas are stabilized and covered with vegetation. Drainage ditches will be constructed around the disposal cells prior to final grubbing of each Phase cell to move surface water northwestward and westward into the sedimentation traps as depicted in Figure 4.

It has been noted that a perched water table exists across the site, where water sits within the topsoil/root mat above the relatively impermeable silty clays which underlie the site⁶. This site condition highlights the appropriateness of ditching and directing surface water as part of the site management, as surface sheet flow will tend to follow the contour of the land rather than

⁶ MGI Ltd. 2004. *Geotechnical and Hydrogeological Assessment – Monitor Well and Test Pit Program, Arlington West Construction and Demolition Waste Disposal Facility, Arlington West, Nova Scotia*. MGI File: 20977A. October 18, 2004. 16pgs + attachments.

recharge to groundwater across the site. It is proposed that as the asbestos cells are phased into construction, that surface drainage ditches are constructed such that they direct flows westward and south along the existing operational drainages. This approach will confine surface flow discharges from the Project to the existing pathways, and away from the seasonal tributary to Granville Line Brook located 235+m to the northwest. Similarly, the finished slope of the proposed Phase 3 through 6 cells should be toward the existing drainage pathways, as shown in Figure 4.

Soils at the site were assessed by MGI Ltd as part of the 2004 C & D development proposal⁷. The typical profile consisted of a 30 cm topsoil layer, underlain by a silty clay extending to 2.5-3.3 m to bedrock. The silty clay has a low hydraulic conductivity, with a tested permeability of 1.5×10^{-8} cm/s underlain by a clayey silt with permeability of 5.0×10^{-8} cm/s. During installation of monitoring wells, MGI Ltd. documented the clay interval across the site, and completed one borehole and six test pits to further confirm consistency of soil conditions. The area between the existing asbestos disposal area and the proposed future Phases had the thickest clay interval, exceeding 10m in depth down to bedrock⁸. The clay layer extended to bedrock in all well locations. This clay layer will be excavated to form individual cells for the various proposed Phases of the asbestos disposal facility.

5.4 Operation and Maintenance

As noted above, the currently active Phase area of the asbestos disposal facility has previously been grubbed, and drainage ditches and sediment catches established prior to daily operation and maintenance activities. Operations follow the Asbestos Waste Management Regulations and the facilities' Industrial Approval Terms and Conditions. The hours of operation of the facility are Monday to Friday 7:30 am to 5:00 pm and Saturday from 8:00 am to 12:00 pm. There are generally no planned shutdowns except for statutory holidays. A lockable gate exists at the entrance to the facility. Facility signage is located at the main entrance adjacent to Arlington Road that provides a contact number and describes the operations and types of materials received. Further signage is erected at each Phase cell as it is developed to indicate both active and reclaimed asbestos disposal areas.

Operationally, a client will bring a truckload of waste asbestos to the AHCD Limited for disposal after having notified them prior to arrival. The truck is weighed in at the scale, and the site manager confirms acceptance of the asbestos waste. The truck transports the waste to the edge of the active cell for disposal, and is then weighed empty out of the facility at the scale.

As AHCD staff are aware of arriving waste, a portion of the active cell is prepped prior to arrival. This preparation involves excavation of an area of need to a depth of about 4.5 m into the clay area. Delivered waste is placed in the cell with an excavator. The asbestos waste is then covered with the previously excavated clay material within 24 hours of reception, to a depth of

⁷ Harris, C.T. 2004. *Proposed Construction & Demolition Debris Disposal Site for Melbourne R. Poole & Valarie F. Poole at Arlington West, Annapolis County, NS*. September 10, 2005.

⁸ MGI Ltd. 2004. *Geotechnical and Hydrogeological Assessment – Monitor Well and Test Pit Program, Arlington West Construction and Demolition Waste Disposal Facility, Arlington West, Nova Scotia*. Letter Report. 16 pages + attachments.

not less than 25 cm. The site is inspected daily to ensure that all material is covered within the specified time. Material continues to be received, placed, and covered in the active area until a height of 3 m above the original grade is achieved and the cell is fully utilized.

As shown in Figure 4, Phase 1 and 2 waste asbestos disposal areas have been utilized under terms and conditions of AHCD Limited’s existing Industrial Approval since 2012. The completed Phase 1 cell covered 0.76 ha, and was used until 2015. Table 3 shows the past rate of use for Phase 1 and 2 cells, while Table 4 shows the current Phase 2 cell has been used since 2015, and the 1.3 ha area of the cell is approximately 65 % utilized at the time of this report submission. Phase 2 cell is predicted to be fully utilized by the end of the 2017 calendar year. Table 4 indicates the predicted lifespan of the proposed Undertaking as totalling 14 years. However, the variable nature of service demand and disposal material density per unit volume observed to date results in a predicted lifespan estimate of relatively low potential accuracy.

Table 3: Past asbestos disposal rates and estimated tonnage at AHCD.

Year	Number of Loads (one load equals 40 cubic yard tandem dump trailer*)	Approximate Annual Tonnage Disposed (metric tonne)
2012	146	1022
2013	256	1790
2014	336	2350
2015	425	2975
2016	500 to 600 loads (estimate)	

*est. 3-10 mt depending on packing density.

Table 4: Current and predicted area, volume, and period of use for the six cell Phases of the AHCD asbestos disposal facility.

Phase	Cell	Area (m ²)	Est. Volume* (m ³)	Est. Capacity (# of loads**)	Est. Years of Use***
1	Completed cell	7600	57000	740+	2012-2015
2a	Current cell (covered)	8500	63750	925	2015-2017
2b	Current cell (available)	4500	33750	450	1.3
3	Northeast proposed cell	11400	85500	1220	3.5
4	Southeast proposed cell	10500	78750	1125	3.2
5	Northwest proposed cell	9200	69000	985	2.8
6	Southwest proposed cell	10800	81000	1155	3.3
	Totals	62500	468750	6600	14

*assumes 4.5 m deep hole and another 3 m above ground before cap, for a total depth of 7.5 m (25ft)

** assumes 70m³ of cell volume utilized per 35m³ truck load based on numbers to date (Phase 1 and 2 volume divided by loads). This accounts for addition of daily cover material rather than just disposed waste volume.

*** assumes 350 loads per year projected (current range 146-500). Presented as past year range and predicted number of years use.

Each of the proposed Phase cells will be established in sequence. The outlined sequence is anticipated to allow the best balance for establishing the hedgerow to mitigate adverse effects, facilitating site access that minimizes road construction, and allowing land forming of completed cells to direct surface sheet flow along the desired drainage pathways as shown in Figure 4. A progressive reclamation schedule will occur as each Phase cell is established, and final decommissioning will take place once all Phases are fully utilized or upon abandonment.

5.5 Decommissioning and Reclamation

A progressive reclamation of the asbestos disposal site is proposed. A “spent” cell is one that is fully utilized, or filled to the specified height and covered with the minimum 25 cm of mineral soil as described in the preceding section. As an area of discontinued use, part or all of a Phase cell will be reclaimed with a layer of mineral soils and a topping of salvaged grubbing’s/topsoil atop the cell surface until a total cover not less than 125 cm is achieved. The surface will then be immediately seeded and mulched with hay.

Using the Phase cell areas in Table 4 as a reference for sequencing, progressive reclamation of part or all of one Phase cell is intended such that no more than 10,000m² of spent but unreclaimed area exists across the entire operation. This equates to the average surface area of one Phase cell for the proposed operation.

The asbestos disposal facility Project Area will be fully reclaimed within 12 months of abandonment. The site will be marked permanently with a sign indicating it is an Asbestos Disposal Site, and monitored as specified in the Industrial Approval to ensure the final cover remains intact.

5.6 Monitoring

An existing and ongoing groundwater monitoring program exists for the AHCD Limited C and D facility that will meet the needs of the asbestos disposal facility given the addition of another monitoring well. As previously submitted to NSE, baseline surface water chemistry was collected in 2004 at the un-named tributary to Poole Brook⁹. Analysis included metals, nutrients, and phenol. This ephemeral stream is the closest watercourse to the proposed Undertaking, and given the proposed drainage alignment around the asbestos disposal cells, will be the primary receiving body of surface sheet flows from the Project Area. The surface water site is not regularly sampled, and the ephemeral nature of flow would make a regular sampling program difficult. Therefore, the current monitoring program centers on a series of five groundwater monitoring wells.

The five existing monitoring wells are currently sampled on a quarterly basis in February, May, August and November and analyzed at a certified laboratory. The wells were established in 2004 and a baseline water chemistry and metal analysis was conducted by MGI Ltd.⁹. Currently, once annual full spectrum analysis including inorganics, volatile organics, “other” organics, and field parameters is conducted in August. Inorganics, “other” organics, and field parameters are

⁹ Harris, C.T. 2004. *Proposed Construction & Demolition Debris Disposal Site for Melbourne R. Poole & Valarie F. Poole at Arlington West, Annapolis County, NS*. September 10, 2005.

assessed during the remaining three quarters. Results are submitted to NSE. The most recent full spectrum sampling conducted in August 2016 was reported as "...in acceptable ranges and no abnormal effects are noted from operations"¹⁰. Full results from 2014 through 2016 are presented in Appendix 4.

As determined by MGI Ltd. during their 2004 Geotechnical and Hydrological Assessment of the site, groundwater flow direction is toward the west-northwest. As the proposed Project Area is in the east/south east of the Study Area, the disposal cells will lie predominantly "upstream" of the existing well monitoring array, and thereby monitoring of the established wells is anticipated to reflect the asbestos disposal facility land use. It is proposed with the expansion of asbestos disposal cells 4 through 6, that an additional monitoring well be installed to the west of Phase 4 cell and added to the regular monitoring schedule to ensure appropriate spatial coverage for the expanded operations. The proposed location of this new well is indicated in Figure 4.

Additional surface water, dust particulate emission, and sound level monitoring shall be carried out at the request of NSE as described in the terms and conditions of the Industrial Approval.

6. Valued Environmental Components and Effects Management

6.1 Methodology

As part of the preparation of the Environmental Assessment Registration for the proposed Undertaking, East Coast Aquatics Inc. (ECA) undertook a desktop review of existing information, reports and data sources. This included, but was not limited to, the following sources:

- Proposed Construction and Demolition Debris Site Prepared by C.T. Harris, P.Eng. 2004
- Environmental Insurance Review of the C&D operation conducted by Jacques Whitford, 2005
- 2014-2016 well monitoring data and report prepared by E & Q Consulting and Associated Limited.
- Geotechnical and Hydrogeological Assessment of the Study Area conducted by MGI Ltd. 2004
- Air photography, 2017 drone photography contracted to NSCC, and topographic mapping of the site.
- Atlantic Canada Conservation Data Center report for the Project Area.
- NSDNR Ecological Land Classification System
- NSDNR Wetland Inventory

Ecological field studies were conducted by ECA and their representatives on a number of dates between July 22 and November 22, 2016. A list of the surveys, timing, and technical specialists involved are presented in Table 5.

¹⁰ Frazee, J. 2016. Letter report on August 09, 2016 well monitoring results to AHCD Limited. E&Q Consulting and Associates Limited. Dated August 25, 2016.

Table 5: Summary of 2016 field survey activities, timing, and technical specialists involved.

Field Survey Activity	Type of Survey	Survey Period	Technical Specialist
Botanical Inventories	Inventory by plant community	August 24, 2016	Tom Neily
Herpetofauna and Terrestrial mammals	Opportunistic visual surveys of individuals and sign	August to November 2016	Andy Sharpe & Mike Parker
Avian fauna	Continuous survey (counts) / Area search	September 17, 2016 September 30, 2016	Dr. Sarah Gutowsky & Jacob Walker
Surface water resources	YSI Multimeter assessment, physical channel measures, visual assessment	October 2016	Mike Parker, Wanda Watts & Andy Sharpe
Wetlands	Visual survey, mapping of boundaries	August and October 2016	Andy Sharpe & Mike Parker
Site assessments of proposed expansion area and associated constraints	Visual survey	August to November 2016	Andy Sharpe & Mike Parker
Archaeological Resource Impact Assessment	Onsite walk-over assessment.	November 2016	Laird Niven

6.2 Vegetation Communities

Description of Existing Conditions

The vegetation survey was conducted by botanist Tom Neily in August 2016. Mr. Neily is an experienced field botanist, who has worked extensively throughout Atlantic Canada. His experience includes wetland classifications, vascular plant surveys, evaluation of rare and endangered flora, and identification of lichens. The Study Area vegetation was categorized as seven separate communities: tall shrub/sapling, stream slope, abandoned farmland, mixed woods, operational areas, wet ditches/excavated drainages, and old field. These areas are mapped in Figure 5, and Photos are presented in Appendix 3. Each community was assessed by the botanist to establish a community plant inventory, and to search for species at risk, species of conservation concern, and invasive/exotic species. A complete inventory of species by community is presented in Appendix 5.

Eighty-eight (88) plant species were inventoried over the Study Area. No Species At Risk, or species of conservation concern were encountered. Twenty exotic species (ACDC “SE” ranking) were identified, of which 19 were found in the old field and abandoned farmland habitats. All other species had an “S5” ranking by the Atlantic Canada Conservation Data Center which is defined as... “Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions”.

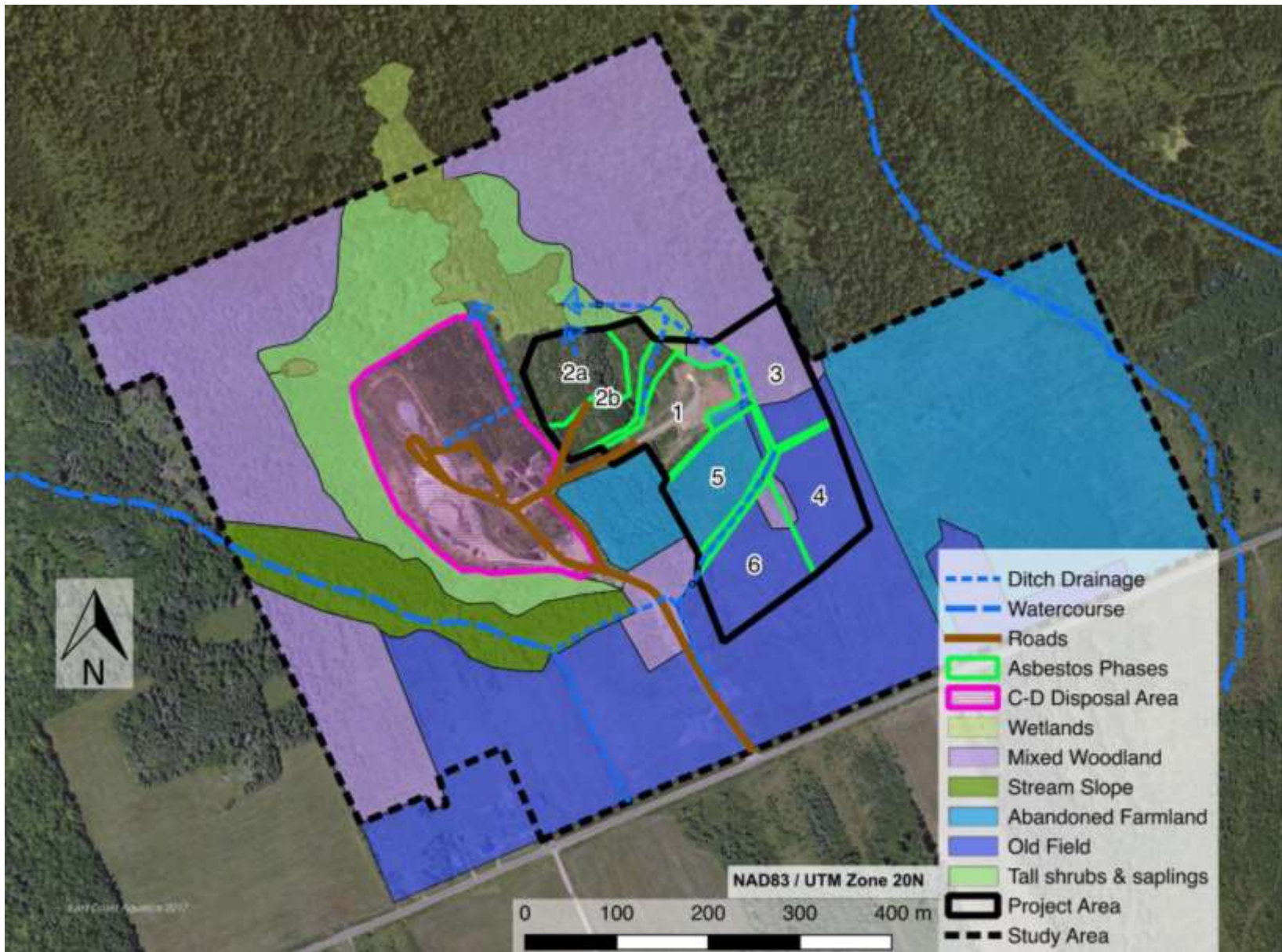


Figure 5: Study Area habitat map indicating primary vegetation communities and watercourses relative to current and proposed operational areas.

Much of the existing Project Area over which the proposed asbestos disposal cells are to be constructed is former agricultural land. A small portion is mixed wood forest, and another small portion is very new regeneration (<2 years) contiguous with the existing operational area. Including the currently completed disposal cell areas and the future proposed cells, 6.25 ha of asbestos disposal area will be established if the facility is fully utilized. Of the proposed and current cells, Phase 1 and 2 cells (33% of total proposed area) are in previously grubbed and cleared areas of the C & D operations. Part of Phase 3 cell (12% of total proposed area) will be established in a mixed forest habitat area. The remainder of Phase 3, and all of Phase 4 and 6 cells, will be in old field (40% of total proposed area). Phase 5 will be created in a recently cleared operational area (15% of total proposed area).

Tall Shrub/Sapling

The tall shrub/sapling plant community of the study area lies predominantly north and west of the existing C & D disposal cell as shown in Figure 5. The area was cleared in 2004 as part of the establishment of the C&D operation, but lies outside of the actual operational footprint. As such it has dense regeneration growth. None of this habitat falls within the proposed Project Area of the asbestos disposal facility.

The tall shrub/sapling habitat was characterized by a community of Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*), Grey Birch (*Betula populifolia*), Black Starthistle (*Centaurea nigra*), Fireweed (*Chamerion angustifolium*), Wild Carrot (*Daucus carota*), Parasol White-Top (*Doellingeria umbellata*), Brittle-Stem Hempnettle (*Galeopsis tetrahit*), Fowl Manna-Grass (*Glyceria striata*), White Spruce (*Picea glauca*), Tall Butter-Cup (*Ranunculus acris*), Bristly Black Currant (*Ribes lacustre*), Allegheny Blackberry (*Rubus allegheniensis*), Red Raspberry (*Rubus pubescens*), Red Elderberry (*Sambucus racemosa*), Rough-Leaf Goldenrod (*Solidago rugosa*), and Colt's Foot (*Tussilago farfara*). A photo of this habitat can be seen in Appendix 3.

Stream Slope

The stream slope habitat plant community was inventoried along the Un-named Tributary to Poole Brook, located west of the proposed asbestos disposal Project Area. This community is a riparian buffer left undisturbed since the initiation of C&D operations in about 2004, although past land use activities associated with farming may well have influenced the community composition. None of this habitat falls within the proposed Project Area of the asbestos disposal facility, which lies 185+m to the eastward of the stream slope habitat.

Currently, the stream slope habitat consists of Red Maple (*Acer rubrum*), Speckled Alder (*Alnus incana*), Wild Sarsaparilla (*Aralia nudicaulis*), Lady-Fern (*Athyrium filix-femina*), Yellow Birch (*Betula papyrifera*), White Turtlehead (*Chelone glabra*), Parasol White-Top (*Doellingeria umbellata*), Hairy Willow-Herb (*Epilobium ciliatum*), Common Boneset (*Eupatorium perfoliatum*), Flat-Top Fragrant-Golden-Rod (*Euthamia graminifolia*), Swamp Loosestrife (*Lysimachia terrestris*), Small Forget-Me-Not (*Myosotis laxa*), Sensitive Fern (*Onoclea sensibilis*), Arrow-Leaved Tearthumb (*Polygonum sagittatum*), Bristly Black Currant (*Ribes lacustre*), Climbing Nightshade (*Solanum dulcamara*), Broad-Leaf Cattail (*Typha latifolia*), Possum-Haw Viburnum (*Viburnum nudum*), and Marsh Blue Violet (*Viola cucullate*). A photo of this habitat can be seen in Appendix 3.

Abandoned Farmland

Abandoned farmlands are those areas that were at one time open field, but have been left unused for a significant period of time. Although these areas have a significant ground cover of herbs and grasses, there are also dense patches of woody shrub and sapling growth that have begun to colonize these sites. Wet pockets exist within the abandoned farmland where old access trails and drainage features exist. As shown in Figure 5, proposed Phase 5 cell of the asbestos disposal facility, covering approximately 9200m², falls almost entirely within this habitat, although the majority of this plant community lies further east of the proposed Undertaking footprint.

The abandoned farmland habitat consists of Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*), Speckled Alder (*Alnus incana*), Pearly Everlasting (*Anaphalis margaritacea*), A Sedge (*Carex gynandra*), Pointed Broom Sedge (*Carex scoparia*), Black Starthistle (*Centaurea nigra*), Creeping Thistle (*Cirsium arvense*), Dwarf Dogwood (*Cornus canadensis*), Eastern Hay-Scented Fern (*Dennstaedtia punctilobula*), Parasol White-Top (*Doellingeria umbellata*), Spinulose Shield-Fern (*Dryopteris carthusiana*), Eastern Helleborine (*Epipactis helleborine*), Flat-Top Fragrant-Golden-Rod (*Euthamia graminifolia*), White Ash (*Fraxinus americana*), Soft Rush (*Juncus effuses*), Wild Lily-of-The-Valley (*Maianthemum canadense*), White Spruce (*Picea glauca*), Christmas Fern (*Polystichum acrostichoides*), Old-Field Cinquefoil (*Potentilla simplex*), Choke Cherry (*Prunus virginiana*), Bracken Fern (*Pteridium aquilinum*), Apple (*Pyrus sp.*), Rose (*Rose sp.*), Allegheny Blackberry (*Rubus allegheniensis*), Dwarf Red Raspberry (*Rubus pubescens*), Cottongrass Bulrush (*Scirpus cyperinus*), Canada Goldenrod (*Solidago canadensis*), Rough-Leaf Goldenrod (*Solidago rugosa*), Northern Starflower (*Trientalis borealis*), and Tufted Vetch (*Vicia cracca*). A photo of this habitat can be seen in Appendix 3.

Mixed Woods

The mixed woods habitat lies north and northwest of the current and proposed asbestos disposal Project Area. This forested area has mature trees and a relatively natural understory community. A small portion of this community, approximately 6000 m², is proposed to be removed for the establishment of the northern half of the Phase 3 cell, as shown in Figure 5.

The tree species of the Mixed Woods plant community consist predominantly of Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*), White Spruce (*Picea glauca*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*) and Paper Birch (*Betula papyrifera*). The understory is comprised of Wild Sarsaparilla (*Aralia nudicaulis*), Bladder Sedge (*Carex intumescens*), Eastern Hay-Scented Fern (*Dennstaedtia punctilobula*), Woodland Horsetail (*Equisetum sylvaticum*), , Twinflower (*Linnaea borealis*), Wild Lily-of-The-Valley (*Maianthemum canadense*), Whorled Aster (*Oclemena acuminata*), Sensitive Fern (*Onoclea sensibilis*), White Wood-Sorrel (*Oxalis montana*), Northern Beech Fern (*Phegopteris connectilis*), Choke Cherry (*Prunus virginiana*), Farewell-Summer (*Symphotrichum lateriflorum*), and Northern Starflower (*Trientalis borealis*). A photo of this habitat can be seen in Appendix 3.

Operational Areas

The area defined as operational area habitat includes both the existing C&D disposal area and Phase 1 and 2 asbestos disposal areas. It also includes the open cleared area available for future C&D expansion. Vegetation is quite sparse in this habitat as it was grubbed for operational use, and the remaining clay dominated mineral soils are slow to establish cover. Operations continue

to shift across this habitat as drainage paths and access roads are moved to facilitate ongoing operational requirements. Small patches of shrub and sapling are established in the least used operational areas, but the community is predominantly sparse herbaceous growth. The remaining portions of the Phase 2 asbestos disposal facility cell, estimated at 4500m², falls within this habitat.

The operational area plant community consists of Red Maple (*Acer rubrum*), A Sedge (*Carex gynandra*), Pointed Broom Sedge (*Carex scoparia*), Wild Carrot (*Daucus carota*), Spinulose Shield Fern (*Dryopteris carthusiana*), Crested Shield-Fern (*Dryopteris cristata*), Hairy Willow-Herb (*Epilobium ciliatum*), Flat-Top Fragrant-Golden-Rod (*Euthamia graminifolia*), Low Cudweed (*Gnaphalium uliginosum*), Hawkweed (*Hieracium sp.*), Soft Rush (*Juncus effusus*), Slender Rush (*Juncus tenuis*), Arrow-Leaved Tearthumb (*Polygonum sagittatum*), Old-Field Cinquefoil (*Potentilla simplex*), Creeping Butter-Cup (*Ranunculus repens*), Allegheny Blackberry (*Rubus allegheniensis*), Smooth Blackberry (*Rubus canadensis*), Bramble (*Rubus sp.*), Cottongrass Bulrush (*Scirpus cyperinus*), Canada Goldenrod (*Solidago canadensis*), Rough-Leaf Goldenrod (*Solidago rugose*), Narrow-Leaved Meadow Sweet (*Spiraea alba*), Rabbit-Foot Clover (*Trifolium arvense*), Colt's Foot (*Tussilago farfara*), Broad-Leaf Cattail (*Typha latifolia*), and Gypsy-Weed (*Veronica officinalis*). A photo of this habitat can be seen in Appendix 3.

Wet Ditch/Excavated Drainages

The wet ditch/excavated drainages habitats are densely vegetated with herbaceous growth. Some of these features were established in the early 2000's while other portions may have existed since times when land use at the Study Area was predominantly agricultural. They are all man made, and given that they do not have continuous mineral bottoms with a defined bank, none are considered watercourses. Gradients typically approach 0% slope. None of this habitat falls within the proposed future cells of the asbestos disposal facility, although surface water from current and future cells will be directed to utilize these existing drainages.

The plant community associated with the wet ditch/excavated drainage habitat includes Pointed Broom Sedge (*Carex scoparia*), Flat-Top Fragrant-Golden-Rod (*Euthamia graminifolia*), Narrow-Panicled Rush (*Juncus brevicaudatus*), Soft Rush (*Juncus effusus*), Slender Rush (*Juncus tenuis*), Swamp Loosestrife (*Lysimachia terrestris*), Rose (*Rosa sp.*), Bramble (*Rubus sp.*), Cottongrass Bulrush (*Scirpus cyperinus*), Red Clover (*Trifolium pretense*), Colt's Foot (*Tussilago farfara*), Broad-Leaf Cattail (*Typha latifolia*). A photo of this habitat can be seen in Appendix 3.

Old Field

The Old Field plant community abuts the Arlington Road across the southern extent of the Study Area. It is dominated by grasses and herbs, weakly interspersed with woody stemmed species. This area corresponds to lands that were last actively managed for agricultural operations. Of the communities inventoried within the Study Area, the Old Field habitat had the greatest diversity of plant species at 34. However, 16 of those species are considered introduced exotics by the Atlantic Canada Conservation Data Center, and likely reflect the historic use as agricultural lands and perhaps the proximity to the adjacent roadway that could facilitate introduction of species from passing vehicular traffic. Approximately 40% of the area of the proposed future Phases of the asbestos disposal facility will be established in Old Field habitat. This is the greatest habitat

type area to be altered by the proposed Undertaking, and represents approximately 26,700 m² consisting of Phase 4 and 6 cells and part of Phase 3 cell. In total, this represents about 24% of the Old Field habitat existing on the project properties.

The plant community of the Old Field habitat consists of Annual Ragweed (*Ambrosia artemisiifolia*), Gray Birch (*Betula populifolia*), Pointed Broom Sedge (*Carex scoparia*), Creeping Thistle (*Cirsium arvense*), Wild carrot (*Daucus carota*), Parasol White-Top (*Doellingeria umbellata*), Barnyard Grass (*Echinochloa crus-galli*), Hairy Willow-Herb (*Epilobium ciliatum*), Canada Rush (*Juncus canadensis*), Soft Rush (*Juncus effusus*), Oxeye Daisy (*Leucanthemum vulgare*), Birds-Foot Trefoil (*Lotus corniculatus*), Purple Loosestrife (*Lythrum salicaria*), Common Evening-Primrose (*Oenothera biennis*), Reed Canary Grass (*Phalaris arundinacea*), Meadow Timothy (*Phleum pratense*), White Spruce (*Picea glauca*), Nipple-Seed Plantain (*Plantago major*), Tall Butter-Cup (*Ranunculus acris*), Creeping Butter-Cup (*Ranunculus repens*), Rose (*Rosa sp*), Red Raspberry (*Rubus idaeus*), Cottongrass Bulrush (*Scirpus cyperinus*), Climbing Nightshade (*Solanum dulcamara*), Canada Goldenrod (*Solidago canadensis*), Rough-Leaf Goldenrod (*Solidago rugosa*), Narrow-Leaved Meadow-Sweet (*Spiraea alba*), Little Starwort (*Stellaria graminea*), New Belgium American-Aster (*Symphyotrichum novi-belgii*), Rabbit-Foot Clover (*Trifolium arvense*), Red Clover (*Trifolium pratense*), Colt's Foot (*Tussilago farfara*), Broad-Leaf Cattail (*Typha latifolia*), and Tufted Vetch (*Vicia cracca*). A photo of this habitat can be seen in Appendix 3.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

The project has the potential to adversely affect the identified plant communities to varying degrees. The Abandoned Farmland, Mixed Woods and Old Field will be subject to direct habitat loss associated with site preparation and conversion to Operational Area habitat during the establishment the disposal cells. In contrast, Tall shrub/Sapling and Stream Slope habitats will be completely avoided. Indirect changes to the Wet Ditch/Excavated Drainages and Operational Area habitats of the Undertaking may occur.

The Mixed Wood habitat is abundant around the Study area, ecoregion, and province. The conversion of this habitat is relatively small in area. The Abandoned Farmland and Tall Shrub/Sapling habitat of the Study area that will be left unaltered, will continue to naturally mature toward Mixed Wood habitat over time, and thereby provide some replacement of the altered Mixed Wood habitat. The proposed berm and hedgerow will also be planted with tree species, further replacing the lost mixed wood habitat over time. The removal of 0.6 ha of Mixed Wood habitat will reduce the carbon sequestration by an estimated 1.57 tonne CO₂/yr¹¹ having a negligible effect on global climate change. The overall, the project effect on Mixed Wood habitat is an impact that would be negligible, short term, direct, site specific, and reversible using the terminologies defined for assessing significance of impacts from project activities in the Guide to Climate Change in EA's¹².

¹¹ EPA. 2017. Greenhouse Gas Equivalencies Calculator. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>. Website visited February 15, 2017.

¹² NSE. 2011. *Guide to Considering Climate Change in Environmental Assessments in Nova Scotia*. Nova Scotia Department of Environment. February 2011. 18pp.

The Old Field habitat to be altered during the construction of Phase 3, 4, and 6 cells is considerably less common. Although, similar sized areas of Old Field habitat can be found within a 2 km radius of the Project Area, and throughout this ecoregion where property use has been changing from rural small farm to seasonal and permanent ocean view properties. The predicted loss of 24% of fallow field habitats at the Study Area, which provides valuable nesting and fall migration feeding grounds to a number of bird species, is an important impact discussed as part of the Avian VEC. The loss of Old Field habitat is potentially easier to replace than Mixed Wood habitat which takes decades for trees to reach maturity, as it can be achieved by converting active farmland to inactive farmland. The proponent does not have access to such lands to propose this as a mitigative measure. However, the loss of Old Field habitat (est. 26,700 m²) will be somewhat mitigated by site reclamation that will seed completed Phase cell areas, establishing a fallow herbaceous cover dominated by grasses. Although the reclaimed cells may not initially provide the same quality as the Old Field habitat, they will be greater in area (62,500 m²) and should thereby provide similar wildlife capacity. The impact on Old Field habitat of conversion to operational area through the Undertaking is therefore considered to be small in magnitude, short term, direct, site specific, and reversible.

Standard mitigation measures will be employed to minimize the adverse effects of the Project on all plant communities, including watering of Study Area roads to suppress dust that may accumulate on roadside vegetation, use of native soils from grubbed piles in site reclamation works, and the use of seed mixes free of noxious weeds during site reclamation. Where ever possible, seed mixes containing native plants will be used in site reclamation. If not available, seed mixes containing naturalized species which are well established in Nova Scotia (e.g. Nova Scotia Highway Reclamation Mix), and are not aggressive weeds in wetland and forest communities will be utilized.

In conclusion, following the recommended mitigation measures and reclamation, significant long term Project-related adverse effects on terrestrial plant communities are unlikely to occur. A short term effect on avian and small mammal species related to changing plant communities is anticipated and discussed in subsequent sections.

6.3 Terrestrial Fauna

Description of Existing Conditions

Incidental observations of terrestrial fauna were made throughout the study area during field surveys of existing habitats and mapping of operational features. Table 6 lists those mammal species confirmed on site through observation of sign. There is minimal traffic, residential, or other land use activities that would provide significant disturbance to wildlife at the Project Area. The lands surrounding the Study Area are typically forested private lands with a history of small clear cut type harvesting that provide a diversity of forest stage habitats from new regeneration to mature, with minimal fragmentation. Connectivity of forested habitat along the North mountain brow exists, as does connectivity to the south with the Annapolis Valley, allowing for species with larger home ranges to readily make use of the Study Area. Therefore, a wide range of mammals that are found within habitats like those of the Study Area, such as bobcat, black bear, red squirrel and fox for example, could be expected in and around the Study Area and Project Area. Small bodied mammals such as voles, shrews and mice would be expected given the Old

Field and Abandoned Farmland habitats. No reptiles or amphibians were observed during site visits, but it is likely that the large wetland and watercourse corridors (see Figure 5) provide habitat to a number of common herpetofauna. The lack of significant year-round open water likely limits the presence of some otherwise common amphibian species, and no turtle species would be expected in the habitats in and around the Study Area.

Table 6: Observed mammal sign within the Study Area at Arlington Heights.

Common Name	Latin Name	Common Name	Latin Name
Raccoon	<i>Procyon lotor</i>	Snowshoe Hare	<i>Lepus americanus</i>
White Tailed Deer	<i>Odocoileus virginianus</i>	Eastern Coyote	<i>Canis latrans</i>

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

Potential effects to terrestrial fauna exist from proposed habitat alteration, operational noise and human presence at the Project Area. The mammalian species observed during the study period exhibit abundance in a diversity of habitats throughout Nova Scotia. While conversion of Mixed Wood and Old Field habitat may result in displacement from existing habitats, this impact would be short to medium term and reversible, given the reclamation activities proposed. Small mammals, such as voles, mice, rabbit and shrews are likely present in moderate numbers in the Old Field habitat. They would provide a prey source for a number of avian species and larger mammals such as fox. All of these species are highly mobile and expected to temporarily vacate the existing habitats to immediately adjacent habitats as the areas are converted to operational disposal cells. Subsequent reclamation of disposal cells will provide similar habitat to the Old Field, and the Mixed Wood habitat is abundant surrounding the Study Area making the loss of these habitats negligible. Proposed operational activities are the same as existing activities that have occurred for many years. Therefore, impacts to terrestrial fauna that may have been associated with noise and human presence have long been realized in and around the Study Area. Providing weekend and evening operation closures mitigates the potential negative sound and human presence effects to terrestrial wildlife in the area. Most if not all mammalian species currently using the habitats in and adjacent to the existing operations would be expected to continue to use the available and reclaimed habitats. Therefore, based on these factors, although small scale localized shifts in mammalian habitat use may occur with operational expansion and reclamation activities, no long term adverse impacts to mammalian species are expected from the proposed continuation and expansion of ongoing activities as proposed.

No alteration to the existing adjacent wetland and watercourses is proposed. These habitats likely provide for various species of frog and salamander, although limited open water areas would minimize the value for a number of species and could preclude the presence of others. Concentration of surface flows in proposed drainage paths and catch basins may provide pockets of additional wet habitat in the operational area that would be beneficial to frog and salamander species. Based on this assessment, significant adverse environmental effects on herpetofauna species resulting from the proposed Undertaking are unlikely to occur, and a slight positive effect may occur.

6.4 Avian Fauna

Description of Existing Conditions

Two avian surveys of an 800 m radius centered on the Study Area were conducted in September 2016. The first survey was conducted by Dr. Sarah Gutowsky on September 17th, 2016. The second survey was conducted by Jacob Walker on September 30th, 2016. This timing would allow that both resident and migratory species might be detected. Both surveyors covered the seven various habitats described in Section 6.2 Vegetation Communities. Full reports of both surveys are presented in Appendix 6.

As listed in Table 7, a total of fifty-two (52) individual species were identified during the two surveys. An estimate of 690+ and 480 individual birds were surveyed on September 17th and 30th respectively. The most abundant group of birds observed in the study area were 10 species of warblers, dominated by a migratory movement of Palm, Magnolia, Common Yellowthroat, Black-throated Green, and Yellow-rumped warblers. Sparrows were also abundant later in September with 117 individuals of 9 species being observed on the last day of the month. Blue Jays, Black-capped Chickadees, and American Goldfinch were noted to be abundant resident species. Observed abundance of the overall twenty most numerous species by date is presented in Figures 6 and 7. The observed abundance may not reflect actual abundance of individual species as a number of factors affect observations. For example, bird species using open habitats are generally more easily observed and counted than birds in dense vegetation. Time of day and weather conditions also influence observations.

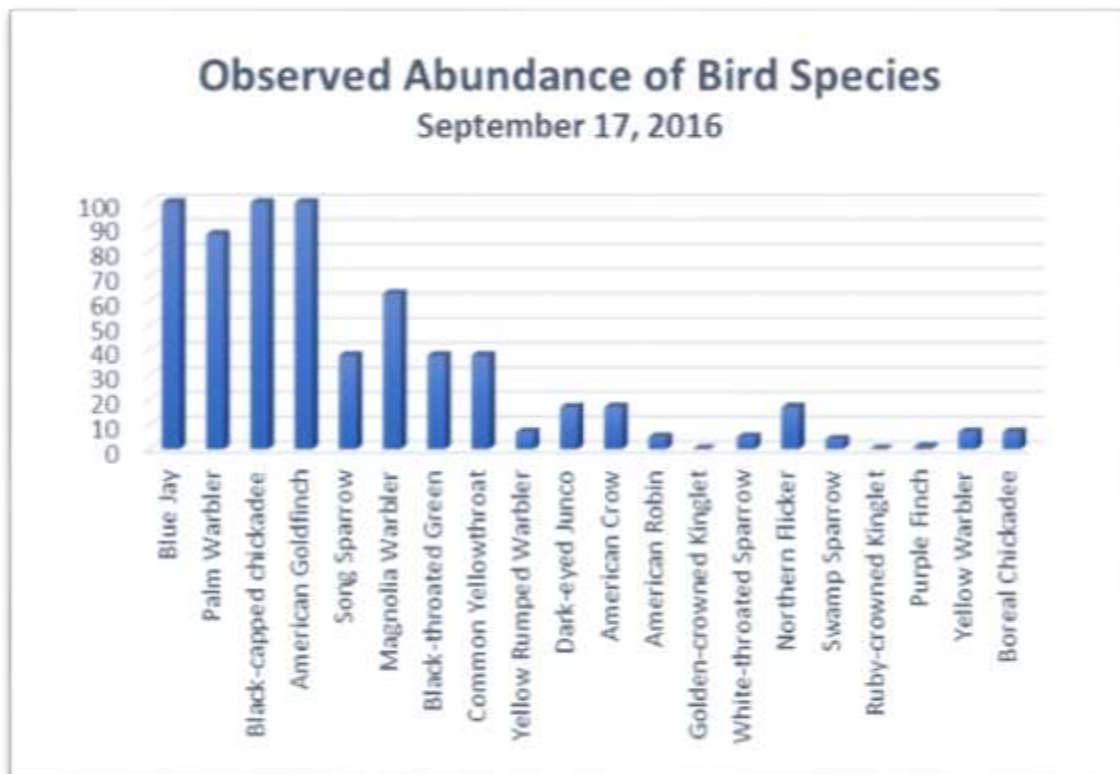


Figure 6: Observation estimates on September 17, 2016 for the top 20 most observed species during September bird inventories of the Study Area. Survey completed by Dr. Sarah Gutowsky.

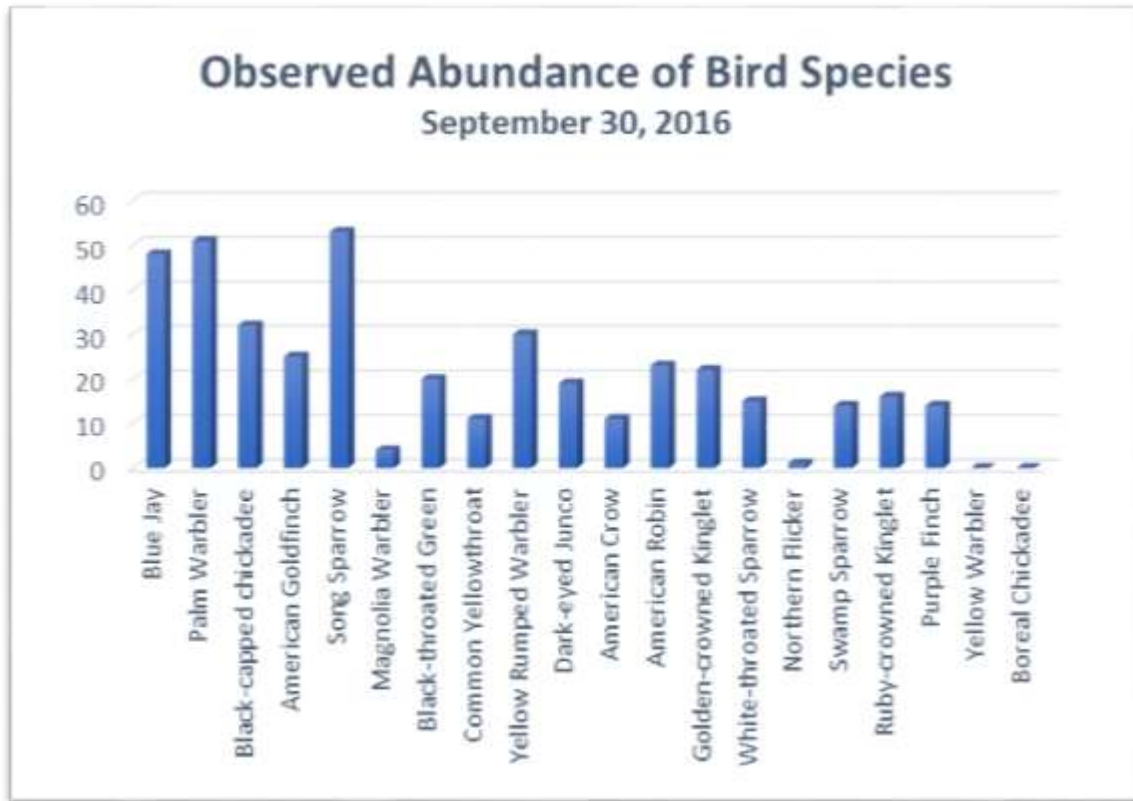


Figure 7: Observation estimates on September 30, 2016 for the top 20 most observed species during September bird inventories of the Study Area. Survey completed by Jacob Walker.

In general, during September fall migrants are thought to be concentrated along the North Mountain as they head southwest through the province. Most of these species likely move through the study area relatively quickly, and the few migrant species actively using the disposal site during the late September survey, as opposed to the periphery. Palm Warblers were one migrant species observed feeding over the disturbed ground of the Operational Area habitat.

The birds found using the Mixed Wood habitat and its margin were resident species such as woodpeckers, Black-capped Chickadees, Golden-crowned Kinglets, White-throated Sparrows and fall migrant songbirds such as Ruby-crowned Kinglets, Blue-headed Vireos, Yellow-rumped Warblers, and Black-throated Green Warblers.

Within the perimeter of the active Operational Area of the Study Area, including the immediate edge, 187 birds of 33 species were recorded during the September 30th survey. The sparrows were the most abundant group of birds with 53 individuals of 8 species, followed by warblers with 50 individuals of 7 species.

The habitat provided by the disturbed ground in the disposal site itself and the surrounding fallow fields is not as common in the region as the forested areas. Few fields are left fallow and allowed to go to seed in the area (most are in crops or hayed multiple times during the season). This provides a valuable resource for seed-eating birds like sparrows during the fall migration.

Table 7: Inventory of avian species observed during September 2016 Study Area point count and general area survey of the Study Area.

Scientific Name	Common Name	Provincial Rank
<i>Poecetes gramineus</i>	Vesper Sparrow	S2B
<i>Carduelis pinus</i>	Pine Siskin	S2S3
<i>Perisoreus canadensis</i>	Gray Jay	S3
<i>Poecile hudsonica</i>	Boreal Chickadee	S3
<i>Sitta canadensis</i>	Red-breasted Nuthatch	S3
<i>Dumetella carolinensis</i>	Gray Catbird	S3B
<i>Catharus fuscescens</i>	Veery	S3S4B
<i>Catharus ustulatus</i>	Swainson's Thrush	S3S4B
<i>Dendroica striata</i>	Blackpoll Warbler	S3S4B
<i>Regulus calendula</i>	Ruby-crowned Kinglet	S3S4B
<i>Sitta carolinensis</i>	White-breasted Nuthatch	S4
<i>Dendroica fusca</i>	Blackburnian Warbler	S4B
<i>Melospiza lincolni</i>	Lincoln's Sparrow	S4B
<i>Spizella passerina</i>	Chipping Sparrow	S4B
<i>Junco hyemalis</i>	Dark-eyed Junco	S4S5
<i>Empidonax minimus</i>	Least Flycatcher	S4S5B
<i>Passerculus sandwichensis</i>	Savannah Sparrow	S4S5B
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	S4S5B
<i>Carpodacus purpureus</i>	Purple Finch	S4S5B,S3S4N
<i>Bonasa umbellus</i>	Ruffed Grouse	S5
<i>Carduelis tristis</i>	American Goldfinch	S5
<i>Certhia americana</i>	Brown Creeper	S5
<i>Corvus brachyrhynchos</i>	American Crow	S5
<i>Corvus corax</i>	Common Raven	S5
<i>Cyanocitta cristata</i>	Blue Jay	S5
<i>Dryocopus pileatus</i>	Pileated Woodpecker	S5
<i>Picoides pubescens</i>	Downy Woodpecker	S5
<i>Picoides villosus</i>	Hairy Woodpecker	S5
<i>Poecile atricapilla</i>	Black-capped Chickadee	S5
<i>Regulus satrapa</i>	Golden-crowned Kinglet	S5
<i>Bombycilla cedrorum</i>	Cedar Waxwing	S5B
<i>Catharus guttatus</i>	Hermit Thrush	S5B
<i>Colaptes auratus</i>	Northern Flicker	S5B
<i>Dendroica coronata</i>	Yellow-rumped Warbler	S5B
<i>Dendroica magnolia</i>	Magnolia Warbler	S5B
<i>Dendroica palmarum</i>	Palm Warbler	S5B
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler	S5B
<i>Dendroica petechia</i>	Yellow Warbler	S5B
<i>Dendroica virens</i>	Black-throated Green Warbler	S5B
<i>Geothlypis trichas</i>	Common Yellowthroat	S5B
<i>Melospiza georgiana</i>	Swamp Sparrow	S5B
<i>Melospiza melodia</i>	Song Sparrow	S5B
<i>Mniotilta varia</i>	Black-and-White Warbler	S5B

Table 7 cont.

Scientific Name	Common Name	Provincial Rank
<i>Parula americana</i>	Northern Parula	S5B
<i>Vireo olivaceus</i>	Red-eyed Vireo	S5B
<i>Vireo solitarius</i>	Blue-headed Vireo	S5B
<i>Zonotrichia albicollis</i>	White-throated Sparrow	S5B
<i>Turdus migratorius</i>	American Robin	S5B,S3N
<i>Spizella arborea</i>	American Tree Sparrow	S5N
<i>Dendroica discolor</i>	Prairie Warbler	SNA
<i>Phasianus colchicus</i>	Ring-necked Pheasant	SNA
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	SNA

The sparrow abundance and diversity found within the Operational Area and the surrounding fields was as high. The area is expected to be important for seed eating birds between late-September and January. A list of species likely to breed in the fallow Old Field habitat and within the disposal site are shown in Table 8.

Table 8: Additional species that may be breeding in the Operational Area and the surrounding inactive agricultural fields, but not encountered during 2016 avian surveys.

Common Name	Scientific Name	Common Name	Scientific Name
Bobolink	<i>Dolichonyx oryzivorus</i>	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Common Nighthawk	<i>Chordeiles minor</i>	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>
European Starling	<i>Sturnus vulgaris</i>	Eastern Kingbird	<i>Tyrannus tyrannus</i>

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

The major impact of the proposed expansion to avian fauna is through the direct loss of habitat, and conversion to new habitat types. The importance of this has to be considered not only for the absolute loss but as a part of the cumulative impact of many small developments and clear-cuts reducing the available habitats of the region. The seriousness of such losses will depend on several factors, including a) the regional scarcity of the habitats in question, b) its importance to bird species present, c) the extent to which habitat can regenerate following asbestos disposal operations, and d) the successional stage of the ecosystem. These losses, of course, need to be weighed against the value to birds of new habitats created by the proposed Undertaking. Migration in the Study Area appears to be typical of that for the North Mountain in general, and impacts would be proportional to regional habitat loss (or gain), since migrants over woodlands will stop in whatever feeding areas are available.

The removal of Mixed Wood forest, Old Field, and subsequent stripping of soil cover will have the most direct negative impact on bird species using these habitats for feeding or breeding/nesting. Conversion of Mixed Wood habitat is predicted to have a smaller impact on avian species than conversion of the Old Field habitat as the latter is a relatively more limited habitat type. Old Field habitat was observed to be a well used fall migration forage area, is predicted to be an important breeding and nesting habitat for grassland species, and was

observed or predicted to support a number of bird Species at Risk and Species of Conservation Concern.

As proposed operations are the same as existing operations that have occurred for more than a decade, incremental impact to avian species from sound and human presence are predicted to be short term, site specific, and negligible. These impacts are also temporary to the life of the operation, and as such are reversible. An ongoing potential impact that could be expected to affect avian species in and around new operational areas during expansion is from the dust produced by heavy truck traffic and excavation spreading into habitats along the access roads. This impact can affect vegetation, and thereby avian habitat, and could affect young birds in nests close to operations. The nature of soils at the Project Area are not particularly prone to creating dust, and vehicle speeds are slow on the short access roads around the Project Area. Dust is also actively managed by applying water to driving surfaces as a suppressant as necessary. These factors reduce the risk of dust impact on surrounding habitats and wildlife, making it negligible. This direct impact would also be considered short term, site specific, and reversible in the context of the Undertaking.

Several operational efforts will be made to minimize and mitigate alteration of avian habitat that could impact species observed or predicted to be using Mixed Wood and Old Field habitats.

- First, timing habitat disturbance to avoid the breeding season of most birds observed at the site (late May to late July) will minimize the direct impacts on nesting birds, nearly all of which are protected by the Migratory Birds Convention Act. Therefore, grubbing and clearing of all expansion areas will occur outside of the breeding season (May 1 to August 31).
- Second, although the direct impacts of habitat loss can not be fully mitigated, long-term recovery through progressive site reclamation and natural regeneration will help replace altered Mixed Wood and Old Field habitats. Ensuring the progressive reclamation of areas where asbestos disposal operations have been concluded will mitigate impacts by shortening the timeframe between alteration and replacement of grassland habitat of the Old Field, and will establish a net gain in area of fallow grass over the life of the Undertaking. Adjacent Abandoned Farmland and Tall Shrub/Sapling habitats will be allowed to undergo natural succession toward mature Mixed Wood habitat. A proposed berm and hedgerow will have transplanted tree species that will replace a portion of the abundant Mixed Wood habitat lost to expansion.
- The Old Field habitat that is part of the operational properties but not part of the proposed asbestos disposal facility will not be mowed during the nesting season, or any time other than periodically to limit the establishment of woody vegetation.
- Although noise and human presence are long term operational impacts that have existed for more than a decade which will not change, proposed expansion and on site transportation routing changes have the potential to change dust related impacts within the site specific geographic extent of the Project Area. Therefore, attention will be given to dust abatement to minimize this impact, especially during June and early July, when most young birds are in the nest.

Based on the avian assessment and implementation of the above mitigation measures, impacts on avian species is predicted to be negligible, short term, direct, site specific, and reversible.

Therefore, it is not anticipated that the proposed development will result in any significant adverse environment impacts to observed avian fauna species.

6.5 Surface Water Resources and Fish Habitat

Description of Existing Conditions

No watercourses travel through the current or proposed Project Area. Three small watersheds (IDC-SD39 to Granville Line Brook, IDC-SD40 to Un-named tributary, IDC-SD41 to Poole Brook) originate in the study area and flow northward to the Bay of Fundy. Baseline surface water samples were reported on three dates in 2004 from the un-named tributary to Poole Brook located 185+ m west of the proposed Undertaking, and included general chemistry, metal and phenol concentrations representative of conditions prior to the start of C & D operations¹³. Notable results were a neutral pH of 6.9, slightly elevated copper of 0.18 mg/L deemed to be reflective of natural conditions, and an October stream flow estimated at 2 L/min¹⁴.

Fish habitat within the study area is extremely limited, and no visual observation of fish were made during field studies of the available habitat. Long established excavated drainage pathways help drain what would be flat topography of the Study Area. These are typically heavily vegetated, and the plant communities of these drainages have been described in the Terrestrial Flora VEC. The drainages from around the south and west side of the proposed Undertaking are relatively flat with gradients around 0.5%, and they connect together to concentrate flow. The confluence of two primary ditched drainages in the south of the study area (see Figure 5) forms the beginning of the watercourse referred herein as the Un-named tributary to Poole Brook. The Un-named tributary to Poole Brook appears to be an ephemeral stream, flowing predominantly following moderately heavy rain events. The channel maintained shallow pockets of water during the drier period of 2016, but flow was discontinuous for meters between small wetted areas even by October. The channel was measured at approximately 0.5 m bankfull width and 0.20 m bankfull depth. The tributary joins Poole Brook, a known fish bearing stream, at a confluence approximately 1.4 km downstream of the Study Area. The tributary to Poole Brook has an average slope of 7 % and gradients to more than 10 % which would limit, but not prevent, fish migration. The Stream Slope habitat vegetation was presented under the Terrestrial and Aquatic Flora VEC section of this report. The habitat provides a good overland buffer to the Un-named tributary to Poole Brook, and habitat for a number of flora and fauna. Poole Brook itself flows from Rumsey Lake, a locally important recreational lake that is spring stocked with Rainbow trout *Oncorhynchus mykiss*¹⁵ and that supports Brook trout *Salvelinus fontinalis* and a number of other small bodied species. However, the seasonal flows, steep gradients, and limited pool habitat could be expected to limit fish presence in the Un-named tributary to Poole Brook in the reaches within and adjacent to the Study Area to rare occasions during wet periods, if at all.

¹³ Jacques Whitford. 2005. *Environmental Insurance Review Arlington Heights C&D Site*. Project No: NSD19602. 12 pages + Appendices.

¹⁴ Harris, C.T. 2004. *Proposed Construction & Demolition Debris Disposal Site for Melbourne R. Poole & Valarie F. Poole at Arlington West, Annapolis County, NS*. September 10, 2005.

¹⁵ NSIF. 2017. Hatchery Stocking Program. <https://novascotia.ca/fish/sportfishing/hatchery-stocking/>. Nova Scotia Department of Inland Fisheries. Website visited February 18, 2017.

The Un-named tributary to Granville Line Brook lies 235+ m northwest of the proposed Undertaking at the eastern edge of the Study Area is likely a seasonal flow system based on 2016 observations. There is no direct connection of surface drainages and excavated ditches from the Study Area to the tributary. Surface sheet flow from the extreme eastern edge of the proposed Undertaking Project Area might currently move toward the tributary through the heavily vegetated Abandoned habitat, but flat topography in the area makes it inconclusive without additional survey. Within the Study Area the tributary has a bankfull width of 2 m and a depth of 0.4 m. The channel is boulder controlled; with the moss covering on the 20-40 cm diameter boulders indicating a stable system. The tributary joins Granville Line Brook some 500 m downstream of the Study Area to the north. The entire system is characterized by gradients of 5 % and greater. There are no ponds or lakes along the Granville Line Brook system that might provide significant deep water and overwinter habitat. The small pools within the system may provide a limited amount of these habitats depending on water levels and freezing characteristics of a given period.

Waste asbestos is covered within 24 hours to ensure material can not become mobile through wind and water. Monthly inspections of the asbestos disposal site are required under the terms of the Industrial Approval to ensure that disposed asbestos waste remains encapsulated within each cell.

Additional site drainage from the Undertaking flows toward the large wetland located north of the current disposal area. The potential for adverse environmental effects to the wetland are discussed in the Wetland VEC section of this report.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

The potential effects of the proposed Undertaking on surface water resources and fish habitat is limited due to the minimal area of water courses and fish habitat within the Study Area, and the vegetated distance between Project Area drainage features and these watercourses. Fish habitat in the closest watercourses is predicted to be minimal to non-existent given the ephemeral and seasonal nature of flows, and steep gradients connecting the watercourses to known fish bearing reaches.

The potential effects of the Undertaking on surface water resources and fish habitat are therefore associated with transport of contaminants or sediments through drainage pathways on site to the watercourses and fish habitat that are further removed from the Project Area. Potential sources of sedimentation are the exposed mineral surfaces of the operation. Potential sources of surface water contamination are operational equipment, and trucks bringing disposal materials to the site.

In order to minimize these risks and the potential effects associated with sedimentation and contamination, a number of mitigation strategies are proposed.

- Final Phase 3-6 cells are to be land formed to slope westward toward existing and proposed drainage paths. This will limit or eliminate the potential for surface discharge and associated potential for sediment and contaminant delivery from the Project Area toward the Un-named tributary to Granville Line Brook.

- Sediment traps will be installed at the downslope end of constructed drainages and upslope of any receiving watercourse, and both the sediment traps and drainages will be seeded and mulched at the time of construction. The sediment traps and vegetated drainages will intercept surface sheet flow that will run off the active operational areas, allowing the heavier fraction of sediment to be captured in the sediment traps rather than moving downslope to ultimate receiving areas. This will minimize the risk of sediment or contaminant delivery from the Project Area to surface water resources of the Study Area.
- Industry-standard sediment and erosion control measures will be employed to control onsite runoff as necessary, and the progressive reclamation plan will minimize the area of exposed soils to further reduce the potential for sediment transfer.
- Drainage paths will be constructed around Phase cells prior to final grubbing and use to ensure surface runoff is directed away from the asbestos disposal cells and exposed mineral surfaces. This approach will also allow drainages to become vegetated and stabilized prior to use.
- Adherence to the existing Operations and Maintenance Manual, Industrial Approval, and Asbestos Waste Management Regulations will minimize contamination risks.

Based on the above analysis, it is unlikely that there will be any significant adverse environmental effects arising from the proposed Undertaking on surface water resources and fish habitat. It is acknowledged that climate change could lead to more severe rain events that would increase the risk associated with transport of sediment and contaminants. However, daily on site management and adaptability to a severe weather related risks are anticipated to negate any potential increase in risk of an adverse environmental effect to surface water resources for the proposed Undertaking. Surface water monitoring at the site will be conducted at the request of NSE. The significance of impacts should they occur are believed to be small, short term, direct, local, and reversible.

6.6 Wetlands

Description of Existing Conditions

Two wetland areas were identified within the study area. One is a small wetland (0.17ha) to the northwest of the C & D operations, and is the planned and approved receiving area of drainage from that operation¹⁶. A portion of the area had previously been excavated as a sediment catchment for receiving the drainage. Vegetation is dominated by cattail and alder. It is possible that this site is an artifact of the artificial drainage established in 2004 with the opening of the C & D operations, as concentrated flows on top of the thin soils and clay subsoil could be expected to form a perched water table. Site preparation prior to 2004 had removed trees from the site, and would thereby have facilitated the establishment of a wetland plant community given increased surface water concentration. This fact, and the small size of the wetland, make it difficult to determine through air imagery whether the wetland is the result of operational changes to the landscape or existed previously. Its close proximity to the C & D site and reception of site drainage limit habitat value. It serves hydrological functions of storm water attenuation and groundwater recharge, but its small size and lack of connectivity to other water features limit the significance of these functions. This small wetland site is located 230 m west of the edge of the

¹⁶ Harris, C.T. 2004. *Proposed Construction & Demolition Debris Disposal Site for Melbourne R. Poole & Valarie F. Poole at Arlington West, Annapolis County, NS*. September 10, 2005.

proposed Undertaking and is not connected in any manner by surface water drainage with the Undertaking.

The second wetland is undoubtedly a natural forested wetland that existed prior to the C&D operation. The perimeter of the wetland was mapped in the field using a handheld GPS, and found to be just over 2 ha in size as shown in Figure 5. Referred within this report as the “large” wetland, it lies immediately north of the current C&D operations and the existing asbestos disposal cells and extends northward well beyond the study area. Forest cover has been partially harvested across the wetland, although poplar, gray birch, and red maple trees remain. The wetland has no defined inflow other than site drainage that is directed to the wetland from around the perimeters of both the existing C&D and asbestos disposal area. It is likely that the wetland formed due to the naturally flat topography collecting surface sheet flows in a perched water table on top of the clay layer that underlies a shallow organic soil and root mat across the Study Area. The moderate size and surrounding woodland habitat would make this wetland have moderate wildlife habitat values. It appears likely to be a headwater source for a small un-named tributary outside of the study area and north of the mapped wetland boundary based on topographic slopes, although there is no defined channel within the wetland and no defined outlet channel. As a headwater feature it would likely help sustain base flows and regulate temperatures in the Un-named watercourse downslope to the north. Minimal open water pockets within the wetland would provide for limited amphibian reproduction potential.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

Existing C&D disposal and asbestos disposal operations abut the large wetland to the north of the Project Area. Neither this wetland, nor any other wetland, will be physically altered through construction of the proposed Undertaking. Potential impacts to the large wetland include dust from the operation, and silt/sedimentation delivered through site drainage. The effect of these impacts could be to coat plant material and amphibian eggs should they be present. If covering of these organisms was either significant enough or long enough duration it could be effected to have a range of adverse effects on the organisms. Therefore, mitigation measures are proposed. First, dust abatement will be undertaken as necessary by applying water to access roadways to limit on site air borne particulate matter and to ensure Industrial Approval operating conditions are met. Second, silt and sedimentation may occur as surface runoff from exposed soils of the operational area get transported to constructed drainage paths during heavy rain events. This risk will be mitigated by the construction of a sediment trap basin within the drainage path upslope of the wetland as shown in Figure 4. This sediment trap will allow sediments to be captured prior to site drainage discharge to the wetland. Sediment traps will be established where they can be easily monitored and maintained by removing accumulations of sediment as necessary. Some residual fine silts may not be captured by the catch basin and may be carried in suspension into the wetland. The wetland has no through path channel, so movement of such fine silts beyond the immediate vegetation of the wetland would not be anticipated. It is unlikely that any fine silts, should they be delivered to the wetland, would alter the plant community at any resolution. Third, the progressive reclamation and vegetation of completed asbestos disposal cells will further mitigate the risk of silt/sediment delivery to the wetland by stabilizing exposed soils with roots and plant matter, and minimizing the area of exposed soils at the proposed Undertaking. The residual impact of potential sedimentation to the large wetland is expected to be negligible, short term, site specific, and reversible.

The second small wetland identified in the study area lies well northwest of the Project Area, and will not receive any drainage from the proposed asbestos disposal operations. As such there is no anticipated adverse environment impacts to wetlands from the proposed project.

6.7 Species at Risk and Species of Conservation Concern

Description of Existing Conditions

A data report¹⁷ for the Project Area was obtained from the Atlantic Canada Conservation Data Center (ACCDC), and is presented in full in Appendix 7. The 2016 field surveys were undertaken to both characterize the physical and biological features within the Study Area and ascertain the presence, or likelihood of presence, of Species at Risk (SAR) and species of conservation concern at the Study Area. SAR are those which are protected by either Federal or Provincial legislation because of their rarity. Species of conservation concern are those that are known or believed to be rare or uncommon at a Provincial scale, and therefore ranked as S1-S3 by the ACCDC.

Table 9: Species at Risk found within 5km of the Project Area as documented in the ACCDC records.

Common Name	Scientific Name	COSEWIC Status	SARA Status	NSESA Status	Provincial Rarity	Observed During Field Surveys
Prototype Quillwort	<i>Isoetes prototypus</i>	Special Concern	Special Concern	Vulnerable	S2	No
Eastern White Cedar	<i>Thuja occidentalis</i>	N/A	N/A	Vulnerable	S1	No
Bank Swallow	<i>Riparia</i>	Threatened	N/A	N/A	S2S3B	No
Barn Swallow	<i>Hirundo rustica</i>	Threatened	N/A	Endangered	S3B	No
Canada Warbler	<i>Wilsonia canadensis</i>	Threatened	Threatened	Endangered	S3S4B	No
Peregrine Falcon	<i>Falco peregrinus pop.1</i>	Special Concern	Special Concern	Vulnerable	S1B, SNAM	No
Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	N/A	Vulnerable	S3S4B	No
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	Endangered	S2B	No
Eastern Wood-Pewee	<i>Contopus virens</i>	Special Concern	N/A	Vulnerable	S3S4B	No

No Species at Risk were observed during 2016 field surveys of the Study Area. However, the ACCDC notes that nine SAR have been documented within 5 km of the Project Area as listed in

¹⁷ ACCDC.2016. *Data Report 5584: Arlington, NS*. Atlantic Canada Conservation Data Center. Prepared July 29, 2016 by J. Churchill, Data Manager. 26pp.

Table 9. Of those nine species, the Mixed Wood and Abandoned Farm habitats of the Study area might be expected to support the Bobolink, and Eastern Wood Pewee. The Canada Warbler, Peregrine Falcon, and Rusty Blackbird might be occasionally observed, but would be less dependant on the immediately available habitats. The remaining four species shown in Table 9 (Prototype Quillwort, Eastern White Cedar, Swallows) have specific habitat requirements that are not found in the Study Area.

Table 10: ACCDC records of species of conservation concern found within 5km of the Project Area. Six avian species were observed within the Study Area during the 2016 field surveys.

Common Name	Scientific Name	NS General Status	Provincial Rarity	Obs. During 2016 Field Surveys
Rock Hairball Lichen	<i>Spilonema revertens</i>	Undetermined	S1	No
Appalachian Speckleback Lichen	<i>Punctelia appalachensis</i>	Sensitive	S3	No
Bearded Jellyskin Lichen	<i>Leptogium saturninum</i>	Undetermined	S3S4	No
American Cancer-root	<i>Conopholis americana</i>	May Be At Risk	S1S2	No
Round-lobed Hepatica	<i>Hepatica nobilis var. obtusa</i>	May Be At Risk	S1S2	No
Small's Knotweed	<i>Polygonum buxiforme</i>	Undetermined	S2S3	No
Panicled Hawkweed	<i>Hieracium paniculatum</i>	Secure	S3	No
Rosy Sedge	<i>Carex rosea</i>	Secure	S3	No
Maidenhair Spleenwort	<i>Asplenium trichomanes</i>	Secure	S3	No
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Secure	S3	No
Eastern Bluebird	<i>Sialia sialis</i>	Sensitive	S3B	No
Northern Goshawk	<i>Accipiter gentilis</i>	Secure	S3S4	No
Willet	<i>Tringa semipalmata</i>	May Be At Risk	S2S3B	No
Gray Jay	<i>Perisoreus canadensis</i>	Sensitive	S3	Yes
Boreal Chickadee	<i>Poecile hudsonica</i>	Sensitive	S3	Yes
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Secure	S3	Yes
American Kestrel	<i>Falco sparverius</i>	Secure	S3B	No
Gray Catbird	<i>Dumetella carolinensis</i>	May Be At Risk	S3B	Yes
Common Eider	<i>Somateria mollissima</i>	Secure	S3S4	No
Spotted Sandpiper	<i>Actitis macularius</i>	Sensitive	S3S4B	No
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Sensitive	S3S4B	No
Veery	<i>Catharus fuscescens</i>	Secure	S3S4B	Yes
Swainson's Thrush	<i>Catharus ustulatus</i>	Secure	S3S4B	Yes
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Secure	S3S4B,S3N	No

The ACCDC also identified an additional 24 species of flora and fauna that have been documented within 5 km of the Project Area that are considered species of conservation concern. All of these species is listed in Table 10. Six avian species on that list were observed within the Study Area during field surveys, and are likely to make regular use of the available Study Area

habitats. Eight of the species in Table 10 would not be expected within the habitats of the Study Area (Hepatica, Cancer-root, Hawkweed, Rosy Sedge, Four-toed salamander, Common Eider, Spotted Sandpiper, Willet), instead relying on hardwood forests, rocky outcrops, aquatic and coastline habitats. The three lichen species might be found associated with the undisturbed wetland habitat area that extends north of the Study Area. The remaining ten species within Table 10 are birds, and would be considered probable in their use of the varied habitats available within the Study Area.

The ACCDC data only contains observations for records that have been submitted. Therefore, field studies may identify SAR or species of conservation concern that are not previously documented. No observations of flora, herpetofauna, or mammals were made during field surveys of such previously undocumented SAR or conservation concern. Eleven avian species, shown in Table 11, were observed during the Study Area inventories that may be considered species of conservation concern. As previously noted, the habitat provided by the disturbed ground in disposal site itself and the surrounding fallow fields is not as common in the region as the forested and shrub/sapling portions of the Study Area. The fallow fields that are allowed to go to seed provide a valuable resource for seed-eating birds in fall migration. Species such as the Bobolink, Canada Warbler, Olive-sided Flycatcher, Eastern Wood Pewee and Common Nighthawk may breed in the old field and abandoned farmland or adjacent forest habitats of the Study Area.

Table 11: Avian species of conservation concern identified during field surveys of the Study Area at Arlington Heights.

Scientific Name	Common Name	NS General Status	Provincial Rarity
<i>Pooecetes gramineus</i>	Vesper Sparrow	May Be At Risk	S2B
<i>Carduelis pinus</i>	Pine Siskin	Sensitive	S2S3
<i>Perisoreus canadensis</i>	Gray Jay	Sensitive	S3
<i>Poecile hudsonica</i>	Boreal Chickadee	Sensitive	S3
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Secure	S3
<i>Dumetella carolinensis</i>	Gray Catbird	May Be At Risk	S3B
<i>Catharus fuscescens</i>	Veery	Secure	S3S4B
<i>Catharus ustulatus</i>	Swainson's Thrush	Secure	S3S4B
<i>Dendroica striata</i>	Blackpoll Warbler	Sensitive	S3S4B
<i>Regulus calendula</i>	Ruby-crowned Kinglet	Sensitive	S3S4B
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Sensitive	S5

Three special management areas are located within a 5 km radius of the Project Area. Approximately 1.8 km to the west of the current operation, there is the St. Croix Cove Nature Conservancy of Canada management area. Described by ACCDC as partly field, and part forest types ranging from spruce forest to hardwood forest. A brook running down the middle of property holds potential for uncommon flora species. Comprised of basalt bedrock, the site has the most fertile soil types in the area. The NSDNR designated Level 1 Fundy Shore SES, is a noted waterfowl area along the Bay of Fundy Shoreline, extending some 43 kilometers from Parkers Cove to Port George. This coastal habitat is 2.2 km to the northwest of the proposed

Undertaking at its closest. Lastly, Valley View Provincial Park lies 4.5 km to the southwest of the existing operation. The Park offers seasonal overnight camping with limited facilities and hookup amenities. It is not expected that the current and proposed asbestos disposal facility might in any way have an adverse impact on these three management areas.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

As noted in the preceding section, no avian, amphibian, reptile, plant or mammal Species at Risk were observed during field studies of the Study Area. However, five SAR known to be within the surrounding 5 km either would be expected to use or may use the Mixed Wood and Old Field habitats of the proposed Project Area. All five are bird species. An additional sixteen bird species of Conservation Concern were either observed during Study Area field inventories or would be anticipated to use the habitats present. The proposed Undertaking is not expected to directly impact individual bird of these species as they are mobile. However, potential negative effects may indirectly occur through alteration of existing habitats.

The effect of altering the Mixed Wood and Old Field habitats on the known and anticipated bird SAR or conservation concern within the Study Area may be a reduction in available breeding/nesting and forage areas for these species. Given the vast availability of Mixed Wood habitat within the region, alteration of this habitat type is anticipated to have a negligible effect.

In contrast, field habitats are rarely left fallow. Fallow field habitat provides a safe nesting area for grassland species that typically face haying activities that temporarily destroy the habitat and can negatively impact nests and nesting success depending on harvest timing. Fallow fields also provide a diversity of grass species and an abundance of seed that is not found in actively farmed hayfields. This seed source can be a valuable feeding area for birds during fall migration. The fallow Old Field habitat of the Project Area is a somewhat limited habitat regionally and locally, and a portion of that habitat will be lost during construction of future Phases of the asbestos disposal facility. Approximately 2.7 ha (22 %) of the 12.2 ha Old Field habitat within the Study Area will be altered, so the habitat loss is partial. Similar fallow field habitats exist within the ecoregion and within 2 km of the Project Area. The effect of the habitat loss will be mitigated by the progressive reclamation of the operational area, a process that will cover completed cell areas with native grubbing soils and a variety of species of grasses. Given that the entire Project Area will be reclaimed with time, the future grassed reclamation area is 2.3 times that to be altered during construction. Given these factors, the impact to avian species of altering Old Field habitat is considered small, temporary, short term, indirect, site specific, and reversible.

In summary, as bird SAR and species of conservation concern are known or expected to use habitats at the Project Area, the potential for an adverse effect exists. The alteration of Old Field habitat is most likely to have an adverse effect on these species by reducing potential fall migration forage area, and breeding/nesting habitat of grassland species. However, the alteration of habitat is partial, and mitigation measures will result in the alteration being temporary. Given these factors it is not anticipated that the proposed development will result in any significant adverse environment impacts to Species at Risk or species of conservation concern.

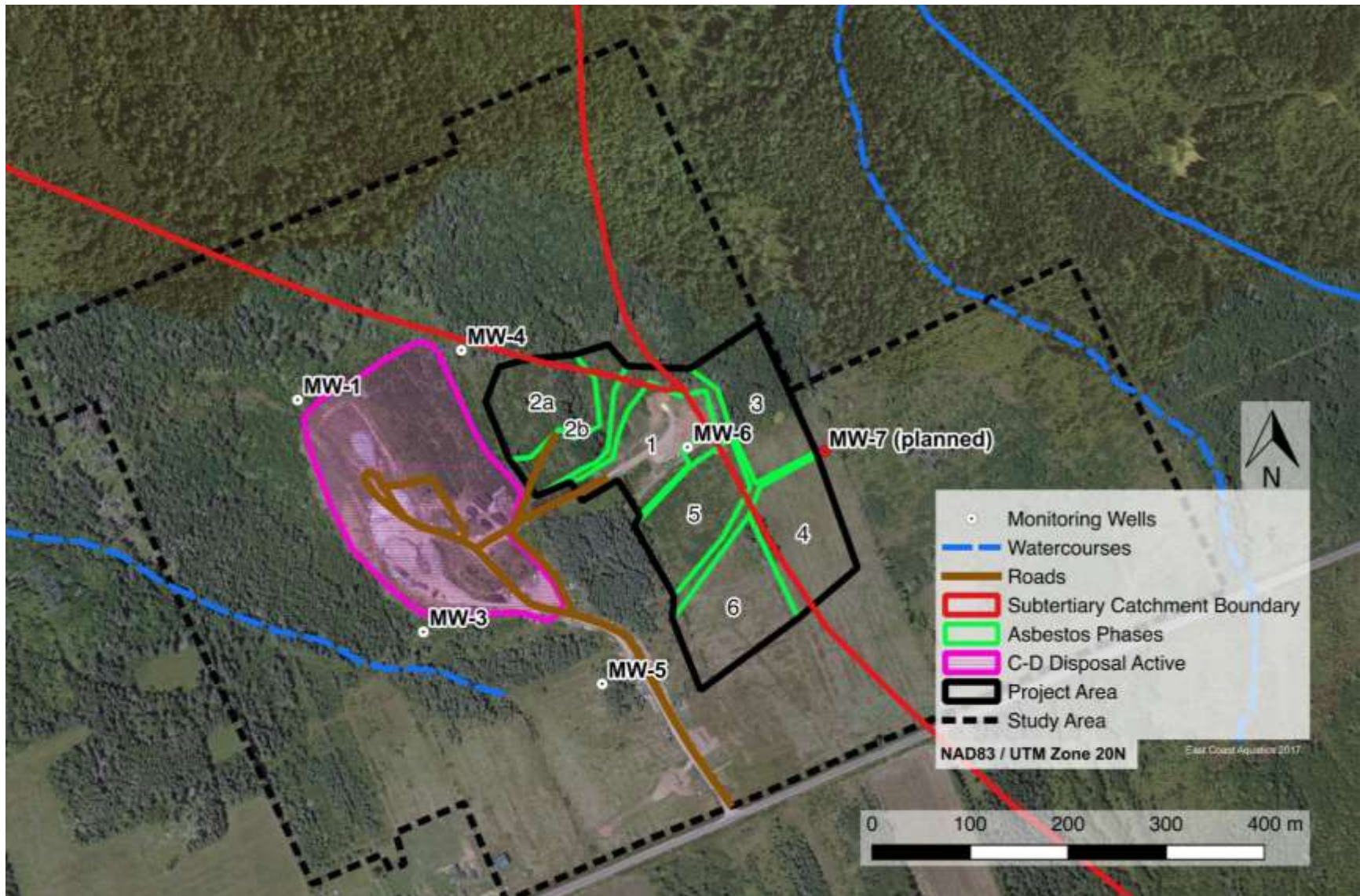


Figure 8: Watershed boundaries and water courses relative to the proposed Undertaking.

6.8 Groundwater and Geological Resources

Description of Existing Conditions

A Geotechnical and Hydrological Assessment was completed on the Study Area in July 2004 by MGI Ltd. They indicated that the groundwater flow reflects the topography of the site, with a flow direction to the west-northwest. They indicate that the hydraulic gradient changes from approximately 0.001 on the eastern side of the site, and the location of the proposed asbestos disposal facility, to 0.0025 on the western portion of the Study Area. This reflects the change in topography as the slope increases to the west. The silty clays of the site were noted to be relatively dry, and ranging in thickness from 4 to 10.36 meters atop a bedrock of columnar basalt of the North Mountain Formation. Hydraulic conductivity of the silty clay layer was noted to be very low, in the range of 0.47 to 1.58 cm/year¹⁸.

Prior to establishment of the C&D disposal facility groundwater sampling occurred at the Study Area, providing a baseline for future comparison. These wells are all downgradient of the Project Area, and therefore will provide suitable baseline and future monitoring of the asbestos disposal facility. MGI Ltd. noted that arsenic and aluminium exceeded the CCME Fresh Water Aquatic Life Guidelines of the day, and that Manganese was above the Canadian Drinking Water Quality Guidelines in the baseline sampling¹⁸. None of the slightly elevated concentrations were uniformly observed across all of the monitoring wells at the site.

Quarterly monitoring of the five groundwater wells is ongoing as a term of the existing Industrial Approval to AHCD Limited. The most recent groundwater monitoring report from August 2016 indicates that, “Data trends are in acceptable ranges and no abnormal effects are noted from operations”¹⁹. These results are presented in Appendix 4. As shown in Figure 8, hydrologically monitoring well 6 lies immediately up gradient of the completed Phase 1 asbestos disposal cell, and Monitoring well 4 lies immediately downgradient of the currently active Phase 2 cell and would be reflective groundwater movements from both Phase 1 and 2. This is a desirable “upstream” and “downstream” monitoring setup. When the most recent full spectrum monitoring results from August 2016 for these two wells are compared to the current CCME Drinking Water Quality Guidelines, arsenic is slightly elevated up gradient (0.013mg/L), but not downgradient (0.004). A similar result to the 2004 baseline surveys. As shown in Appendix 4, all other parameters at these two sites are below the Guidelines and comparable, indicating no upstream to downstream differences.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

As no groundwater or geological resources are to be extracted during the proposed Undertaking, the potential effects of the proposed activities on these VEC’s predominantly limited to degradation of the resource quality through contamination. The potential sources of contamination are operational vehicles and buried waste. Large volumes of hydrocarbon fuels are not stored on site, and a hydrocarbon spill response kit is maintained on-site during operations as a mitigation measure.

¹⁸ MGI Ltd. 2004. *Geotechnical and Hydrogeological Assessment – Monitor Well and Test Pit Program, Arlington West Construction and Demolition Waste Disposal Facility, Arlington West, Nova Scotia*. Letter Report. 16 pages + attachments.

¹⁹ Frazee, J. W. 2016. Letter report on sampling conducted August 09, 2019. Prepared by E & Q Consulting and Associates Limited. Dated August 25, 2016.

The proposed operations are the same as the existing operations with the exception of spatial area for the proposed expansion. Groundwater monitoring has occurred at the Study Area for thirteen years. No adverse effects have been observed in the independently collected and analyzed samples. The closest downgradient groundwater receptor, a domestic well, is located approximate 1.5 km to the north. Silty clay soils used for containment of asbestos waste have been tested to have a hydraulic conductivity that was noted to be very low, in the range of 0.47 to 1.58 cm/year¹⁸. The significance of an impact to groundwater contamination could be considered medium in terms of magnitude, long term, direct, local, and semi-permanent. Groundwater monitoring of six established wells is ongoing based on requirements outlined in the Industrial Approval for the existing operations. This monitoring will be continued, and an additional well will be added to the east of the proposed future Phase 3 and 4 cells to ensure potential groundwater effects from the proposed expansion areas are fully captured within the monitoring regime. Ongoing monitoring will allow for appropriate response should groundwater contamination be detected on site, well before contamination could migrate to potential receptors.

The potential for groundwater contamination to neighboring receptors from the proposed asbestos disposal operations following mitigation of risk through on site waste management procedures, operational procedures, regular disposal site inspections, and ongoing quarterly groundwater monitoring is negligible. Given the factors considered, it is not anticipated that the proposed development will result in any significant adverse environment impacts to groundwater and geological resources.

6.9 Archaeology and Heritage Resources

Description of Existing Conditions

In Situ was retained to conduct an archaeological impact assessment of the proposed asbestos disposal facility expansion. A full report by Laird Niven is presented in Appendix 8. Fieldwork was carried out in November, 2016.

Background studies indicated that the Study Area had a low potential for containing First Nation's or historic archaeological resources and this finding was confirmed by the archaeological fieldwork. A major criterion in the determination of First Nation and historic archeological potential is the presence of watercourses that could have served as transportation routes as well as sources of water and food (fish and fowl). There are no primary watercourses within the study area, although the small Un-named tributary to Poole Brook exists in the south west portion of the Study Area.

The cartographic evidence suggest the Study Area was settled, albeit sparsely so, some time between 1855 and 1878, when the east-west Arlington Road was constructed. The 1930 mapping of the area shows houses would have been built almost exclusively along the road. Although the south west portion of the Study Area along the Arlington Road held the highest probability of containing the remains of a historic structure, field surveys confirmed no potential features.

Given this evidence, the potential for historic archaeological resources within the proposed footprint of the Undertaking is considered low.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

As no historic archaeological resources are likely to exist within the Project Area, no potential effects to these resources are anticipated. No mitigation or follow up is intended.

6.10 Air Quality

Description of Existing Conditions

Air quality has been identified as a VEC due to its potential to adversely affect receptors, principally humans, at the Project Area. On site workers are the closest receptor. The closest public receptor would be two residential buildings on Arlington Road that will be 230 and 345m from the closest proposed disposal cell edge. Wildlife and adjacent vegetation community receptors also occur. Potential sources of air quality impacts are combustion from vehicles, mineral dust from operational activities and wind erosion, and dust from asbestos waste disposal activities. The primary vector for transport of these dusts are wind.

During asbestos disposal operations, a number of internal combustion engines will be used to power equipment within the disposal area. These include an excavator and trucks disposing of asbestos waste. All major pieces of equipment utilize diesel as the fuel source. One to three diesel engines would typically be operating simultaneously during typical disposal operations producing airborne emissions.

Operations involve the movement, and exposure of mineral soils and disposal material. These operations provide the opportunity for airborne dust. The current Industrial Approval issued by Nova Scotia Environment particulate emissions beyond the Study Area property boundaries does not exceed:

Annual geometric mean - 70 microgram/cubic meter; or
Daily average (24 hr) 120 microgram/cubic meter

Currently, impact of airborne dusts from operations on human, wildlife, and plant community receptors are mitigated through a number of actions required as terms and conditions of the Industrial Approval for the site. Asbestos Waste Management Regulations outline containment of wastes during transport to and within the site prior to disposal. Trucks transporting waste onto the AHCD properties for disposal are inspected at weigh in to ensure the waste is properly contained. Waste asbestos is covered within 24 hours to ensure material can not become mobile through wind and water. Monthly inspections of the asbestos disposal site are required to ensure that disposed asbestos waste remains encapsulated within each cell. Furthermore, access road dust is suppressed through the application of water as required.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

Potential operational effects on air quality include vehicle emissions and dust generated by vehicle traffic and waste disposal that could degrade air quality.

The operation of heavy equipment and vehicles at the Project Area will generate combustion emissions. These emissions will include greenhouse gas emissions that have a negative impact on climate change. Given the scale of the proposed operations, these emissions are anticipated to

be negligible, short term, direct, site specific and reversible. Vehicle emissions from the operation are not anticipated to have a significant adverse environmental impact on public receptors beyond the Study Area.

On site trucking activities have the potential to generate dust and airborne particulate emissions. Vehicle speeds at the operation are limited in part by short road segments (<500m), and thereby minimize the potential for vehicles to create airborne dust. As necessary, dust is controlled through the application of water to roads. Mineral dust risk is further mitigated as exposed mineral areas of completed disposal cells will be reclaimed based on a progressive schedule, covering mineral fines with organic grubbing's, seeding, and mulch. The remediated surfaces will stabilize mineral soils preventing dusts from potentially becoming airborne through wind erosion.

In order to ensure that asbestos fibres and dust do not become airborne, AHCD Limited's asbestos waste handling and disposal at the site follows the Asbestos Waste Management Regulations and terms and conditions of their Industrial Approval. This includes inspection of materials as they arrive on site to ensure that they are properly packaged before disposal, covering disposed waste placed in the disposal cell with a minimum of 0.25 m of mineral soils within 24 hours of disposal, and covering disposed waste with a minimum of 1.25 m of material during reclamation. Reclamation activities of seeding and mulching will ensure a vegetation cover stabilizes the reclaimed cell surface, limiting the potential for re-exposure of encapsulated material through wind and water erosion. Additionally, monthly inspections of the asbestos disposal site are required to ensure that disposed asbestos waste remains encapsulated within each cell, and still further limiting the potential for waste materials to become airborne from an undetected event of re-exposure of encapsulated waste. Following the terms of the Industrial Approval, monitoring of airborne dust emissions will be conducted at the request of NSE.

The Undertaking is located in a rural setting, with little residential development within 2000 m and a significant wooded buffer surrounding much of the site that further minimizes the potential for long distance transport of airborne dusts to potential human, wildlife, and plant community receptors, should airborne dusts occur. Off site transport of airborne dusts will further be limited by the proposed establishment of a vegetated berm and hedgerow along the southern boundary of the Undertaking. Based on the completed assessment, the significance of air quality impacts from the proposed undertaking predicted to be negligible, short term, direct and indirect, site specific, and reversible.

6.11 Noise

Description of Existing Conditions

Noise generated as a result of the project has been identified as VEC due to its potential impact on neighbouring receptors. The principal receptors of interest are terrestrial and avian fauna, as well as adjacent residences. The closest public receptor would be two residential buildings on Arlington Road that will be 230 and 345 m from the closest proposed disposal cell edge. The current Industrial Approval, shown in Appendix 1, issued by Nova Scotia Environment stipulates noise levels do not exceed those listed in Table 12.

Table 12: Equivalent sound levels (Leq) guidelines for the AHCD asbestos disposal facility as outlined in the current Industrial Approval.

Day	Evening	Night, Sundays, and Statutory Holidays
07:00 – 19:00 hours	19:00 – 23:00 hours	23:00-07:00 hours
65 dBA	60dBA	55dBA

Noise will be generated by heavy vehicles delivering disposal waste and on site machinery used to properly place and cover material in cells. During expansion, there will be a short-term use of additional machinery to remove forest cover in the are of proposed Phase 3 cell. All proposed activities that will generate noise are the same as existing activities that have occurred at the site over 13 years of operation. No new noise generating activities are proposed. Noise levels emitted from the operation have been previously measured by NSE at the receptor and were determined to fall within the guidelines. Currently, the operation is 80 % surrounded by dense forest and 20 % surrounded by dense shrub/sapling cover which helps attenuate sound propagation off the Project Area properties. As demonstrated by the results of field surveys for birds and mammals, a wide number of species utilize the habitats in and around the current operations.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

Potential effects of operational noise are disturbance of human and wildlife receptors in a manner that could result in alteration of natural behaviours, enjoyment, and use of space.

A number of approaches will be employed to mitigate noise emissions from project activities. Operations at the asbestos disposal facility will comply with the operational noise-level limits outlined in the Industrial Approval. Noise is minimized through the use of mufflers on all equipment used on site, and adherence to operational hours. Prior to the operation expanding to future Phases 4-6, a low level berm and hedgerow will be constructed on the southern edge of the asbestos disposal facility cells. Establishing dense evergreen vegetation on this berm will not only provide a visual barrier between Arlington Road and the operations but will serve to attenuate sound propagation toward the road and nearest residence located approximately 230 m away to the southeast. This hedgerow will maintain the integrity of the current full circumference vegetation buffer around the operation. Sound level monitoring at the site will be conducted at the request of NSE.

The development and operations at the disposal facility will produce noise as a result of equipment operation. These operations will not be significantly different than what has occurred over the previous 13 years of operation at the site. The potential impact of noise related effects is considered medium in terms of magnitude, short term, direct, local and reversible. As such, when these factors and the noted mitigation strategies are considered, the potential for project-related noise to have a significant effect on receptors is considered low.

6.12 Socio-Economic Environment

Description of Existing Conditions

The two closest residences are approximately 230 and 345 m from the closest edge of the proposed Undertaking footprint. These permanent residences are located on the Arlington Road, hydrologically up gradient of the Undertaking. Including these two, there are four residence within 1000 m. There are 72 residence within 2000 m. Of the residence within 2km, approximately 25 are seasonal cottage properties on Rumsey Lake, located 1.6 km upslope to the south of the Project Area. The remainder, both at Rumsey and along Arlington Road and St. Croix Cove Road, are permanent. The nearest hydrologically downgradient residence is located approximately 1.5 km to the north of the Project Area on St. Croix Cove Road.

Rumsey Lake is a popular recreational area, with numerous seasonal and a few year round residence. The lake is stocked with Rainbow trout by the Province, and as such is frequented by fishermen who are not residents to the lake during the fishing season. Seasonal hunting occurs in the area for deer, bird, rabbit, and perhaps bear. A predominant land use on adjacent properties to the Undertaking is timber harvesting on private lands, although some agricultural fields exist to the south and southwest. Agricultural fields in the area are almost exclusively for hay production rather than crops. The fishing ports of Hampton (5.5 km NW) and Port Lorne 4 km (NE) are home to a small number of boats participating in a variety of fisheries on the Bay of Fundy, including lobster and groundfish.

Potential Effects, Proposed Mitigation, Proposed Monitoring and Follow-up

The proposed Undertaking, at current rates of use, provides direct employment for two full time positions and two part time positions in rural Nova Scotia. An additional number of indirect jobs with asbestos abatement and trucking operations are supported by the continued operation of AHCD Limited, and the asbestos waste disposal facility. This is a positive socio-economic effect of the Undertaking.

Given, the proponent owned lands (57ha) surrounding the proposed Undertaking (6.25 ha), the forested buffer around the majority of the operation, the proposed construction of a berm and hedgerow to maintain a visual barrier and buffer between the operation and Arlington Road, and the 13-year history of operations at the current site, adverse impacts on existing and future adjacent land uses are not anticipated.

Recreation and tourism use in the area is limited primarily to fishing, swimming, and cottage use at Rumsey Lake. No operational effects on these uses has been claimed or reported to the operators. The large and visual separation distance between the site, Rumsey Lake and other local recreation/tourism destinations, such as Valley View Provincial Park or Hampton beach, makes the potential for adverse effects of the operation on recreation and tourism negligible. While hunting is possible within the Study Area, the Project Area is situated on private land with gated access, and hunters requiring the permission of the land owner. Therefore, the proposed continued operation and expansion of the asbestos disposal facility is not anticipated to have an adverse effect on hunting.

Human health effects from contaminants, noise, and airborne emissions are mitigated through operational procedures and the positive quality of the site in terms of soil types and

hydrogeology for proper asbestos disposal. These factors minimize the risk of adverse effects occurring and the ability of adverse effects to leave the project properties should they occur. The lack of streams, lakes, or surface water bodies in the area of proposed expansion further limits potential for effects on adjacent properties. The continued and expanded groundwater monitoring proposed will allow early detection of potential impacts should they occur, allow time for remediation considerations to be made and implemented before effects beyond the proponent properties are realized. The proposed construction of a berm and hedgerow between the operation human receptors at Arlington Road is anticipated to further mitigate the potential for adverse socioeconomic effects by attenuating sound propagation and dust movement toward the receptors.

Based on this assessment, the potential for significant adverse impacts from the proposed Undertaking on existing and future socioeconomic constituents of the adjacent lands and area are considered negligible, short term, direct and indirect, local, and reversible. When these factors and the noted mitigation strategies are considered, the potential for the proposed Asbestos Waste disposal facility to have a significant adverse socio-economic effect is considered negligible.

6.13 Other Undertakings in the Area

The immediately adjacent construction and demolition debris disposal site is owned and operated by the proponent. This operation footprint falls within the Study Area evaluated as part of this Environmental Assessment process. The closest other known Undertakings are open pits/quarries located on Hampton Mountain Road approximately 4.7 km to the west.

6.14 Summary of Proposed Mitigation Measures and VEC Impacts

Table 13 provides a summary of the proposed mitigation measures for the Undertaking with respect to each of the Valued Environmental Components.

Table 13: Summary of VEC's assessed for the proposed Undertaking and the mitigation measures to limit or eliminate adverse environmental effects of the Undertaking.

Valued Environmental Component	Mitigation Measures Proposed
Terrestrial Vegetation Communities	<ul style="list-style-type: none"> • Minimize disturbance of Mixed Wood forest habitat that can not be readily reclaimed on site. • Reclaim completed disposal areas to a grass covered habitat to allow some replacement of Old Field habitat lost in the expansion. • Use of seed mixes free of noxious weeds during site reclamation. Native soils from grubbed piles will be used in site reclamation. Where ever possible, seed mixes containing native plants will be used in site reclamation. If not available, seed mixes containing naturalized species which are well established in Nova Scotia and are not aggressive weeds in wetland and forest communities will be utilized.

	<ul style="list-style-type: none"> • Establish a treed berm and allow regeneration of Tall Shrub/Sapling habitat to contribute to the replacement of Mixed Wood habitat lost in expansion
Terrestrial Fauna	<ul style="list-style-type: none"> • Adhere to a limited daytime schedule, noise levels maximum, and air quality dust maximum through operations to limit effect on terrestrial fauna and other receptors. • Ensure dust suppression through application of water to driving surfaces as necessary.
Avian Fauna	<ul style="list-style-type: none"> • Site clearing will not occur during the late May to late July breeding and nesting period. • Undertake progressive reclamation of completed cells to minimize the area of Old Field habitat loss to avian use at any one point in time. Seed reclaimed areas with native mixes to provide fall migration forage opportunities for birds, and breeding opportunities for grassland species. • Do not mow Old Field habitat that remains outside of the Undertaking, other than periodically outside of the breeding/nesting period to limit establishment of woody species. • Ensure dust suppression through application of water to driving surfaces as necessary.
Surface Water Resources	<ul style="list-style-type: none"> • Establish proposed sediment trap upslope of final drainage pathways that lead to the Un-named tributary to Poole Brook in order to reduce the potential for a sedimentation event from site drainage. • Establish and vegetate proposed drainage pathways prior to final grubbing of proposed cell areas to limit potential for surface water exposed mineral interaction. • Contour completed cells toward designed drainage pathways to limit the potential of overland drainage toward the Un-named tributary to Granville Line Brook and its watershed. • Undertake progressive reclamation of completed cells to minimize the area of exposed mineral soils that could create a siltation/sedimentation event. • Implement industry-standard erosion and sediment control measures during expansion operations to limit the risk of sedimentation events.
Wetlands	<ul style="list-style-type: none"> • No wetland alterations will occur as part of the proposed Undertaking. • Proposed drainage patterns are intended to neither add to or remove from the current surface water inputs to the wetland north of the Undertaking. • Establish proposed sediment trap upslope of final drainage pathways that lead to large wetland in order to reduce the potential for a sedimentation event from site drainage. • Industry-standard sediment and erosion control measures will be employed to control onsite runoff. • Undertake progressive reclamation of completed cells to minimize the area of exposed mineral soils that could create a siltation/sedimentation event.

Groundwater and Geological Resources	<ul style="list-style-type: none"> • No soil or geological resources will be removed from the site through proposed operations. • Large volumes of hydrocarbon fuels will not be stored on site, and a hydrocarbon spill response kit will be maintained on-site during operations. • Groundwater monitoring will occur regularly, allowing a timely response should water quality issues be observed. • One groundwater monitoring well will be added to the existing array to ensure adequate capture of potential groundwater pathways around the proposed Undertaking.
Air Quality	<ul style="list-style-type: none"> • A berm and hedgerow will be constructed between the future Phase cell areas and the nearest human air quality receptors along Arlington Road to limit the potential for dust movement from the work area to the receptors. • Dust will be suppressed through application of water to roadways. • Exposed mineral soils will be minimized by progressive reclamation and revegetation of completed cells. • Follow Asbestos Waste Management Regulations and terms and conditions of the Industrial Approval to ensure that proper encapsulation of and monitoring of waste asbestos occurs and is maintained over time at each cell.
Noise	<ul style="list-style-type: none"> • A berm and hedgerow will be constructed between the future Phase cell areas and the nearest human noise receptors along Arlington Road to limit the potential for noise propagation from the work area to the receptors • All engines used on site will be fitted with mufflers. • Typical hours of operation for the pit will be from 07:30 to 17:00, Monday to Friday. Occasionally, waste materials delivery will occur on Saturdays.

Following implementation of all mitigation measures, the proposed Undertaking will give rise to a number of potential residual impacts on VECs. These residual impacts, both positive and negative are summarized in Table 14.

The preceding sections have presented baseline conditions for VECs within the Study Area and have considered the spatial and temporal scope of the proposed Undertaking, and expansion and continued operation of the existing asbestos waste disposal facility. A number of mitigation measures have been proposed to address potential impacts. It is expected that there will be both positive and negative residual impacts arising from the proposed Undertaking as shown in Table 14. The negative residual impacts have been considered within their temporal and spatial scope, together with the ecological setting. Based on this, it is concluded that the asbestos disposal facility expansion, as proposed and with the implementation of the mitigation measures, will not result in any significant adverse environmental effects

In conjunction with the above-noted mitigation measures, it is recognized that a number of additional measures will be required to ensure no significant adverse effects will arise from the

Table 14: Summary of residual impacts, after mitigation measures, to Valued Environmental Components for AHCD Limited proposed asbestos disposal facility expansion.

Valued Environmental Component	Anticipated Residual Impact (+) positive impact (-) negative impact	Temporal Scope of Impact	Spatial Scope of Impact	Adversity Category*
Terrestrial Vegetation	(-) Loss of Mixed Wood forest cover until naturally regenerated, and until partially replaced by hedgerow growth.	10 to 50 years	Site Specific 0.6 ha	Moderate
	(-) Loss of Old Field habitat	Permanent	Site Specific 2.67ha	Low
	(+) Progressive reclamation and seeding of completed operational areas will establish new grass habitat.	2 to 15 years	Site Specific 6.25 ha	Positive
Terrestrial Fauna	(-) Partial displacement from habitats until remediated	5 to 10 years	Site Specific 6.25 ha	Negligible
Avian Fauna	(-) Loss of Mixed Wood habitat for forest birds until regenerated.	50 years	Site Specific 0.6 ha	Small
	(-) Loss of Old Field habitat for grassland birds	2 to 15 years	Site Specific 2.67 ha	Low
	(+) Progressive reclamation and seeding of completed operational areas will establish new grass habitat for fall forage and breeding/nesting.	2 to 15 years	Site Specific 6.25 ha	Positive
Surface Water Resources	(-) Limited potential for sedimentation impacts during extreme precipitation events	< 1 week	Site Specific <100 m linear stream length	Negligible
Fish and Fish Habitat	No anticipated impacts	N/A	N/A	Negligible
Wetlands	(-) Limited potential for sedimentation impacts during extreme precipitation events	< 1 week	Site Specific <100 m ² linear stream length	Low

Table 14 Cont.

Valued Environmental Component	Anticipated Residual Impact (+) positive impact (-) negative impact	Temporal Scope of Impact	Spatial Scope of Impact	Adversity Category
Species at Risk and Species of Conservation Concern	(-) Loss of fallow Old Field Habitat that is of significance for migratory and grassland bird species	Permanent	Site Specific 2.67ha	Low
	(+) Expansion of fallow grassland habitat following Progressive Reclamation and operational closure.	Ongoing	Site Specific 6.25 ha	Positive
	(+) Periodically mow the Old Field habitat, outside of breeding and nesting, to limit the establishment of woody vegetation that would naturally reduce this valuable fallow field habitat.	Ongoing	Site Specific 8.69ha	Positive
Groundwater and Geological Resources	No anticipated impacts	N/A	N/A	Negligible
Archaeological and Heritage Resources	No anticipated impacts	N/A	N/A	Negligible
Air Quality	(-) Dust emissions	Dry periods during summer months	Local, <200 m from project boundary	Low
Noise	(-) Equipment noise	Daily operational hours	Local, <500 m from project boundary	Low
Socio-Economic	(+) Securing of employment (2 permanent, additional indirect positions)	Ongoing	Regional	Positive

*As defined in NSE. 2011. *Guide to considering Climate Change in Environmental Assessments in Nova Scotia*. Table 2-2.

project. These include:

- Continued groundwater monitoring, including at the proposed new well, as outlined in the existing Industrial Approval.
- Adherence to the Asbestos Waste Management Regulations.
- Adherence to the existing terms and conditions of the Industrial Approval for the operation.
- Adherence to the existing and future terms of the Operation and Maintenance Manual.
- Implementation of additional monitoring requested by NSE as outlined in the existing Industrial Approval.

7. Effects of the Project on the Environment

The activities proposed for the expansion of the AHCD Limited asbestos disposal facility will be conducted in accordance with the terms and conditions of the current Industrial Approval, any subsequent amendments to the Approval, and the Asbestos Waste Management Regulations.

The environmental effects of the facility expansion will include the loss of Mixed Wood and Old Field terrestrial habitats until reclamation and natural regeneration re-establishes these losses. Biological surveys have indicated that the assessed properties support a number of flora and fauna, including species of conservation concern. Although no Species at Risk were found directly within areas of proposed expansion, several were found within 5 km to proposed expansion areas, and those that are mobile, such as birds, may occasionally be found within the proposed areas of expansion. Surveys indicate that habitats of the Project and Study Areas likely support avian Species at Risk. Additional information on the specific assessment and mitigation measures for these species is presented in Section 6.7 of this report. While expansion of the asbestos disposal area may result in habitat loss and temporary displacement for some species, others may well benefit from the Undertaking with the implementation of appropriate mitigation measures. This is particularly true for avian species that favour edge habitats, diversity of plant cover, and grassy habitats.

The analyzed soil types and groundwater movements of the site, together with the limited surface water features, predominant forested buffer, and physical separation between the proposed Undertaking and human receptors would indicate a low likelihood of significant adverse environmental effects on humans. Ongoing groundwater monitoring, and Industrial Approval limits for a number of potential effects (noise, surface water quality, particulate emissions) provide additional assurance that adverse human effects will not result from the operations.

In addition to the assessed VEC's, the project will have potentially negative impacts to climate change. Project vehicles will directly contribute to greenhouse gas emissions and the removal of Mixed Wood forest habitat will be a loss of a carbon sink.

Assuming that the proposed expansion is operated in accordance with existing provincial guidelines and approvals, and the mitigation measures recommended in this report are implemented, it is unlikely that any significant adverse residual environmental effects will occur as a result of the Undertaking.

8. Effects of the Environment on the Project

The environment may affect the Undertaking primarily through changes in climatic conditions. The potential effect of climate change on a project depends on project-specific factors including the type of project, size, location, and duration²⁰ The lifespan of the proposed Undertaking is likely 10-20 years. As such, the effects of climate change on this project are not as great a consideration as a project that might occur over a 50+ year lifespan. The relatively high elevation location negates concerns of sea level rise on the project. The location within flat topography at a height of land, away from active watercourses, and underlain by a deep clay subsoil with low hydraulic conductivity limits some of the potential effects of higher rainfall events. The relatively small 6.25 ha size of the Undertaking and proposed progressive reclamation limits the area of exposure to significant climate change related weather events. Evaluation of the project risk category for climate change is low/no risk. This determination is made given that the project is not reliant on resources affected by climate, is in an existing industrial location, is not reliant on undisturbed electrical power source to be safely operated, and is not in a climate change hazard zone. Climate change is not considered likely to have an adverse effect on the project.

Significant precipitation events and the associated runoff could cause temporary delay in the preparation, excavation and reclamation of land within the active area. Similarly, heavy snow conditions may result in the earlier suspension of autumn development activities and a delay resuming activities in the spring. These events may also delay the delivery of waste asbestos to the site from abatement locations around the Province. If these delays should occur, the impacted activities will be suspended until conditions improve.

Mitigation measures, such as construction of durable roads and the installation of erosion and sediment control measures, have allowed for the successful operation of the current asbestos disposal facility activities through a variety of conditions over the past 13 years. Similar measures will be employed with the proposed expansion. Therefore, typical climatic and meteorological conditions are not anticipated to significantly affect the operation of the pit over its proposed lifetime.

9. Other Approvals Required

The Proponent is required to register this Project as a Class I Undertaking pursuant to the Nova Scotia Environment Act and Environmental Assessment Regulations, and obtain Environmental Assessment Approval as a term and condition of their current Industrial Approval No. 2005-045327-T01.

²⁰ NSE. 2011. *Guide to Considering Climate Change in Environmental Assessments in Nova Scotia*. Nova Scotia Department of Environment. 18pp.

The expansion of the asbestos disposal facility will require an amendment to the existing Industrial Approval from NSE, pursuant to the Activities Designation Regulations.

No other approvals are anticipated.

10. Funding

The proposed Undertaking will be 100% privately funded.

11. Additional Information

No additional information has been provided to support this application.

Appendix 1. Industrial Approval



APPROVAL

Province of Nova Scotia
Environment Act, S.N.S. 1994-95, c.1, s.1

APPROVAL HOLDER: Arlington Heights C & D Limited
SITE PID: 05127873, 05127899, 05127881
APPROVAL NO: 2005-045327-T01
EXPIRY DATE: August 1, 2017

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1, s.1, as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Construction, operation and reclamation of a Asbestos Disposal Facility, and associated works, at or near Arlington West, Annapolis County in the Province of Nova Scotia.

Administrator: Jennifer Lonergan Effective Date Nov 3rd 2015

The Minister has delegated his powers and responsibilities under the *Act* with respect to the Approval to the Administrator named above. Therefore any information or notifications required to be provided to the Minister under this Approval can be provided to the Administrator unless otherwise advised in writing.

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Environment

Approval Holder: Arlington Heights C & D Limited
Project: Asbestos Disposal Facility
Site: Arlington West, Annapolis County
PID # 05127873, 05127899, 05127881

Approval No: 2005-045327-T01

File No: 31000-30

Map Series: 21 A/14 (Bridgetown)

Grid Reference: E320100 N4975700

Reference Documents:

- Application dated October 5, 2015 and attachments;
- Contents of NSE file no. 31000-30-KEN-2005-045327;
- Contents of NSE file no. 31000-30-KEN-2005-045327-R01;
- Site Plan: Plan No 467-01, Construction & Demolition Debris Disposal Site, dated October 22, 2004 by C. T. Harris, P.Eng.;
- Authorization Letter: dated January 2, 2015 and signed by Valerie Poole.

1. Definitions

- a) "Abandonment" means cessation of operation for a period of twelve (12) months, unless authorized by the Minister.
- b) "Act" means the *Environment Act*, Chapter 1 of the Acts of 1994-1995, and includes, unless the context otherwise requires, all regulations made pursuant to the *Act*.
- c) "Administrator" means a person appointed by the Minister for the purpose of this *Act*, and includes an Acting Administrator.
- d) "Approval" means an approval issued pursuant to this *Act* with respect to an activity.

- e) "Associated Works" means any building, structure, machinery, equipment, storing facility, device, tank, system, stockpile, pollution abatement system or other related infrastructure.
- f) "Department" means the Department of Environment, and the contact for the Department for this Approval is:
 - Nova Scotia Environment
 - Compliance Division
 - Western Region, Kentville Office
 - 136 Exhibition St. 2nd Floor
 - Kentville, NS B4N 4E5

 - Phone: (902) 679-6086
 - Fax: (902) 679-6186
- g) "Disturbed Area" means any area on the Site that has been stripped of vegetation and is susceptible to erosion.
- h) "Extension" means an increase in size, volume or other physical dimensions of an activity such that the increase may cause an adverse effect if not properly mitigated.
- i) "Facility" means the Asbestos Disposal Facility and associated works.
- j) "Grab sample" means an individual sample collected in less than 30 minutes and which is representative of the substance sampled.
- k) "Minister" means the Minister of Environment, and may include any person appointed as a designate of the Minister.
- l) "Modification" means a change to an activity that may cause an adverse effect if not properly mitigated and includes, but is not limited to, the expansion of the same process, addition of product lines and replacement of equipment with different technology other than that presently in use.
- m) "Reclamation" means work performed or to be performed in accordance with an authorization plan, and includes rehabilitation of a Site or Facility.
- n) "Site" means the lands where an activity or proposed activity will take place.
- o) "Standard" means a standard, policy, code, guideline, protocol or other rule in relation to a designated activity that, by reason of its establishment or adoption by regulation or as a condition of an Approval or certificate of

qualification, becomes a mandatory requirement for participation in that designated activity.

- p) "Trained Employee" means an employee trained in Workplace Hazardous Materials Information System "WHMIS", Transportation of Dangerous Goods "TDG" and terms and conditions of this Approval.
- q) "Water Resource" means all fresh and marine waters comprising all surface water, groundwater, and coastal water.
- r) "Watercourse" means the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and all groundwater.
- s) "Wetland" means land commonly referred to as a march, swamp, fen or bog that either periodically or permanently has a water table at, near or above the land's surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation and biological activities adapted to wet conditions.

Environmental Assessment Approval

- a) The Approval Holder shall conduct an Environmental Assessment of the site, in compliance with the *Environmental Assessment Regulations*.
- b) The Approval Holder shall obtain an Environmental Assessment Approval from the Department prior to **May 1, 2017**.
- c) The Department reserves the right to no longer renew this Approval if an Environmental Assessment Approval is not obtained prior to the expiry date.

Scope of Approval

- a) This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to construct, operate and/or reclaim the Facility, situated at or near Arlington West, Annapolis County (the "Site").
- b) The Site and/or Facility shall not exceed the area as outlined in the application and supporting documentation.

- c) It is the Approval Holder's responsibility to ensure applicable legislation, approvals, and codes of practice are met for all other aspects of the operation of the Facility.

General Terms and Conditions

- a) The Approval Holder shall operate and reclaim the Facility in accordance with the following provisions:
 - i) the *Environment Act* S.N.S. 1994-1995, c.1, s.1, as amended from time to time;
 - ii) Regulations made pursuant to the above *Act*, as amended from time to time.
- b) No authority is granted by this Approval to enable the Approval Holder to operate the Facility on lands which are not in the control or ownership of the Approval Holder. It is the responsibility of the Approval Holder to ensure that such a contravention does not occur.
- c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- d) Any request for renewal or extension of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.
- e) The Minister may add, modify or delete conditions to this Approval at any time pursuant to Section 58 of the *Act*.
- f) This Approval is not transferable without the consent of the Minister.
- g)
 - (i) If the Minister determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister may cancel or suspend the Approval pursuant to subsections 58A(1) and 58A(2) of the *Act*, until such time as the Minister is satisfied that all terms and conditions have been met.
 - (ii) If the Minister cancels or suspends this Approval, the Approval Holder remains subject to the penalty provisions of the *Act* and regulations.
- h) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Facility, including, but not limited to, the active area, operating area, process changes or waste disposal practices

which are not granted under this Approval. An amendment to this Approval may be required before implementing any change.

- i) Extensions or modifications to the Facility may be subject to the *Environmental Assessment Regulations*. Written approval from the Minister may be required before implementing any change.
- j) Pursuant to Section 60 of the *Act*, the Approval Holder shall submit to the Minister any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.
- k) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.
- l) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- m) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.
- n) Unless written authorization is received otherwise from the Minister, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- o) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.
- p) Upon any changes to the Registry of Joint Stock Companies information, the Approval Holder shall provide a copy to the Department.

5. **Surface Water**

- a) The Site shall be developed and maintained to prevent surface water contaminants from being discharged into a watercourse, wetland, water resource, or beyond the property boundary, in excess of the following criteria:

- i) **Total Suspended Solids: Clear Flows (Normal Background Conditions)**
 - (1) Maximum increase of 25 mg/l from background levels for any short term exposure (24 hour or less);
 - (2) Maximum average increase of 5 mg/l from background levels for longer term exposure (inputs lasting between 24 hours and 30 days);
 - ii) **Total Suspended Solids: High Flow (Spring Freshets and Storm Events)**
 - (1) Maximum increase of 25 mg/l from background levels at any time when background levels are between 25 mg/l and 250 mg/l;
 - (2) Maximum increase of 10% over background levels when background is >250 mg/l;
 - iii) **pH (Outfall)**
 - (1) Maximum 5 to 9 in grab sample;
 - (2) Maximum 6 to 9 as a Monthly Arithmetic Mean;
- b) The Approval Holder shall ensure surface water is monitored at the following locations and frequency:
- i) **Monitoring Locations**
 - (1) upon Department request;
 - ii) **Monitoring Frequency**
 - (1) upon Department request;
- c) The Approval Holder shall submit surface water monitoring results to the Department, upon request.
- d) Erosion and sedimentation control devices shall be installed prior to construction at the Site and shall remain in place and be maintained until disturbed areas are stabilized.
- e) The Department reserves the right to require modifications including, but not limited to, monitoring locations, monitoring frequency, contaminants of concern, and surface water criteria.
- f) No authority is granted by this Approval to enable the Approval Holder to discharge surface water onto adjoining lands without the authorization of the affected landowner(s). It is the responsibility of the Approval Holder to ensure authorizations are current and valid.

- g) The Approval Holder shall immediately contact the Department should sulphide bearing material be encountered on the Site and shall include planned remedial measures in conformance with the *Sulphide Bearing Material Disposal Regulations*.

6. Designated Disposal Area

- a) The Approval Holder shall limit the disposal of asbestos to "Cell 3" as indicated on Construction & Demolition Debris Disposal Site, Site Plan, Plan No. 467-01, dated October 22, 2004 by C. T. Harris, P.Eng. until an Environmental Assessment Approval has been issued.
- b) The asbestos waste shall be placed in an area that is designated as an asbestos disposal area. The area shall be separate from any other waste disposal area.
- c) Only asbestos waste shall be placed in the designated asbestos disposal area.
- d) The designated asbestos disposal area shall be clearly marked.
- e) A copy of the site plan indicating the asbestos waste disposal area shall be recorded by the Approval Holder in the Registry of Deeds where the site is located. A copy of the registration is to be submitted to the Department within 90 days of receiving the approval.

7. Operating Requirements

- a) The Approval Holder shall ensure that legible signage is posted at the entrance to the Facility that includes, but is not limited to, information pertaining to the days and hours of operation, the list of acceptable/unacceptable waste, and emergency contact numbers.
- b) The area designated for asbestos waste disposal must be secured from unauthorized access. The asbestos disposal area and the surrounding fence enclosure shall remain locked when the Facility is not in use or operation.
- c) The Facility shall not accept waste that is not packaged in accordance with *Asbestos Waste Management Regulations*.
- d) Construction and operation of the asbestos waste disposal area must conform to the *Asbestos Waste Management Regulations*.

8. Designated Area Cover Limits

- a) The Approval Holder shall cover the asbestos waste within twenty four (24) hours of burial in the designated asbestos waste disposal area.
- b) The depth of cover material shall be a minimum of twenty five (25) centimetres.
- c) The Approval Holder shall use natural soil or rock as the cover material. The use of any other material as daily cover will require the written approval of the Department.
- d) Upon abandonment or discontinuance of use of the designated asbestos waste disposal area, the Approval Holder shall apply a final cover material having a depth of not less than one hundred twenty five (125) centimetres.

9. Staffing

- a) Only trained employees shall be involved in the asbestos waste storage, handling and transfer operations.
- b) The Approval Holder shall ensure that employees are properly trained to carry out the routine functions in a safe and effective manner and that staff are trained in the specific type of material being handled.
- c) The Facility shall have sufficient trained staff on duty at any given time to ensure the safe handling of the asbestos waste. At least one person with the appropriate training must be at the Facility whenever it is in operation.
- d) The Approval Holder shall keep records of the qualifications of individual employees and documentation of any special training. The training certification/records are to be made available to the Department upon request.

10. Facility Inspection

- a) The Approval Holder shall inspect the actively used portion of the designated asbestos waste disposal area to ensure that the daily cover has been applied after each day that disposal occurs.
- b) Upon abandonment or discontinuance of use of the designated asbestos waste disposal area, the Approval Holder shall inspect the area on a monthly basis to ensure that the final cover is intact.

- c) The Approval Holder shall undertake any repairs that may be required to maintain the cover limits specified in this Approval.

11. Transportation and Disposal of Waste Dangerous Goods

- a) The transportation of the waste dangerous goods shall meet the requirements of the Transportation of Dangerous Goods (Canada) Regulations, including packaging, labelling and manifesting. It is the responsibility of the Approval Holder to ensure compliance with this Regulation.

12. Particulate Emissions (Dust)

- a) Particulate emissions shall not contribute to an ambient concentration of total suspended particulate matter that exceed the following limits (in micrograms per cubic metre of air) at or beyond the Site property boundaries:

Annual Geometric Mean 70 $\mu\text{g}/\text{m}^3$;

Daily Average (24 hr.) 120 $\mu\text{g}/\text{m}^3$.

- b) The use of used oil as a dust suppressant is prohibited.
- c) Monitoring of ambient total suspended particulate matter shall be conducted at the request of the Department. The location of the monitoring station(s) for total suspended particulate matter will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval. This may include point(s) beyond the property boundary of the Site.
- d) When requested, ambient total suspended particulate matter shall be measured by the EPA standard; EPA/625/R-96/010a; Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM_{10} shall be done using a High Volume (HV) Sampler.
- e) No visible emissions shall result from the asbestos waste transport or disposal operations. The Approval Holder must assure that asbestos fibres or dust will not become airborne.

13. Sound Levels

- a) Sound levels measured at the Site property boundaries shall not exceed the following equivalent sound levels (L_{eq}):

- i) 65 dBA 0700-1900 hours;
 - ii) 60 dBA 1900-2300 hours;
 - iii) 55 dBA 2300-0700 hours.
- b) Monitoring of sound levels shall be conducted at the request of the Department. The location of the monitoring station(s) for sound will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval. This may include point(s) beyond the property boundary of the Site.

14. Spills or Releases

- a) Spills or releases shall be reported in accordance with the *Act* and the *Environmental Emergency Regulations*.
- b) Spills or releases shall be cleaned up immediately in accordance with the *Act* and the *Contaminated Sites Regulations*.

15. Operating Records

- a) The Approval Holder shall maintain, on Site, an operating report of all Facility operations. The report shall include the following items:
 - i) quantity and source of asbestos waste received at the Facility;
 - ii) name of the client and/or generator of the asbestos waste;
 - iii) date when the asbestos waste material was received and/or delivered to the Facility;
 - iv) details of any incidents or spills at the Facility;
 - v) any registered complaints and measures taken to resolve the complaints;
 - vi) any changes in procedure;
 - vii) site inspection dates and results;
 - viii) facility maintenance repairs;
 - ix) any other information requested by the Department.
- b) The records required under item (a) above shall be kept for a minimum of two years and shall be made available to the Department upon request.

16. **Contingency Plan**

- a) The Approval Holder shall develop and maintain a contingency plan to address potential discharges of dangerous and waste dangerous goods, fires or other emergency situations. The contingency plan shall be in accordance with the Environmental Assessment Approval, when received, and the Department's Contingency Planning Guidelines.
- b) The Approval Holder shall ensure that the contingency plan is reviewed on an annual basis and updated as required. The Approval Holder shall document the updates and how the plan was communicated to staff.
- c) A copy of the contingency plan is to be maintained on site at all times and shall be made available to the Department upon request.
- d) All employees shall be apprised of the contingency plan.

17. **Reclamation**

- a) The Approval Holder shall submit a reclamation plan to the Department for review at least ninety (90) days prior to the scheduled abandonment/closure date for the Facility.
- b) The Approval Holder shall reclaim the Site within twelve (12) months of abandonment unless an alternate time frame is approved, in writing, by the Department.
- c) The Facility shall be reclaimed in accordance with the reclamation plan and to the satisfaction of the Department.
- d) The designated waste disposal area shall be marked with a permanent sign which states that this is an Asbestos Disposal Site.
- e) The Approval Holder shall maintain the final cover material at a depth of one hundred twenty five (125) centimetres.
- f) The Approval Holder shall inspect the designated asbestos disposal area on a monthly basis.
- g) On or before **February 1** of each year, the Approval Holder shall submit a report to the Department certifying that for the previous year, the markers as specified above are still in place and that the daily cover has a depth of at least one hundred twenty five (125) centimetres.

Appendix 2. Registration Advertisements and First Nations Correspondence



Habitat Assessment ⇌ Rehabilitation / Restoration Prescriptions ⇌ In Stream / Riparian Works ⇌ Effectiveness Monitoring

November 7, 2016

Office of Aboriginal Affairs
5251 Duke Street, 5th Floor
P.O. Box 1617
Halifax, NS
B3J 2Y3

RE: Arlington Heights Asbestos Disposal Site – Environmental Assessment Registration

I am writing to you concerning plans to undertake an Environmental Assessment Registration with Nova Scotia Environment for the continued operation of the Arlington Heights Asbestos Disposal Site, located in the community of Arlington West, Annapolis County. Please see the attached sheet for a diagram showing the location of the site, situated at 1481 Arlington Road, approximately 8 km north of the Bridgetown. The approximate UTM coordinates of the site are: 20T 319602 4975656.

The Arlington Heights Asbestos Disposal Site has been active for approximately 10 years, with ongoing operations requiring the completion of an Environmental Assessment. Operations at the site are governed by the Asbestos Waste Management Regulations. Future activities at the site are anticipated to be contained within the existing site footprint.

Over the next three months, East Coast Aquatics Inc. will be gathering the necessary information to allow for the preparation of the Environmental Assessment registration document for the asbestos disposal operation. The document "Proponents' Guide: The role of proponents in crown consultation with the Mi'kmaq of Nova Scotia" (November 2012) is being used to provide guidance in this process. We will shortly be writing to the closest First Nation bands (Annapolis Valley First Nation and Bear River First Nation) as well as the Native Council of Nova Scotia. The purpose of this correspondence will be to engage the communities in the environmental assessment process and seek their input. This letter seeks to advise the Office of Aboriginal Affairs of these efforts. Any further input or guidance on this process would be most welcome.

Yours sincerely,

Andy Sharpe
Projects Manager

P.O. Box 129 Bridgetown, Nova Scotia
B0S 1C0

(902) 665-4682
www.eastcoastaquatics.ca



November 7, 2016

Native Council of Nova Scotia
P.O. Box 1320
Truro, NS
B2N 5N2

RE: Arlington Heights Asbestos Disposal Site – Environmental Assessment Registration

I am writing to you concerning plans to undertake an Environmental Assessment Registration with Nova Scotia Environment for the continued operation of the Arlington Heights Asbestos Disposal Site, located in the community of Arlington West, Annapolis County. Please see the attached sheet for a diagram showing the location of the site, situated at 1481 Arlington Road, approximately 8 km north of the Bridgetown. The approximate UTM coordinates of the site are: 20T 319602 4975656.

The Arlington Heights Asbestos Disposal Site has been active for approximately 10 years, with ongoing operations requiring the completion of an Environmental Assessment. Operations at the site are governed by the Asbestos Waste Management Regulations. Future activities at the site are anticipated to be contained within the existing site footprint.

Over the next three months, East Coast Aquatics Inc. will be gathering the necessary information to allow for the preparation of the Environmental Assessment registration document for the asbestos disposal operation. Issues to be addressed will include: local species at risk, surface and groundwater resources, archaeological and heritage resources, wetlands, and air quality. The potential effects of the asbestos disposal activities will be addressed in the registration document. We welcome you to provide any information or concerns you may have regarding the area and the proposed operations directly to East Coast Aquatics Inc. at the address listed below.

Yours sincerely,

Andy Sharpe
Projects Manager



November 7, 2016

Chief and Council
Bear River First Nation
P.O. Box 210
Bear River, NS
B0S 1B0

RE: Arlington Heights Asbestos Disposal Site – Environmental Assessment Registration

I am writing to you concerning plans to undertake an Environmental Assessment Registration with Nova Scotia Environment for the continued operation of the Arlington Heights Asbestos Disposal Site, located in the community of Arlington West, Annapolis County. Please see the attached sheet for a diagram showing the location of the site, situated at 1481 Arlington Road, approximately 8 km north of the Bridgetown. The approximate UTM coordinates of the site are: 20T 319602 4975656.

The Arlington Heights Asbestos Disposal Site has been active for approximately 10 years, with ongoing operations requiring the completion of an Environmental Assessment. Operations at the site are governed by the Asbestos Waste Management Regulations. Future activities at the site are anticipated to be contained within the existing site footprint.

Over the next three months, East Coast Aquatics Inc. will be gathering the necessary information to allow for the preparation of the Environmental Assessment registration document for the asbestos disposal operation. Issues to be addressed will include: local species at risk, surface and groundwater resources, archaeological and heritage resources, wetlands, and air quality. The potential effects of the asbestos disposal activities will be addressed in the registration document. We welcome you to provide any information or concerns you may have regarding the area and the proposed operations directly to East Coast Aquatics Inc. at the address listed below.

Yours sincerely,

Andy Sharpe
Projects Manager



November 7, 2016

Chief and Council
Annapolis Valley First Nation
P.O. Box 89
Cambridge Station, Kings County, NS
B0P 1G0

RE: Arlington Heights Asbestos Disposal Site – Environmental Assessment Registration

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Yours sincerely,

Andy Sharpe
Projects Manager



Native Council of Nova Scotia

The Self-Governing Authority for Mi'kmaq/Aboriginal Peoples residing Off-Reserve in Nova Scotia throughout traditional Mi'kmaq Territory

"Going Forward to a Better Future"

P.O. Box 1320
Truro, Nova Scotia
B2N 5N2

Tel: 902-895-1523
Fax: 1-902-895-0024
Toll Free: 1-800-565-4372
chiefconrad@eastlink.ca
www.ncns.ca

Aboriginal/Treaty Rights
Negotiations Facilitating
Directorate

NCNS Citizenship
Information Office

Education & Student
Services

Rural & Native
Housing Group

Aboriginal Peoples
Training & Employment
Commission (APTEC)

Netukulimkew'e'l
Commission

Wenjikwom Housing
Commission

Social Assistance
Recipient Support for
Employment & Training
(SARSET)

Micmae Language
Program

Native Social
Counselling Agency

Child Help Initiative
Program (CHIP)

E'pit Nuji Hmuet
Program (Prenatal)

Aboriginal Homelessness
Program

Parenting Journey
Program

Youth Outreach Program

Mi'Kma'ki Environments
Resource Developments
Secretariat (MERDS)

January 25, 2017

Mr. Andy Sharpe
Projects Manager
East Coast Aquatics
P.O. Box 129
Bridgetown, NS B0S 1C0

RE: Arlington Heights Asbestos Disposal Site – Environmental Assessment Registration

Dear Mr. Sharpe:

Thank you for attending our offices on Tuesday, January 17, 2017 at 172 Truro Height Road, Truro Heights, Nova Scotia with Mike Parker, to present Joshua McNeely, Executive Director of IKANAWTIKET, and myself of the Native Council of Nova Scotia (NCNS) Mi'Kmaq Environments Resource Developments Secretariat (MERDS) to share more detailed information about the Arlington Heights Asbestos Disposal Site located in Arlington, Nova Scotia.

Thank you for informing the NCNS that the deposited asbestos will be immediately entrained in clay cells at the top of the North Mountain, which has little significant drainage, and that ground water monitoring will be conducted at 7 well sites within the project area.

Also, thank you for the details regarding the lifespan of the existing site, as the facilities lifespan is based on the volume and type of asbestos deposited. As noted during the meeting, over the last several years the site has received approximately 350 truckloads of asbestos annually for a total of nearly 1000 bags, and the proponent has proposed to double this capacity.

The NCNS looks forward to reviewing Environmental Assessment document which was noted to be submitted to Nova Scotia Environment by March 2017.

NCNS Response to Arlington Heights Asbestos Disposal Site Jan 25, 2017

Page 1

The Native Council of Nova Scotia Community of Off-reserve Status and Non-Status Indian / Mi'Kmaq /Aboriginal Peoples supports projects, works, activities and undertakings which do not significantly alter, destroy, impact or affect the sustainable natural life ecosystems, or natural eco-scapes. That is hills, mountains, wetlands, meadows, woodlands, shores, beaches, coasts, brooks, streams, rivers, lakes, bays, inland waters, and the near shore, mid-shore and off-shore waters with their multitude of *in-situ* biodiversity, and the natural life within those ecosystems and eco-scapes. Our NCNS Community has continued access and use for the equitable sharing of benefits arising therefrom. Works, activities, projects, and undertakings must serve a beneficial purpose towards progress in general and demonstrate the sustainable use of the natural wealth of Mother Earth, through the rule of law and respect for the Constitutional Treaty Rights, Aboriginal Rights, and Other Rights of the Native Council of Nova Scotia Community continuing throughout our Traditional Ancestral Homeland in that part now known as the Province of Nova Scotia.

Feel free to contact me toll free at 1 855-858-7240, or long distance at 902-895-2982, or email at jseward@mapcorg.ca, or fax at 902-895-3844.

Progress through consultation, accommodation
and participatory involvement and partnerships



Jessica Seward
MERDS

JS:jh

Cc: Grace Conrad, Chief and President, NCNS
Roger Hunka, Director, MAPC
Joshua McNeely, Executive Director, IKANAWTIKET
Tim Martin, Commissioner, Netukulimkewe'l Commission
Justin Martin, Prefect, Netukulimkewe'l Commission
Mike Parker, President/Senior Biologist, East Coast Aquatics

NOTICE

**Registration of Undertaking for
Environmental Assessment
ENVIRONMENT ACT**

This is to advise that Arlington Heights C&D Limited registered an Asbestos Waste Disposal Facility for environmental assessment, in accordance with Part IV of the Environment Act.

The purpose of this proposed Undertaking is for the continued operation of the existing asbestos disposal facility at 1481 Arlington Road West, Annapolis County. The project is scheduled to begin on May 1, 2017.

Copies of the environmental assessment registration information may be examined at the following locations:

- Location 1, Bridgetown, NS
- Location 2. Bridgetown, NS
- Nova Scotia Environment, 136 Exhibition Street, Kentville NS
- Nova Scotia Environment Library, 1903 Barrington Street, Suite 2085, Halifax NS
- EA website: <http://www.gov.ns.ca/nse/ea>

The public is invited to submit written comments to:

Environmental Assessment Branch

Nova Scotia Environment

P.O. Box 442, Halifax, Nova Scotia B3J 2P8

On or before (DATE, 2017) or contact the Department at (902) 424-3960, fax (902) 424-6925, or e-mail at EA@gov.ns.ca.

Appendix 3. Site Photos

HABITATS



Photo 1: Tributary to Poole Brook, October 04, 2016, demonstrates minimal flow and cobble substrate. The ephemeral watercourse is located southwest of the proposed Project site.



Photo 2: Tributary to Granville Line Brook located east of the proposed Project Site. Moss covered boulders demonstrate the stable nature of this seasonal watercourse.



Photo 3: Old field habitat. View southeastward from proposed Phase 6 cell toward Arlington Road.



Photo 4: Tall shrub/sapling habitat north of C&D site operations.



Photo 5: Abandoned farmland east of the proposed Project Site within the Study Area, near the tributary to Granville Line Brook.



Photo 6: Mixed Woods habitat at a portion of the proposed Phase 3 cell and extending north of the proposed Project Site.



Photo 7: Wet ditch/drainage habitat between proposed Phase 5 and Phase 6 cells.



Photo 8 Current operational area offers minimal vegetation cover.



Photo 9: View south toward the active Phase 2 cell from within the treed wetland habitat. Partially logged, the wetland extends northwestward downslope toward the Bay of Fundy.

Current Operations



Photo 10: Facility signage at Arlington Road entrance.



Photo 11: Site specific signage for asbestos disposal area.



Photo 12: Current Phase 2 cell with yellow bagged asbestos waste waiting to be placed in excavated cell.



Photo 13: Bagged asbestos waste in current Phase 2 disposal cell. Waste is covered with a minimum 0.25m of soil within 24hrs of delivery.



Photo 14: Covered and vegetated Phase 1 asbestos disposal cell.



Photo 15: Gated and lockable entry to the operation at Arlington Road.



Photo 16: Site road junction between C & D site and asbestos disposal area.



Photo 17: Active C&D disposal area, with edge of Phase 2 asbestos disposal visible in extreme right edge of photo.



Photo 18: On site office and scale house.



Photo 19: Truck on the scales at the scale house prior to entering the operation.



Photo 20: Groundwater monitoring well 6 south of Phase 1 cell and north of proposed Phase 5 cell

Appendix 4. Groundwater Monitoring Results and Reporting



E & Q Consulting

and Associates Limited

Environmental Chemists

1725 White Rock Road, R.R. # 1, Wolfville, N.S., Canada B4P 2R1

Phone: (902)542-4309 Cell: (902)670-5750

Email: jfrazee@accesswave.ca Website: andmembers.accesscable.net/~eandq/

Aug. 25, 2016

Arlington Heights C & D Site
Att: Jennifer Poole
8281 Shore Rd. W
Hampton, N.S. B0S 1L0

Dear Jennifer,

Attached are the results of the tests on the samples collected on Aug. 9, 2016 from your monitoring wells, as required for quarterly monitoring by the N.S. Department of the Environment.

Well #2 has been decommissioned. This well is scheduled to be relocated.

Data trends are in acceptable ranges and no abnormal effects are noted from operations.

Tests were done by AGAT Laboratories. Original reports are attached. Thank you for using our services.

Sincerely

W. James Frazee, M.Sc., P. Chem.

CC: Regional Director, NS Dept. Of Environment and Labour, Kentville

Results of Testing

Location: Arlington Heights C & D Disposal Site

Sampling Date: Aug. 9,2016

Parameters	Units	Ground Water Monitoring Wells					
		# 1	# 2	# 3	# 4	# 5	# 6
<u>Sample Number</u>		EQ1595	EQ1596	EQ1597	EQ1598	EQ1599	EQ1600
<u>Inorganics</u>							
Alkalinity	mg/L	74	Not Sampled	133	239	171	171
Ammonia	mg/L	0.03	Not Sampled	0.09	<0.03	<0.03	<0.03
Arsenic	mg/L	0.003	Not Sampled	0.006	0.004	0.011	0.013
Barium	mg/L	0.024	Not Sampled	0.043	0.073	0.092	0.068
Boron	mg/L	0.021	Not Sampled	0.066	0.029	0.051	0.018
Cadmium	mg/L	0.00003	Not Sampled	0.000032	0.000019	<0.000017	<0.000017
Calcium	mg/L	25.7	Not Sampled	41.8	56.7	43.1	54.5
Chloride	mg/L	5	Not Sampled	8	5	10	7
Chromium	mg/L	0.001	Not Sampled	0.003	<0.001	<0.001	<0.001
Conductivity	µS/cm	137	Not Sampled	175	222	195	190
Copper	mg/L	<0.002	Not Sampled	<0.002	<0.002	<0.002	<0.002
Iron	mg/L	0.288	Not Sampled	0.392	0.091	0.385	<0.050
Lead	mg/L	0.0011	Not Sampled	0.0006	<0.0005	<0.0005	<0.0005
Magnesium	mg/L	6.4	Not Sampled	9.4	14.2	9.1	10.7
Manganese	mg/L	0.022	Not Sampled	0.027	0.038	0.046	0.003
Mercury	mg/L	<0.026	Not Sampled	0.048	<0.026	<0.026	<0.026
Nitrate	mg/L	0.28	Not Sampled	0.16	<0.05	<0.05	0.36
Nitrite	mg/L	<0.05	Not Sampled	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	<0.4	Not Sampled	3.6	2.0	2.6	2.9

Results of Testing(Continued)

Location: Arlington Heights C & D Disposal Site

Sampling Date: Aug. 9,2016

Parameters	Units	Ground Water Monitoring Wells					
		# 1	# 2	# 3	# 4	# 5	# 6
Sample Number		EQ1595	EQ1596	EQ1597	EQ1598	EQ1599	EQ1600
pH		7.82	Not Sampled	8.01	8.02	8.10	8.11
Total Phosphorus	mg/L	0.08	Not Sampled	0.06	<0.03	0.11	0.11
Potassium	mg/L	0.7	Not Sampled	1.2	0.8	1.4	0.8
Sodium	mg/L	11.6	Not Sampled	14.9	19.5	24.5	13.9
Suspended Solids	mg/L	<5	Not Sampled	<5	<5	6	<5
Total Dissolved Solids	mg/L	115	Not Sampled	166	247	198	198
Sulphate	mg/L	19	Not Sampled	9	7	6	7
Zinc	mg/L	<0.005	Not Sampled	0.005	<0.005	<0.005	<0.005
Volatile Organics							
Benzene *	µg/L	<1	Not Sampled	<1	<1	<1	<1
1,4 Dichlorobenzene *	µg/L	<1	Not Sampled	<1	<1	<1	<1
Dichloromethane *	µg/L	<2	Not Sampled	<2	<2	<2	<2
Toluene *	µg/L	<2	Not Sampled	<2	<2	<2	<2
Vinyl Chloride *	µg/L	<0.89	Not Sampled	<0.89	<0.89	<0.89	<0.89
Other Organics							
BOD ₅	mg/L	Not Required	Not Sampled	Not Required	Not Required	Not Required	Not Required
COD	mg/L	3	Not Sampled	4	<3	7	5
Dissolved Organic Carbon	mg/L	1.73	Not Sampled	1.65	0.83	0.88	0.49
Total Organic Carbon	mg/L	1.8	Not Sampled	1.8	1.1	1.2	0.8
Phenolics	mg/L	<0.001	Not Sampled	0.003	<0.001	<0.001	<0.001
Tannins/Lignins	mg/L	Not Required	Not Sampled	Not Required	Not Required	Not Required	Not Required

* Reported as micrograms per Litre (µg/L)

BOD - Biochemical Oxygen Demand

COD - Chemical Oxygen Demand

Results of Testing(Continued)

Location: Arlington Heights C & D Disposal Site

Sampling Date: Aug. 9,2016

Parameters	Units	Ground Water Monitoring Wells					
		# 1	# 2	# 3	# 4	#5	#6
<u>Sample Number</u>		EQ1595	EQ1596	EQ1597	EQ1598	EQ1599	EQ1600
<u>Field Parameters</u>							
GPS Location (Latitude)	deg	44.91483	44.91405	44.91280	44.91538	44.91231	44.91440
GPS Location (Longitude)	deg	65.27986	65.27905	65.27823	65.27780	65.27583	65.27470
Well Head Above Sea Level	m	181	184	185	188	197	192
Well Head above Ground	cm	45	45	45	45	45	45
Water level below well head	cm	370	Not Sampled	240	175	180	190
Temperature	°C	11.7	Not Sampled	9.6	11.8	9.4	10.8
pH		7.7	Not Sampled	8.3	7.8	8.4	8.3
Conductivity	µS/cm	181	Not Sampled	279	425	329	328

Parameter	Units	Well # 1											
		Feb-14	May-14	Aug-14	Nov-14	Jun-15	May-15	Aug-15	Nov-15	Feb-16	May-16	Aug-16	
Drinking Water Guidelines													
Inorganics													
Alkalinity	mg/L	36	34	29	70	No Sample collected	28	67	27	41	33	74	
Ammonia	mg/L	<0.03	<0.03	<0.03	<0.03	No Sample collected	<0.03	0.1	<0.03	<0.03	<0.03	0.03	
Arsenic	mg/L	0.007	<0.002	<0.002	<0.002	was collected	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	
Barium	mg/L	0.007	0.006	0.006	0.012		0.006	0.015	0.007	0.01	0.007	0.024	
Boron	mg/L	0.008	0.015	0.014	0.014		0.009	0.026	0.013	0.009	0.007	0.021	
Cadmium	mg/L	<0.000017	0.000047	<0.000017	<0.000017	Due to	0.000054	0.000086	0.000071	0.000051	0.000044	0.00003	
Calcium	mg/L	8.3	7.1	7.5	23.8		5.9	29.5	5.7	12.6	7.6	25.7	
Chloride	mg/L	6	5	3	4	Very Deep Snow	4	4	4	5	4	5	
Chromium	mg/L	<0.001	<0.001	0.002	0.002		0.001	0.001	<0.001	<0.001	0.001	0.001	
Conductivity	uS/cm	134	103	94	187		102	228	93	146	99	137	
Copper	mg/L	<0.002	<0.001	<0.002	<0.002		<0.002	0.003	<0.002	<0.002	<0.002	<0.002	
Iron	mg/L	<50	<0.050	<0.0050	<0.050		<0.050	0.137	<0.050	0.128	0.09	0.288	
Lead	mg/L	<0.5	<0.0005	<0.0005	<0.0005		<0.0005	0.0006	<0.0005	<0.0005	<0.0005	0.0011	
Magnesium	mg/L	2.7	2.9	2.8	4		1.9	3.2	1.9	3.1	2.6	6.4	
Manganese	mg/L	0.005	0.005	<0.002	0.003		0.006	0.01	0.009	0.006	0.008	0.022	
Mercury	mg/L	Not Required	Not Required	<0.00005	Not Required		Not Required	<0.026	Not Required	Not Required	Not Required	<0.026	
Nitrate	mg/L	0.07	<0.05	0.08	0.06		0.07	0.32	0.08	0.06	0.15	0.28	
Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05		<0.05	0.08	<0.05	<0.05	<0.05	<0.05	
Total Kjeldahl Nitrogen	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	4.8	Not Required	Not Required	Not Required	<0.4	
pH		7.26	6.9	7.22	7.43		6.89	7.57	7.37	7.37	7.27	7.82	
Total Phosphorus	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	<0.03	Not Required	Not Required	Not Required	0.08	
Potassium	mg/L	0.1	0.1	0.3	0.2		<0.1	0.4	0.2	0.2	0.2	0.7	
Sodium	mg/L	8.6	10.7	8.2	7.4		5.7	6.6	5.9	8.1	7.9	11.6	
Suspended Solids	mg/L	<5	<5	5	9		5	7	<5	<5	<5	<5	
Total Dissolved Solids	mg/L	82	57	46	89		45	115	44	67	56	115	
Sulfate	mg/L	12	11	6	7		10	29	10	13	13	19	
Zinc	mg/L	<0.005	<0.005	<0.005	<0.005		<0.005	0.006	<0.005	<0.005	<0.005	<0.005	
Volatile Organics													
Benzene	ug/L	Not Required	Not Required	<1	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1	
1,4 Dichlorobenzene	ug/L	Not Required	Not Required	<1	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1	
Dicromethane	ug/L	Not Required	Not Required	<2	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2	
Toluene	ug/L	Not Required	Not Required	<2	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2	
Vinyl Chloride	ug/L	Not Required	Not Required	<0.89	Not Required		Not Required	<0.5	Not Required	Not Required	Not Required	<0.89	
Other Organics													
BOD5	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	
COO	mg/L	<3	<3	<3	5		4	22	8	<3	<3	3	
Dissolved Organic Carbon	mg/L	1.6	1	0.6	1.7		0.8	4.7	2.1	2.2	1.1	1.73	
Total Organic Carbon	mg/L	Not Required	Not Required	0.6	1.2		0.6	4	1.9	1.9	1.1	1.8	
Phenol	mg/L	Not Required	Not Required	<0.001	Not Required		Not Required	0.001	Not Required	Not Required	Not Required	<0.001	
Tannins/Lignins	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	
Field Parameters													
Water Depth	cm	200	140	280	340		194	350	282	220	264	370	
Water Temperature	deg C	3.4	9.7	12.3	10.5		7.8	16.7	10.8	5.9	6.7	11.7	
pH		6.5	6	6.2	6.9		6.2	7	6.6	6.7	6.7	7.7	
Conductivity	uS/cm	122	100	93	176		103	227	95	123	103	181	

*** aesthetic objective

		Well #3											
		Drinking Water											
Parameter	Units	Feb-14	May-14	Aug-14	Nov-14	Jan-15	May-15	Aug-15	Nov-15	Feb-16	May-16	Aug-16	
Inorganics													
Alkalinity	mg/L	103	83	106	61	No Sample collected	102	86	98	107	50	133	
Ammonia	mg/L	<0.03	<0.03	<0.03	<0.03	No Sample collected	<0.03	<0.03	<0.03	<0.03	<0.03	0.09	
Arsenic	mg/L	0.007	0.002	0.007	0.003	Sample was collected	0.005	0.007	0.003	0.003	<0.002	0.006	
Barium	mg/L	0.032	0.02	0.036	0.015	Due to Very Deep Snow	0.045	0.031	0.027	0.044	0.022	0.043	
Boron	mg/L	5	0.016	0.02	0.024	Due to Very Deep Snow	0.017	0.035	0.194	0.038	0.044	0.066	
Cadmium	mg/L	<0.000017	0.00003	<0.000017	0.000028	Due to Very Deep Snow	<0.000017	0.000049	0.000069	0.000021	0.000031	0.000032	
Calcium	mg/L	29.8	17.7	32.8	26.9	Due to Very Deep Snow	38.5	34.4	30.6	33.1	14.2	41.8	
Chloride	mg/L	8	8	7	8	Very Deep Snow	9	9	6	7	4	8	
Chromium	mg/L	<0.001	<0.001	0.001	0.001	Very Deep Snow	0.001	0.001	0.002	0.001	0.001	0.003	
Conductivity	uS/cm	287	153	259	190	Very Deep Snow	251	272	225	250	121	175	
Copper	mg/L	<0.002	<0.001	<0.002	0.002	Very Deep Snow	<0.002	0.002	0.003	0.003	0.015	<0.002	
Iron	mg/L	<0.3	0.221	<0.0050	<0.050	Very Deep Snow	<0.0050	0.175	<0.050	0.152	0.341	0.392	
Lead	mg/L	<0.5	<0.0005	<0.0005	<0.0005	Very Deep Snow	<0.0005	<0.0005	0.0008	<0.0005	0.0038	0.0006	
Magnesium	mg/L	5.2	4	7.1	3.7	Very Deep Snow	4.2	4.1	4.5	4.9	3.1	9.4	
Manganese	mg/L	<0.002	0.006	<0.002	0.005	Very Deep Snow	0.006	0.022	0.05	0.068	0.028	0.027	
Mercury	mg/L	0.001	Not Required	<0.00005	Not Required	Very Deep Snow	Not Required	<0.026	Not Required	Not Required	Not Required	0.048	
Nitrate	mg/L	0.19	<0.05	0.11	0.1	Very Deep Snow	0.23	0.3	0.16	0.11	0.1	0.16	
Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	Very Deep Snow	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	
Total Kjeldahl Nitrogen	mg/L	8.04	7.44	8.07	7.4	Very Deep Snow	7.92	7.76	7.99	7.96	7.49	8.01	
pH	mg/L	Not Required	Not Required	Not Required	Not Required	Very Deep Snow	Not Required	2.6	Not Required	Not Required	Not Required	3.6	
Total Phosphorus	mg/L	0.3	0.3	0.6	0.5	Very Deep Snow	0.3	<0.03	Not Required	Not Required	Not Required	0.06	
Potassium	mg/L	<0.1	14.5	15.4	9.5	Very Deep Snow	9	8	10.4	14.3	0.6	1.2	
Sodium	mg/L	5	<5	13	26	Very Deep Snow	<5	6	<5	<5	5	<5	
Suspended Solids	mg/L	168	103	134	86	Very Deep Snow	130	118	119	134	66	166	
Total Dissolved Solids	mg/L	8	8	7	6	Very Deep Snow	7	8	7	8	5	9	
Subtotal	mg/L	<0.005	<0.005	<0.005	<0.005	Very Deep Snow	<0.005	<0.005	0.007	<0.005	0.017	0.005	
Zinc	mg/L	5	5	<1	Not Required	Very Deep Snow	Not Required	<1	Not Required	Not Required	Not Required	<1	
Volatile Organics													
Benzene	µg/L	Not Required	Not Required	<1	Not Required	Very Deep Snow	Not Required	<1	Not Required	Not Required	Not Required	<1	
1,4-Dichlorobenzene	µg/L	Not Required	Not Required	<1	Not Required	Very Deep Snow	Not Required	<1	Not Required	Not Required	Not Required	<1	
Dichloromethane	µg/L	Not Required	Not Required	<2	Not Required	Very Deep Snow	Not Required	<2	Not Required	Not Required	Not Required	<2	
Toluene	µg/L	Not Required	Not Required	<2	Not Required	Very Deep Snow	Not Required	<2	Not Required	Not Required	Not Required	<2	
Vinyl Chloride	µg/L	Not Required	Not Required	<0.89	Not Required	Very Deep Snow	Not Required	<0.5	Not Required	Not Required	Not Required	<0.89	
Other Organics													
BOO5	mg/L	Not Required	Not Required	Not Required	Not Required	Very Deep Snow	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	
COD	mg/L	<3	<3	<3	12	Very Deep Snow	8	13	11	<3	6	4	
Dissolved Organic Carbon	mg/L	0.9	1.8	0.6	5.3	Very Deep Snow	0.7	1.6	3.1	2.6	3.3	1.65	
Total Organic Carbon	mg/L	Not Required	Not Required	<0.001	6.2	Very Deep Snow	<0.5	4.3	2.9	2.4	2.2	1.8	
Phenol	mg/L	Not Required	Not Required	Not Required	Not Required	Very Deep Snow	Not Required	0.001	Not Required	Not Required	Not Required	0.003	
Tannin/Lignin	mg/L	Not Required	Not Required	Not Required	Not Required	Very Deep Snow	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	
Field Parameters													
Well Water Depth	cm	149	140	210	145	Very Deep Snow	130	250	133	150	134	240	
Temperature	deg C	3.7	8.3	11	10.2	Very Deep Snow	7.7	11.3	10.3	6.1	6.9	9.6	
pH	mg/L	7.65	6.8	8	7	Very Deep Snow	7.8	7.8	7.8	7.8	7	8.3	
Conductivity	uS/cm	255	144	261	170	Very Deep Snow	263	274	239	250	115	279	

*** aesthetic objective

Parameter	Units	Drinking Water Guidelines											
		Feb-14	May-14	Aug-14	Nov-14	Jan-15	May-15	Aug-15	Nov-15	Feb-16	May-16	Aug-16	
Inorganics													
Alkalinity	mg/L	No Value	223	198	198	198	No Sample	192	137	211	223	236	239
Ammonia	mg/L	No Value	<0.03	<0.03	<0.03	<0.03	No Sample	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Azenic	mg/L	0.006	0.004	0.004	0.005	0.005	was collected	0.004	0.005	0.004	0.004	0.003	0.004
Barium	mg/L	1	0.056	0.071	0.052	0.065		0.065	0.073	0.065	0.069	0.065	0.073
Boron	mg/L	5	0.028	0.026	0.032	0.028		0.017	0.03	0.028	0.022	0.02	0.029
Cadmium	mg/L	0.005	<0.000017	<0.000017	<0.000017	<0.000017	Due to	<0.000017	<0.000017	0.000022	0.000022	<0.000017	0.000019
Calcium	mg/L	No Value	64.8	59.5	61.9	61.9		67.2	30.9	58.7	63.6	56.1	56.7
Chloride	mg/L	<250 ***	6	4	4	4	Very Deep Snow	6	5	5	5	3	5
Chromium	mg/L	0.05	<0.001	<0.001	0.001	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Conductivity	uS/cm	No Value	416	423	423	423		396	401	396	364	402	222
Copper	mg/L	<1 ***	<0.001	<0.002	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	mg/L	<0.3 ***	<0.050	<0.050	<0.050	<0.050		<0.050	0.081	<0.050	0.19	0.118	0.091
Lead	mg/L	0.01	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium	mg/L	No Value	14.9	13.4	11.9	11.9		7.8	7.5	9.9	15	13.9	14.2
Manganese	mg/L	<0.05 ***	0.046	0.01	<0.002	<0.002		0.017	0.013	0.046	0.028	0.05	0.038
Mercury	mg/L	0.001	Not Required	<0.00005	Not Required	Not Required		Not Required	<0.026	Not Required	Not Required	Not Required	<0.026
Nitrate	mg/L	48	<0.05	<0.05	<0.05	<0.05		0.07	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite	mg/L	48	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	No Value	7.95	8.07	7.92	7.92		7.97	8.4	8.12	8.08	8	8.02
pH	mg/L	6.5 - 8.5	7.95	8.07	7.92	7.92		7.97	7.89	8.12	8.08	8	8.02
Total Phosphorus	mg/L	No Value	0.4	0.8	0.5	0.5		0.3	<0.03	0.4	0.6	0.5	<0.03
Potassium	mg/L	<200 ***	20.6	19.7	15	15		19.7	10.7	21.8	18.5	17.1	19.5
Sodium	mg/L	<500 ***	247	221	216	216		222	<5	<5	<5	5	<5
Suspended Solids	mg/L	<500 ***	6	5	4	4		5	5	6	7	4	7
Sulfate	mg/L	<5 ***	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	<5 ***	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organics													
Benzene	ug/L	5	Not Required	<1	Not Required	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1
1,4-Dichlorobenzene	ug/L	5	Not Required	<1	Not Required	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1
Dichloromethane	ug/L	50	Not Required	<2	Not Required	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2
Toluene	ug/L	24	Not Required	<2	Not Required	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2
Vinyl Chloride	ug/L	2	Not Required	<0.89	Not Required	Not Required		Not Required	<0.5	Not Required	Not Required	Not Required	<0.89
Other Organics													
BOD5	mg/L	No Value	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
COD	mg/L	No Value	<3	<3	4	4		11	8	6	<3	3	<3
Dissolved Organic Carbon	mg/L	No Value	1	<0.5	<0.5	<0.5		0.7	<0.5	<0.5	<0.5	0.6	0.83
Total Organic Carbon	mg/L	No Value	1.3	<0.5	1.1	1.1		<0.5	<0.5	<0.5	<0.5	1.2	1.1
Phenol	mg/L	No Value	Not Required	<0.001	Not Required	Not Required		Not Required	<0.001	Not Required	Not Required	Not Required	<0.001
Tannin/Lignin	mg/L	No Value	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Field Parameters													
Well Water Depth	cm	No Value	170	190	170	170		190	220	97	100	106	175
Temperature	deg C	<15 ***	9.7	11	10.5	10.5		7.9	10.6	10.3	4.5	6.3	11.8
pH		6.5 - 8.5	7.5	7.6	7.5	7.5		7.5	7.65	7.65	7.7	7.7	7.8
Conductivity	uS/cm	No Value	401	425	419	419		432	436	433	425	420	425

Parameter	Drinking Water											
	Units	Feb-14	May-14	Aug-14	Nov-14	Jan-15	May-15	Aug-15	Nov-15	Feb-16	May-16	Aug-16
Inorganics												
Alkalinity	mg/L	136	159	135	128	No Sample collected	130	114	145	153	160	171
Ammonia	mg/L	<0.03	<0.03	<0.03	<0.03	No Sample collected	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Arsenic	mg/L	0.016	0.009	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Barium	mg/L	0.064	0.065	0.072	0.062	0.068	0.068	0.081	0.089	0.075	0.076	0.092
Boron	mg/L	0.033	0.049	0.035	0.034	0.037	0.037	0.044	0.047	0.036	0.036	0.051
Cadmium	mg/L	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	0.000018	<0.00017	<0.00017	<0.00017
Calcium	mg/L	41.2	39.1	41.4	40.8	Due to Very Deep Snow	41.9	20.8	39.8	44.3	39	43.1
Chloride	mg/L	11	12	8	13		12	10	10	11	8	10
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Conductivity	uS/cm	366	321	320	325		303	307	305	296	301	195
Copper	mg/L	<0.002	<0.001	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	mg/L	<0.5	<0.050	<0.050	<0.050		<0.050	0.104	<0.050	0.391	0.18	0.385
Lead	mg/L	<0.5	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium	mg/L	6.2	7	8.4	7.6		4.6	4.6	5.8	7.4	7.1	9.1
Manganese	mg/L	<0.002	0.045	0.014	<0.002		0.023	0.034	0.022	0.077	0.014	0.046
Mercury	mg/L	Not Required	Not Required	<0.00005	Not Required		Not Required	<0.026	Not Required	Not Required	Not Required	<0.026
Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	0.07	<0.05	<0.05	<0.05
Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	<0.4	Not Required	Not Required	Not Required	2.6
pH		8.04	8.11	8.11	7.93		8.02	7.95	8.18	8.12	8.08	8.1
Total Phosphorus	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	0.05	Not Required	Not Required	Not Required	0.11
Potassium	mg/L	0.6	0.7	1	0.6		0.6	0.6	0.7	0.9	0.8	1.4
Sodium	mg/L	<0.1	26	20.4	12		27.7	22.5	26	19.7	21.7	24.5
Suspended Solids	mg/L	8	0	8	15		<5	6	10	6	19	6
Total Dissolved Solids	mg/L	198	185	164	155		169	131	175	182	177	194
Sulfate	mg/L	5	5	4	4		4	4	5	6	4	6
Zinc	mg/L	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organics												
Benzene *	µg/L	Not Required	Not Required	<1	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1
1,4 Dichlorobenzene *	µg/L	Not Required	Not Required	<1	Not Required		Not Required	<1	Not Required	Not Required	Not Required	<1
Dichloromethane *	µg/L	Not Required	Not Required	<2	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2
Toluene *	µg/L	Not Required	Not Required	<2	Not Required		Not Required	<2	Not Required	Not Required	Not Required	<2
Vinyl Chloride *	µg/L	Not Required	Not Required	<0.89	Not Required		Not Required	<0.5	Not Required	Not Required	Not Required	<0.89
Other Organics												
BOD5	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
COD	mg/L	<3	<3	<3	7		<3	<3	6	<3	<3	7
Dissolved Organic Carbon	mg/L	1.3	0.6	1	1.8		0.8	6	2.3	<0.5	0.7	0.88
Total Organic Carbon	mg/L	Not Required	Not Required	<0.001	2.2		0.5	1	1.8	<0.5	1.1	1.2
Phenol	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	<0.001	Not Required	Not Required	Not Required	<0.001
Tannins/Lignins	mg/L	Not Required	Not Required	Not Required	Not Required		Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Field Parameters												
Well Water Depth	cm	158	120	190	155		176	210	144	100	100	180
Temperature	deg C	4.5	8.7	10.6	10.1		7.7	10.1	10	6.8	6.6	9.4
pH		7.9	7.9	8	7.6		7.9	8.1	8.1	8.1	8.2	8.4
Conductivity	uS/cm	317	316	322	320		324	326	340	328	320	329

*** aesthetic objective

Parameter	Units	Well # 6											
		Drinking Water Guidelines	Feb-14	May-14	Aug-14	Nov-14	Jan-15	May-15	Aug-15	Nov-15	Feb-16	May-16	Aug-16
Inorganics													
Alkalinity	mg/L	No Value	144	161	143	148	No Sample collected	139	132	150	161	171	171
Ammonia	mg/L	No Value	<0.03	0.03	<0.03	<0.03	No Sample collected	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Arsenic	mg/L	0.006	0.013	0.009	0.012	0.012	0.011	0.011	0.012	0.011	0.01	0.01	0.013
Barium	mg/L	1	0.081	0.057	0.071	0.055	0.06	0.06	0.064	0.061	0.061	0.062	0.068
Boron	mg/L	5	0.015	0.018	0.015	0.02	0.012	0.012	0.018	0.019	0.015	0.014	0.018
Cadmium	mg/L	0.005	0.00002	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	0.000047	<0.000017
Calcium	mg/L	No Value	43.7	49.3	46.3	48.1	53.9	45.9	45.9	47	48.4	46.5	54.5
Chloride	mg/L	<250 ***	8	9	6	6	8	8	8	8	7	5	7
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001
Conductivity	uS/cm	No Value	381	333	335	342	317	309	309	316	296	308	190
Copper	mg/L	<1 ***	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	mg/L	<0.3 ***	<50	<0.050	<0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Lead	mg/L	0.01	<0.5	7.7	9	7.8	5.4	4.9	4.9	6.5	7.9	8	10.7
Magnesium	mg/L	No Value	8.5	7.7	9	8	5.4	4.9	4.9	6.5	7.9	8	10.7
Manganese	mg/L	<0.05 ***	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.004	0.003
Mercury	mg/L	0.001	Not Required	Not Required	<0.00005	Not Required	Not Required	Not Required	<0.026	Not Required	Not Required	Not Required	<0.026
Mercury	mg/L	45	0.25	0.2	0.2	0.19	0.38	0.41	0.41	0.3	0.3	0.2	0.36
Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite	mg/L	No Value	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Total Kjeldahl Nitrogen	mg/L	No Value	8.1	8.07	8.12	8	8.03	7.93	7.93	8.2	8.14	8.06	8.11
pH	mg/L	6.5 - 8.5	8.1	8.07	8.12	8	8.03	7.93	7.93	8.2	8.14	8.06	8.11
Total Phosphorus	mg/L	No Value	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Potassium	mg/L	No Value	0.4	0.4	0.8	0.6	0.4	0.4	0.4	0.5	0.6	0.6	0.8
Sodium	mg/L	<200 ***	6.2	16.2	14.3	10.9	8.3	7.6	7.6	21.1	13.3	13.4	13.9
Suspended Solids	mg/L	No Value	<5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5
Total Dissolved Solids	mg/L	<500 ***	202	186	168	168	166	154	154	180	182	182	198
Sulphate	mg/L	<500 ***	6	6	5	5	5	6	6	6	7	5	7
Zinc	mg/L	<5 ***	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organics													
Benzene	µg/L	5	Not Required	Not Required	<1	Not Required	Not Required	Not Required	<1	Not Required	Not Required	Not Required	<1
1,4-Dichlorobenzene	µg/L	5	Not Required	Not Required	<1	Not Required	Not Required	Not Required	<1	Not Required	Not Required	Not Required	<1
Dichloromethane	µg/L	50	Not Required	Not Required	<2	Not Required	Not Required	Not Required	<2	Not Required	Not Required	Not Required	<2
Toluene	µg/L	24	Not Required	Not Required	<2	Not Required	Not Required	Not Required	<2	Not Required	Not Required	Not Required	<2
Vinyl Chloride	µg/L	2	Not Required	Not Required	<0.89	Not Required	Not Required	Not Required	<0.5	Not Required	Not Required	Not Required	<0.89
Other Organics													
BOD5	mg/L	No Value	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
COO	mg/L	No Value	<3	<3	<3	3	7	7	7	4	<3	<3	5
Dissolved Organic Carbon	mg/L	No Value	1	1.5	1	0.8	0.5	5.2	5.2	1	<0.5	<0.5	0.49
Total Organic Carbon	mg/L	No Value	0.8	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	0.8
Phenol	mg/L	No Value	Not Required	Not Required	<0.001	Not Required	Not Required	Not Required	<0.001	Not Required	Not Required	Not Required	<0.001
Tannin/Lignin	mg/L	No Value	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Field Parameters													
Water Depth	cm	No Value	217	205	225	220	210	160	160	130	130	120	190
Temperature	deg C	<15 ***	4.7	8.7	10.2	10.5	7.7	11.4	11.4	10.7	5.6	6.5	10.8
pH	mg/L	6.5 - 8.5	7.65	7.8	7.9	7.7	7.75	8	8	8	8	8	8.3
Conductivity	uS/cm	No Value	325	323	331	341	337	335	335	345	332	328	328

*** aesthetic objective

Appendix 5. Study Area Vegetation Inventory

The following is an inventory of plants identified in each of the seven communities of the Study Area. The Atlantic Canada Conservation Data Center Provincial Rank is indicated. SE indicates an exotic species, while S5 indicates a species that is demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions. Inventories were completed by botanist Tom Neily on August 24, 2016.

Tall shrub/Sapling		ACCDC Rank
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Acer rubrum</i>	Red Maple	S5
<i>Betula populifolia</i>	Gray Birch	S5
<i>Doellingeria umbellata</i>	Parasol White-Top	S5
<i>Picea glauca</i>	White Spruce	S5
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	S5
<i>Rubus idaeus</i>	Red Raspberry	S5
<i>Chamerion angustifolium</i>	Fireweed	S5
<i>Galeopsis tetrahit</i>	Brittle-Stem Hempnettle	SE
<i>Ribes lacustre</i>	Bristly Black Currant	S5
<i>Sambucus racemosa</i>	Red Elderberry	S5
<i>Rubus allegheniensis</i>	Allegheny Blackberry	S5
<i>Centaurea nigra</i>	Black Starthistle	SE
<i>Ranunculus acris</i>	Tall Butter-Cup	SE
<i>Glyceria striata</i>	Fowl Manna-Grass	S5
<i>Tussilago farfara</i>	Colt's Foot	SE
Stream Slope		ACCDC Rank
<i>Ribes lacustre</i>	Bristly Black Currant	S5
<i>Solanum dulcamara</i>	Climbing Nightshade	SE
<i>Viburnum nudum</i>	Possum-Haw Viburnum	S5
<i>Alnus incana</i>	Speckled Alder	S5
<i>Viola cucullata</i>	Marsh Blue Violet	S5
<i>Polygonum sagittatum</i>	Arrow-Leaved Tearthumb	S5
<i>Eupatorium perfoliatum</i>	Common Boneset	S5
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Chelone glabra</i>	White Turtlehead	S5
<i>Doellingeria umbellata</i>	Parasol White-Top	S5
<i>Typha latifolia</i>	Broad-Leaf Cattail	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	S5
<i>Myosotis laxa</i>	Small Forget-Me-Not	S5
<i>Lysimachia terrestris</i>	Swamp Loosestrife	S5
<i>Epilobium ciliatum</i>	Hairy Willow-Herb	S5
<i>Athyrium filix-femina</i>	Lady-Fern	S5
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
<i>Betula alleghaniensis</i>	Yellow Birch	S5

<i>Acer rubrum</i>	Red Maple	S5
Abandoned Farmland		ACCDC Rank
<i>Picea glauca</i>	White Spruce	S5
<i>Prunus virginiana</i>	Choke Cherry	S5
<i>Alnus incana</i>	Speckled Alder	S5
<i>Pyrus sp</i>	Apple	not a sp at risk
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Doellingeria umbellata</i>	Parasol White-Top	S5
<i>Rosa sp</i>	Rose	n/a
<i>Juncus effusus</i>	Soft Rush	S5
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	S5
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Cirsium arvense</i>	Creeping Thistle	SE
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	S5
<i>Centaurea nigra</i>	Black Starthistle	SE
<i>Vicia cracca</i>	Tufted Vetch	SE
<i>Epipactis helleborine</i>	Eastern Helleborine	SE
<i>Rubus pubescens</i>	Dwarf Red Raspberry	S5
<i>Fraxinus americana</i>	White Ash	S5
<i>Carex gynandra</i>	A Sedge	S5
<i>Potentilla simplex</i>	Old-Field Cinquefoil	S5
<i>Acer rubrum</i>	Red Maple	S5
<i>Anaphalis margaritacea</i>	Pearly Everlasting	S5
<i>Carex scoparia</i>	Pointed Broom Sedge	S5
<i>Dennstaedtia punctilobula</i>	Eastern Hay-Scented Fern	S5
<i>Dryopteris carthusiana</i>	Spinulose Shield Fern	S5
<i>Cornus canadensis</i>	Dwarf Dogwood	S5
<i>Trientalis borealis</i>	Northern Starflower	S5
<i>Maianthemum canadense</i>	Wild Lily-of-The-Valley	S5
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Polystichum acrostichoides</i>	Christmas Fern	S5
<i>Rubus allegheniensis</i>	Allegheny Blackberry	S5
<i>Pteridium aquilinum</i>	Bracken Fern	S5
Mixed Woods		ACCDC Rank
<i>Acer rubrum</i>	Red Maple	S5
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	S5
<i>Picea glauca</i>	White Spruce	S5
<i>Oclemena acuminata</i>	Whorled Aster	S5
<i>Maianthemum canadense</i>	Wild Lily-of-The-Valley	S5
<i>Oxalis montana</i>	White Wood-Sorrel	S5
<i>Dennstaedtia punctilobula</i>	Eastern Hay-Scented Fern	S5

<i>Phegopteris connectilis</i>	Northern Beech Fern	S5
<i>Trientalis borealis</i>	Northern Starflower	S5
<i>Fraxinus americana</i>	White Ash	S5
<i>Equisetum sylvaticum</i>	Woodland Horsetail	S5
<i>Carex intumescens</i>	Bladder Sedge	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	S5
<i>Prunus virginiana</i>	Choke Cherry	S5
<i>Linnaea borealis</i>	Twinflower	S5
<i>Symphotrichum lateriflorum</i>	Farewell-Summer	S5
Current Operational Area		ACCDC Rank
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Tussilago farfara</i>	Colt's Foot	SE
<i>Gnaphalium uliginosum</i>	Low Cudweed	SE
<i>Polygonum sagittatum</i>	Arrow-Leaved Tearthumb	S5
<i>Juncus tenuis</i>	Slender Rush	S5
<i>Veronica officinalis</i>	Gypsy-Weed	S5
<i>Rubus canadensis</i>	Smooth Blackberry	S5
<i>Rubus sp</i>	Bramble	not a sp at risk
<i>Ranunculus repens</i>	Creeping Butter-Cup	SE
<i>Typha latifolia</i>	Broad-Leaf Cattail	S5
<i>Epilobium ciliatum</i>	Hairy Willow-Herb	S5
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	S5
<i>Acer rubrum</i>	Red Maple	S5
<i>Rubus allegheniensis</i>	Allegheny Blackberry	S5
<i>Dryopteris carthusiana</i>	Spinulose Shield Fern	S5
<i>Hieracium sp</i>	Hawkweed	not a sp at risk
<i>Potentilla simplex</i>	Old-Field Cinquefoil	S5
<i>Trifolium arvense</i>	Rabbit-Foot Clover	SE
<i>Dryopteris cristata</i>	Crested Shield-Fern	S5
<i>Spiraea alba</i>	Narrow-Leaved Meadow-Sweet	S5
<i>Carex scoparia</i>	Pointed Broom Sedge	S5
<i>Juncus effusus</i>	Soft Rush	S5
<i>Carex gynandra</i>	A Sedge	S5
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	S5
Wet Ditch/Excavated Drainages		ACCDC Rank
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Juncus tenuis</i>	Slender Rush	S5
<i>Juncus brevicaudatus</i>	Narrow-Panicled Rush	S5
<i>Lysimachia terrestris</i>	Swamp Loosestrife	S5
<i>Carex scoparia</i>	Pointed Broom Sedge	S5
<i>Trifolium pratense</i>	Red Clover	SE

<i>Rubus sp</i>	Bramble	not a sp at risk
<i>Tussilago farfara</i>	Colt's Foot	SE
<i>Typha latifolia</i>	Broad-Leaf Cattail	S5
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	S5
<i>Juncus effusus</i>	Soft Rush	S5
Old Field		ACCDC Rank
<i>Rubus idaeus</i>	Red Raspberry	S5
<i>Solidago canadensis</i>	Canada Goldenrod	S5
<i>Juncus effusus</i>	Soft Rush	S5
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	S5
<i>Typha latifolia</i>	Broad-Leaf Cattail	S5
<i>Betula populifolia</i>	Gray Birch	S5
<i>Rosa sp</i>	Rose	n/a
<i>Doellingeria umbellata</i>	Parasol White-Top	S5
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	S5
<i>Carex scoparia</i>	Pointed Broom Sedge	S5
<i>Symphyotrichum novi-belgii</i>	New Belgium American-Aster	S5
<i>Stellaria graminea</i>	Little Starwort	SE
<i>Phalaris arundinacea</i>	Reed Canary Grass	S5
<i>Spiraea alba</i>	Narrow-Leaved Meadow-Sweet	S5
<i>Cirsium arvense</i>	Creeping Thistle	SE
<i>Ranunculus acris</i>	Tall Butter-Cup	SE
<i>Tussilago farfara</i>	Colt's Foot	SE
<i>Phleum pratense</i>	Meadow Timothy	SE
<i>Lotus corniculatus</i>	Birds-Foot Trefoil	SE
<i>Daucus carota</i>	Wild Carrot	SE
<i>Trifolium pratense</i>	Red Clover	SE
<i>Plantago major</i>	Nipple-Seed Plantain	SE
<i>Oenothera biennis</i>	Common Evening-Primrose	S5
<i>Leucanthemum vulgare</i>	Oxeye Daisy	SE
<i>Echinochloa crus-galli</i>	Barnyard Grass	SE
<i>Epilobium ciliatum</i>	Hairy Willow-Herb	S5
<i>Ambrosia artemisiifolia</i>	Annual Ragweed	S5
<i>Daucus carota</i>	Wild Carrot	SE
<i>Juncus canadensis</i>	Canada Rush	S5
<i>Trifolium arvense</i>	Rabbit-Foot Clover	SE
<i>Ranunculus repens</i>	Creeping Butter-Cup	SE
<i>Lythrum salicaria</i>	Purple Loosestrife	SE
<i>Picea glauca</i>	White Spruce	S5
<i>Solanum dulcamara</i>	Climbing Nightshade	SE
<i>Vicia cracca</i>	Tufted Vetch	SE
<i>Rosa sp</i>	Rose	n/a

Appendix 6. Study Area Avian Studies

Avian Assessment of Arlington Heights Construction and Debris Site,
Annapolis County, Nova Scotia

Jacob Walker, M.Sc.

Submitted to East Coast Aquatics October 4, 2016

Background

A field survey was conducted on September 30, 2016 to evaluate avian use and habitat suitability in a commercial dumping site, and habitats within the immediate vicinity. The survey was conducted during fall migration so that both resident and migratory species might be detected, and habitats were assessed to determine which species likely breed and inhabit the area during other times of year.

Study Site

The Arlington Heights Commercial and Debris Site is located at 1481 Arlington Rd. in Annapolis County, Nova Scotia, on the North Mountain bordering the Annapolis Valley. The site consist of an open pit where construction materials are deposited, an active burial area for asbestos, and an area where debris has been buried. Timber treated with creosote is piled at various locations within the site. A circle of 800 meter radius was used as the study area for this survey, centered on the active disposal area at the following coordinates: UTM 20T 4975949N 319959E (Figure 1).

Within the footprint of the active disposal area of the site, the habitat is primarily disturbed ground with many grasses, weeds, and shrubs, and several small patches of hardwood saplings and nearly mature conifers. The periphery of the site is lined with second-growth saplings to the north and northwest, primarily birch and alder, which are backed by mature, mixed conifer-hardwood forest that extends to the edge of the 800 meter circle. Alder and cattail wetlands are interspersed throughout the forested section of study area to the north of the site. To the south of the site, the habitat is dominated by inactive agricultural land (fallow fields), with patches of mature mixed conifer-hardwood forest, a regenerating clearcut, and one active agricultural field.

Survey Method

To survey avian use of the site during the fall when most species are not singing, an area search strategy was employed focusing on three primary habitat types/areas representative of the study area: the active disposal area of the site including the immediate edge, the inactive agricultural lands, and the mature mixed forest. During fall migration, most species of resident and migrant

landbirds are found in flocks, usually along forest edges and shrubby areas as opposed to the forest interior. The area was surveyed on foot primarily along habitat edges, and flocks located visually or aurally before approaching to determine species composition and obtain counts. The survey included 3.1 km of coverage by foot, and an additional one km along Arlington Rd traveled by car.

Survey Date and Weather

The survey was conducted on the morning of September 30, 2016, from 0700 to 1130. Sunrise was at 0719. There was no wind at the beginning of the survey, and a light breeze (< 5 km/h) by the end. The temperature at the start of the survey was 4°C, and reached 15°C by the end of the survey. The Annapolis Valley was filled with dense fog, but it was clear at the study site situated on top of North Mountain. The date was selected based on the prediction of light wind, and the possibility that a migratory flight could have occurred during the night before. Overnight winds were light and favorable for migration, and winds had been strong and unfavorable for the previous three nights. At this date, the expected migrants could be late season warblers (Yellow-rumped, Palm, and Black-throated Green), Blue Jays, vireos, and sparrows.

Results

A total of 480 birds were encountered of 44 species in the study area. The most abundant group of birds in the study area were warblers with 124 individuals of 10 species (dominated by a large migratory movement of Palm and Yellow-rumped Warblers), followed by sparrows with 117 individuals of 9 species. Within the perimeter of the active disposal site, including the immediate edge, 187 birds of 33 species were recorded. Within the disposal site, sparrows were the most abundant group of birds with 53 individuals of 8 species, followed by warblers with 50 individuals of 7 species. Blue Jays were one of the most abundant species, but all were detected as migrants flying over the area. The species encountered, scientific names, and the numbers of each species from each habitat/area are shown in Table 1.

Discussion

The forested habitat found within the study area was similar to most mature mixed conifer-hardwood stands found along the North Mountain of the Annapolis Valley, with a mix of primarily spruce, fir, maple, and birch. The birds found using this habitat and its margin were resident species such as woodpeckers, Black-capped Chickadees, Golden-crowned Kinglets, White-throated Sparrows and fall migrant songbirds such as Ruby-crowned Kinglets, Blue-headed Vireos, Yellow-rumped Warblers, and Black-throated Green Warblers. Because the forested habitat is comparable to many other sites on the North Mountain, it is possible to predict which species likely breed in the woodlands, and this list of expected species is presented in Table 2.

The habitat provided by the disturbed ground in disposal site itself and the surrounding fallow fields is not as common in the region, as there are few fields left fallow and allowed to go to seed in the area (most are in crops or hayed multiple times during the season). This provides a valuable resource for seed-eating birds in fall migration, primarily sparrows. The sparrow abundance and diversity found within the footprint of the site and the surrounding fields was as

high as the best bird-watching sites for sparrows in the province. The area is expected to be important for seed eating birds between late-September and January. A list of species likely to breed in the fallow fields and within the disposal site are shown in Table 3.

The weather on the night preceding the survey (light north winds) was conducive to migration, and numbers of migrants encountered during the survey indicated a flight had occurred. The dense fog in the Annapolis Valley likely concentrated migrants along the North Mountain, which was above the level of the fog. In general, fall migrants are likely to be concentrated along the North Mountain as they head southwest through the province. Migrants encountered in numbers included: Palm Warblers, Blue Jays, Yellow-rumped Warblers, American Robins, Black-throated Green Warblers, Ruby-crowned Kinglets, Blue-headed Vireos, Magnolia Warblers, and Northern Parulas. Most of these species likely move through the study area relatively quickly, and the only species actively using the disposal site as opposed to the periphery were Palm Warblers, which were feeding all over the disturbed ground. Many of the sparrows encountered likely arrived the preceding evening as well, but the sparrows are expected to settle in to this location as it is a valuable food resource.

Aside from sparrows and Palm Warblers, several other species were observed actively using the disposal site. Common Ravens were seen picking through the debris pile searching for food. Common Yellowthroats and Yellow-rumped Warblers were observed foraging in weedy areas of the site. American Pipits and Horned Larks were not observed during the survey, but are likely to be drawn to the disturbed ground at the site during fall migration. A large wet area in the pit adjacent to the debris pile looked like it might be attractive for waterbirds and shorebirds, but none were observed and there were no bird footprints in the mud surrounding the wet area.



Figure 1. A circle of 800 meter radius, in yellow, was used as the study area for this survey. The gps track of the survey is shown in blue.

No Species at Risk in Nova Scotia were observed during the survey, but the habitat within the forests and fallow fields surrounding the site is suitable for several species at risk during the breeding season, including: Canada Warbler (*Cardellina canadensis*, Endangered), Olive-sided Flycatcher (*Contopus cooperi*, Threatened), Common Nighthawk (*Chordeiles minor*, Threatened), Eastern Wood Pewee (*Contopus virens*, Vulnerable), and Bobolink (*Dolichonyx oryzivorus*, Vulnerable).

Table 1. Numbers of each bird species detected within the survey area by habitat/area.

Species	Total	Site	Fields	Forest
Song Sparrow - <i>Melospiza melodia</i>	53	27	26	
Palm Warbler - <i>Setophaga palmarum</i>	51	32	15	4
Blue Jay - <i>Cyanocitta cristata</i>	48	13	21	14
Black-capped Chickadee - <i>Poecile atricapillus</i>	32	17	4	11
Yellow-rumped Warbler - <i>Setophaga coronata</i>	30	4	5	21
American Goldfinch - <i>Spinus tristis</i>	25	8	13	4
American Robin - <i>Turdus migratorius</i>	23		23	
Golden-crowned Kinglet - <i>Regulus satrapa</i>	22	7		15
Black-throated Green Warbler - <i>Setophaga virens</i>	20	6		14
Dark-eyed Junco - <i>Junco hyemalis</i>	19	6	5	8
Ruby-crowned Kinglet - <i>Regulus calendula</i>	16	5	1	10
White-throated Sparrow - <i>Zonotrichia albicollis</i>	15	6	4	5
Purple Finch - <i>Haemorhous purpureus</i>	14	8		6
Swamp Sparrow - <i>Melospiza georgiana</i>	14	5	8	1
American Crow - <i>Corvus brachyrhynchos</i>	11	7	4	
Common Yellowthroat - <i>Geothlypis trichas</i>	11	4	7	
Blue-headed Vireo - <i>Vireo solitarius</i>	9	4		5
Common Raven - <i>Corvus corax</i>	9	3	6	
Savannah Sparrow - <i>Passerculus sandwichensis</i>	7	4	3	
Lincoln's Sparrow - <i>Melospiza lincolni</i>	6	3	3	
Cedar Waxwing - <i>Bombycilla cedrorum</i>	4	4		
Hairy Woodpecker - <i>Picoides villosus</i>	4	1		3
Magnolia Warbler - <i>Setophaga magnolia</i>	4	1		3
Northern Parula - <i>Setophaga americana</i>	4	2		2
Ring-necked Pheasant - <i>Phasianus colchicus</i>	4		4	
Brown Creeper - <i>Certhia americana</i>	3			3
Downy Woodpecker - <i>Picoides pubescens</i>	3	1		2
Pine Siskin - <i>Spinus pinus</i>	2	2		
Red-breasted Nuthatch - <i>Sitta canadensis</i>	2			2
Blackburnian Warbler - <i>Setophaga fusca</i>	1			1
Blackpoll Warbler - <i>Setophaga striata</i>	1			1
Chestnut-sided Warbler - <i>Setophaga pensylvanica</i>	1	1		

Chipping Sparrow - <i>Spizella passerina</i>	1	1		
Hermit Thrush - <i>Catharus guttatus</i>	1			1
Northern Flicker - <i>Colaptes auratus</i>	1		1	
Pileated Woodpecker - <i>Dryocopus pileatus</i>	1			1
Prairie Warbler - <i>Setophaga discolor</i>	1			1
Red-eyed Vireo - <i>Vireo olivaceus</i>	1	1		
Ruffed Grouse - <i>Bonasa umbellus</i>	1			1
Swainson's Thrush - <i>Catharus ustulatus</i>	1	1		
Species	Total	Site	Fields	Forest
Vesper Sparrow - <i>Pooecetes gramineus</i>	1		1	
White-breasted Nuthatch - <i>Sitta carolinensis</i>	1	1		
White-crowned Sparrow - <i>Zonotrichia leucophrys</i>	1	1		
Yellow-bellied Sapsucker - <i>Sphyrapicus varius</i>	1	1		

Table 2. Expected breeding species in the forested portion of the study area.

Ruffed Grouse (<i>Bonasa umbellus</i>)	Hermit Thrush (<i>Catharus guttatus</i>)
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	American Robin (<i>Turdus migratorius</i>)
Northern Goshawk (<i>Accipiter gentilis</i>)	Gray Catbird (<i>Dumetella carolinensis</i>)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	Cedar Waxwing (<i>Bombycilla cedrorum</i>)
American Woodcock (<i>Scolopax minor</i>)	Ovenbird (<i>Seiurus aurocapilla</i>)
Mourning Dove (<i>Zenaida macroura</i>)	Northern Waterthrush (<i>Parkesia noveboracensis</i>)
Great Horned Owl (<i>Bubo virginianus</i>)	Black-and-white Warbler (<i>Mniotilta varia</i>)
Barred Owl (<i>Strix varia</i>)	Nashville Warbler (<i>Oreothlypis ruficapilla</i>)
Northern Saw-whet Owl (<i>Aegolius acadicus</i>)	American Redstart (<i>Setophaga ruticilla</i>)
Ruby-throated Hummingbird (<i>Archilochus colubris</i>)	Northern Parula (<i>Setophaga americana</i>)
Yellow-bellied Sapsucker (<i>Sphyrapicus varius</i>)	Magnolia Warbler (<i>Setophaga magnolia</i>)
Downy Woodpecker (<i>Picoides pubescens</i>)	Blackburnian Warbler (<i>Setophaga fusca</i>)
Hairy Woodpecker (<i>Picoides villosus</i>)	Yellow Warbler (<i>Setophaga petechia</i>)
Pileated Woodpecker (<i>Dryocopus pileatus</i>)	Chestnut-sided Warbler (<i>Setophaga pensylvanica</i>)
Merlin (<i>Falco columbarius</i>)	Black-throated Blue Warbler (<i>Setophaga caerulescens</i>)
Eastern Wood-Pewee (<i>Contopus virens</i>)	Palm Warbler (<i>Setophaga palmarum</i>)
Alder Flycatcher (<i>Empidonax alnorum</i>)	Yellow-rumped Warbler (<i>Setophaga coronata</i>)
Least Flycatcher (<i>Empidonax minimus</i>)	Black-throated Green Warbler (<i>Setophaga virens</i>)
Blue-headed Vireo (<i>Vireo solitarius</i>)	Canada Warbler (<i>Cardellina canadensis</i>)
Red-eyed Vireo (<i>Vireo olivaceus</i>)	Chipping Sparrow (<i>Spizella passerina</i>)
Gray Jay (<i>Perisoreus canadensis</i>)	Dark-eyed Junco (<i>Junco hyemalis</i>)
Blue Jay (<i>Cyanocitta cristata</i>)	White-throated Sparrow (<i>Zonotrichia albicollis</i>)
American Crow (<i>Corvus brachyrhynchos</i>)	Swamp Sparrow (<i>Melospiza georgiana</i>)
Common Raven (<i>Corvus corax</i>)	Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>)
Black-capped Chickadee (<i>Poecile atricapillus</i>)	Common Grackle (<i>Quiscalus quiscula</i>)
Boreal Chickadee (<i>Poecile hudsonicus</i>)	Purple Finch (<i>Haemorhous purpureus</i>)

Red-breasted Nuthatch (<i>Sitta canadensis</i>)	Red Crossbill (<i>Loxia curvirostra</i>)
White-breasted Nuthatch (<i>Sitta carolinensis</i>)	White-winged Crossbill (<i>Loxia leucoptera</i>)
Brown Creeper (<i>Certhia americana</i>)	Pine Siskin (<i>Spinus pinus</i>)
Winter Wren (<i>Troglodytes hiemalis</i>)	American Goldfinch (<i>Spinus tristis</i>)
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	Evening Grosbeak (<i>Coccothraustes vespertinus</i>)
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	
Veery (<i>Catharus fuscescens</i>)	
Swainson's Thrush (<i>Catharus ustulatus</i>)	

Table 3. Expected breeding species in the footprint of the disposal site, and the surrounding inactive agricultural fields.

Ring-necked Pheasant (<i>Phasianus colchicus</i>)
Common Nighthawk (<i>Chordeiles minor</i>)
European Starling (<i>Sturnus vulgaris</i>)
Eastern Kingbird (<i>Tyrannus tyrannus</i>)
American Robin (<i>Turdus migratorius</i>)
Gray Catbird (<i>Dumetella carolinensis</i>)
Common Yellowthroat (<i>Geothlypis trichas</i>)
Yellow Warbler (<i>Setophaga petechia</i>)
Chestnut-sided Warbler (<i>Setophaga pensylvanica</i>)
Savannah Sparrow (<i>Passerculus sandwichensis</i>)
Song Sparrow (<i>Melospiza melodia</i>)
Bobolink (<i>Dolichonyx oryzivorus</i>)
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)
American Goldfinch (<i>Spinus tristis</i>)

REPORT - Avian fauna survey at Arlington Heights Construction and Demolition Site For Environmental Assessment Subcontracted by East Coast Aquatics Ltd. September 2016

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Summary

An avian fauna survey was conducted by Sarah Gutowsky (contracted ornithologist), at the Arlington Heights Construction and Demolition Site. This survey is one component of a Class III Environmental Assessment to ensure on-going operation required by the terms of the Nova Scotia Environment Industry Approval. A continuous survey was conducted on September 17, 2016, covering a route of 6.58 km within an 800m radius of the site center (44.91419°N 65.27727°W). During the 370 minutes of surveying, 10 focused stops were made (each of approximately 20 minutes in duration), coinciding with areas that comprised novel habitat types, which could potentially support different species assemblages. All bird species detected (seen or heard) throughout the entirety of the survey route were recorded, along with relative abundance. A total of 35 species were detected, including >100 individuals each of three common resident species (Blue jay, Black-capped chickadee, American goldfinch). The varying cleared and mature forest and open field habitat surrounding the disposal site appear to support a great abundance and diversity of avian fauna. Because this survey was conducted over the course of a single day during the fall migration period, it is recommended that further survey efforts be made during the spring migration and breeding season periods, as it is suspected that a higher number of species would be detected, with high potential for various avian species-at-risk.

Introduction

The Arlington Heights Construction and Demolition Site, near Bridgetown, Nova Scotia, has been in operation for over 10 years, accepting locally generated construction and demolition waste for disposal. The terms of the Nova Scotia Environment (NSE) Industrial Approval require the completion of a Class III Environmental Assessment (EA) to ensure on-going operation. One component of this EA is to address the use of the study area by avian fauna.

In Canada, billions of birds raise their young or spend their migratory stop-overs or non-breeding seasons across the country's diverse landscapes. Unfortunately, Canadian bird populations face numerous threats, resulting in many species experiencing declines in recent times. In Nova Scotia, 15 species are considered to be at-risk, many of which may occur in and around the study area. For this contract, an avian survey was conducted during the fall migration period (September), with special attention paid to the potential presence of species-at-risk.

Methods

An avian survey was conducted within an 800m buffer of the study area center (44.91419°N 65.27727°W, Figure 1) on September 17, 2016. Point count surveys and playbacks are not practical during the autumn period when birds are generally not vocalizing and defending on territories. Instead, the species utilizing habitat during this period of the annual cycle are a mixture of year-round residents and those stopping over on their southbound migration. Thus, a continuous survey approach was employed, whereby all species encountered along a survey route through the area were recorded, along with relative abundance. Most identifications were made using a combination of sight (with binoculars) and sound. An effort was made to intersect a variety of available habitat types within the study area. This necessitated hiking on foot, mostly off-trail, although remnant roads or ATV tracks were used where possible. Along the survey route, prolonged stops (approximately 20 minutes in duration) were made when either open areas with relatively good visibility or novel habitat types were encountered. For navigation and recording of survey tracks and waypoints, the iPhone application Topo Map+ by Glacier Peak Studios was used. This application allows detailed USGS topographic maps to be downloaded in advance, allowing access without cell phone service and remarkable GPS accuracy.

Findings

On September 17, 2016, a total distance of 6.58 km was surveyed over 370 minutes between 0825-1435 (Table 1). Ten prolonged stops, each of approximately 20 minutes in duration, were made throughout the route (Figure 1, Table 1). Conditions were generally favourable for surveying (0-15% cloud cover, variable light winds, 13-18 °C), although wind at times made detection by sound challenging, further exacerbated by noise from active machinery at the disposal site. Variable habitat

types were encountered along the survey route, including the open areas of the active disposal site, cleared forest edges, semi-cleared forest areas with low shrub regrowth and deadfall, areas of thick alder regeneration, mixed mature hardwood and conifer stands with varying undergrowth, wet low-lying areas, creek beds, and active and inactive agriculture fields.

In total, 35 bird species were detected over the course of the survey. Of those species detected, 16 are known year-round residents in Nova Scotia, while the remaining 19 species would be migratory, either using the study area as a staging area following breeding at or near the site, or as a stop-over site on southbound migration (Table 2). The most common species included Blue jay, Black-capped chickadee and American goldfinch, all resident species. The most common migratory species comprised four warbler species, including Palm warbler, Magnolia warbler, Black-throated green warbler and Common yellowthroat.

The varying habitats available within the study area clearly provide suitable habitat for a diverse community of both resident and migratory avian species. Despite the active disposal site and clearing of forest areas, a diverse assemblage of species has taken advantage of the area. Many sparrow species for example prefer the low shrubby vegetation in open areas created from forest clearing and agriculture activities. Large foraging flocks of warblers were found using forest edges created from clearing around the disposal site (for example, stop 1). It is important to keep in mind that detectability is much higher along cleared edges, and it is likely that migratory warblers were using the entirety of the study area equally. Mixed species foraging flocks were also encountered in natural clearings within more mature forest tracts (for example, at stop 6) and in the tree canopies along creek beds (for example, stop 5). Species identification within dense forest tracts was difficult, but high bird abundance was evident (for example, stop 3). White-tailed deer are also using the study area, as numerous tracks were encountered along the survey route, and one individual was encountered in a tract of dense forest.

This survey effort was restricted to a single day during the fall migratory period. It is suspected that further survey efforts during the spring and fall migratory period and the breeding season would reveal a greater diversity and abundance of avian species utilizing the study area, including potentially various species-at-risk. During the breeding season, detectability of all species would be highest. Based on the findings of this survey alone, it is evident that a significant community of both resident and migratory avian species utilize the habitats available at the study area.

Tables

Table 1. Details of the avian survey route and stops at the Arlington Heights Construction and Demolition Site on September 17, 2016.

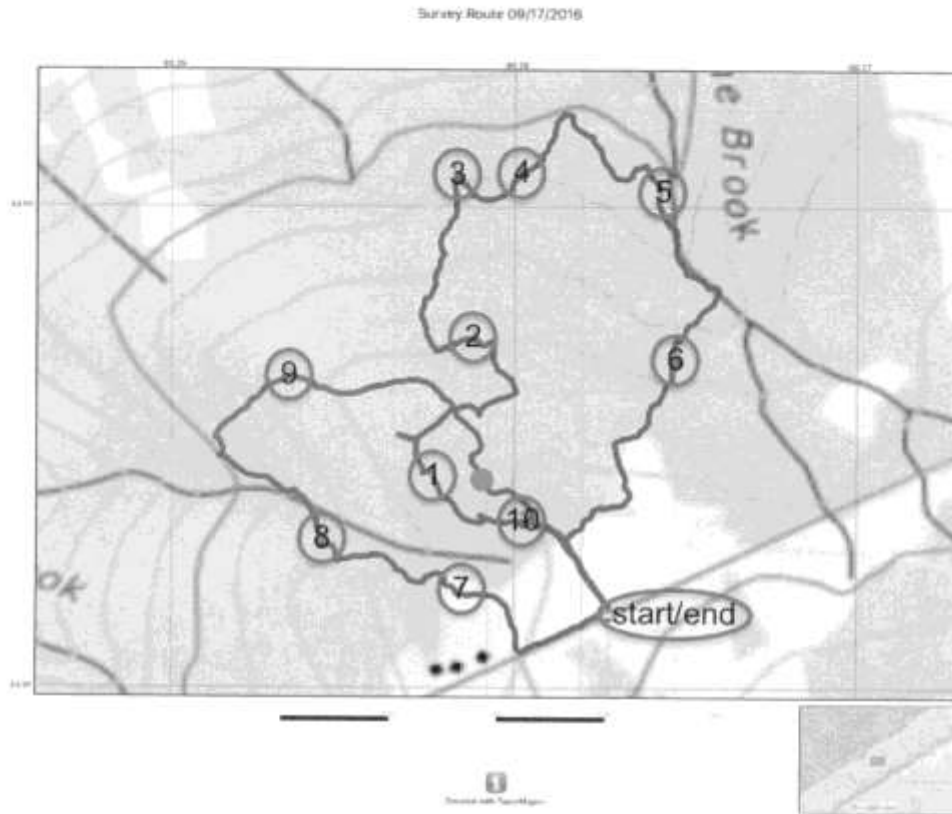
survey route	latitude (°N)	longitude (°W)	arrival time	notes
start	44.91154	65.27727	0825	parked just outside gate at site entrance, began surveys immediately
stop 1	44.91422	65.28239	0845	construction noise makes vocalizing birds difficult to detect by sound, wind makes movement difficult to detect by sight, but large foraging flocks evident
stop 2	44.91723	65.28118	0915	many species using mixed habitat including sparrows in the shrubby regrowth, warblers and finches foraging in remaining tree tops
stop 3	44.92066	65.28178	0955	dense forest makes species identification challenging but high bird abundance evident
stop 4	44.92064	65.27988	1027	similar to stop 3
stop 5	44.92006	65.27579	1105	many birds foraging in trees along creekbed valley, large mixed species flock of chickadees, nuthatches and warblers
stop 6	44.91675	65.27527	1150	large mixed flock of foraging warblers in open forest patch
stop 7	44.91194	65.28151	1236	grouse and pheasants evident in forest habitat
stop 8	44.91294	65.28570	1300	sparrows in meadow
stop 9	44.91643	65.28660	1334	abundant evidence of woodpeckers using snags and deadwood to forage
stop 10	44.91347	65.27978	1403	sparrows using edge habitat and small patches directly at construction site
end	44.91154	65.27727	1435	same as start

Table 2. Species detected (seen or heard) and estimated relative abundance during an avian survey at the Arlington Heights Construction and Demolition Site on September 17, 2016. Relative abundance values are based on the following scheme: individuals numbering 1, 2, 3, 4, or 5 were recorded precisely, while approximations were made for species detected in numbers between 5-10, 10-25, 25-50, 50-75, 75-100, and >100. Year-round resident species are marked with an asterisk*.

Species	Relative abundance
blue jay*	>100
black-capped chickadee*	>100
american goldfinch*	>100
palm warbler	75-100
magnolia warbler	50-75
black-thoated green warbler	25-50
song sparrow*	25-50
common yellowthroat	25-50
american crow*	10-25
northern flicker*	10-25
dark-eyed junco*	10-25
yellow warbler	5-10
yellow-rumped warbler	5-10
boreal chickadee*	5-10
american robin	5
white-throated sparrow*	5
black-and-white warbler	4
swamp sparrow	4
ring-necked pheasant*	4
red-breasted nuthatch*	3
american tree sparrow	2
blue-headed vireo	2
red-eyed vireo	2
savannah sparrow	1
gray catbird	1
northern parula	1
yellow-bellied sapsucker	1
gray jay*	1
pileated woodpecker*	1
veery	1
purple finch	1
brown creeper	1
ruffed grouse*	1
least flycatcher	1
white-breasted nuthatch*	1

Figures

Figure 1. The study area at the Arlington Heights Construction and Demolition Site, with site center (red circle) survey route (blue line) and stops (green circles) from an avian survey conducted on September 17, 2016 (see Table 1 for coordinates).



Appendix 7. Project Area ACCDC Report



DATA REPORT 5584: Arlington, NS

Prepared 29 July 2016
by J. Churchill, Data Manager

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Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
ArlingtonNS_5584ob.xls	All Rare and legally protected <i>Flora and Fauna</i> within 5 km of your study area
ArlingtonNS_5584ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
ArlingtonNS_5584ma.xls	All <i>Managed Areas</i> in your study area
ArlingtonNS_5584sa.xls	All <i>Significant Natural Areas</i> in your study area

1.2 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

- Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- The ACCDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- ACCDC data responses are restricted to the data in our Data System at the time of the data request.
- Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- The absence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

Please direct any additional questions about ACCDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sblaney@mta.ca

Animals (Fauna)

John Klymko, Zoologist
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jklymko@mta.ca

Plant Communities

Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
stobinson@mta.ca

Data Management, GIS

James Churchill, Data Manager
Tel: (902) 679-6146
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Billing

Jean Breau
Tel: (506) 364-2657
jbreau@mta.ca

Questions on the biology of Federal Species at Risk can be directed to ACCDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

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Eastern: Terry Power
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Terrance.Power@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

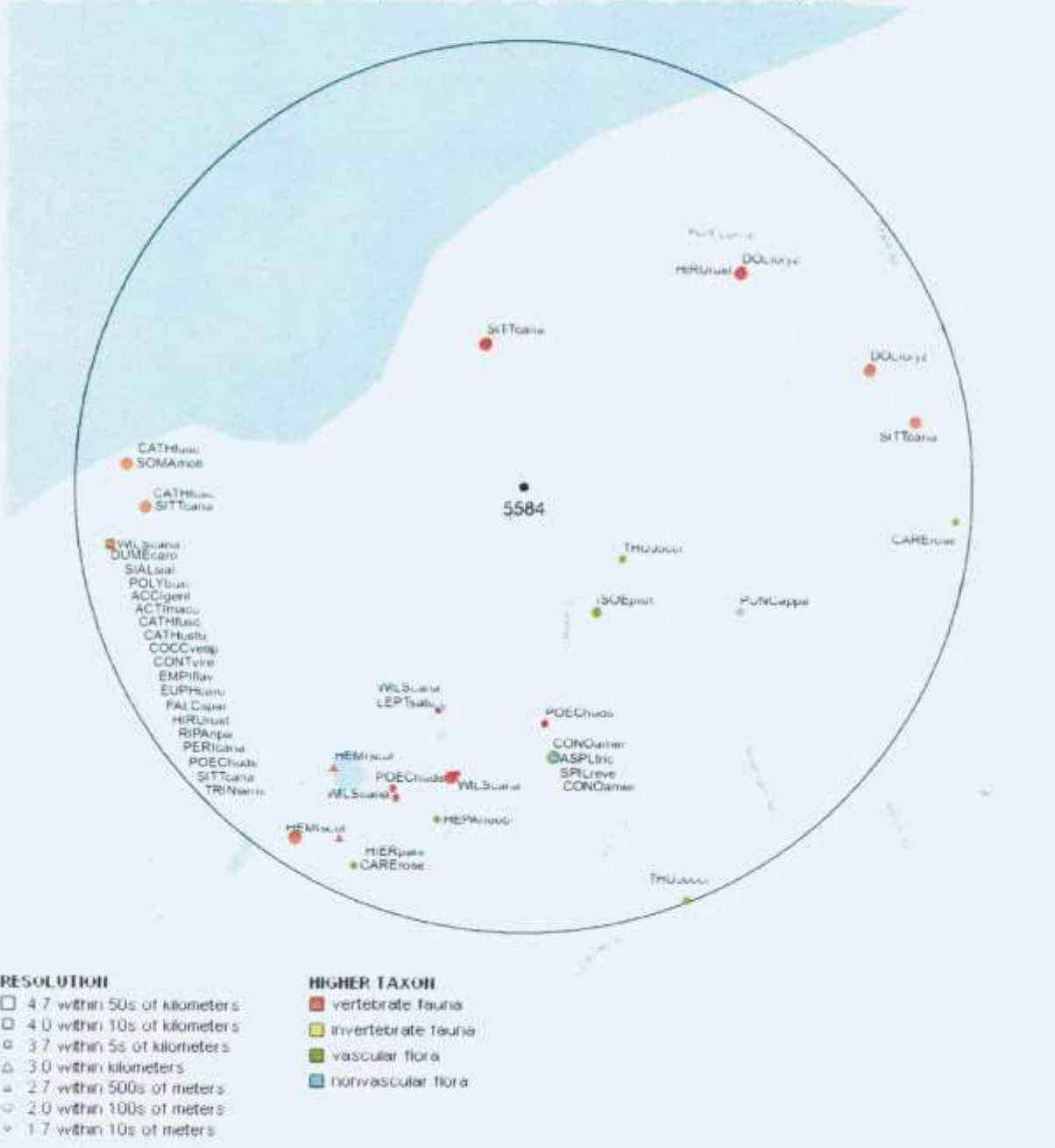
2.1 FLORA

A 5 km buffer around the study area contains 11 records of 8 vascular, 3 records of 3 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 48 records of 21 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2. Known observations of rare and/or protected flora and fauna within 5 km of the study area.



3.0 SPECIAL AREAS

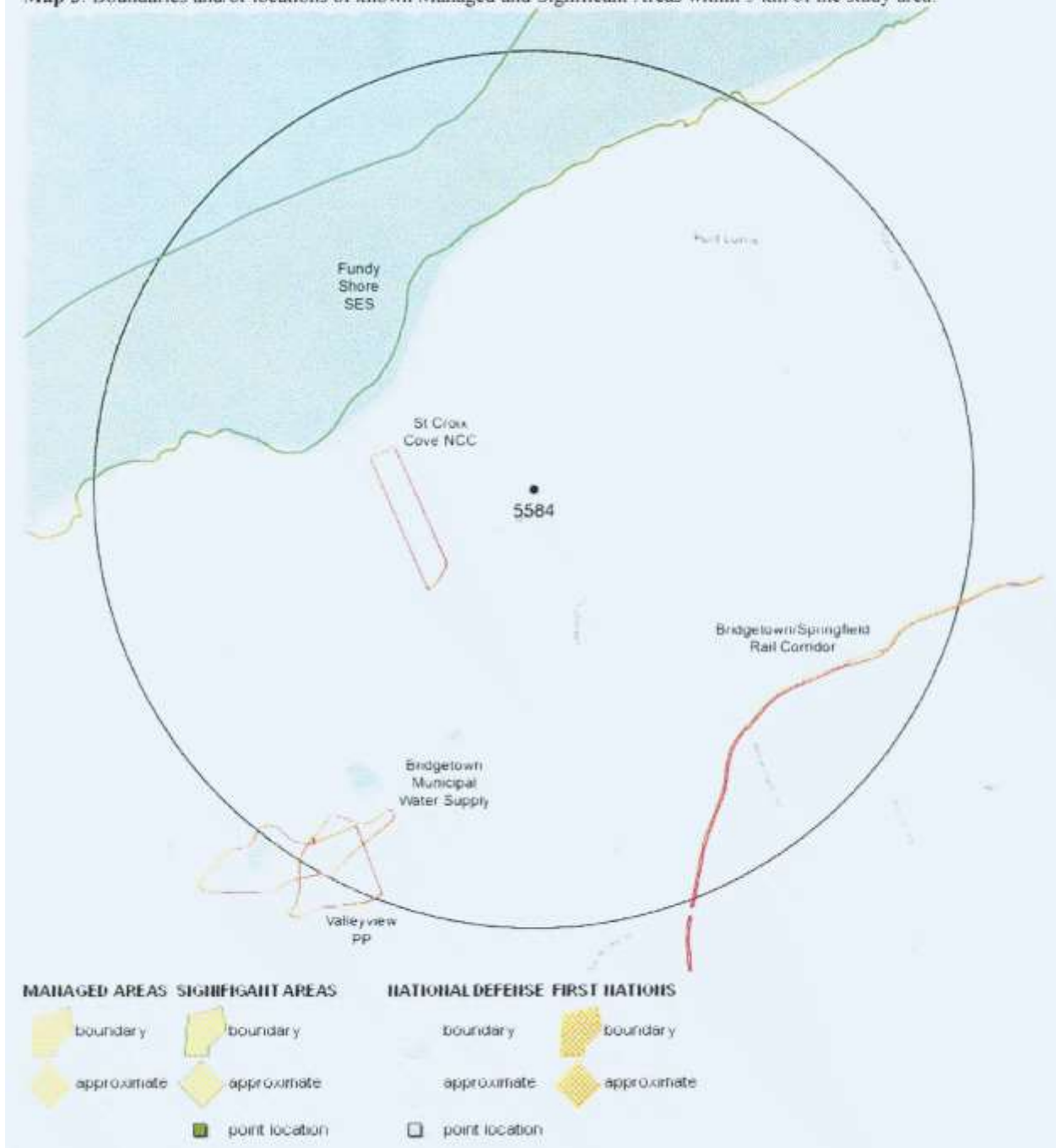
3.1 MANAGED AREAS

The GIS scan identified 4 managed areas in the vicinity of the study area (Map 3 and attached file: *ma*.xls)

3.2 SIGNIFICANT AREAS

The GIS scan identified 10 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls)

Map 3. Boundaries and/or locations of known Managed and Significant Areas within 5 km of the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the 5 km-buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls*, *ob.shp* only.

4.1 FLORA

Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
<i>Spilonema rivierense</i>	Rock Hairball Lichen				S1	5 Undetermined	1	3.1 ± 0.0
<i>Punctelia apalachensis</i>	Appalachian Speckleback Lichen				S3	3 Sensitive	1	2.8 ± 0.0
<i>Leptogium saturninum</i>	Bearded Jellyskin Lichen				S3S4	5 Undetermined	1	2.8 ± 0.0
<i>Isocetes prototypus</i>	Prototype Quiltwort	Special Concern		Vulnerable	S7	3 Sensitive	1	1.6 ± 0.0
<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	1 At Risk	2	1.4 ± 0.0
<i>Conopholis americana</i>	American Cancer-root				S1S2	2 May Be At Risk	2	3.1 ± 0.0
<i>Hepatica nobilis</i> var. <i>obtusis</i>	Round-lobed Hepatica				S1S2	2 May Be At Risk	1	3.9 ± 0.0
<i>Polygonum buxiforme</i>	Small's Knotweed				S2S3	5 Undetermined	1	4.6 ± 7.0
<i>Hieracium paniculatum</i>	Panicled Hawkweed				S1	4 Secure	1	4.6 ± 0.0
<i>Carex rostris</i>	Rosy Sedge				S3	4 Secure	2	4.6 ± 0.0
<i>Asplenium brachomanes</i>	Maidenhair Spikenwort				S3	4 Secure	1	3.1 ± 0.0

4.2 FAUNA

Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
<i>Riparia riparia</i>	Bank Swallow	Threatened		Endangered	S2S3E	2 May Be At Risk	1	4.6 ± 7.0
<i>Hirundo rustica</i>	Barn Swallow	Threatened		Endangered	S3E	1 At Risk	2	3.4 ± 0.0
<i>Wisnomia canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3S4E	1 At Risk	6	2.7 ± 0.0
<i>Delichonix oryzivorus</i>	Bobolink	Threatened		Vulnerable	S3S4E	3 Sensitive	2	3.4 ± 0.0
<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2E	2 May Be At Risk	1	4.6 ± 7.0
<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4E	3 Sensitive	1	4.6 ± 7.0
<i>Hemidectylum scuratum</i>	Four-toed Salamander	Not At Risk			S3	4 Secure	6	3.8 ± 0.0
<i>Salix saia</i>	Eastern Bluebird	Not At Risk			S3E	3 Sensitive	1	4.6 ± 7.0
<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	4 Secure	1	4.6 ± 7.0
<i>Troglodytes aedon</i>	Willie	Not At Risk			S2S3E	2 May Be At Risk	1	4.6 ± 7.0
<i>Pensoseus canadensis</i>	Gray Jay				S3	3 Sensitive	3	4.6 ± 7.0
<i>Picella hudsonica</i>	Boreal Chickadee				S3	4 Secure	6	1.7 ± 0.0
<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3E	4 Secure	1	4.6 ± 7.0
<i>Falco sparverius</i>	American Kestrel				S3E	4 Secure	1	4.6 ± 7.0
<i>Dumetella carolinensis</i>	Gray Catbird				S3E	2 May Be At Risk	1	4.6 ± 7.0
<i>Somateria mollissima</i>	Common Eider				S3S4	4 Secure	1	4.4 ± 0.0
<i>Actitis macularia</i>	Spotted Sandpiper				S3S4E	3 Sensitive	2	4.6 ± 7.0
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4E	3 Sensitive	1	4.6 ± 7.0
<i>Catharus fuscescens</i>	Veery				S3S4E	4 Secure	5	4.2 ± 0.0
<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4E	4 Secure	2	4.6 ± 7.0
<i>Coccythraustes vesperinus</i>	Evening Grosbeak				S3S4E S3N	4 Secure	1	4.6 ± 7.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting a 5 km buffer of your study area are indicated below with "YES".

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within 5 km of Study Site?
<i>Fraxinus nigra</i>	Black Ash		Threatened	Nc
<i>Erythronium albidum</i>	Blanding's Turtl - Nova Scotia pop.	Endangered	Vulnerable	Nc
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Nc
<i>Pipilo fuscus</i>	Red-winged Blackbird	Special Concern	Vulnerable	YES
<i>Bel'hibernaculum</i>		[Endangered]	[Endangered]	Nc

¹ *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Pipistrellus subflavus* (Tricolored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
36	LePage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB. 407,838 recs
10	Parker, M.S.R. 2011. Hampton Wind Farm 2010 - significant florifaunal observations. 13 recs
8	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS. 8856 recs
4	Staff. DNR 2007. Restricted & Limited Use Land Database (RLUL)
3	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB. 69 recs
2	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources. 8436 recs
2	Blaney, C.S., Mastrolite, D.M., Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre. # recs
1	Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources
1	Enkline, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ. Halifax. 82,125 recs
1	Gottz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Cullwort (<i>Isoplexis prototypus</i>). Committee on the Status of Endangered Wildlife in Canada. 111 recs
1	Zinck, M. & Roland, A.E. 1996. Roland's Flora of Nova Scotia. Nova Scotia Museum. 3rd ed. rev. M. Zinck. 2 Vol., 1287 pp.

The remaining twenty pages of this report list all species observation records within 100 km of the proposed undertaking. In consideration of paper waste, they have not been reproduced here.

Appendix 8. Archaeological Study

Archaeological Impact Assessment of the Arlington Heights Asbestos Disposal Site (HRP A2016NS094)



Prepared for East Coast Aquatics

Prepared by:
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B2Y 2X8

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Introduction

The Arlington Heights Construction and Demolition facility is proposing the expansion of six waste asbestos disposal cells on their current site located in Arlington West, north of Bridgetown, Annapolis County. *In Situ* was retained to conduct an archaeological impact assessment of the proposed expansion area and conducted fieldwork in November, 2016. Background studies indicated that the area had a low potential for containing First Nation's or historic archaeological resources and this finding was confirmed by the archaeological fieldwork. It was recommended that the project proceed as planned without the need for further archaeology.

Project Description

The Arlington Heights Construction and Demolition facility is located north of Bridgetown, Annapolis County, and has been operating for over 10 years, accepting locally generated C&D waste for disposal, including asbestos (Figure 1). The proposed project is the expansion of the facility in the future to accommodate waste asbestos. The expansion will consist of six asbestos disposal cell that will require subsurface excavation to a depth of c.5m below grade (Figure 2). The asbestos will be trucked to the site in sealed bags, placed in the disposal cell, and covered with a layer of soil. This process will continue until the cell reaches a height of c.3.5m above grade, at which point the cell will be sealed with a layer of clay, then topsoil, and revegetated. The disposal cells will be excavated on an as needed basis.

Project Area

The project area is approximately 4.275ha and is located within a 32ha study area, which is located at the top of the North Mountain, approximately 8km north of Bridgetown. The site overlooks the Bay of Fundy. The soils in the area belong to the Middleton Group, which are found between Arlington West and Upper Clarence. The soils are moderately well-drained and are forested with spruce, fir, maple, and birch. While the soils can make for good crop land, those on the top of the mountain are hindered by their cobbliness and are exposed to more severe climatic conditions due to

the elevation and influence from the Bay of Fundy.¹ Approximately 30% of the land has been cleared and stumped in the past, presumably for agriculture.

Methodology

This project began with a historical background study, although very little could be found in the history of Arlington. The background study suggested that the SA had a low potential for containing First Nation's and historical archaeological resources and this was to be confirmed by a pedestrian survey of the SA. Preparation for the survey included preparing a transect pattern of waypoints and uploading them to the GPS for the fieldwork. The transects were concentrated in the forested area to the north and were spaced 100m apart. Basically the surveyor would begin at a waypoint, travel north to the waypoint at the end of the transect, travel west to the next waypoint, then south to the end of the second transect, continuing until it was completed. GPS-enabled digital photos were also taken.

Archaeological Potential

The determination of archaeological potential is a necessary step for designing a field program, which would include a pedestrian survey and, perhaps, shovel testing if areas of high potential are identified. The archaeological potential for the study area was determined by evaluating eight criteria:

- the presence of or proximity to recorded archaeological sites (250m buffer)
- Presence of a water source (primary, secondary, ancient) within 300m (primary) and 200m (secondary)
- Elevated topography
- Unusual land formations
- Proximity to a resource-rich area (animal, vegetable or mineral)
- Evidence of Euro-Canadian settlement
- Proximity to historic transportation routes (e.g. road, rail, portage)
- Is the property protected under the Special Places Protection Act?

¹ MacDougall and Nowland, 1969: p.31

These items are evaluated individually below.

Recorded Archaeological Sites

The distribution of recorded archaeological sites throughout a region can aid in predicting where unrecorded sites may be located. There are no recorded archaeological sites within the study area, however.

Water Sources

A major criterion in the determination of First Nation and historic archeological potential is the presence of watercourses that could have served as transportation routes as well as sources of water and food (fish and fowl). There are no primary watercourses within the study area. There is however a small stream located in the southwest corner of the study area.

Elevated Topography

The study area is located at the top of the North Mountain, which does overlook the Bay of Fundy, which is approximately 3km to the north. This location does not have any unforested vantage points that may have been used as a lookout over the Bay of Fundy, however.

Unusual Land Formations

There were no unusual land formations noted during the field survey.

Natural Resources

No evidence was found that pointed to any abundance of natural resources that would have encouraged settlement or exploitation by First Nations or historic peoples.

Evidence of Euro-Canadian Settlement and Proximity to Historic Transportation Routes

The Project Area is located just over 8km north of the town of Bridgetown. The name Arlington may refer to the original Loyalist settlers who came from Virginia in

1785.² There are no histories that refer specifically to Arlington West and the most relevant resources for the background study were cartographic. The 1850 Belcher map shows the road that runs from Bridgetown to Chute's Cove (now Hampton) but it does not have a road running east to the study area (Figure 4). The 1878 Roe Brothers' map shows a much more complete set of roads north and east of Bridgetown, including the road that runs to the study area. Again, no buildings are illustrated on this map (Figure 5). The 1889 A.F. Church map has essentially the same information as the Roe Brothers' (Figure 6). Finally, the 1930 Geological Survey of Canada map shows at least one and perhaps two buildings beside the road at the south end of the study area (Figure 7). These are presumably the buildings that are at the southwest end of the property.

Special Places Protection Act

The study area is not a designated Special Place under the *Special Places Protection Act*.

Archaeological Potential

First Nations

In general, the potential for an area to contain First Nation's archaeological resources is tied to proximity to water. Lake and river systems not only provided food and water to the Mi'kmaq but were used for traveling between the coast and the interior. There are no primary watercourses within the study area. There are no other resources that would have attracted settlement, so, in general, the potential for First Nation's archaeological resources should be considered low.

Historic

The cartographic evidence suggest the study area was settled, albeit sparsely so, some time between 1855 and 1878, when the east-west road was constructed. While the maps do not show houses that does not suggest that there we no houses there at that time. However, as the 1930 map shows, the houses would have been

² Place Names of Nova Scotia (novascotia.ca).

built almost exclusively along the road. Given this evidence, the potential for historic archaeological resources should be considered low.

Field Methods - Pedestrian Survey

The pedestrian survey consisted of two parts. The first part of the survey involved traveling along the edge of the cleared field where the visibility was excellent. The second section involved using a GPS in the forested area to travel along an uploaded transect grid. A GPS-enabled camera was used for the digital photos.

The survey began at the C&D weigh station at the south end of the property, moving south to the road and northeast along the field to the southeast corner (Plates 1 to 3). This area was all field and held the highest probability of containing the remains of a historic structure, but no potential features were observed. The survey then moved north along the property line continuing through the open field. There was a stone fence (c.30cm high and 75cm wide) running along the property line (Plate 4). The field in general was very hummocky and wet, suggesting it may not have been used for crops. At this point the field ended and the survey moved into a quite open mixed forest with moss-covered ground cover (Plates 5 and 6). As the survey moved to the north a weak signal meant the GPS compass was not and the survey strayed off-course to the northeast. The terrain in this area sloped to the north and the forest and ground cover were essentially the same, but a bit wetter (Plate 7). The survey was corrected and was able to get to the northeast corner of the SA (Plate 8). The forest was very open in this area with visibility of 30 to 40m. The GPS transect began in the northeast corner and moved south to the end of the first transect, which was at the edge of a large clear cut (Plate 9). The survey then traveled west across the clear cut to the next transect point (Plates 10, 11 and 12). The survey then moved north to the end of the transect where the ground was quite wet and the forest was a mix of softwoods and birch (Plates 13, 14 and 15). The terrain in this area began to slope down to the north. The survey then travelled west along the property line to the final transect point in the northwest corner. The forest in this area remained very open and the terrain was relatively dry with a leafy ground cover (Plates 16 and 17).

The survey turned back to the south and moved along the western edge of the C&D operation. The forest in this area was quite young and scrubby with a lot of fallen trees. The terrain was hummocky and wet (Plate 18). At this point the survey moved directly beside the west end of the C&D operation (Plates 19 and 20). The terrain to the southwest of the C&D operation was low and wet with a lot of alders and a small section of more mature softwoods. A small stream (c.1 to 1.5m wide and .25m deep) ran southeast through this area (Plate 21). The southwest corner of the SA was open field that was riddled with ruts and ditches (Plates 21 and 22). The survey then moved to the northeast across the field to a small, wooded copse where a stone pile was noted (Plate 23). The stones were not structural and the pile measured roughly 10 by 5m. There is little doubt that this is the result of field clearing. The survey continued north to the edge of the C&D operation,, south through a small hedge of trees, then west through the field to weigh station.

Summary and Conclusions

The background research for this project suggested that there was a low potential for archaeological resources to be found within the study area. A pedestrian survey was conducted to ground truth those conclusions. There were no high potential areas identified during the pedestrian survey and no potential archaeological resources were observed. It was concluded that the study are does have low archaeological potential and it is recommended that the proposed project proceed as planned without the need for further archaeology.

References

Bellin, Jacques. 1764. "Plan Du Port Royal dans l'Acadie". J.N. Bellin, Paris.

Blackmore, Nathaniel. 1736. "Bay of Fundy and harbor of Annapolis Royal". Thomas and John Bowles, London.

Church, Ambrose F. 1889. "Church's Mineral Map of Nova Scotia". A.F. Church and Co., Bedford.

Government of Canada, Department of Mines, Geological Survey. 1930. "Annapolis County, Bridgetown Sheet (Map 253A)". Department of Mines, Ottawa.

MacKay, William. 1855. "Belcher's Map of the Province of Nova Scotia, including the Island of Cape Breton". John Snow, Halifax.

Roe Brothers. 1878. "Atlas of the Maritime Provinces: Counties of Annapolis and Queens, Nova Scotia. Roe Brothers: Saint John.

Figures and Plate

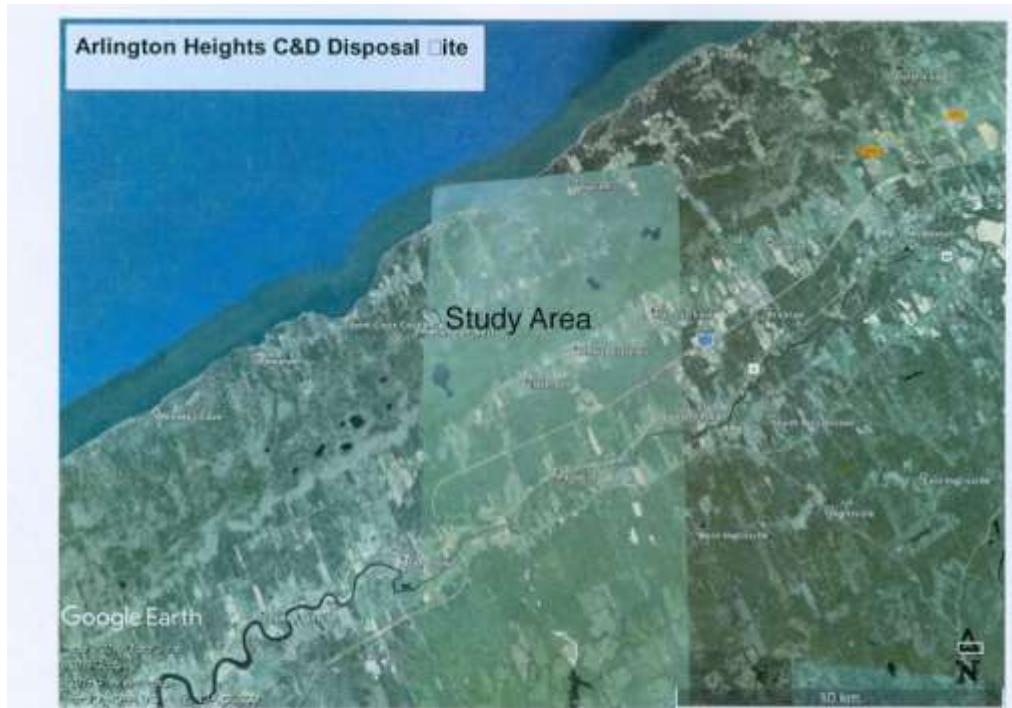


Figure 1: Overall view of SA.

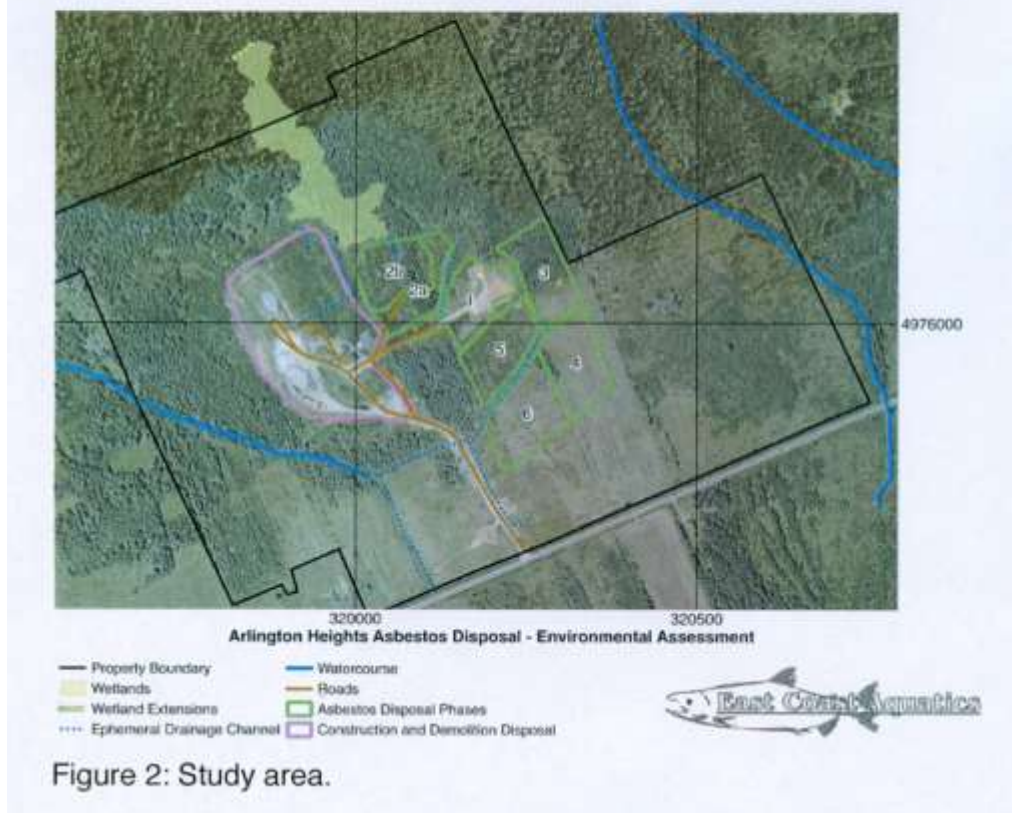


Figure 2: Study area.

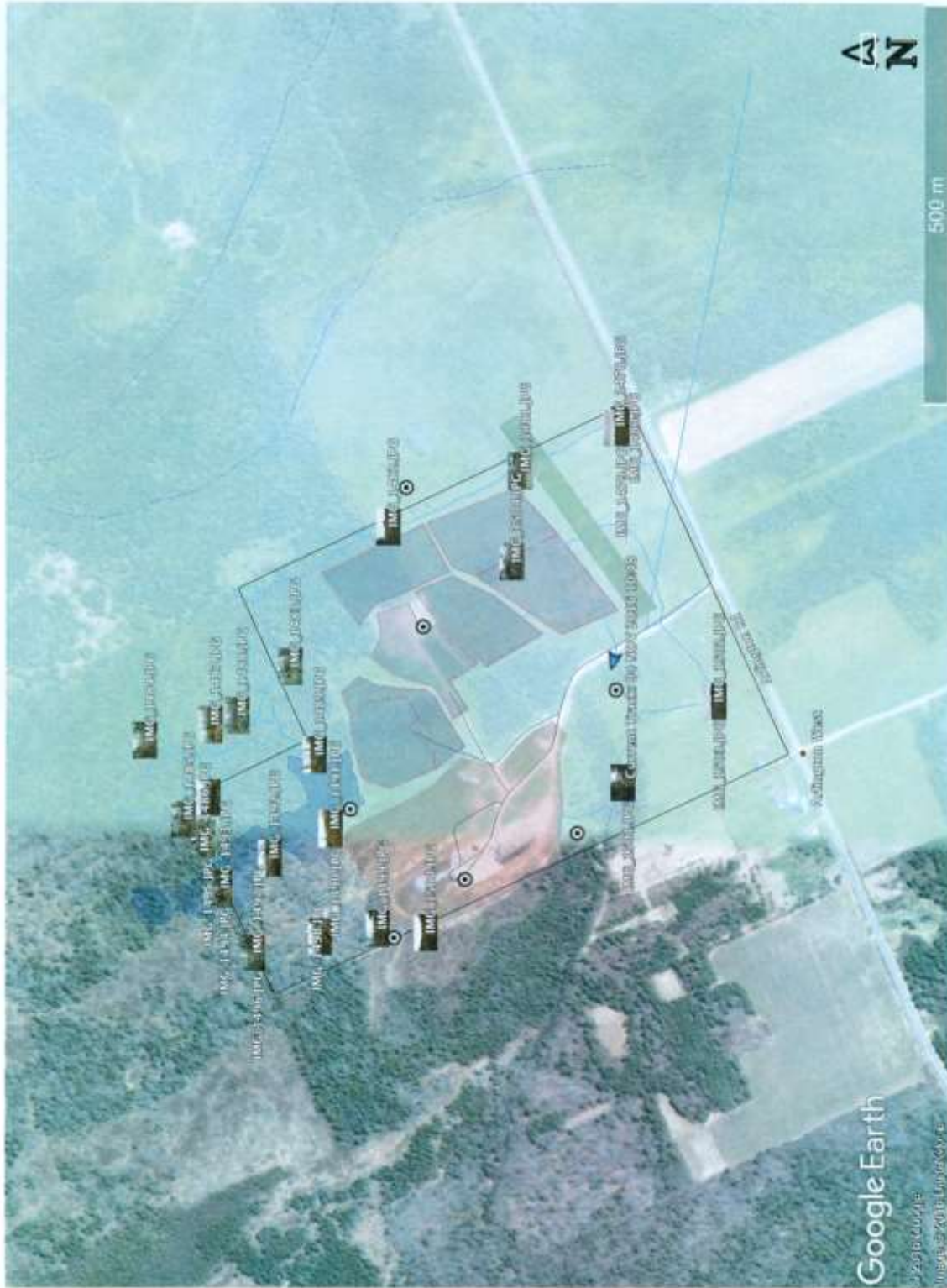


Figure 3: GPS tracks (light blue) and digital photos.

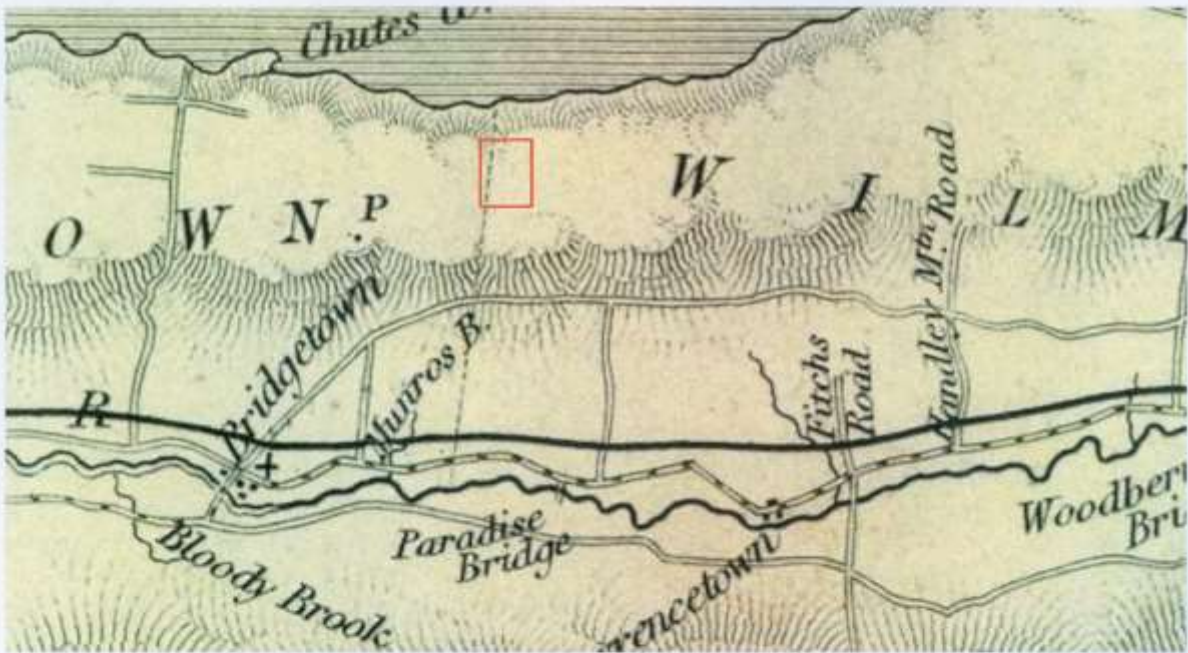


Figure 4: Belcher, 1855 (study area in red).



Figure 5: Roe Brothers, 1878 (study area in red).



Figure 6: A.F. Church, 1889 (study area in red).



Figure 7: Geological Survey of Canada, 1930 (study area in red).



Plate 1: SE corner of the SA, looking N (#1878)



Plate 2: SE corner of the SA, looking NW (1879)



Plate 3: SE corner of the SA, looking W (1880)



Plate 4: Stone fence along the SE property line, looking E (#1481)



Plate 5: Edge of the field and woods, E side of the SA, looking SW (#1482)



Plate 6: Forest, E side of SA, looking N (#1483)



Plate 7: NE of the SA, looking S (#1484)



Plate 8: NE corner of the SA, looking S (#1485).



Plate 9: Edge of the clear-cut, looking SW to C&D area (#1489)



Plate 10: Centre of the clear-cut, looking N (#1490)



Plate 11: Centre of the clear-cut, looking S to C&D area (#1491)



Plate 12: Clear cut, looking W (#1492)



Plate 13: N edge of SA, looking N (#1493)



Plate 14: N edge of SA, looking S (#1494)



Plate 15: N edge of SA, looking W (#1495)



Plate 16: NW corner of SA, looking S (#1496)



Plate 17: NW corner of SA, looking E (#1497)



Plate 18: Forest in NW corner, looking N (#1498)



Plate 19: W side of C&D operation, looking E (#1499)



Plate 20: W side of C&D operation, looking SW (#1500)



Plate 21: Stream in the SW corner, looking SE (#1500)



Plate 21: Field, SW corner, looking NW (#1501)



Plate 22: SW corner, looking NW (#1502)



Plate 23: Stone pile, looking SW (#1504)