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REPORT

Supplementary Report
Environmental Assessment Registration
Russell Lake West Wetland Alteration

CLAYTON DEVELOPMENTS LIMITED

REPORT NO. NSD19184

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REPORT TO	Nova Scotia Environment and Labour
FOR	Clayton Developments Limited
ON	Environmental Assessment Registration for Russell Lake West Wetland Alteration - Supplementary Report

November 2005

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1.0 INTRODUCTION

This information is submitted to Nova Scotia Environment and Labour (NSEL) further to the Minister's decision with respect to the Environmental Registration document filed by Clayton Developments Limited (Clayton) in September 2005 [Environmental Assessment Registration - Russell Lake West Wetland Alteration].

An environmental protection plan (EPP) was prepared for Clayton Russell Lake West lands located in Dartmouth, NS, and submitted to Nova Scotia Environment and Labour in October 2004. With that document, development associated with the Eisner Cove watershed wetland was included. The purpose of this Supplementary Report is to:

- Provide erosion and sedimentation control information strictly associated with the wetland alteration;
- Provide stormwater management planning associated with the wetland alteration; and
- Provide further information on the archaeological survey.

1.1 Background

The final or specific alterations to the project site by Clayton have not been decided at this time; however, other provincial and municipal initiatives in the area are described as follows. The Province and Halifax Regional Municipality (HRM) commenced constructing a major interchange adjacent to the wetland in September 2005. The location of the interchange was chosen by the Province. Because of the funding source for the interchange, the federal government conducted its own environmental assessment of the interchange and noted that it was to be constructed in an area characterized by rolling terrain and low areas of impaired drainage or natural bog. The federal government recognized that the decision to locate the interchange in this area was necessary in order to ensure an effective interface with the Woodside Business Park; furthermore, the Department of Transportation and Public Works had directed that the interchange be constructed at this location almost 20 years ago. That an interchange is to be constructed on or adjacent to a wetland is not an uncommon occurrence in Nova Scotia. NSEL has been directly involved in the approval and construction of many new interchanges throughout the Province and has an established protocol for evaluating construction plans including progressive methods for limiting the intrusion and impact on existing wetlands.

The requirement to construct a trunk sewer to service not only the lower portion of the Russell Lake West project, but also the future development of the Shearwater lands along with the provision of a trunk watermain to the Woodside Industrial Park requires the construction of a service corridor through the wetland (Eisner Cove watershed wetland) adjacent to the interchange. The corridor required for the installation of these services must bisect the wetland and in order to provide a gravity system and avoid an additional lift station, a berm about 8.5 metres (28 ft) high above the existing wetland elevation will have to be constructed with a 6.1 metres (20 ft) travel way on the surface and 3:1 side slopes. Therefore, a swath about 61 metres (200 ft) wide will be infilled through the wetland. The portion of the wetland to the west of this corridor will be separated from the main wetland area and due to the design of the interchange and the major arterial, the overland drainage which fed this portion of the wetland will be redirected away from this area thus compromising the likelihood of its survival. Therefore, Clayton is proposing infilling this area for commercial development.

The following sections in this Supplementary Report will describe the erosion, sedimentation and stormwater control plan and maintenance procedures to prevent the occurrence of on-site and off-site erosion and sedimentation. The information provided herein is generic as land development is not known at this time. Site specific and lot specific plans will be submitted to both NSEL and HRM during the construction approval process. Detailed information on the method of infill and erosion and sediment control measures for both during and post construction will be provided to NSEL at time of application for the Water Approval and the Permit to Construct for the sanitary storm and watermain lines. The HRM will receive the same information through their approval process at which time a municipal servicing agreement will be signed by Clayton guaranteeing that the work will be performed in accordance with all design drawings, municipal and provincial approvals.

The development of the site will include approximately 30 ha of possibly multiple and or commercial and roadways.

Industry standard erosion and sediment control measures discussed in this plan will be implemented in accordance with the Nova Scotia Department of the Environment Erosion and Sedimentation Control Handbook for Construction Sites.

2.0 EROSION AND SEDIMENTATION CONTROL PLAN

The following is a summary of the generic plan, see Appendix A for best management practices.

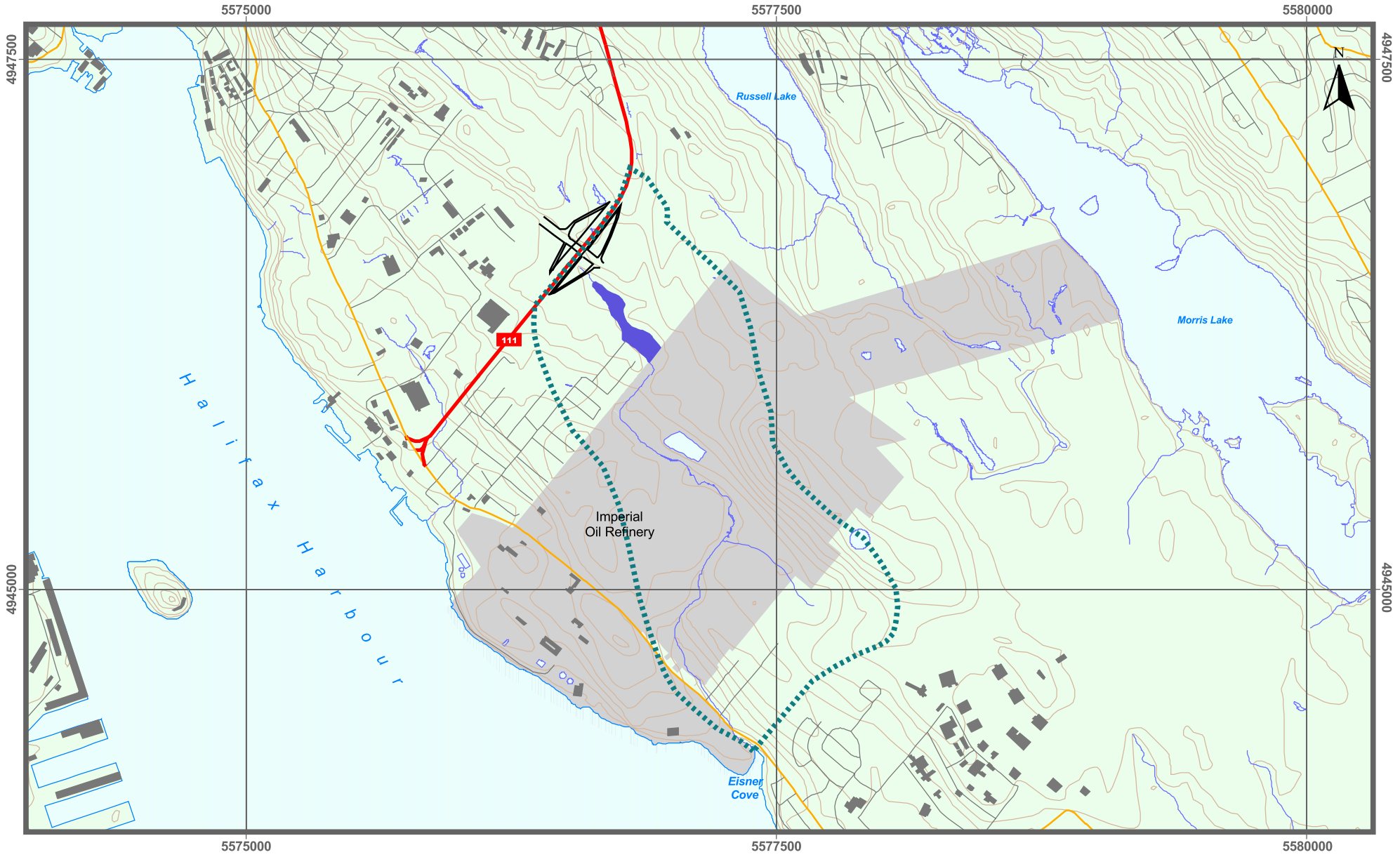
2.1 Environmental Considerations

2.1.1 Site Topography

The site is located in the watershed of Eisner Cove, on the eastern shore of Halifax Harbour near Eastern Passage. The area of the watershed is approximately 224 ha. The project wetland accounts for about 1.6% of the watershed. An outline of the site within the watershed is depicted in Figure 2.1.

2.1.2 Phase 1 Environmental Site Assessment

A Phase I Environmental Site Assessment (ESA) was performed by Jacques Whitford Environmental Limited in June 2004 on the property. Historically, the site has been a vacant woodlot, with a portion of the northeastern part of the site cleared, possibly for agricultural use, with several possible buildings visible in a 1931 aerial photograph.



Map Features

- Watershed Boundary
- Freeway / Arterial / Expressway
- Collector / Minor Collector
- Interchange
- Local Street
- Watercourse
- Contour (5m)
- Wetland
- Imperial Oil Refinery
- Building
- Land
- Waterbody

Figure 2.1
Wetland Project Site And Watershed Area Delineation

750 0 750 1500

Meters

Map Parameters
Projection: MTM-ATS77-ZONE5
Scale - 1:25,000
Date: November 7, 2005
Project: NSD19184

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Based on information gathered and observations made, the Phase I ESA has not revealed evidence of actual contamination associated with the site. Evidence of potential environmental contamination and environmental concerns was revealed including:

- Several discarded, rusty, old appliances and debris including tires, hot water heaters, metal debris and two drums were observed to be discarded along a stream near the path walked along the southern boundary of the site. No obvious hydrocarbon sheen was observed on the water in the vicinity of these materials, however, these materials should be removed and discarded and if any surface staining is observed beneath the items, the soil should be tested for potential contamination.
- Several pieces of metal, debris, wood, and tires, including rusted scrap metal, were observed to be discarded along the northern boundary of the residential properties on Waynewood Drive and Brompton Road. Some of the materials were covered in leaves and partially hidden from view. These materials should be removed and discarded and if any surface staining is observed beneath the items, the soil should be tested for potential contamination.

2.1.3 Wetlands and Watercourses

A 3.7 ha treed bog occurs along the southern boundary of the property which is located within the watershed of Eisner Cove, Halifax Harbour. The wetland is a headwater in the Eisner Cove watershed. Detailed descriptions of the flora and fauna of this wetland and a wetland evaluation were provided in the environmental assessment report submitted to NSEL in September 2005. Two seasonal field surveys have shown that there are no rare, endangered or species of concern in this wetland.

A site evaluation was performed by Jacques Whitford in 2005 to determine the quality of existing fish habitat and the effect of future development in the area. The evaluation revealed that the wetland at the site is not considered fish habitat because it does not provide spawning or rearing habitat. This watercourse has been significantly altered downstream by the presence of a waterline, roads, and commercial (Imperial Oil Refinery) and urban developments and the majority of it is enclosed in culverts. The culvert that discharges this watercourse into Eisner Cove is elevated above the tide line and water discharges onto a gravel area, ultimately presenting barriers to any diadromous fish species.

Any changes to, or work on the wetland will require a Water Approval from NSEL.

During public information sessions (see environmental assessment report) residents located adjacent to the wetland on Waynewood Drive and Brompton Road have complained to Clayton about fixing flooding issues. As noted above, an improperly installed and poorly maintained culvert on Imperial Oil Refinery property is causing flood problems. Clayton has offered to encourage Imperial to remediate the problem on behalf of the residents.

2.1.4 Site Soils and Erosion Potential

The wetland is underlain by Goldenville greywacke and slate mantled by Lawrencetown Glacial till and overlain by Hantsport soil, which is a sandy clay loam. There is a high risk to erosion not only from clay soils but a portion of the project site is within a perched water table.

Imported soil will be limited to top soil needed for landscaping. Standard practices for erosion and sedimentation control measure will be employed for all erodible soils.

2.2 Protection Measures During Site Development

The erosion and sedimentation control plan during construction includes:

- Silt fences installed before grubbing operation.
- Clean run-on water controlled/diverted by installation of channels, berms, and grading.
- Exposed soil minimized via rapid cover by wood chips, mulch, gravel, and other suitable materials.
- Soil exposure controlled relative to forecasted weather conditions.
- Site grading to low slopes complete with ponding depression areas and shallow ditches to retain stormwater.
- Monitoring plan set up.

2.3 Permanent Protection Measures

Erosion and sedimentation control for permanent stabilization is:

- All disturbed surfaces will be stabilized with a thick mat (15 to 20 cm) of wood chips on slopes 3:1 or less grade.
- Parking lot runoff routed through CDS units (or approved equal) for removal of sediments, oils and greases.
- Parking lot ponding to retain peak flows in rain events.
- Periodic inspection of erosion and sedimentation control measures to ensure continued effectiveness.

2.4 Maintenance Program

The maintenance program to ensure the effectiveness of the erosion and sedimentation control plan is as follows:

- Inspection of temporary measures will be performed daily (and during precipitation events) to check for damage. Damaged structures will be repaired.
- Environmental protection structures will be maintained (including removal of silt material) until stabilization of disturbed areas has occurred. The structures will then be removed and the area will be regraded and stabilized.
- Inspection and maintenance of CDS systems (or approved equal) will be performed at a minimum quarterly frequency and per manufacturer's recommendations and as site conditions warrant. This monitoring frequency complete with result reports submitted to the HRM will continue for a two-year period, at the end of which it will be reassessed.

3.0 STORMWATER MANAGEMENT CONTROL PLAN

The objectives of the stormwater management plan follows the policies set out in the Municipal Planning Strategy and Land Use Bylaw Amendments for Dartmouth, Eastern Passage / Cow Bay and Cole Harbour / Westphal (1999) and Master Development Plan (Morris-Russell Lake Public Participation Committee (2000):

- Ensure that the quantity of the runoff is as close to predevelopment conditions as possible, while ensuring the runoff coefficient does not exceed the industry standard for single family development.
- Prevention of deterioration of adjacent water bodies. Minimize erosion and mobilization of sediments.
- Maximize removal of mobilized sediments on the site.
- Water quality on and leaving the site will remain suitable for public health and aesthetic uses.

3.1 Stormwater Quantity/Rate of Flow

The Municipal Planning Strategy and Land Use Bylaw Amendments for Dartmouth, Eastern Passage / Cow Bay and Cole Harbour / Westphal (1999) categorised four environmental protection mechanisms. The design and development control mechanisms provides recommendations that address, in part, the hydrological aspect of stormwater management planning.

ML-10 (a) encourages development to reproduce the predevelopment hydrological conditions while (d) and (e) encourage the minimization of disturbance to the topography while preserving and utilizing the natural drainage systems. As it is impossible to achieve (a) without ignoring (d) and (e) it was decided that the important issue in (a) was the quality of the water not the quantity. Therefore, the quality of the water will be the driving force for the design of the stormwater system. The Quantity / Rate of Flow will be controlled by an overall c-factor of 0.55 which is the industry standard for single-family development and a c-factor up to 1.0 for a commercial development. Development in this drainage area must comply with the pre-post balancing of stormwater during the detailed design stage. Detailed grading of the infilled area must ensure that the existing neighboring properties are not subjected to any additional drainage flows as a result of this development. NSEL's requirement for the pre-post balancing of the 1:5 and 1:100 year storm events shall be adhered to for the existing wetland in the southern corner of this development, as detailed on Mac Williams Engineering Limited drawings numbers 04544-SK01 and 04544-SK02 (see Appendix B).

Non-structural approaches to stormwater management are typically considered at the planning stages of the development project and include site planning techniques to minimize runoff, to achieve no-net runoff, and maintenance practices. Non-structural approaches applied to this development will consider:

- Preserving natural vegetation, and
- Maximizing dispersion (downspout dispersion, sheet flow dispersion, etc.)

Structural approaches use systems that include discharge reduction and velocity strategies. Such strategies incorporate designs to minimize and treat runoff and to provide source controls. Structural approaches applied to this development will consider:

- Parking lot storage,
- Gross pollutant traps (CDS units),

- Swales,
- Infiltration trench, and
- Extended detention wet pond.

An extended detention basin is proposed to be incorporated into the design of the siting and grading plan for the proposed commercial development south of the Mount Hope Interchange. The purpose of an extended detention basin is to reduce peak discharge by providing storage and gradual release. The combination of lot storage, swales, infiltration trenches and a detention pond will work cumulatively to control runoff at source, in conveyance design and finally at end-of-pipe.

3.2 Stormwater Quality

There are two main sources of water quality effects from urban development: the construction practices, and the post-development landowner practices.

The Municipal Planning Strategy and Land Use Bylaw Amendments for Dartmouth, Eastern Passage / Cow Bay and Cole Harbour / Westphal (1999) categorised four environmental protection mechanisms. Policies for design and development control, public awareness and education programs, and stormwater management mechanisms provide recommendations that address water quality aspects of stormwater management planning.

Non-structural approaches to managing water quality aspects of stormwater are considered at both the planning stages of the development project and include site planning techniques to minimize runoff, to achieve no-net runoff, and maintenance practices. Non-structural approaches applied to this development will consider:

- Preserving natural vegetation,
- Construction stormwater pollution prevention planning,
- Post-construction soil quality (landscaping practices),
- Turf management,
- Commercial operations,
- Street and catchbasin cleaning, and
- Road salt management.

The majority of the stormwater management practices above result from landowner use on their property. Halifax Regional Municipality (HRM) addresses some aspects of source control measures through their educational *Naturally Green Program*. Land developer / builder practices are controlled solely by the HRM Municipal Service System (Red Book), by-laws and the MPS. The last two best management practices are the responsibility of HRM engineering and maintenance departments.

Structural approaches focus on runoff treatment at source, conveyance and treatment facilities. Non-structural approaches applied to this development will consider:

- Oil/grit separators,
- Infiltration,
- Biofiltration swales around commercial lots, and

- Extended detention basin.

To prevent deterioration of the water bodies in the area the stormwater runoff will be treated on the site. During construction an erosion and sediment minimization plan will be followed to minimize sediment mobilization. Mobilized sediments will be contained by the use of silt fences and stormwater ponding on site.

3.3 The CDS System (or approved equal)

A CDS system is a vertically-oriented stormwater separator that removes oil, sediment and other contaminants in urban runoff. The lower treatment chamber of the CDS system allows liquids with a specific gravity less than water to rise to the surface and suspended solids to settle to the bottom of the chamber. CDS units contain an emergency bypass system that allows runoff to directly circumvent the lower chamber and prevent the re-suspension and scour of settled pollutants. The design of this system is based on the criteria that the initial 6.4 mm of rainfall (first flush) during a storm event flushes the site. Therefore, with this initial flow being captured and processed, the remaining runoff can be conveyed directly to the receiving body of water with no concern of contamination. A CDS unit will be installed in front of the extended detention basin which will discharge treated water in to the wetland in a controlled manner.

3.4 Swales, Biorentention Areas and Constructed Wetlands

Bioretention is a vegetative treatment system which directs runoff from a parking lot into a long filtering system composed of a stone, grass strip and a wooded strip. A swale system will be incorporated around each commercial lot for infiltration, and stormwater will be directed to a CDS and extended detention basin prior to discharge to the wetland.

4.0 ARCHAEOLOGICAL AND HERITAGE RESOURCES

4.1.1 Description of the Existing Environment

The archaeological investigation of the wetland was undertaken by Laird Niven, *B.A.*, Professional Archaeologist. A summary of the findings was included in the environmental assessment report filed with the NSEL in September 2005. The full report from Mr. Niven is presented as Appendix C.

For the purposes of the environmental assessment, archaeological and heritage resources are defined as physical remains that inform us of the human use of and interaction with the physical environment. These resources may be above or below the surface of the ground and cover the earliest Pre-Contact times to the relatively recent past. Heritage resources are generally considered to include historic period sites such as cemeteries, heritage buildings and sites, monuments, and areas of significance to First Nations or other groups. Pre-Contact refers to the time before the arrival of non-Aboriginal peoples.

Examination of historic maps revealed no recorded archaeological sites within the general area of the wetland. The area is considered to have low potential for native archaeological resources, particularly given the proximity of Dartmouth Cove, which was heavily used by the Mi'kmaq. The wetland does not

form part of the historical/cultural heritage of any regional populations, nor is it currently utilized for cultural events or cultural renewal.

The study area has only low potential for identifiable human use in the pre-Contact and historic periods. No archaeological/heritage resources or areas of elevated heritage potential were identified in the study area during the visual reconnaissance conducted in November 2004. As such, development and operation of the proposed wetland infill are not expected to have any adverse environmental effects on archaeological and heritage resources.

4.1.2 Potential Effect, Proposed Mitigation, Monitoring and Follow-up

Certain activities associated with the project (*i.e.,* grubbing, grading), could affect archaeological or heritage sites if they were present within the zone of surficial and subsurface disturbance. These disturbances, if unmitigated, could result in the loss of resources and the potential knowledge to be gained from its interpretation.

If archeological or heritage resources are discovered during development of the project, the find will be immediately reported to the Curator of Archaeology and the Curator of Special Places at the Nova Scotia Museum. If the resources are thought to be of Aboriginal origin, the Museum Curator will also be consulted regarding requirements for further notification. In the case of suspected human remains, the RCMP will be called. The appropriate authorities will determine further actions to be undertaken which could include avoidance and further assessment.

4.1.3 Summary

In summary, assuming appropriate measures are undertaken in the event archaeological or heritage resources are discovered, significant project-related effects on these resources are not likely to occur.

APPENDIX A

Erosion and Sediment Minimization Plan

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EROSION AND SEDIMENT MINIMIZATION PLAN

CONSTRUCTION SCHEDULE

Environmental Concern

The probability for erosion and sedimentation on construction sites is highest during precipitation events. According to 30 years records at Shearwater Airport, the greatest amounts of precipitation occur during winter and spring months.

Soils within the property are classified as Hantsport Soil, which are classified as sandy loam to sandy clay loam with moderate erosion potential; however, a portion of the work will be undertaken in a wetland which exacerbates the erosion potential. Construction on the site must proceed with caution to ensure that the environmental protection measures are adhered to and enforced.

CLEARING AND GRUBBING

Environmental Concern

Clearing activities in the vicinity of a watercourse will cause disturbance of the protective vegetative buffer or riparian zone adjacent to the watercourse and could subsequently lead to erosion of the approach slopes and sedimentation into and the obstruction of the watercourse. For construction projects, there are three categories of erosion and sediment control: runoff controls, erosion protection, and sediment interception.

Runoff controls limit or contain soil movement from the construction site, minimizing raindrop impact on the soil and reducing runoff volume and runoff velocities. Generic controls considered for this Project are discussed below.

Erosion protection measures are used to reduce or eliminate the detachment of soil particles by falling raindrops or to resist sheet or channel flow. These measures are placed on, or applied to, the soil surface and are often used in conjunction with runoff control and sediment interception measures. Erosion protection measures to be used as appropriate in pipeline construction include:

- gravel sheeting;
- mulches;
- tackifiers;
- erosion control blankets; and
- revegetation.

Revegetation is generally used only for permanent protection and often requires another form of temporary protection measure to be successfully established.

The key to managing runoff and stormwater flows is to minimize erosion and sedimentation. Methods for managing stormwater flows include:

- wet and dry pond for stormwater detention;
- infiltration systems;
- engineered stormwater systems;
- onsite detention facilities; and
- constructed wetlands.

Best Management Practice

Before any clearing or grubbing commences. clearing limits, easements, setbacks, sensitive/critical areas and their buffers, trees and drainage courses will be delineated with flagging tape and enviro-fences. This practice ensures workers can clearly recognize areas to be protected.

No clearing or construction will occur within the protective green/belts/protected sensitive areas as identified on the development plans.

Organic humus layer soils should be stockpiled for re-use during site landscaping. This soil material wicks and retains water better than mineral soils and provides nutrients to sustain lawn growth with minimal fertilization required.

To reduce the velocity of runoff, crop residues, plants, and rough soil surfaces are applied to help spread the flow of water over a greater area and into a thin layer.

Diversion berms are commonly used on slopes to intercept sheet flow on exposed surfaces and to reroute flow into undisturbed areas. Erosion protection is required at the berm outlets.

Check dams are a temporary measure constructed in ditches, swales, or chutes to reduce hydraulic gradient and flow velocity, thus minimizing the potential for erosion of the channel.

Sediment traps and swales or dikes (diversion channels) will be installed around each lot before construction begins to control excavation water and where required to intercept runoff from sheet flow from entering the disturbed house pad area. Necessary erosion control measures such as interception ditches will be completed prior to clearing of each work site.

The work site will not be grubbed nor will topsoil be removed prior to commencement of construction.

Cleared and graded areas will be limited to minimize the area of exposed soil.

Minimal amount of natural vegetation and topsoil will be removed at each construction site.

Bulk excavation sites will be prepared by the contractor to foundation ready and fully stabilized.

Mulches consisting of wood chips, stone or commercial anti-erosion mats will be used to limit erosion on land, which is cleared of vegetation.

All non-mercantile timber will be chipped on site and used as protective cover over exposed and disturbed areas.

Grubbed material, which is not used for fill, will be disposed offsite in accordance with Nova Scotia Department of Environment legislation and Halifax Regional Municipal Bylaws.

The contractor and developer will maintain a stockpile of erosion control material onsite.

GRADING

Environmental Concern

Grading requirements near watercourses can be extensive in housing developments to accommodate lot and street development. Accordingly, slopes may be contoured to allow for the site development. Disturbance of the slopes may cause instability, which could result in erosion and subsequent sedimentation of watercourse and Morris Lake.

Soil loss from slopes may occur even with erosion and runoff control measures. If this soil can enter a waterbody, mitigative measures will be required to intercept it. Methods used to trap sediment include vegetated buffer strips, silt fences, filter berms, and sediment traps.

Best Management Practices

Construction along the access roads will be sequenced such that each section is to be completed and stabilized before proceeding to the next section unless overlapping work is approved by the project engineer.

The contractor will work continuously until the streets are completed. If work is halted for 5 days, temporary stabilization structures and material will be installed.

A crushed rock construction entrance will be established to prevent tracking of mud offsite and through the new and adjacent subdivisions.

Lot grading will entail completion of each lot driveway first and vehicular travel on the lot will be restricted to the driveway. Access to each lot will be restricted to one driveway.

The driveway will consist of clear stone or gravel to a thickness of three to six inches. If necessary, filter fabric will be laid under the stone if fines are encountered. This surface will be maintained during construction.

Once the house pad is graded, the exposed pad will be graveled with clear stone. All exposed soil or unworked home sites will be stabilized no more than 5 days upon completion of the construction.

No mud, debris or other excavation material will be placed on the street. Fill material will not be stored next to the curb. Fill will be piled within the perimeter of the cleared lot (no more than 3 metres around the house pad) until needed for cut lots or landscaping.

Imported fill material will be assessed to ensure that material is not composed of high percentage of fines.

All stockpiled fill material will be covered with hay mulch to protect it from rainfall.

Diversions will be constructed at the top of each fill slope at the end of each work day, as needed. Diversions will be located at least 0.6 m uphill from the tope edge of each fill. The outlet of diversions, if free of sediment, will be located on undisturbed or stabilized areas when possible. Otherwise, sediment laden runoff must be diverted to a sediment retention structure.

Sediment traps, smaller than sediment basins, are more easily installed and moved as grading progresses, will be incorporated into the drainage pattern around each house lot. Sediment traps will serve areas less than 2 ha (5 acres). These structures will be placed downslope of the home lots to intercept runoff on relatively level areas or natural depressions.

Sediment barriers will be used to treat small areas and include enviro-fencing, straw bales, filter fabric, gravel and earth berms. Barriers will be placed below disturbed areas subject to erosion including along the contour of exposed slopes; at the base of a slope; along a street or sidewalk; and at storm drain inlets. Barriers will not be placed in a drainage way with high volume or high velocity.

All water pumped from ditches, swales or sumps should be discharged away from the watercourse and filtered through a sediment trap, 2 m^3 (3 yd^3) of class B gravel, filter bag, or undisturbed vegetation to filter out solid material before the water enters the watercourse.

Silt accumulation along silt fences and swales will be removed regularly.

Long and steep slopes on the construction site will be minimized to prevent erosional velocities from developing. If long slopes are present, they will be benched to interrupt the flow of water and minimize erosion.

CULVERT INSTALLATION

A buffer zone will be established along the watercourse by pacing geotextile silt fences on both sides of the channel. Work must be completed in the dry, therefore, water will be diverted around the construction site.

Diversion channels can consist of a ditch lined with polyethylene liners that are properly placed and secured. Sandbags or an impermeable dam will be installed at the inlet to divert the flow. Inlet and outlet protection to prevent erosion and scouring at the ends will be installed.

Unlimited fording of watercourses by construction equipment will not be permitted.

Culverts will be properly designed to handle the increased flows as a result of development and comply with NSDOE regulations with respect to the Watercourse Alteration Permit.

Side banks of the channel will be stabilized and re-vegetated subsequent to completion of the culvert installation.

INSPECTION AND ENFORCEMENT

Environmental Concern

Thorough maintenance of all temporary and permanent erosion and sediment control measures will ensure the integrity of the aquatic resources they protect. Monitoring of the site following major rainstorms will determine that runoff control devices are effective and allow for the removal of accumulated sediment.

Best Management Practices

With respect to sediment control, all work is to be completed to the satisfaction of the project engineer and HRM.

On-site inspection will be an active part of any near-lake development and management program. The effectiveness of control measures will be inspected and monitored during rain events and maintained and upgraded as necessary or as directed by the Project Engineer or Environmental Inspectors.

The Contractor and Project Engineer will incorporate a routine end-of-day check to ensure the integrity of the protection measures.

Monitoring of meteorological conditions and forecasts as a proactive means will be conducted to minimize the potential for erosion.

RESTORATION AND PERMANENT PROTECTION MEASURES

The final restoration phase is critical for mitigation long-term impacts to watercourses. Clayton Developments Ltd will incorporate all appropriate mitigative to ensure proper restoration of the sites adjacent to watercourses and channel of each watercourse.

Environmental Concern

Proper restoration of the watercourses and adjacent areas will minimize post-construction impacts to these areas. Implementation of permanent protection measures such as a stormwater management plan will minimize the volume of stormwater constituents into Russell Lake and Halifax Harbour.

Best Management Practices

The sites will be reclaimed immediately to limit sustained erosion.

- Vegetative growth or rock facing (riprap) on steep slopes will be restored in all denuded areas by seeding or laying sod.
- Prompt re-establishment of vegetation will reduce the need for costly remedial measures caused by erosion damage to slopes.

The targets to minimize and reduce contaminant input to Russell Lake will be met through implementation of four control devices that have proven to reduce contaminant inputs. The strategy recommended for this site is to provide an integrated approach to stormwater management that is premised on controlling surface runoff and pollution at the source. Therefore, a hierarchy, or train, of stormwater management practices may include:

- stormwater lot level controls, which will be achieved using an overflow catchbasin piping arrangement, roof leaders to the ground, storage upon the roof and / or parking lot, infiltration swales around commercial lots, and
- end-of-pipe stormwater management facilities which will consist of CDS Units (or approved equal), and an extended detention pond.
- Stormwater lot level controls involve measures to store and treat stormwater before it reaches the street conveyance system.
- End-of-pipe stormwater management facilities found to be most suitable for the proposed development for treatment of the stormwater and removal of phosphorous is the CDS Unit (or approved equal) system for the following reasons:
  - performance does not depend upon soil characteristics;
  - no additional disturbance to the natural areas to create retention ponds or artificial wetlands;
  - the performance is definable and measurable; and
  - maintenance is simple and the HRM has the equipment required.

HAZARDOUS MATERIAL STORAGE AND HANDLING OF FUELS AND HAZARDOUS MATERIALS

Environmental Concern

Accidental spills of fuels, lubricants or other chemicals may enter the wetland and eventually into Halifax Harbour. Proper storage and handling of these materials should prevent the probability of accidents.

Best Management Practice

Machinery maintenance will not be performed in or near a watercourse, ditch or storm sewer. Some examples of maintenance include washing out cement mixers, changing oil, greasing, spray painting, cleaning of spraying equipment or painting equipment, etc.

Any hazardous liquid including fuel and lubricants will be stored in a designated area surrounded by an impervious berm which would contain a spill of the volume of all stored liquid.

Solid hazardous materials including cement, lime and sulphur should not be stored within 25 m of a watercourse.

Any spillage of a hazardous material into any watercourse will be reported to the NSEL's Environmental Emergencies 24 Hour Service (424-5620).

CONTINGENCY PLANNING

Extreme Storm Events

Extreme storm events (usually subtropical storms) can result in extensive erosion due to heavy rainfall impact and the associated stormwater runoff. Hurricane season is normally between August and November. Erosion of approach slopes adjacent to watercourses is to be expected during these events. Watercourse flows can be expected to increase suddenly, possibly exceeding the capacity of ditches, swales and sediment traps. Throughout the course of construction, the CONTRACTORS and their Environmental Inspectors must be aware of current meteorological predictions and the potential ramifications. Subject to a review of the construction activities planned for the day and the locations of these activities, the prediction of storm events will result in the suspension in the vicinity of watercourses and wetlands.

Excessive runoff can be mitigated or controlled by the use of additional diversion berms, straw bale check dams, sediment fences and/or sandbag barriers. Additional sediment interception measures such as sediment traps can also be constructed quickly. The CONTRACTOR will ensure that equipment, personnel and required materials will be available for application as required.

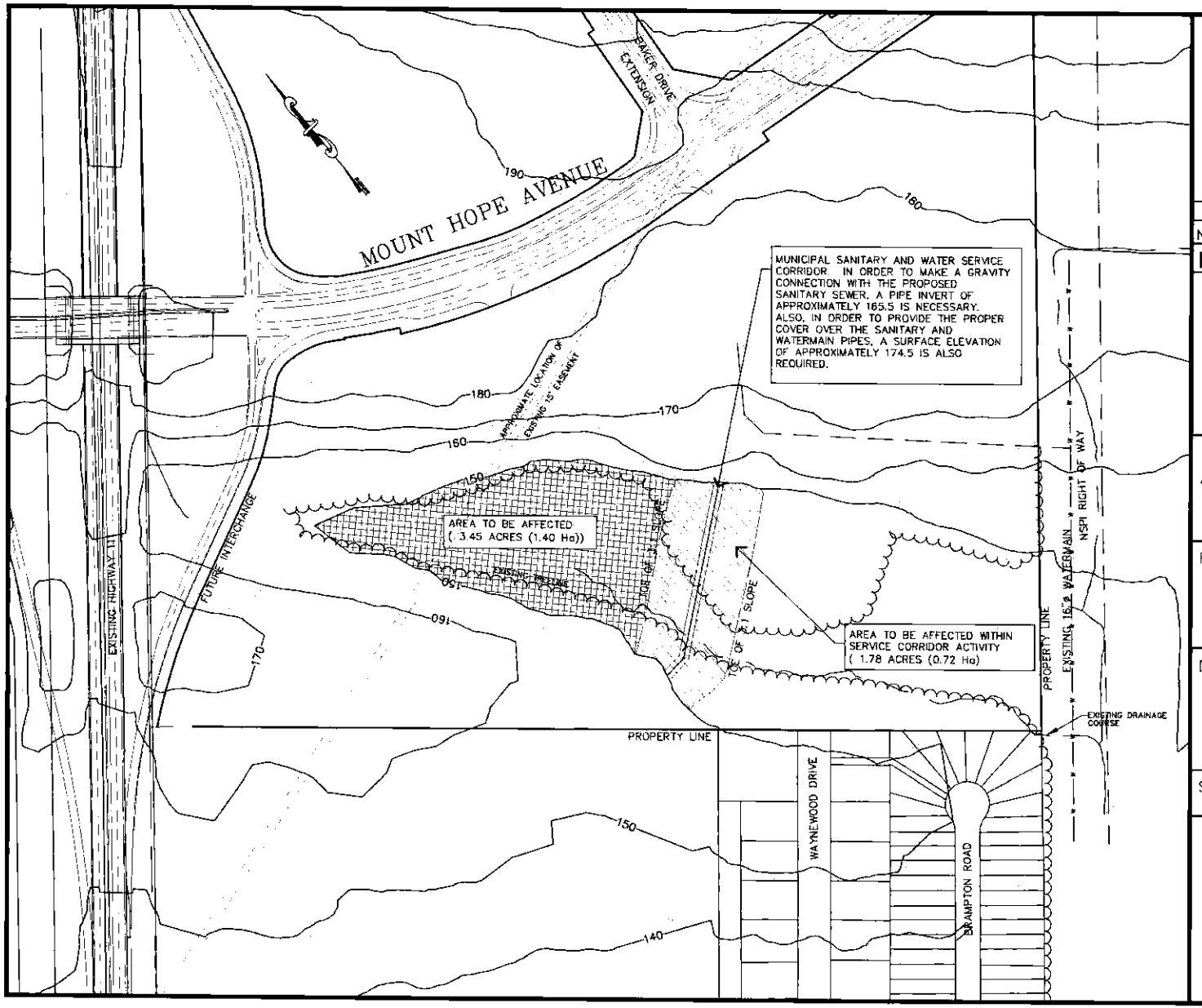
Following extreme storm events, Environmental Inspectors, will conduct environmental monitoring in those areas deemed at risk. Recommendations regarding erosion control will be made by the Environmental Inspectors as required.

APPENDIX B

Mac Williams Engineering Limited Drawings
(Nos.: 04544-S01 and 04544-SK02)

Jacques Whitford

SKETCH 2



No	Description	Date	By
	Revision or Issue		

THE SHAW GROUP

MAC WILLIAMS ENGINEERING LIMITED

Project

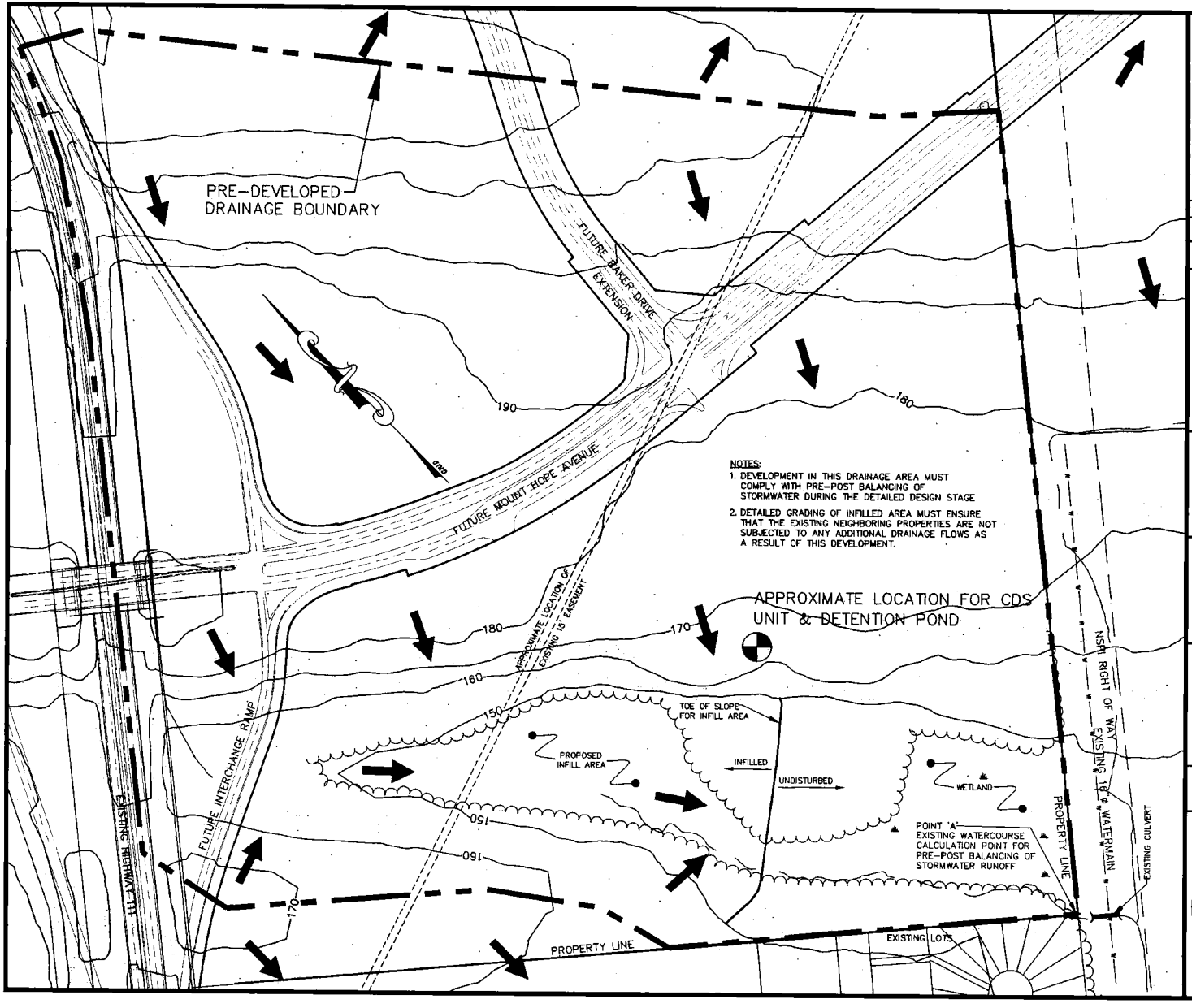
RUSSELL LAKE PROPERTY
DARTMOUTH, N.S.

Drawing

INFILL FOR SERVICE CORRIDOR
& PROPOSED INFILL BY
CLAYTON DEVELOPMENTS LIMITED

Scale 1"=200'

Date SEPT. 9, 2005		Drawn RJA
Design	Check DMW	Approv.
Project No. 04544		Sheet Of 1 1
Drawing No. 04544-S01		Rev.



No	Description	Date	By
1.	Add Culvert & Note	Nov. 24/05	DMW

Revision or Issue

THE SHAW GROUP

MAC WILLIAMS ENGINEERING LIMITED

Project

RUSSELL LAKE PROPERTY
DARTMOUTH, N.S.

Drawing

PRE-DEVELOPMENT
DRAINAGE BOUNDARY

Scale 1"=200'

REGISTERED PROFESSIONAL ENGINEER
Nov.24/05
DATE
D. M. WILLIAMS
5104
PROVINCE OF NOVA SCOTIA

Date	Drawn
NOV. 7, 2005	RJA
Design / Check: DMW	Approv.
Project No. 04544	Sheet Of 1 / 1
Drawing No. 04544-SK02	Rev. 1

APPENDIX C

Archaeological and Heritage Resources

Jacques Whitford

ARCHAEOLOGICAL IMPACT ASSESSMENT – HIGHWAY 111 WETLAND

This project involves the archaeological assessment of a small wetland located near a new interchange on Highway 111 in Dartmouth. The project area is located to the southwest of Russell and Morris Lakes and the total area affected is 2.12 ha. The background research on the project determined that there is a low potential for the area to contain significant First Nations or historic archaeological resources.

BACKGROUND RESEARCH

The Nova Scotia Museum has no record of any First Nations or historic archaeological sites within or close to the study area (Stephen Powell, *Assistant Curator – Archaeology, Nova Scotia Museum*, personal communication). The A.F. Church map (1865) shows no structures of any kind within or close to the study area. The Geological Survey of Canada map (1908) also shows no structures of any kind within or near the study area, although there is a dirt road/path shown running parallel to Russell Lake, north of the study area. An examination of historic aerial photographs in the library of the Nova Scotia Department of Natural Resources also failed to find evidence of historic resources in the study area.

ARCHAEOLOGICAL POTENTIAL

First Nations

The greatest potential for First Nations archaeological resources would be in areas associated with Russell and Morris Lakes. Although there have been no archaeological sites recorded on either of these lakes, their size and proximity to known First Nations resources on Halifax Harbour means that there is a high potential that the shores of the lakes as well as the streams leading into and out of them may contain First Nations archaeological resources. However, the study area is not located on the shores of the lake nor is it on an associated stream. There appear to be no resources located within the study area that would have been exploited by First Nations peoples in the past and it is concluded that there is a low potential for the study area to contain First Nations archaeological resources.

Historic

The background research conducted suggests that there has been no historic settlement within or close to the study area, although by 1908 a road or path was passing to the north, which may have opened the area to settlement. However, aerial photographs from the 1940s also indicate that there was no settlement within the study area. It was concluded that there is a low potential for the study area to contain historic archaeological resources.

CONCLUSION AND RECOMMENDATIONS

The background research indicates that there is a low potential for the study area to contain First Nations and/or historic archaeological resources and it is recommended that the project proceed as planned.