ENVIRONMENTAL ASSESSMENT REGISTRATION

PROPOSED SPAR ROAD
WAL-MART SYDNEY

COUNTERPOINT ENGINEERING INC.

PROJECT NO. SS52938

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REPORT TO	**Counterpoint Engineering Inc.** **8555 Jane St., Unit 2** **Vaughan, ON** **L4K 5N9**
FOR	**Environmental Assessment Registration**
ON	**Proposed Spar Road Wal-Mart**

September 01, 2005

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1.0 INTRODUCTION

1.1 Introduction

Wal-Mart Canada Corporation (Wal-Mart) proposes to construct and operate a 12,400 square metre (m^2) retail store and automotive centre, with a proposed future expansion, at Spar Road in Sydney, Nova Scotia. The proposed Project includes construction and operation of the store and Tire Lube Express (TLE) automotive centre as well as associated parking areas, with a gardening centre to be located in the parking lot on a seasonal basis. The area of the property proposed for the Project is 6.8 hectares (ha) (see Figure 1).

The location of the proposed Project is in an area of Sydney locally known as the Burnac Lands. These undeveloped lands have recently been rezoned by the Cape Breton Regional Municipality (CBRM) for commercial development. The property upon which the project is to be constructed, is partially occupied by a wetland. Given that the area of wetland disruption resulting from the Project is greater than 2 ha, Wal-Mart is required to register this project as a Class I Undertaking pursuant to the Environmental Assessment Regulations under the Nova Scotia *Environment Act*. This report is the Environmental Registration submitted by Wal-Mart to Nova Scotia Environment and Labour (NSEL) to satisfy these regulatory requirements.

1.2 Project Background

Wal-Mart currently operates a smaller store in the Mayflower Mall on Grand Lake Road approximately 1 km from the proposed building site. This store has been in operation for 11 years and was recently identified as a candidate for expansion into a new building. Wal-Mart land agents investigated lands available for acquisition in a commercially viable area near the existing store. An evaluation of lands of interest resulted in the identification of the Burnac lands as a preferred location for the new store with land use zoning and recent developments (Home Depot and Canadian Tire) in the immediate area consistent with the proposed Project.

A siting exercise was carried out and potential site configurations identified. A number of environmental constraints are present on the Burnac Lands including the Northwest Brook and a number of wetlands. Considering these constraints and the land available to accommodate the development, a configuration was developed that confined potential effects of construction activity to a single wetland, and minimized potential for interaction with the nearby Northwest Brook. In short, the current proposed location and site layout were considered to be the best solution from an environmental and technical perspective given the available lands in the area.

LANDS DEEDED TO

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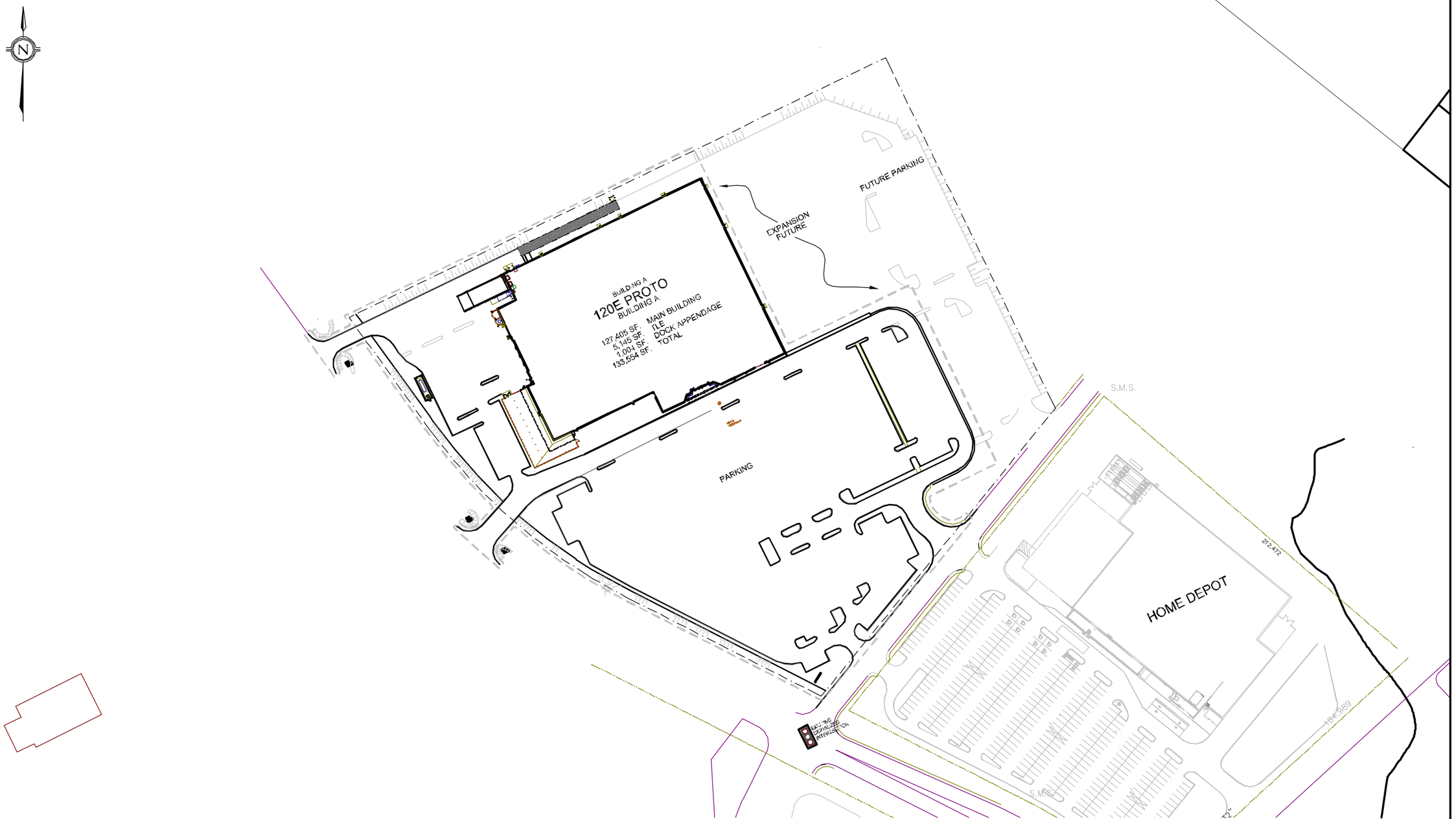

SITE LAYOUT

SCALE 1: 2000

Jacques Whitford

NSS52938-1

FIGURE 1

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1.3 Proponent Information

Wal-Mart began in 1962 with its first store in Arkansas. The company grew to some 15 stores through the 1960s and its introduction to the New York Stock Exchange in 1970 was the impetus for significant growth through the 1970s and 80s, with the company becoming international in 1991. Wal-Mart Canada Corporation (the Proponent) was founded in March of 1994 and currently operates 256 Wal-Mart and 6 Sam's stores in Canada. The existing Wal-Mart in Sydney has been present in the community for 11 years.

Name of the Proponent:	Wal-Mart Canada Corporation
Postal Address:	1940 Argentia Road Missisauga, Ontario L5N 1P9
Tel:	(905) 821 2111
Fax:	(905) 821 6350

Company President, Chief Executive Officer and/or ***Environmental Assessment Contact***:

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2.0 PROJECT DESCRIPTION

2.1 Geographic Location

The proposed location for the Project is the undeveloped property identified in Figure 1 located along Spar Road in Sydney, Nova Scotia. The location of the proposed new store is on Spar Road (PID 15508880 and 75035709). This lot is bounded on the west side by Spar Road, and to the north by an abandoned tramline and the northern half of the wetland and the decommissioned regional landfill. To the south east is the property is bounded by the Home Depot. An undeveloped lot borders the site to the east.

The nearest occupied and/or active properties include the Home Depot and the Canadian Tire currently under construction. The soon to be decommissioned CBRM municipal incinerator is west of the Project area and the decommissioned municipal landfill is located immediately north of the wetland. There is some commercial development along Grand Lake Road south of the Project site with the nearest residence located approximately 0.25 km from the site along Grand Lake Road just south of the Canadian Tire development. The nearest concentration of residences is approximately 1.5 to 2 km away.

2.2 Project Components

The Project will incorporate three main areas: the retail store; the automotive centre; and the parking area. The project will be consistent with current Wal-Mart store models that have been recently constructed (*e.g.*, Antigonish) and includes the following major components:

- retail store including fast food restaurant;
- Tire Lube Express (TLE) automotive centre;
- paved parking;
- garden centre in the parking area;
- landscaping in specific areas along the perimeter of the parking area;
- an underground grease separator with 568 litre tank at the back of the McDonald's restaurant
- an underground oil/water separator with a 2,273 litre tank with a 454 litre oil storage reservoir for the TLE;
- a 2,728 litre aboveground tank for the temporary storage of waste oil from the TLE;
- stormwater system throughout the parking area to collect surface runoff and direct stormwater to the treatment units discharging to the ditch on SPAR Road;
- sanitary sewer system connected to the municipal collection system;
- domestic drinking water system connected to the municipal collection system;
- electrical power system connected to the Nova Scotia Power system;
- propane fuel supply including four 9 kg (20 lb) tanks to service fork lifts and cleaning equipment as well as an aboveground tank for refilling barbeque tanks; and
- fencing on northern perimeter of the property as required for aesthetics.

All components will be constructed and operated in accordance with governing federal, provincial, and industry regulations and standards.

The Project will include the construction and operation of the retail store and associated automotive facility. The retail operation offers family apparel, house wares, lawn and garden equipment, hardware, recreational and sporting goods, groceries, toys and electronics, among others. The Project also includes the operation of an automotive centre to maintain and repair automobiles. Additional project details are provided in the sections that follow.

2.3 Site Preparation/Construction Activities

The construction work will include:

- clearing and grubbing, excavation of rootmat/topsoil and peat, exporting from the site unsuitable organic material, and importing granular fill to raise the site to design elevations;
- excavations for foundations and services within the building area, and subsequent building component construction;
- excavations and installation of underground services outside the building, including water, sanitary and storm lines;
- construction of a paved parking area; and,
- landscaping in specific areas of the site, including the future building expansion area.

The Project will adhere to Wal-Mart's strict procedures on erosion and sediment control during construction. A detailed erosion and sediment control drawing and specification are included with the construction documents. Furthermore, a pre-construction environmental orientation meeting will be held with the general contractor, regulators, and consultants to ensure a thorough understanding of the environmental requirements for the Project prior to commencement of construction. A geotechnical/environmental consultant will monitor the work on a full-time basis.

2.4 Operations and Maintenance

The retail operation will include the sale of family apparel, house wares, lawn and garden equipment, hardware, recreational and sporting goods, groceries, toys and electronics, among others. The Project will also include the operation of the lawn and garden centre on a seasonal basis as well as the operation of an automotive centre to maintain and repair automobiles.

Maintenance activities for the Project relate primarily to building maintenance as well as snow removal and property maintenance (*e.g.*, parking lot areas).

2.5 Project Employment

The existing Wal-Mart employs some 200 personnel who would be transferred to the new location. The number of personnel, including full and part time positions, will be approximately 250 to 300 at the new location.

2.6 Emissions and Waste Discharges

Based on the nature of both the construction and operational stages of this project, emissions and waste discharges will be minimal. The types of waste that may be generated during construction may include but are not limited to typical construction debris (*e.g.*, packaging, rebar, waste concrete) and domestic waste generated by construction personnel. Waste from the operational phase of the Project will include waste paper, packaging from bulk shipment of goods, domestic waste from customers and personnel, and wastes and hazardous waste from the TLE automotive centre.

Emissions and discharges associated with the proposed Project include liquid, gaseous and solid wastes.

2.6.1 Waste Water Discharges

Construction

The following waste water will be generated during Project construction:

- stormwater runoff;
- sanitary wastewater; and
- wash water.

During construction, management of stormwater runoff will be key to minimizing potential effects downstream of the proposed development. One of the key components of managing runoff is to keep clean water clean by diverting runoff away from disturbed areas. Sediment and erosion control structures will be an important part of minimizing the effect on the surrounding environment. In accordance with standard NSEL requirements, erosion and sedimentation controls will be in place to ensure that runoff generated during site construction is managed appropriately. This will include minimization of the amount and duration of exposure of erodible soil at all times. Sediment and erosion controls will be in place prior to the commencement of construction. Drawing No. SW-G in Appendix A, has been prepared at this time to provide the erosion and sediment control details for the construction phase of the Project.

Permanent structures will be installed in accordance with the detailed design for the operations phase of the Project to maintain the hydrological balance coming onto and leaving the property and to reduce total suspended solids in stormwater and runoff.

Washroom facilities will be provided and maintained by a licensed contractor in accordance with applicable legislation. Waste will be collected from the washroom facilities on a regular basis.

Wash water from cleaning concrete trucks will be discharged either at the concrete manufacturer's place of business (assuming that the plant is in close proximity to the work site) or alternately, at a wash water settling pond. All such discharges will be of minimal volume and will not occur within the Buffer Zone of a wetland/watercourse or other environmentally sensitive area.

Operation

The following waste water will be generated during Project operations:

- sanitary wastewater discharged to the Municipal collection system;
- stormwater runoff to the site collection system; and
- TLE area.

Sanitary wastewater will originate from public and employee washroom areas only and will be discharged to the municipal collection system. There are no sanitary wastes requiring treatment prior to discharge to the municipal collection system. There is no municipal sewer-use by-law in place.

Stormwater runoff will originate from precipitation and flow overland along predominately paved or otherwise stabilized areas (*e.g.*, vegetated). As an extra measure to ensure that stormwater discharge is within applicable suspended solids guidelines and regulations, storm water treatment units will be used at the outlets. The storm water treatment units will be monitored following runoff events for the first 30 days of operation to monitor accumulation of solid materials in the sump, sediment accumulation, and deposition of floating trash/debris in the separation chamber. An inspection and clean out schedule will be determined based on storm events and deposition in the units. This is in accordance with the manufacturer's recommendations. Furthermore, as detailed on Drawing SW-D in Appendix A, the stormwater units are equipped with an oil baffle and sump. Oil will be vacuum pumped for disposal in accordance with provincial regulations.

Waste water collected from the TLE area will be directed to a floor grate leading into the oil/water separator. While wastewater from the oil/water separator is connected to the sanitary sewer, oil will be collected in the sump and vacuum pumped for disposal. A regular maintenance and pump out schedule, including recycling of waste oil will be in place. The oil interceptor in the automotive section will be equipped with a liquid level control system and remote alarm box. The TLE area will meet all applicable guidelines and regulations for handling and discharge of waste waters.

2.6.2 Noise Emissions

Project construction noise will be intermittent, as equipment is operated on an as needed basis and mostly during daylight hours.

Noise emissions generated during construction and operations will not exceed the provincial guidelines at the property boundaries of the site.

NSDEL has established the following criteria for the provincial Guideline for Environmental Noise Measurement and Assessment (NSDEL Guidelines) (NSDOE 1989) with respect to sensitive receptors (*e.g.*, residential areas, schools, *etc.*):

- An L_{eq} of 65 dBA between 0700 to 1800 hours;
- An L_{eq} of 60 dBA between 1900 to 2300 hours; and
- An L_{eq} of 55 dBA between 2300 to 0700 hours.

The Equivalent Sound Level (L_{eq}) is a logarithmic average of noise levels due to all sources of noise in a given area over a stated period of time.

Noise emissions are not anticipated to be an issue during the operational phase of the Project.

2.6.3 Air Emissions

Air quality impacts associated with construction activities are generally related to the generation of dust and routine emissions from the operation of construction equipment. Control measures for dust will include providing a water truck to apply water to the ground surface, when required. The air emissions from the construction equipment will be localized and temporary, lasting the duration of construction activities; these emissions will be similar to those considered acceptable for other large construction projects. Routine inspection and maintenance of construction equipment will minimize exhaust fumes.

No significant dust emissions will result from the operation; the parking lot is paved, as are all access roads.

2.6.4 Solid and Hazardous Wastes

Waste will be managed in accordance with applicable waste management regulations and guidelines.

Construction

Construction waste from the Project will be recycled where applicable and where waste is not recyclable it will be disposed of at an approved waste management facility. Domestic and solid waste generated on site during construction will be collected in designated containers and disposed of or recycled in accordance with provincial Solid Waste Resource Management Regulations as well as additional municipal and disposal facility requirements. Potential sources of non-hazardous or solid wastes generated by Project construction activities include scrap metals, insulation waste, packing/crating materials, and domestic wastes.

The rootmat/topsoil and peat layer will be taken to a location offsite which meets all applicable guidelines and regulations. The location will be determined by the General Contractor.

Hazardous waste that is expected to be generated from Project construction sources will be minimal and includes small quantities of waste oils. Hazardous wastes will be removed from the site by a licensed contractor and disposed at an approved facility.

Operation

Waste generated during the operational phase of the Project will be recycled or recovered in keeping with waste management objectives.

Potential sources of non-hazardous or solid wastes generated by Project operation activities include packing/crating materials and domestic wastes. Waste management procedures will comply with the provincial Solid Waste Resource Management Regulations as well as applicable municipal and disposal facility requirements. Wastes will be transported offsite to a licensed facility.

Hazardous waste that may be generated from Project operation sources includes waste oils and other automotive maintenance related wastes such as antifreeze, windshield wash, brake fluids, etc. A 2,728 litre waste oil tank will be in place for the TLE. The waste oil tank will be double walled and equipped with interstitial space monitoring and an overfill alarm as well as a remote monitoring panel. The floor drain in the shop will direct drainage to an oil separator. Hazardous wastes will be removed from the site by a licensed contractor for recycling where applicable or for disposal at an approved facility.

Spill Contingency Planning

In the event of a spill, kits are provided on site to prevent the release of spilled material to the environment. Wal-Mart also subscribes to a spill response service who can be contacted by the store to provide guidance on clean up procedures and can dispatch a spill response unit to the site. Wal-Mart has a Hazardous Waste Spills program in place that includes a brief overview, the actions to take in the event of a spill, the contact information for the spill service, the location of spill kits, confirms the requirement for appropriate disposal of hazardous materials and gives contact names for additional resources.

2.6.5 Hazardous Materials

The use of hazardous materials at the Wal-Mart will be predominantly limited to the automotive maintenance and repair area. Hazardous materials used for automotive repair are anticipated to be supplied and consumed in domestic quantities and may include but are not limited to compressed gases, brake and transmission fluids, solvents, oils, antifreeze and other materials regulated under WHMIS (Workplace Hazardous Materials Information System). These materials will be in use by technicians appropriately trained in the handling, use and disposal of hazardous materials. Materials will be stored, handled and disposed of in accordance with manufacturer's recommendations and federal and provincial regulations. Furthermore, Wal-Mart has a plan in place for provision of MSDS On-demand as well as a 24/7 Spill/Exposure and Information hotline.

Spills, leaks, or accidental releases of potentially hazardous materials during construction or operation of the Project could adversely affect water quality including groundwater. It is noted that there is no public water supply near the Project area. The Project is located in an area served by the municipal system which draws its water from Dumaresque Lake (Service Nova Scotia Municipal Relations (SNSMR) 2005) located approximately 5 km to the south of the site. The closest groundwater well to the site and the nearest well down gradient are the two groundwater wells located at the CBRM incinerator site (T. McNeil pers. comm. 2005). These wells are drilled, non potable wells used to supply cooling water for the incinerator site. The nearest residential groundwater well is located on the south side of Grand Lake Road, hydrologically up gradient of the Project. Given the current and post development hydrology of the site (Section 5.1), interactions with residential wells related to site runoff are unlikely. No groundwater withdrawals will be required for the construction, operation, or maintenance of the Project. Water will be supplied to the facility through the local municipal water supply.

In the case of an accidental release of materials resulting from Project activities, reporting and clean-up procedures will follow provincial emergency spill regulations as required by the spill contingency program. Petroleum oils and lubricants will be stored and waste oils disposed of in accordance with provincial regulations. Small spills will be contained by on site personnel using spill kits kept at the site.

2.7 Project Schedule

Construction start up is anticipated to for the fall/winter of 2005 with completion anticipated in the spring/summer of 2006. The Project will commence once all necessary provincial and federal approvals are in place. Expansion of the store will occur when market conditions are favourable.

Typical hours of operation for the proposed store are from Monday to Saturday from 08:00 to 22:00 hours, excluding holidays.

2.8 Decommissioning

There is no current plan or schedule for decommissioning and abandonment of the store. Decommissioning and abandonment will be undertaken in accordance with the regulatory requirements applicable at the time of such activities.

Removal of buildings or structures is expected to have similar effects and considerations as construction and will be conducted in accordance with regulatory requirements applicable at the time of removal. Disposal of related waste will be conducted in accordance with NSEL waste management regulations and guidelines.

3.0 SCOPE OF THE ASSESSMENT

As it is the intent of Wal-Mart to infill an area of wetland resulting in disruption of an area of that wetland of greater than 2 ha, the Project must be registered for Environmental Assessment under the Nova Scotia *Environment Act*. This report fulfils the primary requirements for Project Registration under this legislation.

3.1 Scope of the Undertaking

Wal-Mart Canada proposes to construct and operate a retail store and automotive centre on a 6.8 ha property located on Spar Road. A 7.7 ha wetland straddles the northern portion of the site where the Project is to be located and the undeveloped property immediately north of the site. Construction of the Project will require infilling approximately 3.3 ha of the wetland.

Initial construction work will consist of: clearing, grubbing, excavation of peat, and site grading. Marketable timber, if any, will be salvaged and the remaining material chipped on site or disposed as necessary. Organic materials, soils unsuitable for reuse and excess soils will be removed from site to a location determined by the General Contractor. Following site grading, building construction will be initiated along with placement for base gravel and asphalt for the parking areas.

3.2 Project Alternatives

Alternative means for the Project are defined as methods of similar technical character or methods that are functionally the same (CEA Agency 1997). Construction practices to be used for this project are routine and there are no defined alternative methods.

During the site selection process, other properties outside the Burnac Lands were investigated for suitability but were found to have similar constraints as the current location, *i.e.* the property contains a number of wetlands and is traversed by a watercourse. Alternative locations and configurations within the Burnac Lands were also considered. The original configurations had potential to disrupt a number of wetlands and a watercourse and were decided against in favour of the current site layout. Given the preference for commercial development of the Burnac Lands, including rezoning, this location was the most attractive option in proximity to the existing store.

3.3 Scope of the Environmental Assessment

Part IV Section 31 of the provincial *Environment Act* stipulates that projects prescribed as undertakings by the Minister or under the Environmental Assessment Regulations are subject to Ministerial approval under the environmental assessment process. Section 3 (1) and Schedule A of the regulations, describe an enterprise, activity, project, structure or work which disrupts a total of 2 ha or more of any wetland as a Class I Undertaking. As per Section 3 (2), the regulations also apply to the modification, extension, abandonment, demolition or rehabilitation of an undertaking. Given that the Project will disrupt an area greater than 2 ha, Wal-Mart is required to register this project as a Class I Undertaking pursuant to the Environmental Assessment Regulations under the Nova Scotia *Environment Act*.

The Project is subject to provincial statutes applicable to infilling of a wetland and as such, an approval under Section 29 1(b) of the Activities Designation Regulations will be required. As the wetland is greater than 2 ha (it is 7.7 ha.) in area, the Nova Scotia Department of Environment Wetlands Directive

requires a formal wetland evaluation using the North American Wetlands Conservation Council (Canada) Wetland Guide. Solid and non hazardous waste recycling and disposal is regulated under the Solid Waste Resource Management Regulations and management of waste dangerous goods generated by the Project is regulated under the Dangerous Goods Management Regulations under the *Environment Act.* The *Endangered Species Act* protects provincially listed species.

Municipal by laws outline the requirements of a variety of permits and regulations related to construction and operation of the Project such as building and occupancy permits, wastewater management and land use compliance, among others. Wal-Mart will procure these permits within the appropriate timeframe to minimize Project delays.

One of Canada's strategies to protect biological diversity is to address species at risk. These are native species that are sensitive to human activity due to their rare occurrence, restricted range in Canada, dependence on specialized habitats or declining population or distribution (Canadian Wildlife Service 2004). This has been achieved through, amongst other initiatives, the *Species at Risk Act* (*SARA*). *SARA* serves to protect listed species by prohibiting activities that may harm individuals or critical habitat. Specific prohibitions under *SARA* came into force on June 1, 2004; those relevant to the proposed Project include the following:

- Section 32 (1): *No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.*
- Section 33: *No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada.*
- Section 58: *Subject to this section of the Act, no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species – or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada - if (a) the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada; (b) the listed species is an aquatic species; or (c) the listed species is a species of migratory birds protected by the Migratory Birds Convention Act, 1994.*

The scope of the factors to be considered in the environmental assessment for the proposed Project has been determined by the Proponent and their consultant and is based upon: the proposed Project elements and activities; the professional judgement and expert knowledge of the study team; and consultations with stakeholders and regulatory authorities on this and similar projects.

The proponent and their consultant met with representatives of NSEL and the Nova Scotia Department of Natural Resources (NSDNR) on May 27, 2005 to discuss the Project, location, proposed studies, scoping requirements and key activities associated with the proposed Project, in an effort to focus the scope of the assessment. Other Stakeholders were also contacted (see Section 4.0) for the purpose of consultation and issue identification.

The primary issues raised during this consultation process centred on potential impacts to the remaining portion of the wetland and potential offsite impacts to sensitive receptors such as Northwest Brook. CBRM, NSEL and NSDNR were concerned that the remainder of the wetland may be affected during construction and operation of the Project by changes in the hydrologic regime or by sedimentation from construction activities. An issue of concern for the New Waterford Fish and Game Association was the potential for the nearby Northwest Brook to be subject to siltation from construction activities. Site specific hydrologic information was collected and provided to CDS™ Technologies to

enable the design of a stormwater system that will balance the flow entering and leaving the site, therefore maintaining the hydrologic integrity of the remaining portion of wetland. The same technology has the ability to remove a significant quantity of Total Suspended Solids from stormwater (see Appendix A).

The EA methodology for this Project has been developed to satisfy regulatory requirements for an EA of a Class I Undertaking under the Nova Scotia Environmental Assessment Regulations.

The approach and methodology used are based on accepted environmental assessment practice, focusing on environmental and socio-economic issues of greatest concern. Assessing all of the potential issues associated with a proposed undertaking is impractical, if not impossible (Beanlands and Duinker 1983). It is therefore generally acknowledged that an environmental assessment should focus on those components of the environment that are valued by society and/or serve as indicators for environmental change. These components are known as Valued Environmental Components (VECs) and Valued Socio-economic Components (VSCs). The environmental assessment for this Project evaluates potential effects with regard to each VEC or VSC. VECs/VSCs evaluated for this assessment include:

- hydrology;
- rare and sensitive flora habitat;
- wildlife (including herpetiles and birds)
- archaeological and heritage resources; and
- land use.

A description of the bio-physical and socio-economic environment and an evaluation of potential effects are provided in Section 5.0. A complete North American Wetlands Conservation Council Wetland Evaluation is included in Appendix B.

4.0 STAKEHOLDER AND LOCAL CONSULTATION

4.1 Methods of Involvement

The Proponent's consultants met with representatives of NSEL and NSDNR on May 27, 2005 to identify potential issues of concern associated with the proposed Project and to focus the scope of the assessment. In late June and early to mid July calls were placed to local stakeholders to discuss the Project and potential concerns. Stakeholders consulted included a CBRM planner, a CBRM development officer, the New Waterford Fish & Game Association, the zone director of the ATV Association of Nova Scotia and the Secretary of St. Augustine's church. A follow up site visit was conducted the week of July 6, 2005 to complete a "windshield survey" of the Project area to determine local land use. On June 27, 2005, further Project information was provided to the New Waterford Fish & Game Association to provide project location and general construction information.

4.2 Stakeholder Comments and Steps Taken to Address Issues

Table 4.1 summarizes the comments received and issues raised as a result of the issues scoping and consultation efforts described above and in Section 3.2 as well as the Proponent's proposed response or resolution.

TABLE 4.1 Summary of Stakeholder Comments and Concerns

Raised By:	Issue/Concern	Response/Resolution
CBRM	Potential impacts to local hydrology	Collection of site specific hydrologic data and design of a stormwater management system to control and balance flow entering and leaving the site
NSDNR	Potential impacts to the remainder of the wetland	Hydrology VEC to confirm the hydrologic connectivity of the two halves of the wetland. The Proponent will also employ a stormwater management system that will balance the flow entering and leaving the site and will remove a significant quantity of Total Suspended Solids (TSS) and oils from stormwater leaving the site.
ATV Association of NS	Potential loss of use of the abandoned railroad (tramway)	The abandoned railroad is not within the Project boundaries and its use will not be affected by the Project
NSEL, NSDNR	Development of an appropriate Wetland Compensation Program	Discussions have been initiated with the provincial wetlands specialist and the local NSDNR representative to identify suitable candidates for a wetland compensation program in the Project vicinity or region.
New Waterford Fish & Game Association	Potential for migration of sediment laden water into Northwest Brook	Current and post development site drainage flows away from Northwest Brook. Implementation of sediment and erosion control measures including working in small areas that can be rapidly stabilized, gravel cover for stabilization, landscaping where applicable, compaction of fill surfaces at the end of the day and avoidance of stockpiling loose materials on site will reduce potential for sediment laden runoff to receiving waters. Filter fabric will be employed over catch basin covers, grates and rock lined aprons will be in place at stormwater outlets. The permanent stormwater management system will remove a significant quantity of TSS from stormwater prior to releasing it into the Spar Road ditch which drains away from Northwest Brook.
NSDNR	Need to ensure that plant phenology is taken into consideration for vegetation surveys	Following the initial vegetation survey, species of interest were noted and a call placed to inform the NSDNR Species at Risk biologist Mark Elderkin. A table of plant phenology was also developed and sent to Mr. Elderkin to identify the timing and species of interest for the follow up survey which was conducted in August.
NSDNR	Potential impacts off site	Environmental controls *i.e.* sediment and erosion controls and stormwater management systems will be implemented to minimize potential for offsite impacts. Controls are designed to greatly reduce potential for TSS and oils in runoff
NSEL	Identification of community use of the wetland	Calls were placed to the local Fish and Game Association, the local ATV Association, the municipal planner and the municipal development officer.
New Waterford Fish & Game Association	Timing of construction and concerns that garbage generated at the site will blow around	Responded to C. Musial noting that grading and paving are proposed for the fall/winter season. It is noted that debris is an issue in commercial areas. Wal-Mart will have appropriate waste receptacles on site and waste will be managed according to provincial and municipal regulations.

5.0 VALUED ENVIRONMENTAL AND SOCIO-ECONOMIC COMPONENTS AND EFFECTS ASSESSMENT

Field studies were conducted by Jacques Whitford in June, July and August 2005 and consisted of a tour of the Project site and the adjacent portion of the wetland as well as a regional reconnaissance survey to describe the Project area and neighbouring land uses. A preliminary review of candidate sites for wetland compensation was also conducted in August 2005.

Temporal and spatial boundaries encompass those periods during, and areas within which, the VECs are likely to interact with, or be influenced by, the Project. Both the temporal and spatial boundaries for the assessment vary according to the VEC, but are generally limited to the duration of, and for a period of time after, the activities and the immediate Project area unless otherwise noted.

To assess the potential environmental effects of a project and determine the significance of an effect, it is important to consider the magnitude, frequency, duration, geographical extent and reversibility of the potential effect. The study team has considered these elements for each VEC/VSC.

5.1 Hydrology

A desktop study was undertaken by Hydro-Com Technologies to describe the existing hydrologic regime on the Project site, to determine potential hydrologic effects of the Project and to identify mitigative measures. Information from the study was used to provide input to the wetland evaluation conducted at the site. In order to evaluate the hydrological impacts of the development, the following methodologies were used:

- The pre-development drainage areas, wetland hydrology, water quality of the site effluent, and flow attenuation properties of the wetland were described based on topographical mapping (1:50,000, 1:4,800 and 1:1,200 base mapping), site drainage mapping from the neighbouring Home Depot complex (Terrain 2004), as well as detailed wetland survey mapping produced by H.R. Lovell (2005). Because the area east of the wetland is very flat, it was delineated using spot measurements from the 1:4,800 scale mapping.
- The expected changes in drainage areas, wetland hydrology, water quality of the site effluent, and flow augmentation from the site for post-development conditions were described based on available topographical mapping and site drainage and site grading development drawings of the Wal-Mart store (Counterpoint Engineering, 2005).
- The *North American Wetlands Conservation Council Wetland Evaluation Guide* was used to evaluate the hydrological and water treatment values of the wetland based on hydrological and water quality findings.

The following physiographic parameters were obtained from the available project mapping:

- surface area of the wetland (excluding the old tramway line): 6.4 ha;
- drainage area contributing flow to the wetland: 19.7 ha;
- surface area of proposed development Project: 6.8 ha;
- surface area of the proposed development area impacting the wetland: 3.3 ha;
- the inlet invert elevation of the culvert under the SPAR Road receiving flow from the wetland: 30.47 m; and
- distance from wetland outlet to nearest body of water (Municipal Ash Industrial Disposal (MAID) Pond): 0.44 km.

5.1.1 Existing Environment

The wetland along the SPAR Road is located in Sydney, NS near a recently developed commercial complex. It is bordered by the SPAR Road to the south and the Emera Railway line to the north. The wetland generally drains in a south-westerly direction toward the SPAR Road. This wetland represents the upper portion of a watershed which drains into the MAID Pond and Incinerator Brook located west of the site. Incinerator Brook drains into Coke Oven Brook, which discharges into the Tar Ponds and the Sydney Harbour.

The plan view of the wetland as delimited by NSDR is presented in Figure 2. The wetland has total area of 7.7 ha. The area of the wetland considered for the hydrological study is approximately 6.4 ha and excludes the old tramway line which hydrologically divides the northern and southern portions of the wetland. The proposed Wal-Mart development area is presented in Figure 3 with a dashed yellow line. A portion of this proposed development area (approximately 3.3 ha) is planned within the wetland area. A landfill site is located directly north of the wetland area and south of the rail line. This landfill area is hydrologically isolated from the wetland by a drainage channel at the toe of its southern slope.

Based on available topographical mapping and site survey information, the hydrology of the pre-development site conditions was characterized. The results are presented in Figure 2 and are described below.

Drainage Dynamics

- The total drainage area of the wetland in pre-development conditions as delineated in Figure 2 is approximately 19.7 ha and consists predominantly of undeveloped land except for the old tramway line.
- The old tramway line hydrologically separates the northern portion from the southern portion of the wetland. Runoff within the wetland drainage area generally runs toward the intersection of the SPAR Road and the tramway line by way of the drainage channels along both sides of the old tramway line and along the SPAR Road.
- The outlet of the wetland consists of 4 (four) 600 mm diameter culverts located at the intersection of the old tramway line and the SPAR Road.
- Runoff within the Home Depot lot (south east of the wetland) is currently collected by a stormwater system and discharged to the Northwest Brook (outside the drainage area of the wetland).
- Runoff from the landfill site north of the wetland is intercepted by a drainage channel which is located on the periphery of the wetland and drains toward the wetland outlet by way of the drainage channel along the SPAR Road.

Channel Conditions Downstream of the Wetland Outlet

The runoff exiting the wetland area is conducted approximately 0.44 km south west along a drainage channel into the MAID Pond. Based on previous visual observations, this channel has received siltation from nearby construction areas. Downstream of the MAID Pond, the Incinerator Brook connects into the Coke Oven Brook and traverses highly urbanized and industrial areas and drains into the Tar Ponds. This section of the watercourse is located within an area of historically heavy industrial activity. Finally the stream is directed into the Sydney Harbour. Given the existing channel conditions from the wetland outlet to the Sydney harbour, the network of watercourses downstream of the wetland outlet is considered to provide aquatic habitat of poor quality.

Rail Line

Tramway

Drainage Channel

Drainage Channel

Landfill Mound

Drainage Channel

35

30

Proposed Walmart

Northwest Brook

Wetland Outlet

Existing Sanitary System

Drainage Channel

Drainage Channel

Home Depot

Stormwater System

Spar Road

Drainage Channel

Canadian Tire

40

Grand Lake Road

Spar Road Walmart
Sydney, Nova Scotia

Figure 2
Site Hydrology for Pre-Development Conditions

Map Features

Roads
- Road
- Unpaved Road
- Rail

Topography
- Contour (0.25m)
- Watercourse
- Property Boundary
- NSDR Surveyed Wetland

Hydrology
- Wetland Watershed Delineation
- Drainage Channel Flow Direction
- Stormwater System Flow Direction
- Overland Flow Direction

N

0 50 100 150

Metres

Map Parameters
Projection: UTM-NAD83-ZONE20
Scale - 1 : 3,000
Project Number: SS52938
Date: July 14, 2005

Jacques Whitford

Rail Line

Tramway

Drainage Channel

Drainage Channe

Landfill Mound

Drainage Channel

35

Inlet Into Stormwater System

Drainage Area Entering Ditch

Drainage Area Entering Storm System

Northwest Brook

30 Wetland Outlet

Proposed Walmart

Flow Retention Structure

Drainage Channe

Existing Sanitary System

Drainage Chann

Home Depot

Stormwater System

Flow Retention Structure

Spar Road

Drainage Channel

Canadian Tire

40

Grand Lake Road

Spar Road Walmart
Sydney, Nova Scotia

Figure 3
Site Hydrology for Post-Development Conditions

Map Features

Roads
- Road
- Unpaved Road
- Rail

Topography
- Contour (0.25m)
- Watercourse
- Property Boundary
- NSDR Surveyed Wetland

Future Development
- Proposed Property Boundary
- Proposed Walmart Building

Hydrology
- Wetland Watershed Delineation
- Drainage Channel Flow Direction
- Stormwater System Flow Direction
- Overland Flow Direction

N

0 50 100 150

Metres

Map Parameters
Projection: UTM-NAD83-ZONE20
Scale - 1 : 3,000
Project Number: SS52938
Date: July 14, 2005

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Flow Attenuation/Augmentation

The wetland provides some flow attenuation through its flat topography, its depressions and vegetation. The wetland outlet, which consists of the four culverts at the SPAR Road and tramway intersection, is located at an elevation of 30.47 m. According to the survey information, this elevation represents a low point on the wetland floor. In addition, the wetland floor is generally sloped toward its outlet. For this reason, there is little standing water within the wetland and the wetland provides minor flow attenuation and minor augmentation to downstream flows.

Water Quality

As there is no current development upstream of the wetland, little erosion or contamination is expected at the wetland outlet in pre-development conditions.

Although a sanitary sewer line does traverse the wetland drainage area as indicated in Figure 2, there is no potential direct release of sewage into the wetland and discharge from the sanitary system is not considered a water quality issue.

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

The expected changes in the local site hydrology have been evaluated based on site development drawings. The proposed development will directly impact approximately 51.6% (or 3.3 ha) of the wetland. This change in the surface condition of the wetland will result in a change in flow dynamics at the site as presented in Figure 3. The following sections describe the relevant post-development hydrological conditions and potential water quality issues at the site.

Changes in Drainage Areas

The drainage area of the wetland will not change following development. All flow from the drainage area will continue to drain toward the wetland outlet. However, a delineation can be made between the drainage areas whose drainage paths are unaffected by the development and those drainage areas whose runoff is intercepted by the proposed stormwater system within the proposed development area. The separation between these two drainage areas is shown in Figure 3. As shown, the proposed developed area (approximately 6.8 ha) and a portion of the area upstream of the development (approximately 2.2 ha) is collected by the stormwater system. The distinction between the two drainage areas is important as there are changes in temporal and spatial flow patterns in the latter area from pre-development conditions.

Changes in Drainage Dynamics

Following development, the drainage dynamics of the drainage area flowing into the proposed stormwater system are expected to change from pre-development conditions. Collected runoff will be discharged according to the proposed configuration of the stormwater system in two locations along the SPAR Road (as indicated in Figure 3). In addition, due to high rates of conveyance in the stormwater drainage system, the stormwater system runoff will generally reach the wetland outlet sooner during runoff events (smaller time of concentration) than pre-development runoff from the same area.

Flow Attenuation/ Augmentation

Because a high proportion of rainfall is converted to runoff over the impermeable surfaces of the development area, peak flows and runoff volume from the site will increase in the developed area. In

addition, the development is expected to lead to a reduction in low flows as the site runoff will drain more quickly and be less available for detention and aquifer recharge.

Water Quality

Parking areas are subject to the use of salt and/or de-icing agents in the winter and minor releases of coolant and/or other vehicle fluids such as POLs over the course of the year. Downstream water quality in post-development conditions may be affected as potential contaminants from the paved parking area (*i.e.*, salts, petroleum products, de-icing agents, etc.) may be transported with the site runoff into the stormwater system. Based on the nature of the existing channel conditions downstream as described in Section 5.1.1, *i.e.*, urbanization and historic industrial activity, and the implementation of stormwater management technologies to remove TSS and oils and greases, potential effects of parking lot runoff to water quality are not anticipated to be substantial.

Recognizing that road salt can have adverse effects on receiving habitats, its use is anticipated during project operations as it is an important component of vehicular and pedestrian traffic safety on site. The receiving habitat traverses highly urbanized and industrial areas prior to draining into the Tar Ponds and is considered to constitute poor aquatic habitat. The proponent will review Environment Canada's Best Management Practices for Salt Use on Private Roads, Parking Lots and Sidewalks to identify applicable practices.

A number of measures can be adopted to attenuate the hydrologic effects of development described above. Details on water quantity and quality mitigative measures are described below.

Stormwater Retention Systems

Peak flows can be dampened by temporarily detaining runoff in a stormwater retention structure. The outlet of such a structure is designed to ensure peak flows meet specific criteria. Such a system is being implemented as part of the stormwater design plans in the developed area. As shown in Figure 3, two retention structures are being installed at the outlets of the stormwater system before being discharged into the drainage channel along the Spar Road.

The stormwater system is designed to convey the 5-year storm event with a total allowable flow for the site for a 100-year storm event. The 100-year storm controls include two orifice plates, parking lot storage and rooftop storage. Stormwater for events exceeding the 100-year return storm will flow to an emergency spillway to be directed toward the ditch that runs parallel to Spar Road. Additional details related to stormwater retention are included in Appendix A.

The purpose of this stormwater retention system is to attenuate peak flows to pre-development levels. Runoff volume will be temporarily detained in the supersized piping of the stormwater system and potentially within the parking lot area above the piping.

By providing this type of water quantity attenuation, peak flows will be dampened and the reduction in low flow contribution from the developed area will be mitigated. Thus the effects on the downstream flows following development are expected to be minor when considering the implemented storm retention system and the conservation of the existing hydraulic controls under the SPAR Road.

Water Quality Treatment

Minor effects on water quality are anticipated following development however, these impacts can be mitigated using appropriate stormwater treatment technologies. Existing commercially available stormwater treatment technologies, such as the units proposed for the site, can capture floatables, sand, suspended solids, as well as oils and greases. A significant portion (approximately 80%) of

suspended solids will be removed from Project runoff by the stormwater system described in Appendix A. By removing a high proportion of the suspended solids, many of the chemicals sorbed to the particulate material are also removed. Furthermore, the stormwater units are equipped with oil baffle systems capable of reducing oil and grease concentrations in effluent to less than 15 parts per million (ppm) for dry weather spills where the volume is less than or equal to the spill capture volume, and can remove 40% - 70% of free oil and grease from stormwater during wet weather flows. Additional details of the stormwater units' maintenance and effluent quality control are provided in Appendix A.

According to site development plans, such water treatment technologies are being installed above the outlets of the stormwater system prior to discharge into the drainage channel along Spar Road. Implementation of these technologies can reduce contaminant loading in the effluent from the site and mitigate effects of development on site effluent water quality. Thus the effects of the development on site effluent and downstream water quality are expected to be mitigated by the implementation of the stormwater management system.

Summary of Residual Environmental Effects Assessment

In summary, the planned stormwater management system will retain approximately predevelopment hydraulic conditions in the remaining sections of wetland despite loss of 3.3 ha of wetlands; as such, significant residual Project related effects on hydrology are not likely to occur.

5.2 Flora and Fauna

5.2.1 Existing Environment

Terrestrial Habitat

Terrestrial habitat (*i.e.*, non-wetland) is found on the southern half of the property and consists of two types including mature mixedwood forest and tall shrub thicket.

Mature mixedwood forest

This forest stand is dominated by black spruce (*Picea mariana*), red maple (*Acer rubrum*), American larch (*Larix laricina*), and balsam fir (*Abies balsamea*). The shrub understory consists of a mixture of seedlings of balsam fir, black spruce and red maple, tall shrubs the most abundant of which is possum haw viburnum (*Viburnum nudum*) and low shrubs, the most abundant of which are velvetleaf blueberry (*Vaccinium myrtilloides*) and sheep laurel (*Kalmia angustifolia*). The ground vegetation layer is well developed and is dominated by wild lily-of-the-valley (*Maianthemum canadense*), starflower (*Trientalis borealis*), dwarf dogwood (*Cornus canadensis*), and sphagnum moss (*Sphagnum* spp.).

Tall shrub thicket

Tall shrub thicket is found along a sewer right-of-way that passes through the southern half of the property. This area has been heavily disturbed as a result of installation of the sewer. The right-of-way is now fully revegetated but supports a plant community quite different from the surrounding forest. It is characterized by a tall shrub canopy composed of a mixture of speckled alder (*Alnus incana*), possum haw viburnum, and choke cherry (*Prunus virginiana*). There is also a low shrub canopy that consists of a mixture of northern bush-honeysuckle (*Diervilla lonicera*), red raspberry (*Rubus idaeus*) and late lowbush blueberry (*Vaccinium angustifolium*). The ground vegetation layer is quite diverse and consists of a variety of native and introduced species. Some of the more abundant ground vegetation

species include rough-leaf goldenrod (*Solidago rugosa*), Canada goldenrod (*Solidago canadensis*) and hawkweed (*Hieracium* spp.).

Wetland Habitat

The wetland is a wetland complex consisting of coniferous treed basin swamp, mixedwood treed basin swamp, two types of tall shrub dominated basin swamp, graminoid dominated basin fen, and cat-tail dominated basin marsh (Figure 4). Approximately half of the wetland is located within the property. All but one of the wetland habitat types found in the wetland are present on the property. The only wetland habitat type not found on the property is cat-tail dominated basin marsh. A complete North American Wetland Conservation Council Wetland Evaluation is included in Appendix B.

Coniferous treed basin swamp

Coniferous treed basin swamp is found in drier areas of the wetland, It is characterized by a relatively dense tree canopy composed almost entirely of American larch. The shrub understory is relatively sparse and consists mainly of speckled alder (*Alnus incana*), narrow-leaved meadow-sweet (*Spirea alba*), and shining rose (*Rosa nitida*). The ground vegetation consist largely of a mixture of tussock sedge (*Carex stricta*) and sphagnum moss along with smaller amounts of sensitive fern (*Onoclea sensibilis*) dwarf red raspberry (*Rubus pubescens*), Canada goldenrod (*Solidago canadensis*), and three-leaf Solomon's plume (*Smilacina trifolia*).

Mixedwood treed basin swamp

Mixedwood treed basin swamp is found in wetter areas than the coniferous treed basin swamp and appears to be transitional between treed swamp and tall shrub swamp. The tree canopy is relatively sparse and consists mainly of American larch with some red maple. The shrub understory is dense and composed of a variety of tall and low shrub species including narrow-leaved meadow sweet, mountain holly (*Nemopanthus mucronata*), possum-haw viburnum, speckled alder, rhodora (*Rhododendron canadense*), common Labrador tea (*Ledum groenlandicum*), and sheep laurel. The ground vegetation consists of a carpet of sphagnum moss that is punctuated by patches of three-leaf Solomon's plume and blue-joint reedgrass (*Calamagrostis canadensis*).

Tall shrub dominated basin swamp

Two tall shrub dominated basin swamps are present in the wetland. Unfortunately, it is not possible to differentiate them on air photography of the property so it is not possible to display their distributions.

The first type is very similar in species composition to the mixedwood treed basin swamp. It is characterized by a very diffuse tree canopy that consists of a few scattered American larch, black spruce, and red maple. The shrub understory is very dense and consists mainly of narrow-leaved meadow sweet, possum–haw viburnum, and mountain holly along with small amounts of leatherleaf (*Chamaedaphne calyculata*), rhodora, and mountain fly honeysuckle (*Lonicera villosa*). The ground vegetation layer is dominated by sphagnum moss, three-leaf Solomon's plume and dwarf dogwood.

The second tall shrub dominated basin swamp is characterized by a very dense shrub canopy composed largely of speckled alder, narrow-leaved meadow sweet and willows (*Salix* spp.). The ground vegetation layer is rather sparse and consists mainly of some moss cover and three-leaf Solomon's plume found around the margins of a myriad of small pools found under the shrub canopy. Tree cover consists of a few scattered American larch.

Spar Road Walmart
Sydney, Nova Scotia

Figure 4

Habitat Distribution

Map Features

Roads
- Road
- Unpaved Road
- Rail

Topography
- Contour (5m)
- Watercourse
- Property Boundary
- NSDR Surveyed Wetland

Wetland Habitat Types
- A — Coniferous Treed Basin Swamp
- B — Mixed Treed Basin Swamp
- C — Tall Shrub Dominated Basin Swamp
- D — Graminoid Dominated Basin Fen
- E — Cat-Tail Dominated Basin Marsh
- F — Mature Mixedwood Forest
- G — Tall Shrub Thicket

Future Development
- Subject Property Boundary

N

0 50 100 150

Metres

Map Parameters
Projection: UTM-NAD83-ZONE20
Scale - 1 : 3,000
Project Number: SS52938
Date: July 15, 2005

Jacques Whitford

Graminoid dominated basin fen

Graminoid dominated basin fen is found in the center of the wetland, immediately south of the abandoned tram line that passes through the wetland. This plant community lacks tree cover and contains only a light cover of shrubs which are found mainly around the margins of the plant community. Narrow-leaved meadow-sweet and speckled alder are the most abundant shrub species. The ground vegetation layer consists of a dense sward of blue-joint reedgrass and tussock sedge along with some parasol white-top (*Aster umbellatus*) and tall meadow-rue (*Thalictrum pubescens*).

Cat-tail dominated basin marsh

Cat-tail dominated basin marsh is found only in the northern half of the wetland. It appears that the hydrology of the wetland has been altered as a result of the construction of the abandoned tramway that bisects the wetland, resulting in the wetland becoming wetter on the north side of the road. This has resulted in the conversion of swamp to marsh. The vegetation of this plant community is dominated by graminoid species including broad-leaf cat-tail (*Typha latifolia*), black-girdle bulrush (*Scirpus cyperinus*) and tussock sedge. No tree cover is present in this plant community and shrub cover is often restricted to a fringe of narrow-leaved meadow-sweet, speckled alder and balsam willow (*Salix pyrifolia*) found around the margin of the marsh.

Rare Vascular Plants

An assessment of the presence of rare plants on the property and the portions of the wetland located outside of the property was conducted using the methodology recommended by the Nova Scotia Department of Natural Resources. This method consists of four stages including:

- describe habitats present within the study area;
- compile rare plant records for the area surrounding the study area (100 km radius);
- develop a rare plant model to determine if suitable habitat is present in the study area to support any of the rare plants found in the area surrounding the study area; and
- conduct field botanical surveys in habitats in the study area that the model has identified as having potential to harbour rare species.

The results of the habitat assessment are presented above. Information regarding the presence of rare plants within a 100 km radius of the study area was derived from an ACCDC database search. The results of this data base search are presented in Appendix C along with information regarding the phenology, ease of identification and habitat preferences of each species. The habitat preferences of species found in this matrix were compared to the types of habitats present in the study area and those species having habitat requirements similar to the habitats present in the study area were identified as being potentially present in the study area. These 16 species are listed in Table 5.1.

TABLE 5.1 Phenology and Habitat Preferences of Rare Vascular Plant Species Recorded within 100 km of the Project Site, for which suitable habitat is present within the study area.

Binomial and Common Name	Phenology and Ease of Identification	Habitat	NSDNR RANK	ACCDC RANK
Carex tenuiflora, Sparse-Flowered Sedge	Not given for NS, most members of *Heleonastes* group flower June to August. Perigynia required for identification	Wet woods and bogs	RED	S1
Listera australis, Southern Twayblade	June. Quickly senesces after flowering. Must be identified during June	Among the shaded sphagnum moss of bogs or damp woods.	RED	S1
Carex saxatilis, Russet Sedge	Flowers in summer, perigynia required for identification	Damp peaty or gravelly soils	RED	S1
Carex castanea, Chestnut-Colored Sedge	June to July, Perigynia required for identification	Swamps and wet meadows, cliff crevices and ledges	RED	S2
Juncus bulbosus, Bulbous Rush	Flowers late July to September. Can be identified when not in flower	Along borders of freshwater ponds, ditches, canals, and roadsides, especially in alkaline soils	YELLOW	S1
Sparganium hyperboreum, Northern Bur-Reed	Not given for NS. Identifiable in late summer	Peaty pools	YELLOW	S1S2
Vaccinium caespitosum, Dwarf Blueberry	Not given for NS. Identifiable in early summer on to October	Rocky cliffs and rock crevices. Dry or wet acidic sites	YELLOW	S2
Viola nephrophylla, Northern Bog Violet	May to July. Flowers required for identification.	Cool mossy bogs, the borders of streams, and damp woods.	YELLOW	S2
Eriophorum gracile, Slender Cotton-Grass	Flowers and fruits early summer, can be identified into late summer	Wet peat and inundated shores	YELLOW	S2
Coeloglossum viride var. virescens, Long-Bract Green Orchis	May to August	Boggy spots, damp native woods and fir or floodplain forests	YELLOW	S2
Ophioglossum pusillum ,Adder's Tongue	Late May to August. Can be identified until early October if stipe and sporangia are present.	Sterile meadows, grassy swamps, and damp, sandy, or cobbly beaches of lakes.	YELLOW	S2S3
Fraxinus nigra, Black Ash	May and June. Can be identified without flowers.	Low ground, damp woods and swamps.	YELLOW	S3
Epilobium strictum, Downy Willow-Herb	Flowers July to September. Identifiable from late May to October	Boggy areas and wet meadows	YELLOW	S3
Platanthera orbiculata var macrophylla , Large Roundleaf Orchid	Blooms in August. Can be identified when not in flower	Damp woods in deep shade, *P. orbiculata var. macrophylla* is usually in rich old deciduous or mixed woods	YELLOW	S3
Betula pumila, Swamp Birch	May and June. Can be identified without flowers.	Bogs and bog meadows, often mixed with alders.	YELLOW	S2S3
Equisetum pratense, Meadow Horsetail	July to September. Can be identified when not in flower	Open woods and wet meadows, circumneutral soils	YELLOW	S2

Note: None of the above species have been given COSEWIC rankings

The rare plant model indicates that all habitats present in the study area with the exception of the tall shrub thicket have potential to harbour rare plant species. As such, two field surveys were conducted over the entire study area which included the property as well as the portion of the wetland outside of the property. The model was also used to determine the appropriate timing for the field surveys. Of the 16 rare plant species potentially present in the study area, 15 could be reliably identified in June. As such, a field survey was conducted on June 16, 2005. One species could not be reliably identified in June (*Sparganium hyperboreum*, Northern Bur-Reed). Members of the genus *Sparganium* can be readily identified to the level of genus in June. No *Sparganium spp*. were found during the June survey suggesting that it is unlikely that *Sparganium hyperboreum* is present in the study area. A follow-up survey was conducted August 05, 2005 to confirm the presence or absence of this species as well as other late maturing species not captured in the modeling exercise that may be present in the study

area. This species was not noted during the late vegetation survey nor were any other rare plant species predicted to be possibly present on site encountered during the vascular plant surveys.

All species of vascular plant encountered during the field surveys were identified and their population status in Nova Scotia were determined through a review of the species status reports prepared by the Nova Scotia Department of Natural Resources (NSDNR 2003; NSDNR 2004), Atlantic Canada Conservation Data Centre (ACCDC 2004) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2004). A list of the vascular plant species found on the site is presented in Appendix C. None of the species encountered during the field survey are considered to be rare in Nova Scotia (ACCDC 2004; NSDNR 2004) or in Canada (COSEWIC 2004), although one uncommon species, water loosestrife (*Lysimachia thyrsiflora*), listed as S3 by ACCDC was encountered during the survey. This species is considered to be secure in Nova Scotia by NSDNR. Approximately ten water loosestrife plants were encountered in the northwestern corner of the study area in a rich microsite in cat-tail dominated basin marsh. This area is outside of the property and will not be directly affected by construction activity.

Birds

A breeding bird survey was conducted at the site on June 16, 2005. Additional bird observations were recorded during the wetland delineation that was conducted on May 3, 2005. The survey area included terrestrial and wetland habitats found on the proposed construction site as well as the remaining wetland habitat found outside of construction foot print. Birds heard or observed in habitats within several hundred metres of the defined study area as well as those observed flying over the study area were also recorded. The June 16, 2005 breeding bird survey began at 5:00 AM and ended at 9:00 AM. All birds heard or observed within the survey area were recorded. Information regarding the breeding status of birds encountered in the study area was compiled as per the methodology used in the Atlas of Breeding Birds of the Maritime Provinces (Erskine 1992). Additional information regarding use of the area by birds was derived from a review of (Erskine, 1992). The breeding bird data for the atlas square (10 km X 10 km) within which the study area is located was reviewed, and a list of all birds found there along with their breeding status (possible breeder, probable breeder, or confirmed breeder) in the atlas square or study area was compiled.

The population status of each species was determined from existing literature. Lists of provincially uncommon, rare or sensitive birds were derived from the Atlantic Canada Conservation Data Centre (ACCDC 2004), Endangered Species and Status of Wildlife in Nova Scotia (NSDNR 2004) and Species at Risk in Nova Scotia (NSDNR 2003) while nationally rare species were derived from COSEWIC (2004). The Canadian Wildlife Service Maritimes priority list of landbirds was also consulted in regards to population status.

Table 5.2 contains a list of the bird species recorded in the atlas square. Table 5.3 lists those species encountered during the breeding bird survey in both wetland and terrestrial habitats in and near the study area. Thirty-six species of bird have been recorded in the general vicinity of the construction area (atlas data and field data combined). Eight species have been recorded in the atlas square; while a total of 63 birds representing 25 species were recorded in this area in field surveys in 2005. The surprisingly low number of species recorded in the Atlas square indicates that this area was not part of a priority square and received little study during the Atlas surveys conducted in the late 1980's.

TABLE 5.2 Bird Species Listed in the Breeding Birds Atlas square for the Project Site

Common Name	Scientific Name	Breeding Status	Population Status Ranks	
			NSDNR	ACCDC
Common Loon	Gavia immer	Probable	Yellow	SB4 S4N
Great Blue Heron	*Ardea herodias*	Probable	Green	S5B
American Black Duck	*Anas rubripes*	Confirmed	Green	S5B
Ring-Necked Duck	*Aythya collaris*	Probable	Green	S5B
Bald Eagle	*Haliaeetus leucocephalus*	Confirmed	Green	S5B S3N
American Woodcock	*Scolopax minor*	Possible	Green	S4 S5B
Northern Mockingbird	*Mimus polyglottos*	Probable	Green	S3B
European Starling	*Sturnus vulgaris*	Confirmed	Green	SE

TABLE 5.3 Bird Species Encountered on Site During the Breeding Birds Survey

Common Name	Scientific Name	Breeding Status	Habitat		Population Status	
			Wetland	Terrestrial	ACCDC	CWS Priority List
Alder Flycatcher	*Empidonax alnorum*		4	0	S5B	Not Listed
American Crow	*Corvus brachyrhynchos*		1	0	S5	Not Listed
American Goldfinch	*Carduelis tristis*		2	0	SF	Not Listed
Black-and-White Warbler	*Mniotilta varia*		2	0	S5B	Not Listed
Black-Capped Chickadee	*Poecile atricapilla*		0	5	S5	Not Listed
Blue Jay	*Cyanocitta cristata*		0	1	S5	Not Listed
Canada Warbler	*Wilsonia canadensis*		1	0	S5B	Very High
Common Grackle	*Quiscalus quiscula*	Confirmed	1	0	S5B	Not Listed
Common Raven	*Corvus corax*		1	0	S5	Not Listed
Common Yellowthroat	*Geothlypis trichas*		5	0	S5B	Not Listed
Dark-Eyed Junco	*Junco hyemalis*	Confirmed	2	4	S5	Not Listed
Hermit Thrush	*Catharus guttatus*		0	2	S5B	Not Listed
Magnolia Warbler	*Dendroica magnolia*		1	0	S5B	Not Listed
Merlin	*Falco columbarius*		0		S3S4B	Not Listed
Ovenbird	*Seiurus aurocapillus*	Confirmed	0	4	S5B	Not Listed
Purple Finch	*Carpodacus purpureus*		0	1	SB5	Very High
Red-eyed Vireo	*Vireo olivaceus*		0	6	S5B	Not Listed
Ruby-Crowned Kinglet	*Regulus calendula*		0	2	S5B	Not Listed
Ruffed Grouse	*Bonasa umbellus*		0	1	S5	Moderate-Watch List
Song Sparrow	*Melospiza melodia*	Probable	3	0	S5B	Not Listed
Swainson's Thrush	*Catharus ustulatus*		0	1	S5B	Not Listed
Swamp sparrow	*Melospiza georgiana*		6	0	S5B	Not Listed
White-Throated Sparrow	*Zonotrichia albicollis*	Probable	5	6	S5BSZN	Not Listed
Yellow Warbler	*Dendroica petechia*		2	0	S5B	Not Listed
Yellow-Rumped Warbler	*Dendroica coronata*	Probable	0	2	S5B	Not Listed
American Robin	*Turdus migratorius*		0	1	S5B	Not Listed
Downy Woodpecker	*Picoides pubescens*		0	1	S5	Not Listed
Cedar Waxwing	*Bombycilla cedrorum*		0	1	S5B	Not Listed

No COSEWIC listed species were encountered in or near the study area. One species of provincial concern, Common Loon, has been recorded in the area but was not found in the study area. This species is “Yellow” listed by NSDNR indicating that it is sensitive to human activities or natural events. Common Loons typically nest on the shores of lakes. This species has been observed on nearby Grand Lake and probably nests there. No suitable nesting habitat is present in or immediately adjacent to the study area. Construction and operation of the store is unlikely to adversely affect this species.

Of the species listed in the atlas, only the American Woodcock and American Black Duck might be expected to nest in the study area. Great Blue Herons, American Black Ducks, and Ring-Necked Ducks require significant bodies of water, which are not present on the project site. The habitat is also not suitable for either Northern Mockingbirds or European Starlings.

No rare or uncommon bird species were observed on the project site, nor have they been listed as breeding there in the Atlas. One bird species encountered on the site, the Canada Warbler, is a species that is on a COSEWIC watch list, as its population is currently in a non-cyclic decline. This species is considered to be secure in Nova Scotia by NSDNR (2004).

Mammals

Information regarding the presence of rare mammals and sensitive mammal habitat within the study area was derived from field surveys and a review of data compiled by NSDNR. A review of the records for the Nova Scotia Museum and the ACCDC revealed the presence of two rare mammal species in the immediate vicinity of the study area (*i.e.*, within the 100 km radius). These were the Lynx (*Lynx canadensis*), and the Gaspé shrew (*Sorex gaspensis*).

The field survey was conducted concurrently with the vegetation survey of June 16, 2005. The field survey provides a good indication of the presence of large mammal species in the study area. Obtaining site specific knowledge of the distribution of small mammals in the study area is limited by their secretive nature and the undesirable requirement to conduct intensive small mammal trapping programs to determine their presence in the area. Fortunately, many small rare mammals, including the Gaspe shrew, have very specific habitat requirements, which can be used to predict areas where they are likely to be found. The Gaspe Shrew prefers rock outcrops and talus slopes in highlands where there are steep slopes. No such areas are present in the Project area.

In Nova Scotia, Lynx are found only in two areas of the Cape Breton highlands. As the project site is not situated within the Cape Breton highlands, lynx are unlikely to be present on the site.

The mammal species recorded in the study area are generally typical of woodland habitats, and are widespread and common in Nova Scotia. Species recorded during the field survey included white-tailed deer (*Odocoileus virginianus*), varying hare (*Lepus americanus*), raccoon (*Procyon lotor*), red squirrel (*Tamiascurius hudsonicus*), and meadow vole (*Microtus pennsylvannicus*). There was no evidence that moose were present in the study area. The nature of the general habitat in the Project area offers little in the way of important core habitat for large mammals or for deer wintering.

Herpetiles

Information regarding amphibians and reptiles and their habitat within the study area was derived from a review of existing literature, as well as the June 16, 2005 field survey. The number of amphibian species recorded in the proposed Project site and adjacent areas was low.

Amphibian species noted included northern spring peeper (*Pseudacris crucifer*), red-back salamander (*Plethodon cinereus*), and wood frog (*Rana sylvanica*). Four-toed salamanders were not observed during the survey. The breeding habitat on site is poor to marginal at best and only slightly better across the road. Only common, widespread amphibian species were noted or possible for this site.

No reptile species were noted in the area during the survey period. Snake species that are expected to be present in this area include the Maritime garter snake (*Thamnophis sirtalis*), northern redbelly snake (*Storeria occipitomaculata),* and eastern smooth green snake (*Liochlorophis vernalis*). Northern ribbon

snake (*Thamnophis sauritis*) and Blanding's turtle (*Emydoidea blandingii*) populations in the Province are located far to the south and these species would not be expected to be present. Neither eastern painted turtle (*Chrysemys pictiventris*), nor common snapping turtle (*Chelydra serpentina*), was observed or expected to have any significant population at this site. It is unlikely that any wood turtles (*Clemmys insculpta*) (listed as vulnerable under the Nova Scotia *Endangered Species Act* and by COSEWIC) would be present in the Project area, as it is distant from any core water course and riparian habitat for this species. In any event, the proposed Project site would not represent good movement corridor habitat for wood turtles.

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

Flora and Habitat

No rare vascular plant species were encountered in the study area. One uncommon plant species, water loosestrife, was found outside of the property that will be developed but within the wetland. This species is considered to be secure in Nova Scotia. Wetland habitats are valuable and should be conserved wherever possible. The wetland habitats present in the study area are frequently encountered both in the Sydney area as well as Nova Scotia as a whole. The wetland does not provide wildlife habitat that is of greater value than most other wetlands in the area. The wetland does not provide habitat for any rare or endangered species, however, it does provide habitat for water loosestrife, an uncommon plant species and Canada Warbler, a bird species listed on CWS Maritimes priority list of landbirds (a species undergoing population declines but still relatively common). Both species are considered to be secure in Nova Scotia by NSDNR (2004).

One critical value was identified for the wetland. This relates to the ability of the wetland to provide flood control benefits. The wetland provides a small amount of surface water retention due to its limited storage capacity and the presence of dense vegetation which physically slows the flow of water through the wetland. The wetland may also play a small role in stream flow augmentation by retaining and slowly releasing water. This function is limited due to the fact that it detains little water. The wetland probably also play a role in controlling erosion and retaining sediment.

The wetland has some recreational value. The abandoned tramway that passes through the wetland is used by hikers, bicyclists, ATV riders and snowmobilers.

Construction of the proposed store will result in the loss of 3.3 ha of wetland habitat representing 45% of the total area of wetland habitat. As such, the development would have an important effect on the wetland although the wetland is not a significant or particularly sensitive wetland.

Several mitigative measures can be employed to minimize the potential effects of the project on water loosestrife and wetland habitats found outside of the foot print of the project. These include managing site drainage to ensure that construction activities do not result in significant alterations to the hydrology of the wetland such as the creation of impoundments or drainage of the wetland.

A stormwater system will also be installed to maintain the hydrological balance of surface water entering and leaving the site. This system will remove a significant portion of the total suspended solids.

To compensate for wetland disruption, the proponent agrees to carry out a mutually agreed upon wetland compensation program. Jacques Whitford, on Wal-Mart's behalf, is currently engaged in discussions with NSDNR to identify an appropriate program and means of support. Discussion of the progress on the proposed wetland compensation is presented in Section 6.0 Wetland Compensation. Wal-Mart must also

protect the remaining wetland habitat by ensuring proper sedimentation and erosion control and stormwater management practices are adhered to.

When the portion of the wetland within the footprint of the project is cleared and grubbed, the grubbings contain buried seed and other propagules such as rhizomes and roots that provide a good source of native species for revegetation of disturbed areas. If creation or restoration of wetland habitat is required as part of the wetland compensation program, these grubbings can be used to help establish vegetation in constructed or restored wetlands provided the material is used within several years and there is no need to transport it long distances.

Summary of Residual Environmental Effects Assessment

In summary, significant residual Project-related effects on rare flora are not likely to occur.

Fauna

Migratory birds, their eggs and young are protected under the Migratory Birds Convention Act. In order to avoid violating the Act, clearing will be conducted outside of the breeding season for most species of migratory birds in order to prevent the destruction of eggs and unfledged young. In Nova Scotia, most species nest between mid-April and early August, although it is acknowledged that some species breed at other times of the year (*i.e.*, White-winged Crossbills and Red Crossbills). Wal-Mart will conduct clearing activities outside of the nesting period for the majority of species (*i.e.*, outside of the early April to mid-August period) and will implement additional measures as required to ensure compliance with the Act. If the clearing schedule changes, a migratory bird mitigation strategy will be developed in consultation with Environment Canada. Compliance with the Act will ensure that Canada Warbler nestling mortality will not result from Project construction. No significant impacts on birds are likely as a result of the proposed Project.

A review of mammal records for the area compiled by ACCDC revealed the presence of two rare mammal species in the vicinity of the study area. The field survey did not find any evidence of these two species or any habitat which might possibly support them. The habitats present in the study area are commonly encountered throughout the province and are unlikely to provide habitat for rare small or large mammal species. The species recorded in the study area are generally typical of woodland habitats. The proposed construction is not anticipated to interact with or adversely affect deer wintering areas or moose habitat.

None of the species of amphibians or reptiles present or expected to be present at this site are considered to be rare or of particular concern in the Province of Nova Scotia (ACCDC 2004; NSDNR 2004) or in Canada (COSEWIC 2004). The Project area does not provide unique or particularly valuable or productive herpetile habitat. Construction on this site is not likely to have any significant adverse effects on local herpetile populations. Sedimentation and erosion control measures protect herpetile habitat in the remaining half of the wetland.

Summary of Residual Environmental Effects Assessment

In summary, assuming recommended mitigative measures are applied (i.e., clearing outside the bird breeding season) significant Project-related effects on wildlife are not likely to occur.

5.3 Socio-economic Environment

5.3.1 Existing Environment

Labour and Economy

The proposed project is located in Sydney, within the CBRM. The CBRM was formed in 1995 through an amalgamation of eight former municipalities, boards and agencies within the County of Cape Breton. The municipality has a population of 109,330 and covers an approximate area of 2,500 square kilometres (Statistics Canada, 2001). Characteristics for the whole CBRM are presented since a more refined geographic breakdown of statistics was not available. The information presented below is based on the results of 2001 census conducted by Statistics Canada (2001).

The population of CBRM registered a decline of approximately 8% between 1996 and 2001. The median age of the population was 41.3 years with 83% of the population being over the age of 15 years. The median household income was $ 32,623 compared to $ 39,908 for Nova Scotia. The unemployment rate was 19.4% which is substantially higher than the overall Nova Scotia rate of 10.9%. There were a total of 35,825 persons employed in CBRM. Some leading sources of employment include service (45%), retail (18%) and government (8%). Other employment sources include manufacturing, construction, transportation and natural resources extraction.

Transportation

A preliminary survey of local roads was conducted to determine access and transportation capacity in the project site area. Spar Road (Figure 5) is a recently constructed two-lane roadway that connects Highway 125 to Sysco Lands to the northwest of the project site (R. McCready, pers. comm., 2005). Spar Road is the main road that will be used to access the project site. The posted speed limit on Spar Road is 50 km/h with little traffic currently utilizing this roadway. Currently, a majority of the traffic is likely associated with the waste incinerator.

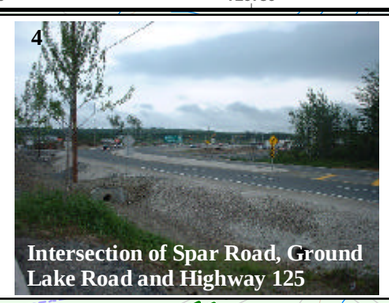
There is a newly constructed two-lane road located south of the study site bordering the Home Depot. This road runs in a northwest direction and contains a set of traffic lights at the intersection with Spar Road. Traffic entering and/or exiting the Home Depot can use this road in addition to entry/exit off Spar Road. Grand Lake Road is a four-lane roadway that leads to Glace Bay. Highway 125 is a major arterial route leading to Louisburg National Historic Site. In addition, Mayflower Mall located nearby to the east of the intersection of Grand Lake and Highway 125 would also be expected to attract considerable traffic.

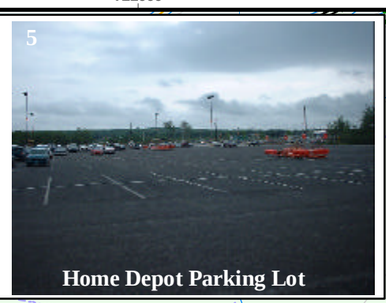
Land Use

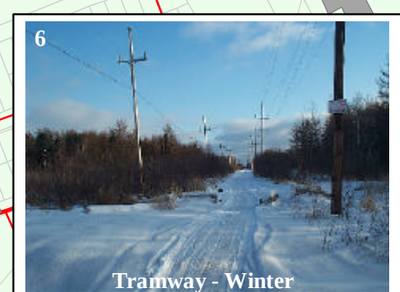
A land use survey of the project area and surroundings was conducted by visual reconnaissance along the roadways, through consultations and visiting a number of information sources to determine general land use in the study area (Figure 5). The project study site is located along Spar Road approximately 500 metres northwest from the intersection of Highway 125 and Grand Lake Road.

Spar Road Walmart
Sydney, Nova Scotia

Figure 5
Landuse







719500 719750 720000 720250 720500 720750 721000 721250

5115250 5115000 5114750 5114500 5114250

1 2 3 4 5 6 7

Abandoned Tramway

Spar Road

Future Expansion

Underground Pipeli

New Road

Home Depot

Storage Area

North West Brook

Gate

Chimney

St. Augustine Cemetery

Canadian Tire

Grand Lake Road

Storage Area

Mayflower Mall

LEGEND

Roads
- Major Road
- Minor Road
- Unpaved Road
- Rail

Topography
- Contour
- Watercourse
- Powerlines
- Abandoned Tramway
- Waterbody
- Land
- Property Boundary
- Parking Area
- Municipal Ash Industrial Disposal (MAID) Site
- Decommissioned Landfill

Future Development
- Footprint
- Subject Property Boundary

Future Road
- Centreline
- Road

N

0 50 100 150 200

Meters

Map Parameters
Projection: UTM-NAD83-ZONE20
Scale - 1 : 5,500
Project Number: SS52938
Date: July 14, 2005

Jacques Whitford

Commercial, Industrial and Residential Use

CBRM officials (R. McCready and B. Spicer, pers. comm., 2005) confirmed that the proposed project area is zoned for industrial and commercial use. A number of commercial facilities are located adjacent to the project area including a Home Depot, built in 2004, and a Canadian Tire, which is currently under construction (Figure 5). The Mayflower Mall, a large commercial facility housing a variety of businesses, including an existing Wal-Mart, is located within 1 km south of the project area along south side of Grand Lake Road (Figure 5). The project will entail relocation of this existing Wal-Mart to the project area approximately 1 km to the north. Approximately 15 small businesses are located along north side of Grand Lake Road to the east of the intersection with Highway 125. The future Canadian Tire site is located to the west of the intersection, along north side of Grand Lake Road. There is also a church, St. Augustine, and cemetery adjacent to the Canadian Tire. This cemetery is currently used by the members of the community (Anon., pers. comm., 2005).

The decommissioned CBRM landfill is located immediately north of the project site and the soon to be decommissioned CBRM waste incinerator is located across SPAR Road from the site. A railway track is located north of the project site. Spar Road intersects these tracks approximately 500 metres northwest of the project site. Communications with the CBRM officials (R.McCready and B. Spicer, pers. comm., 2005) confirmed that the railway track has not been in use for many years and is abandoned.

There are no residential land uses in the immediate vicinity of the project area. However, there are several residential properties along south side of Grand Lake Road west of the intersection with Highway 125. These properties are approximately 1 km from the project area.

Recreational Use

The project area does not fall under officially designated recreation land use but there are some recreational activities associated with power line right of way and old railway track to the north of the study area (B. Spicer and R. McCready, pers. comm., 2005, Figure 5). A visual reconnaissance of the north, south and west sides of the study area perimeter did not show presence of recreation activity or trailheads. The east side of the perimeter was not accessible due to dense vegetation. Communications with regional representative of ATV Association of Nova Scotia (L. House, pers. comm., 2005) revealed that ATV recreation occurs on the old railway track and, to a lesser degree, on the abandoned tramway right of way. In addition the old rail way line has been identified as a candidate for trail development program using abandoned rail lines. These trails are used as multi-recreational paths for hiking, ATV, and biking. The project area is not used for hunting or fishing activities (C. Musial, pers. comm., 2005).

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

Construction

Construction activities can be expected to provide increased employment opportunities. These opportunities are key in a region which continues to have high unemployment rates. Thus, no mitigation is likely required and positive effect can be expected on employment levels.

The construction phase of the Project could result in impacts such as traffic disruption and delays as a result of traffic associated with construction (*i.e.*, heavy machinery, trucks) utilizing the Spar Road. In particular, this construction traffic has the potential to interact with existing commercial traffic associated with nearby Home Depot and industrial traffic associated with CBRM incinerator. Some mitigation

measures adopted to ensure the smooth flow of traffic include installation of traffic lights at the intersection of Spar Road and the road which runs between the south side of the proposed project area and Home Depot. This will help ensure that traffic negotiating a left hand turn on to Spar Road from Home Depot can do so in a safer manner. Standard traffic management procedures will also be applied (*e.g.*, signage, flag persons) where appropriate to reduce inconvenience to motorists. Spar Road itself is a newly constructed road that has relatively low traffic volumes currently. Impacts such as noise and dust will be managed and mitigated through standard construction practices. With the implementation of mitigation measures and existing traffic conditions, traffic disruptions are not expected to cause a significant adverse effect.

Although there are some recreational uses of the land surrounding the project area, the construction phase of the Project likely will not have adverse environmental effect. The local representative of ATV association expressed some concern about access to recreation trails (*i.e.*, old tramway right of way, old railway line) in the area. However, since the proposed Project area is not expected to disturb these trails, no adverse impacts on recreational land use are expected.

Although the Project area does not support fishing and hunting activity, the New Waterford Fish and Game Association has expressed concern that siltation of nearby watercourse, Northwest Brook, may be an issue during construction in terms of downstream impact. The watercourse is located approximately 150 m east of the Project property. As indicated in the hydrology study (Section 5.1), the current and post development overland flow direction on site is west, away from Northwest Brook and toward the ditch on Spar Road and ultimately drains to Sydney Harbour. Furthermore, sediment and erosion control measures, as noted in Table 4.1, will be employed during construction and operation activities to minimize potential for siltation and erosion. In summary, sediment and erosion controls and stormwater management systems, as well as natural drainage patterns (Figures 2 and 3) serve to protect this watercourse from potential effects. Therefore, significant adverse effects on recreational fishing are not expected.

Operations and Maintenance

Although the Project is a relocation of existing Wal-Mart, there will be an increase in the number of employees at the new location from 200 employees to approximately 250 to 300 employees (P. Laruccia, pers. comm., 2005). Furthermore, increased employment associated with construction activities is also expected. The Project is expected to have positive effect on the labour and economy by providing additional employment opportunities.

Traffic management in the area has already been improved by the construction of Spar Road and the installation of traffic lights at key intersections. The Project configuration will ensure safe access from Spar Road to the store.

The Project is not expected to change the existing land access of the area since it is highly impacted. The impact on residential land use is not significant as there is little interaction with the Project. Site reconnaissance revealed that nearest residential land use is approximately 1 km from the Project site. There is some recreational use of the surrounding land which has the potential to interact with the project. In particular, the presence of a tramway right of way and an old railway track north of the Project site has the potential to be impacted by the Project in terms of access and potential numbers of users. The project is not expected to adversely affect existing land use. Recreation may be improved as access to key recreational areas such as the abandoned tramway right-of-way and railway beds are improved. There may be a greater number of users in the area. No mitigation is required.

Summary of Residual Environmental Effects Assessment

This project is not expected to have significant residual adverse environmental effects on land use, transportation and labour and economy. This project is sited on commercially zoned land use and is compatible with surrounding land uses. Some issues raised with respect to recreation land use can be addressed through the mitigation measures outlined. In addition, there are a number of positive effects expected as a result of the project. These include positive effects on recreation access as well as positive influences on labour and economy through new and continued employment opportunities.

5.4 Archaeology and Heritage Resources

5.4.1 Description of Existing Environment

An historical background study was conducted using resources in Halifax including the Nova Scotia Museum, the Public Archives of Nova Scotia, and the Nova Scotia Department of Natural Resources. In Sydney, the Beaton Institute and the Cape Breton Centre for Heritage & Science were consulted. The main documents used were historic maps and plans.

Sydney was founded in 1785 with the influx of United Empire Loyalists who were fleeing the Revolutionary War. While it is not necessary to describe a detailed history of Sydney, it would be useful to briefly examine settlement patterns and land-use as they relate to the study area.

The Town of Sydney was settled along the western side of the peninsula formed by Sydney Harbour and what is now Muggah Creek (Dawson, 1988: 127). As the town grew, settlement expanded from the peninsula to the mainland, particularly to the south and east (Church, 1877). This pattern is very evident at the beginning of the twentieth century and the expansion appears to be particularly heavy to the south of Prince Street (Almon, 1900). This is also the period where we begin to see the industrialization of the east bank of Muggah Creek, with the creation of what was to become Sydney Steel.

The historical background study did show, however, that this settlement did not reach out as far as the study area until later in the twentieth century and no historic maps were found showing any settlement features within or near the study area.

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

Archaeological Potential

Historic

The historic background research found no evidence of historic settlement in or near the study area in the eighteenth or nineteenth century. While settlement did radiate from peninsular Sydney over time, the majority of this settlement was south of Prince Street and well to the southwest of the study area. The conclusion from the background research is that the study area has a low potential for containing historic or archaeological resources.

First Nations (Mi'kmaq)

The potential for a site to contain First Nations archaeological resources is usually determined by examining the physical features of the area to see what resources may have attracted settlement. These most often have to do with food and/or transportation, which in Nova Scotia means proximity to

water. Rivers and lakes provide transportation routes for seasonal migration following food sources, typically to the coast in the summer and the interior in the winter. First Nations archaeological potential increases with the quality of the water body and the potential for exploitable resources to maintain a population.

The Sydney Wal-Mart study area is located southwest of Grand Lake but there is no major river that travels from that lake past the study area. In fact, there are several identified wetlands within the study area, which would be a negative factor for Indigenous settlement in the relatively recent past. The conclusion of this study is that the study area has a low potential for containing First Nations archaeological resources.

Summary of Residual Effects Assessment

Both the historical background research and the examination of First Nations archaeological potential concluded that there was it was unlikely there were any archaeological resources located within the study area. In the unlikely event that archaeological remains are encountered during site excavation, all construction activities in that area will halt and the Nova Scotia Museum will be immediately notified. No significant adverse effects on Archaeological or Heritage Resources are considered likely.

6.0 WETLAND COMPENSATION PROGRAM

Wetland compensation discussions were initiated with the environmental assessment branch of NSEL and provincial and regional NSDNR representatives to identify potential candidate projects in the region that may be suitable as compensation for the Sydney Wal-Mart project. Two potential candidate projects were identified through the regional DNR office: one at Power Lake, a predominantly Crown owned property which is located within the watershed, approximately 3 km south of the Wal-Mart Project; and one at Schooner Pond in Donkin, approximately 25 km east-north-east of Sydney. A preliminary review of the two areas was conducted by a JW ecologist to provide feed back on the proposed projects.

The concern identified at Power Lake related to water levels and the uncontrolled use of recreational vehicles in and around the lake resulting in the loss of lacustrine habitat. The water levels in the lake had been lowered by infrastructure such as piping and ditching installed some years back to divert water from the lake to Sydney Steel. A review of historic air photos seem to indicate that that since that time, water levels in the lake have apparently been significantly lowered and that the candidate project could involve installation of a water control structure and/or removal of pipes. Restoration of the lake to its former levels may reduce traffic and restore lacustrine zones. Furthermore, interpretive signage installation and designation of recreational areas around the lake could be considered to promote appropriate use and local stewardship of the area.

The Schooner Pond wetland, approximately 30 ha in size, has a high profile locally in the Donkin area and is known as a a migratory bird 'hot spot'. It is located within a barrier beach that experiences dramatic shifts in water levels that can affect nesting. The pond experiences periods of dryness (draining) and periodic salt water intrusion (blow outs) from storms. A concrete structure installed by the Port Morien Fish & Game Association provides fish passage to and from the pond. There was evidence of clean out and fortification around the structure, indicating that storms may produce wash-outs introducing sediment loads into the pond and covering the structure. It was apparent that when this happens, seawater swamps the road, and enters the wetland. Species noted at the site by the ecologist and noted by residents included peregrine falcons, eagles, seals black ducks and other water fowl. The compensation project proposed for this wetland would include building up the road to provide an additional buffer from storm surges preventing sediment deposition without impacting the beach or the wetland, replacement of the water control/fish ladder structure currently in place with a more permanent structure and a signage program indicating species inhabiting the area and promoting stewardship of the beach and wetland.

A decision on the specific compensation program to be undertaken will be made following further evaluation of the options and further discussion with NSEL and NSDNR.

7.0 SUMMARY OF EFFECTS OF THE PROJECT ON THE ENVIRONMENT

Activities associated with this proposed Project will be conducted in accordance with the terms and conditions of the Environmental Assessment Approval and the Division VI Approval for the facility. Effects of the Project on the environment include the partial infilling of a wetland and a loss of terrestrial habitat. Field surveys indicate that this area does not include unique habitat or rare or sensitive species and a wetland compensation program will be undertaken.

Assuming the mitigative measures specified in this report are implemented, and the Project is operated according to municipal, provincial, and federal legislation, guidelines and approvals, no significant adverse residual environmental or socio-economic effects are likely.

Positive effects associated with the Project include land use consistent with regional zoning and increased employment.

8.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The definition of an environmental effect often includes any change to the project that may be caused by the environment. Potential effects of the environment on the Project, in this instance, are predominantly related to extreme weather events.

On a national basis, Canada shows a warming and cooling pattern with a higher overall warming trend of approximately 1.1 ºC since 1895. The Atlantic Region, however, shows a warming trend from 1895 which peaked in the mid 1950s, followed by a cooling trend in the 1990s. The overall warming trend of 0.4 ºC in Atlantic Canada since 1895 is not statistically significant. With respect to precipitation, the Atlantic Region shows an overall increasing trend in precipitation since 1948, with an increasing trend in the number of daily precipitation events above 20 mm and a slightly increasing trend in the number of daily snowfall events above 15 cm (Lewis 1997). These changes would not affect the project.

The store, automotive centre and parking areas will be designed and constructed according to standard design codes and guidelines (*e.g.*, stormwater management) to accommodate extreme precipitation conditions. The development will reduce peak flows to approximately predevelopment conditions.

There is potential for heavy rainfall to affect the Project during the construction phase. Grading and site preparation activities will be minimized during these periods. This will be a temporary effect and is not considered significant.

In summary, climate and meteorological conditions, including climate change, are not anticipated to significantly effect the operation of the Project over its proposed lifetime.

9.0 OTHER APPROVALS REQUIRED

As noted in Section 3.2, any project, enterprise, activity, project, structure or work which disrupts a total of 2 ha or more of any wetland must be registered as a Class I Undertaking under the provincial *Environment Act* Environmental Assessment Regulations.

Other provincial approvals required to operate the facility include an Approval pursuant to Division VI of the Activities Designation Regulations for the infilling of the wetland. As the wetland is greater than 2 ha (it is 7.7 ha.) in area, the Nova Scotia Department of Environment Wetlands Directive requires a formal wetland evaluation using the North American Wetlands Conservation Council (Canada) Wetland Guide.

Compliance with federal, provincial and municipal regulations and by laws referenced in Section 3.2 is also required.

10.0 FUNDING

This Project will be 100% privately funded.

11.0 REFERENCES

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Laruccia, P. Planning and Development Coordinator, Walmart Canada. July 13, 2005

McCready, R. Planner, Cape Breton Regional Municipality. June 30, 2005.

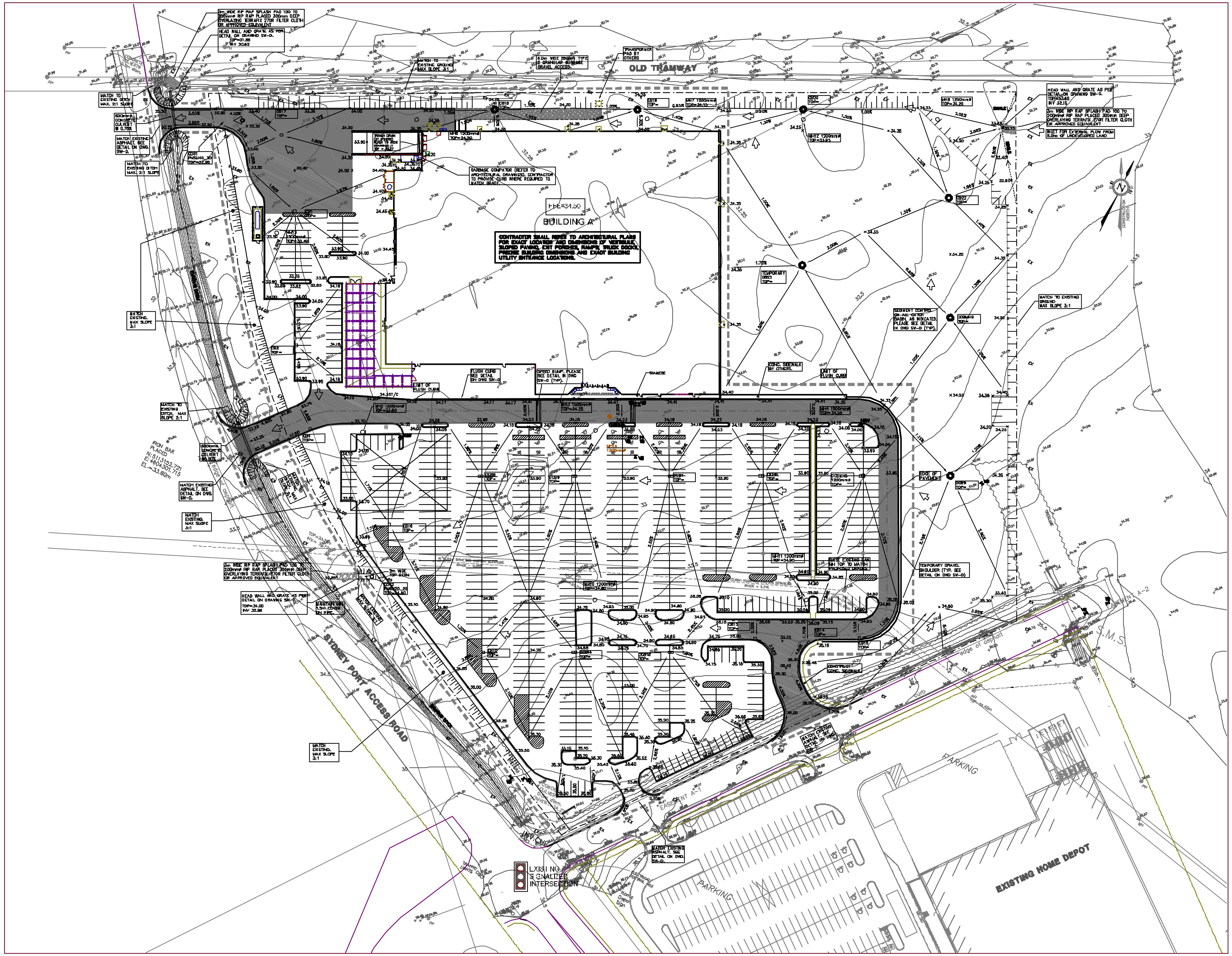
McNeil, Tom. Managing Supervisor Cape Breton Regional Municipality Incinerator Site. July 22, 2005.

Musial, C. New Waterford Fish and Game Association. July 5, 2005.

Spicer, B. Development Officer, Cape Breton Regional Municipality. June 30, 2005.

APPENDIX A

Site Plan, Stormwater Management System Information



LEGAL & TOPOGRAPHY

SURVEYOR:
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BENCHMARK

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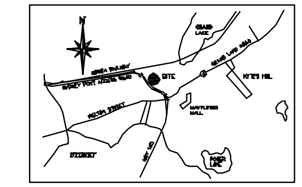
N : 5112783.709
E : 4604098.675
EL. = 40.675m



KEY PLAN

GENERAL NOTES

1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
2. ALL WORKS AND MATERIALS TO CONFORM WITH CURRENT NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT, CAPE BRETON REGIONAL MUNICIPALITY (CBRM), NOVA SCOTIA PROVINCIAL STANDARDS AND SPECIFICATIONS, THE ENVIRONMENTAL PROTECTION ACT AND THE WATER RESOURCES ACT.
3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
4. ALL WORKS TO BE IN COMPLIANCE WITH THE STANDARD SPECIFICATION FOR MUNICIPAL SERVICES (NSSSMS) AS PUBLISHED BY "THE NOVA SCOTIA ROAD BUILDERS ASSOCIATION–NOVA SCOTIA CONSULTING ENGINEERS ASSOC. JOINT COMMITTEE ON CONTRACT DOCUMENTS UNLESS DETAILED OR SPECIFIED OTHERWISE.
5. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE INFORMATION IS SHOWN FOR GENERAL INFORMATION ONLY AND THE ACCURACY OR COMPLETION OF THE PROVIDED INFORMATION HAS NOT BEEN CONFIRMED BY COUNTERPOINT ENGINEERING. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTOR'S EXPENSE.
6. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS PLANS. ANY DISCREPANCIES SHALL BE CLARIFIED PRIOR TO CONSTRUCTION. INFORMATION RELATED TO DIMENSIONS FOR PRIVATE ROAD, PARKING, CURBING, BUILDING LOCATION AND SETBACKS SHALL BE TAKEN FROM THE SITEPLAN PREPARED BY THE SITE ARCHITECT.
7. ALL DIMENSIONS AND ELEVATIONS TO BE VERIFIED PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES FOUND PRIOR TO OR DURING CONSTRUCTION SHALL BE CLARIFIED WITH THE ENGINEER.
8. ALL REQUIRED EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER PRIOR TO COMMENCEMENT OF WORK.
9. INSPECTIONS:
   ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING.
10. CONTRACTOR TO INSTALL SEDIMENT CONTROL FENCE (AS PER DETAIL THIS DRAWING) AROUND PERIMETER OF THE SITE ON PROPERTY LINE AND SHALL MAINTAIN FENCING FOR THE DURATION OF CONTRACT.
12. CONTRACTOR TO REFER TO GEOTECHNICAL REPORT FOR ALL PAVEMENT STRUCTURE AND COMPACTION REQUIREMENTS.

SITE GRADING NOTES

1. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER, WITH SOD ON MIN. 100mm TOPSOIL. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.
2. ALL BARRIER CURB WITHIN THE SITE TO BE CONSTRUCTED AS PER DETAIL NO. D2630-D3 OF THE NSSSMS. HEIGHT OF CURB TO BE 0.15m UNLESS OTHERWISE SHOWN IN SITE GRADING PLAN.
3. ALL BARRIER CURBS AND SIDEWALKS AS SHOWN ON THIS DRAWING ARE TO BE PRICED IN THE SITEWORKS PORTION OF THE CONTRACT. CONCRETE PADS, SIDEWALKS, AND CONCRETE APRONS ABUTTING THE BUILDING ARE TO BE PRICED IN THE BUILDING PORTION OF THE CONTRACT.
4. REFER TO ARCHITECTURAL SITE PLAN FOR ALL DIMENSIONS AND SITE DETAILS INCLUDING RAMPS, WALKWAYS, SIDEWALKS, CURBS, CONCRETE PADS AND ISLANDS.
5. EMBANKMENTS TO BE SLOPED AT MAX. 3:1 UNLESS OTHERWISE SPECIFIED.
6. ALL IMPORT MATERIALS TO BE "BORROW" MATERIAL AS PER SECTION 02200 IN THE NSSSMS OR APPROVED EQUAL PLACED IN 300mm LIFTS AND COMPACTED TO MINIMUM 98% SPMDD IN THE PARKING LOT AREAS. RECYCLED, RECLAIMED OR PROCESSED GRANULAR MATERIAL IS CONSIDERED AN ALTERNATIVE AND SHALL NOT BE USED WITHOUT THE APPROVAL OF THE ENGINEER AND OWNER.
7. ALL IMPORT FILL MATERIAL MUST BE APPROVED BY THE OWNER'S ENGINEERS PRIOR TO PLACEMENT ON THE SITE.
8. METHOD OF TERMINATION FOR CONCRETE CURB AND GUTTER AS PER SECTION 02630.1 OF THE NSSSMS.
9. PERFORATED SUB DRAINS ARE TO BE CONNECTED TO INTERNAL CATCHBASINS AND CATCHBASINS MANHOLES IN A QUADRANT FORMATION AND SHOULD EXTEND AT LEAST 3.0m IN ALL DIRECTIONS EXCEPT IN THE BOULEVARD AREAS. CONTRACTOR IS TO ENSURE POSITIVE DRAINAGE IN THE SUBDRAINS.
10. ALL PERFORATED SUBDRAINS SHALL BE PLACED AT LEAST 300mm BELOW THE BOTTOM OF THE UNDERSIDE OF PARKING LOT SUB-BASE AND CONNECTED TO THE CATCHBASINS/MANHOLES TO PROVIDE POSITIVE DRAINAGE. SUBDRAIN PIPE TO BE 100mm PERFORATED, CORRUGATED, POLYETHYLENE ENCASED IN FILTER FABRIC "SOCK" BACKFILL WITH 20mm WELL GRADED FREE DRAINING GRANULAR MATERIAL.
11. REFER TO LANDSCAPING PLANS FOR ISLAND DETAILS AND THE LIMITS OF LANDSCAPED AREA.
12. THE TOPS OF ANY CURBS BORDERING THE DRIVEWAYS WITHIN THE MUNICIPAL BOULEVARD WILL BE FLUSH WITH THE MUNICIPAL ROAD CURB AND SIDEWALK.
13. ALL EXCESS EXCAVATED MATERIAL WILL BE REMOVED FROM THE SITE.
14. REFER TO LANDSCAPE DRAWINGS FOR LOCATION AND TYPE OF ALL HARD LANSCAPE SURFACE INCLUDING CONCRETE SIDEWALKS, PAVING STONES, COLORED CONCRETE ETC.
15. COMPACTION OF ALL MATERIALS AS PER GEOTECHNICAL RECOMMENDATIONS.

SITE PAVING NOTES

1. ALL GRANULAR BASE MATERIALS SHALL BE COMPACTED TO 100% STANDARD PROCTOR MAX. DRY DENSITY. EACH COURSE OF ASPHALT MATERIAL SHALL BE COMPACTED TO 97% MAX. BULK DENSITY.
2. INSPECTION OF SUBGRADE REQUIRED BY GEOTECHNICAL CONSULTANT PRIOR TO PLACEMENT OF GRANULAR MATERIALS. THE SITE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF INSPECTIONS WITH GEOTECHNICAL CONSULTANT.
3. LIGHT DUTY PAVEMENT – TO BE CONSTRUCTED AS FOLLOWS:
   75mm TYPE C ASPHALTIC CONCRETE
   150mm TYPE 1 GRANULAR BASE COURSE
   150mm TYPE 2 GRANULAR SUB-BASE COURSE
4. HEAVY DUTY PAVEMENT – TO BE CONSTRUCTED AS FOLLOWS:
   40mm TYPE C ASPHALTIC CONCRETE
   50mm TYPE B –HF ASPHALTIC CONCRETE
   150mm TYPE 1 GRANULAR BASE COURSE
   250mm TYPE 2 GRANULAR SUBBASE COURSE
5. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON DRAWING SW-D.
6. ALL PAVEMENT MARKING, LINE PAINTING, DIRECTIONAL LINES/ARROWS ETC. SHALL BE PLACED IN ACCORDANCE WITH THE ARCHITECTURAL SITE PLAN. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT IN ACCORDANCE WITH PROVINCE OF NOVA SCOTIA DEPT OF TRANSPORTATION AND PUBLIC WORKS STANDARD SPECIFICATIONS 2005.

LEGEND

- ×100.00 PROPOSED ELEVATION
- ×100.00TC TOP OF CURB ELEVATION
- ×100.00EX. EXISTING ELEVATION
- ×100.00 PROPOSED FUTURE GRADE
- OVERLAND FLOW ROUTE
- LIGHT STANDARD (BY OTHERS)
- SANITARY MANHOLE
- STORM MANHOLE
- VALVE & BOX
- OGS UNIT
- FUTURE PHASE TEMPORARY CB SEDIMENT CONTROL (SEE DETAIL ON DWG SW-D)
- HEAVY DUTY ASPHALT
- LIMIT OF CONSTRUCTION
- PROPERTY BOUNDARY
- CONCRETE ISLAND
- HYDRANT AND VALVE
- PAINTED ISLAND
- CATCH BASIN MANHOLE
- CATCH BASIN

No.	REVISIONS/ISSUED	DATE	BY	CITY
2	ISSUED FOR BUILDING PERMIT SUBMISSION	APR 11/05	RM	
1	ISSUED FOR TENDER	APR 11/05	RM	

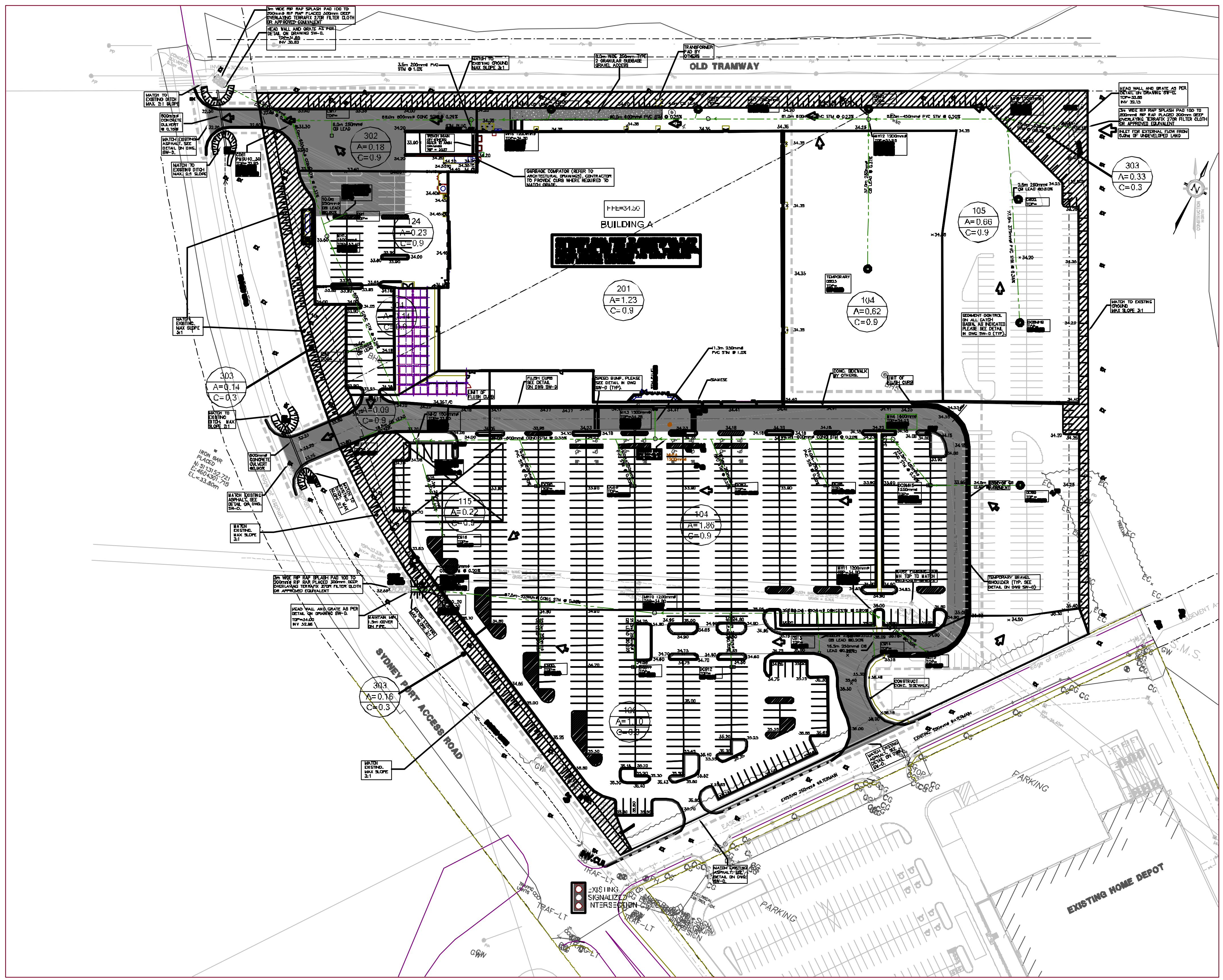
counterpoint ENGINEERING

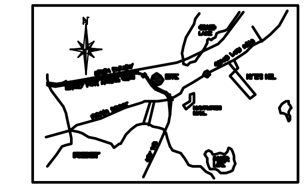
APPLICANT:
WAL-MART CANADA CORP.
1940 ARGENTIA ROAD
MISSISSAUGA, ONTARIO L5N 1P9

SITE LOCATION:
SYDNEY COMMERCIAL DEVELOPMENT
BUILDING "A"
STORE No. 3101
SYDNEY, NOVA SCOTIA

SITE GRADING PLAN

PROJECT No. 03152
SCALE: 1:500
DRAWING No. SW-G





KEY PLAN

LEGEND

- DOUBLE CATCH BASIN
- CATCH BASIN
- STORM SEWER
- LIMIT OF CONSTRUCTION
- BOUNDARY
- EX. STORM SEWER
- PLUG
- STORM MANHOLE
- CDS UNIT
- CATCHMENT NUMBER
- CATCHMENT AREA SIZE (ha)
- RUNOFF COEFFICIENT
- DRAINAGE BOUNDARY

No.	REVISIONS/ISSUED	DATE	BY	CITY
1	ISSUED FOR BUILDING PERMIT SUBMISSION	APR 11/05	RM	

counterpoint ENGINEERING

APPLICANT:
WAL-MART CANADA CORP.
1940 ARGENTIA ROAD
MISSISSAUGA, ONTARIO L5N 1P9

SITE LOCATION:
SYDNEY COMMERCIAL DEVELOPMENT
BUILDING A (31D1)
SYDNEY, NOVA SCOTIA
FOR: WAL-MART CANADA CORP.

SITE DRAINAGE PLAN

03152

SCALE:

SW-D1

LEGAL & TOPOGRAPHY

SURVEYOR:
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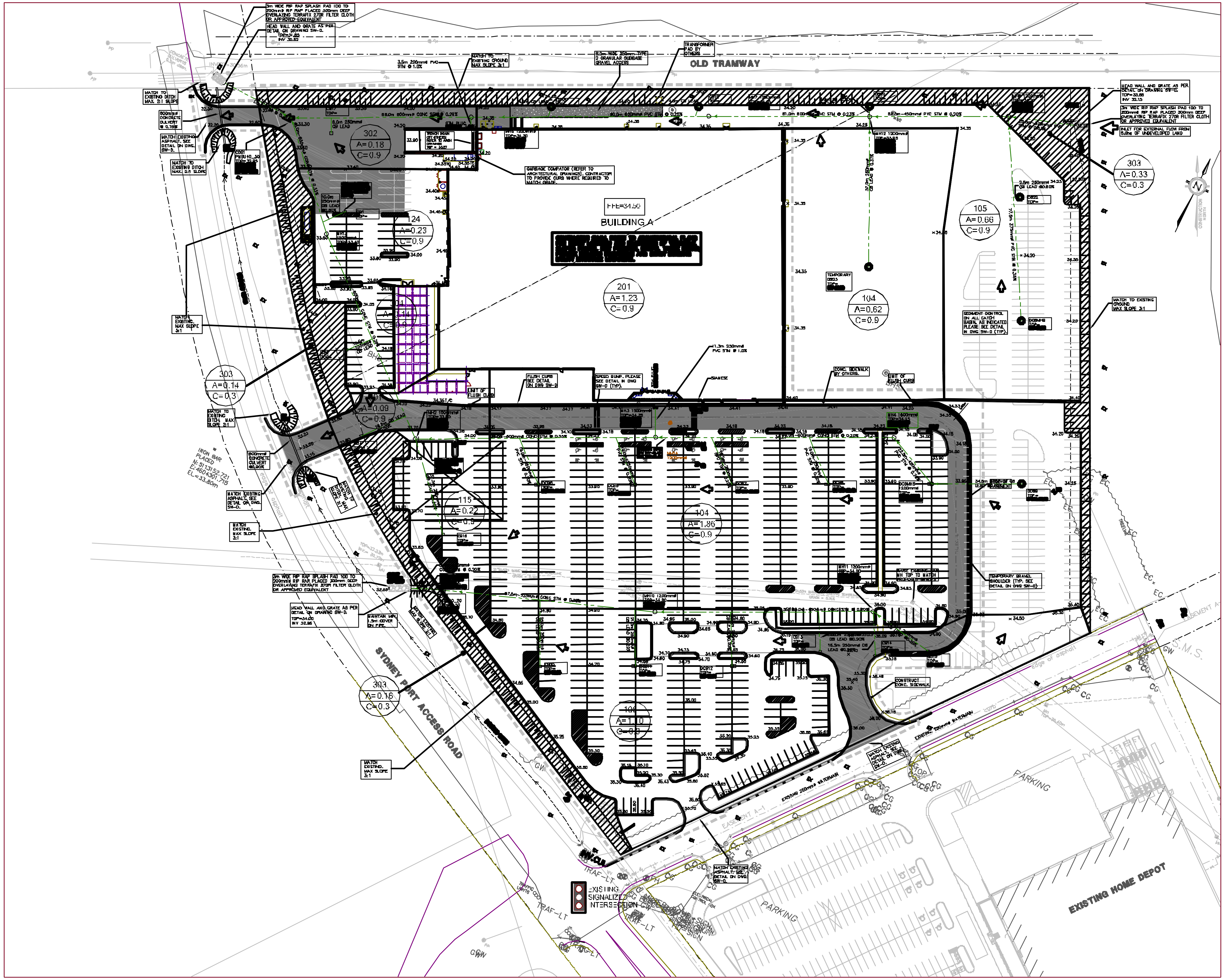

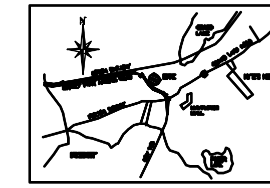

KEY PLAN

DOUBLE CATCH BASIN
CATCH BASIN
STORM SEWER
LIMIT OF CONSTRUCTION
BOUNDARY
EX. STORM SEWER
PLUG
STORM MANHOLE
CDS UNIT
CATCHMENT NUMBER
CATCHMENT AREA SIZE (ha)
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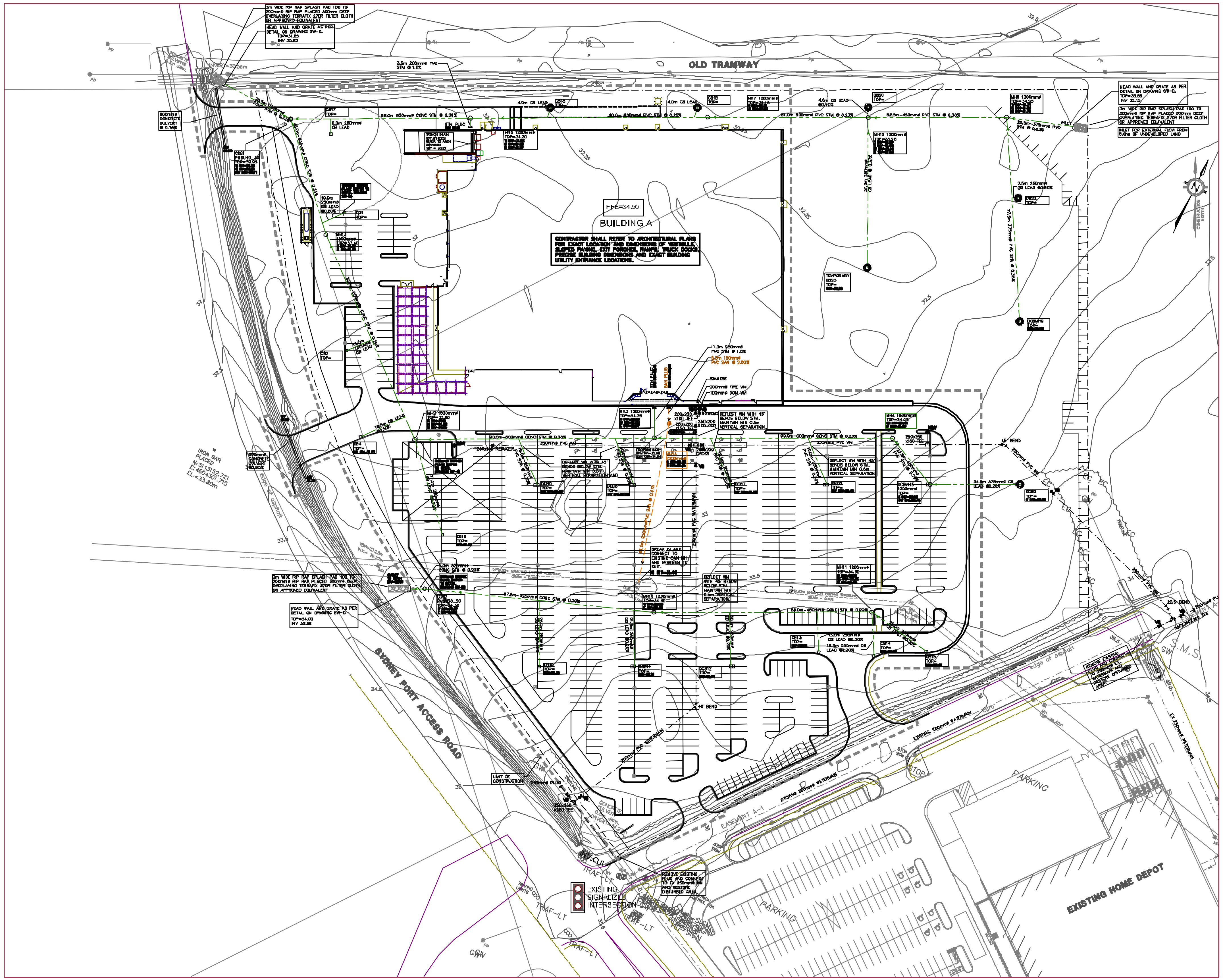

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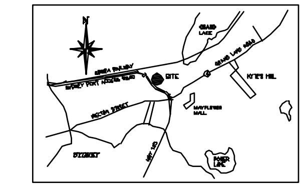

KEY PLAN

GENERAL NOTES

1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
2. ALL WORK MATERIALS AND CONSTRUCTION METHODS TO CONFORM WITH THE LATEST STANDARDS, SPECIFICATIONS, POLICIES, REGULATIONS, GUIDELINES AND LAWS OF THE CAPE BRETON REGIONAL MUNICIPALITY (CBRM), NOVA SCOTIA BUILDING CODE (NSBC), NOVA SCOTIA DEPARTMENT OF THE ENVIRONMENT, NOVA SCOTIA PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS, THE ENVIRONMENTAL PROTECTION ACT AND THE WATER RESOURCES ACT. LOCAL UTILITY STANDARDS AND DEPARTMENT OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.
3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
4. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE INFORMATION IS SHOWN FOR GENERAL INFORMATION ONLY AND THE ACCURACY OR COMPLETION OF THE PROVIDED INFORMATION HAS NOT BEEN CONFIRMED BY COUNTERPOINT ENGINEERING. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTOR'S EXPENSE.
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6. GENERAL CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ALL PERMITS RELATED TO SERVICE CONNECTIONS INCLUDING ROAD CUT PERMITS AND THIRD PARTY UTILITY COSTS.
7. ALL DIMENSIONS AND ELEVATIONS TO BE VERIFIED PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES FOUND PRIOR TO OR DURING CONSTRUCTION SHALL BE CLARIFIED WITH THE ENGINEER.
8. ALL REMOVED OR DAMAGED CURBS, ASPHALT SIDEWALK, LANDSCAPING AND SOD RESULTING FROM SERVICE INSTALLATION SHALL BE RE-INSTATED BY THE CONTRACTOR.
9. ALL UNSUITABLE SOIL OR SURPLUS MATERIAL OBTAINED FROM EXCAVATIONS TO BE DISPOSED OF OFF-SITE.
10. CONTRACTOR TO INSTALL SEDIMENT CONTROL FENCE (AS PER DETAIL DWG. SW-D) AROUND PERIMETER OF THE SITE ON PROPERTY LINE AND SHALL MAINTAIN FENCING FOR THE DURATION OF CONTRACT.
11. ALL REQUIRED EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER PRIOR TO COMMENCEMENT OF WORK. CONTRACTOR TO INSPECT EROSION CONTROL MEASURES BEFORE AND AFTER EVERY RAINFALL EVENT EXCEEDING 25mm DEPTH AND MAKE REPAIRS AND ADJUSTMENTS AS NECESSARY.
12. ALL SERVICE TRENCH EXCAVATIONS AND BACKFILL TO BE AS PER GEOTECHNICAL REPORT, PREPARED BY JACQUES WHITFORD DATED FEB. 9, 2005.
13. FOR ALL WORK WITHIN THE MUNICIPALITY PROPERTY, RESTORATION AND REPAIR WORK SHALL BE TO CURRENT CBRM STANDARDS.

WATERMAINS

1. ALL MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT NSBC, CBRM STANDARDS AND SPECIFICATIONS. WHERE THESE CONFLICT, CLARIFICATION IS TO BE RECEIVED FROM CBRM.
2. WATERMAIN 300mmø AND SMALLER SHALL BE AWWA C-900-97 POLYVINYL CHLORIDE (PVC) CLASS 150 DR-18 AND CSA CAN3 B137.3-02 WITH GASKETED BELL END. A 14 GAUGE TWH SOLID COPPER PLASTIC COATED TRACER WIRE MUST BE INSTALLED WITH THE PIPE AND BROUGHT TO THE SURFACE AT EACH VALVE BOX. TRACER WIRE IS TO BE ATTACHED TO THE PIPE AND THE OUTSIDE OF EACH VALVE BOX BY MEANS OF TAPE.
3. PROVISIONS FOR FLUSHING WATER LINE MUST BE PROVIDED WITH AT LEAST A 50mm OUTLET ON 100mm AND LARGER LINES. THEY MUST BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100mm DIA. MINIMUM ON A HYDRANT.
4. BUILDING SERVICE VALVES TO BE 3.0m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE SHOWN ON PLANS AND MUST BE MECHANICALLY RESTRAINED A MINIMUM OF 12m BACK FROM STUB.
5. WATERMAINS ARE TO BE INSTALLED TO THE ELEVATIONS SHOWN ON THE APPROVED SITE SERVICING PLAN. WHERE SPECIFIC WATERMAIN ELEVATIONS ARE NOT SHOWN ON SERVICING DRAWING, A MINIMUM COVER OF 1.8m FROM PROPOSED GRADES MUST BE MAINTAINED AT ALL TIMES WITH A MINIMUM HORIZONTAL SPACING OF 1.2m FROM THEMSELVES AND ALL OTHER UTILITIES. IN PREGRADE AREAS COVER SHALL BE FROM PREGRADE ELEVATIONS.
6. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.3m OVER/0.5m UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
7. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING SYSTEMS IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING.
8. BEDDING SHALL BE IN ACCORDANCE WITH ALL REQUIREMENTS AS PER JACQUES WHITFORD GEOTECHNICAL INVESTIGATION DATED FEB. 9, 2005.
9. ALL BENDS, TEES, JOINTS, ETC., ARE TO BE RESTRAINED WITH THRUST BLOCKS AS PER SECTION 02510 OF THE NSSSMS.
10. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A 50mm PLUG AND BLOW OFF UNLESS OTHERWISE INDICATED.
11. HYDRANTS SHALL CONFORM TO CBRM STANDARDS AND HAVE A PUMPER NOZZLE. THE INSTALLING CONTRACTOR IS TO CERTIFY IN WRITING TO THE FIRE DEPARTMENT THAT THE HYDRANTS HAVE BEEN TESTED IN ACCORDANCE WITH CBRM STANDARDS AS PER SECTION 02510 OF NSSSMS AND ARE FULLY OPERATIONAL. PUMPER NOZZLE IS TO FACE THE FIRE ROUTE.
12. PRIVATE FIRE HYDRANTS SHALL BE FLOW TESTED AND COLOUR CODED IN CONFORMANCE WITH THE WITH LOCAL MUNICIPAL AND FIRE DEPARTMENT REQUIREMENTS.
13. ALL HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.15m ABOVE PROPOSED FINISHED GRADE AT HYDRANT.
14. ALL DUCTILE IRON FITTINGS SHALL BE CATHODICALLY PROTECTED WITH A 5.5kg ZINC ANODE.
15. ALL WATERMAINS SHALL BE BACTERIOLOGICALLY TESTED IN ACCORDANCE WITH ALL LOCAL MUNICIPAL AND PROVINCIAL REQUIREMENTS. DISPOSAL OF CHLORINATED WATER TO BE IN ACCORDANCE WITH MUNICIPAL REQUIREMENTS.
16. PRIOR TO CONNECTION TO EXISTING, NEW WATERMAIN TO BE CHLORINATED, TESTED AND INSPECTED TO THE SATISFACTION OF CBRM. COPY OF THE TEST REPORT PRIOR TO THE CONNECTION TO BE SUBMITTED TO CBRM.
17. ALL LIVE WATER TAPS, WHETHER INVOLVING WATERMAINS OR SERVICES AND WHETHER ON CITY PROPERTY OR WITHIN THE BOUNDARIES OF THE SITE ARE TO BE PERFORMED BY CBRM PERSONNEL AT THE CONTRACTOR'S EXPENSE. ALL MATERIALS ARE TO BE SUPPLIED BY THE CONTRACTOR.

STORM AND SANITARY SEWERS

1. FOR CONSTRUCTION DETAILS NOT SHOWN ON PLANS, REFERENCE SHALL BE MADE TO THE NSSSMS AND MUNICIPAL STANDARDS.
2. ALL STORM MANHOLES AS PER SECTION 02155-92 AND DETAIL NO. 02515-92 OF THE NSSSMS (SIZE AS SHOWN) WITH FRAME AND COVER AS PER CAN/CSA S70.1-D30 SAFETY PLATFORMS TO BE INSTALLED IN ALL MANHOLES WHERE DEPTHS EXCEED 5.0m.
3. ALL STORM SEWERS UP TO 450mm DIA. SHALL BE PVC ULTRA RIB SEWER AND FITTINGS IN ACCORDANCE WITH CAN/CSA B182.2-Z OR LATEST AMENDMENT UNLESS OTHERWISE SPECIFIED. PVC SEWER SHALL MEET THE CSA AND ASTM REQUIREMENTS AS NOTED WITHIN SECTION 02156 OF THE NSSSMS. ALL STORM SEWERS 525mm OR LARGER SHALL BE REINFORCED CONCRETE IN ACCORDANCE WITH STANDARD MINIMUM CLASS OF CONCRETE SEWER SHALL BE AS PER SECTION 02156 OF THE NSSSMS. RIGID PIPE REQUIRES CONCRETE ENCASEMENT FOR THE FIRST PIPE LENGTH CONNECTING TO ANY APPURTENANCES. WHERE CONCRETE PIPE SMALLER THAN 525mmø IS SPECIFIED CLASS SHALL BE 100-D.
4. PVC STORM SEWER BEDDING SHALL BE AS PER SECTION 02158 OF THE NSSSMS TO TOP OF PIPE. CONCRETE STORM SEWER BEDDING SHALL BE AS PER SECTION 02156 OF THE NSSSMS. ALL BEDDING AND COVER MATERIAL ARE TO BE COMPACTED TO MINIMUM 95% SPMDD WITH A MINIMUM 300mm SAND COVER OVER THE PIPE. WITHIN 0.5m OF SUB-GRADE ELEVATION, BACKFILL TO BE COMPACTED TO 98% SPMDD.
5. ALL CATCH BASINS TO BE PRECAST WITH FRAME AND FLAT GRATE AS PER DETAIL ON DRAWING SW-D.
6. ALL SINGLE CATCHBASIN LEADS TO BE CSA B182.2 AND ASTM D3034 200mmø PVC. ULTRA RIB OR APPROVED EQUIVALENT UNLESS OTHERWISE SPECIFIED.
7. CATCHBASIN LEAD INVERTS TO BE 1.5m BELOW FINISHED GRADE UNLESS OTHERWISE SPECIFIED. CATCHBASIN LEADS TO HAVE MINIMUM 1.5% SLOPE UNLESS OTHERWISE SPECIFIED.
8. ALL SANITARY MANHOLES SHALL BE MIN 1050mmø UNLESS OTHERWISE SPECIFIED AND IN ACCORDANCE WITH CAN/CSA A5274.4-M AND FRAME AND COVER AS PER NSSSMS DETAIL No. 02515-92.
9. ALL SANITARY SEWERS SHALL BE PVC (DR 35) MEETING CSA B182.2-02 SPECIFICATION FITTINGS FOR PVC SANITARY SEWER PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH A.S.T.M. SPECIFICATION D 3034 AND JOINTS SHALL AS PER CAN/CSA A527.3-M.
10. ALL BEDDING FOR SANITARY SEWERS SHALL BE AS PER NSSSMS SECTION 02200 AND JACQUES WHITFORD GEOTECHNICAL INVESTIGATION DATED FEBRUARY 9,2005.
11. ALL MANHOLE AND CATCHBASIN EXCAVATIONS TO BE BACKFILLED AS RECOMMENDED IN JACQUES WHITFORD GEOTECHNICAL INVESTIGATION DATED FEB.9, 2005.
12. ALL SANITARY SEWERS ARE TO BE AIR TESTED AT A PRESSURE OF 35kPa (5.1 psi) AND SHALL BE MAINTAINED FOR 15 MINUTES WITHOUT THE ADDITION OF AIR.
13. MINIMUM CLEARANCE IS 0.15m OR BEDDING REQUIREMENT WHICHEVER IS GREATER.
14. ALL MANHOLES TO BE BENCHED TO SPRINGLINE UNLESS OTHERWISE SPECIFIED. MINIMUM WIDTH OF BENCHING TO BE 0.230m OR AS SPECIFIED ON DRAWINGS.
15. 'MODULOC' OR APPROVED PRE-CAST MANHOLE AND CATCH BASIN ADJUSTERS TO BE USED IN LIEU OF BRICKING. PARGE ADJUSTING UNITS ON THE OUTSIDE ONLY.
16. SERVICES TO BUILDINGS TO BE TERMINATED 0.90m FROM EDGE OF PAVEMENT IN FRONT OF BUILDING UNLESS OTHERWISE NOTED.
17. ALL BUILDING SERVICES SHALL BE CAPPED AND MARKED WITH A 2X4 PAINTED GREEN (SANITARY) AND WHITE (STORM). THE 2X4 SHALL EXTEND 0.6m ABOVE GRADE.
18. THE CONTRACTOR IS TO FLUSH AND PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY AND STORM SEWERS, INCLUDING PICTORIAL REPORT, TWO (2) VIDEO TAPES, AND TWO (2) CD's AS PER SECTION 02517 OF THE NSSSMS.

LEGEND

CATCH BASIN	SANITARY SEWER
	STORM SEWER
HYDRANT AND VALVE	WATERMAIN
VALVE & BOX	LIMIT OF CONSTRUCTION
PLUG	BOUNDARY
SANITARY MANHOLE	EX. SANITARY SEWER
STORM MANHOLE	EX. STORM SEWER
CDS UNIT	EX. WATERMAIN
LIGHT STANDARD (BY OTHERS)	

No.	REVISIONS/ISSUED	DATE	BY	CITY
2	ISSUED FOR BUILDING PERMIT SUBMISSION	APR 11/06	RM	
1	ISSUED FOR TENDER	APR 11/06	RM	

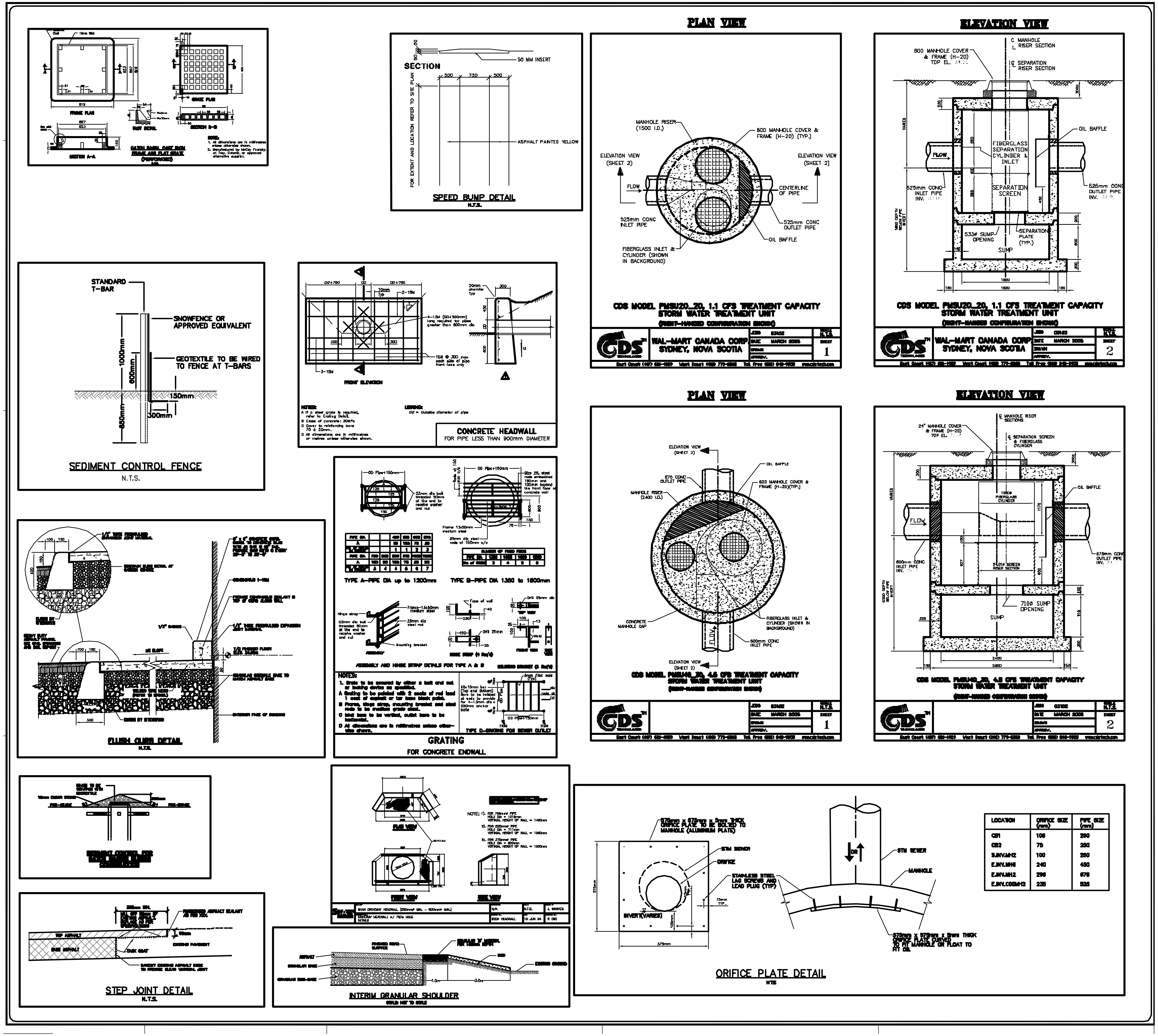
counterpoint ENGINEERING

APPLICANT:
WAL-MART CANADA CORP.
1940 ARGENTIA ROAD
MISSISSAUGA, ONTARIO L5N 1P9

SITE LOCATION:
SYDNEY COMMERCIAL DEVELOPMENT
BUILDING "A"
STORE No. 3101
SYDNEY, NOVA SCOTIA

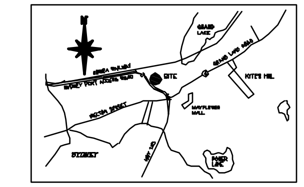
SITE SERVICING PLAN

PROJECT No. 03152
SCALE: 1:500
DRAWING No. SW-5



CATCH BASIN, CAST IRON FRAME AND FLAT GRATE
SPEED BUMP DETAIL
N.T.S.
50 MM INSERT
ASPHALT PAINTED YELLOW
FOR EXTENT AND LOCATION REFER TO SITE PLAN
PLAN VIEW
ELEVATION VIEW
MANHOLE RISER (1500 I.D.)
600 MANHOLE COVER & FRAME (H-20) (TYP.)
ELEVATION VIEW (SHEET 2)
FLOW
CENTERLINE OF PIPE
525mm CONC INLET PIPE
525mm CONC OUTLET PIPE
OIL BAFFLE
FIBERGLASS INLET & CYLINDER (SHOWN IN BACKGROUND)
FIBERGLASS SEPARATION CYLINDER & INLET
SEPARATION SCREEN
SEPARATION PLATE (TYP.)
SUMP
CDS MODEL PMSU20_20, 1.1 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT
WAL-MART CANADA CORP. SYDNEY, NOVA SCOTIA
STANDARD T-BAR
SNOWFENCE OR APPROVED EQUIVALENT
GEOTEXTILE TO BE WIRED TO FENCE AT T-BARS
1000mm
600mm
150mm
300mm
850mm
SEDIMENT CONTROL FENCE
N.T.S.
FRONT ELEVATION
CONCRETE HEADWALL
FOR PIPE LESS THAN 900mm DIAMETER
TYPE A-PIPE DIA up to 1200mm
TYPE B-PIPE DIA 1350 to 1800mm
GRATING
FOR CONCRETE ENDWALL
FLUSH CURB DETAIL
N.T.S.
CDS MODEL PMSU40_30, 4.5 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT
MANHOLE RISER (2400 I.D.)
675 CONC OUTLET PIPE
600mm CONC INLET PIPE
CONCRETE MANHOLE CAP
710ø SUMP OPENING
STEP JOINT DETAIL
N.T.S.
INTERIM GRANULAR SHOULDER
ORIFICE PLATE DETAIL
STM SEWER
ORIFICE
STAINLESS STEEL LAG SCREWS AND LEAD PLUG (TYP)
MANHOLE
INVERT (VARIES)

LOCATION	ORIFICE SIZE (mm)	PIPE SIZE (mm)
CB1	106	250
CB2	75	250
S.INV.MH2	100	250
E.INV.MH6	240	450
E.INV.MH2	296	675
E.INV.CDSMH2	235	525



KEY PLAN

counterpoint ENGINEERING

APPLICANT:
WAL-MART CANADA CORP.
1940 ARGENTIA ROAD
MISSISSAUGA, ONTARIO L5N 1P9

SITE LOCATION:
SYDNEY COMMERCIAL DEVELOPMENT
BUILDING "A"
STORE No. 3101
SYDNEY, NOVA SCOTIA

DETAILS

SCALE: 1:200
PROJECT No. 03152
DRAWING No. SW-D

Burnac Development, Sydney, NS – 5.27ha Site

TSS REMOVAL DESIGN REPORT

July 5, 2005

INTRODUCTION

This report provides a summary of the methodology used to determine the annual removal efficiency of a CDS PMSU40_30 at Burnac Development in Sydney. This analysis projects that the PMSU40_30 is capable of achieving an 80-percent reduction in the total suspended solids (TSS) load based on a total area of 5.27 ha and an average imperviousness of 0.9. The following sections have been prepared to present the methodology used in identifying the performance of the CDS device.

DEVICE SELECTION / EVALUATION

In selecting a storm water treatment device, the design criteria may be based on annual TSS removal performance or design treatment flow.

Performance Based

Under the performance based approach, the device is selected due to it ability to achieve a specific TSS removal efficiency. In Ontario, a storm treatment device must meet Enhanced (80%), Normal (70%) or Basic (60%) levels of TSS removal.

Flow Based

For the flow-based approach, the device is selected based on its ability to provide a minimum treatment flow capacity. Since all CDS devices are rated to provide a specific minimum treatment capacity, a TSS calculation may not be required to select our device. However, it is often desirable to understand the treatment effectiveness this flow-based selection provides by projecting the average annual TSS removal efficiency achieved by the selected device.

For this application, it is understood that the CDS device was selected based on its ability to achieve an annual TSS removal efficiency of 80 percent. The CDS device selected to satisfy this requirement is the PMSU40_30, which provides a treatment capacity of 127 liters per second.

SITE-SPECIFIC DATA

The proposed design is based on site-specific data provided by Counterpoint Engineering and obtained from CDS design reference library. The following tables provide a summary of the hydrologic parameters specific to the application and rainfall data specific to the application's vicinity.

Table 1

Hydrologic Parameter Summary

Landuse Composition		
Total Area:	5.27	ha
Imperviousness:	0.90	
Time of Concentration, T_C:	12	min.
Hydrologic Percentile:	100	%

Table 2

Summary of Local Rainfall Data

Storm Event	Rainfall Intensity	
2-year	41.1	mm/hr
5-year	54.1	mm/hr
10-year	62.2	mm/hr
25-year	72.6	mm/hr
50-year	80.3	mm/hr
100-year	87.9	mm/hr

PEAK FLOW GENERATION

This program can estimate the peak rate of runoff generated by the project's drainage basin using either of two methods, the rational method or the SCS Triangular Hydrograph method. While both of these methods are widely accepted, one may be favored for reasons which may including *an engineer's familiarity, availability of data or the desire to maintain consistency within the project.* For this application, the method selected to predict the peak rates of runoff is the Rational method.

Rational Method

The Rational Method is a relatively simple and accepted method of predicting the peak discharge rate generated by a given drainage area. The peak discharge rate predicted by this method is a function of a runoff coefficient, rainfall intensity and drainage area. The Rational Method is expressed mathematically by the following equation:

$$Q = C \cdot I \cdot A$$

where,

Q = peak discharge
C = runoff coefficient
I = rainfall intensity
A = drainage area

The rational method is effective in predicting discharge rate produced by a storm event of specific return frequency. In the analysis used to project the performance of a CDS device, it is necessary to predict the peak discharge rates produced by storms of varying return frequency. Therefore, this program uses an expanded version of the Rational Method described in the following section.

Probabilistic Rational Method

The Probabilistic rational method is an extension of the rational method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (i.e.: 2-year storm event). Under this method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters increase as the return frequency increases while the drainage area remains constant. The Rational Method is expressed by the following mathematical:

$$Q_f = P_H \cdot C_f \cdot C_{10} \cdot I_f \cdot A$$

where,

Q_f = peak discharge
C_f = runoff coefficient adjustment factor
C_{10} = runoff coefficient for the 10-year storm event
I_f = rainfall intensity
A = drainage area
P_H = hydrological percentile
"f" = statistical frequency (return period) of the subject event

The hydrographs generated using this method are shown in Figure 1 below:

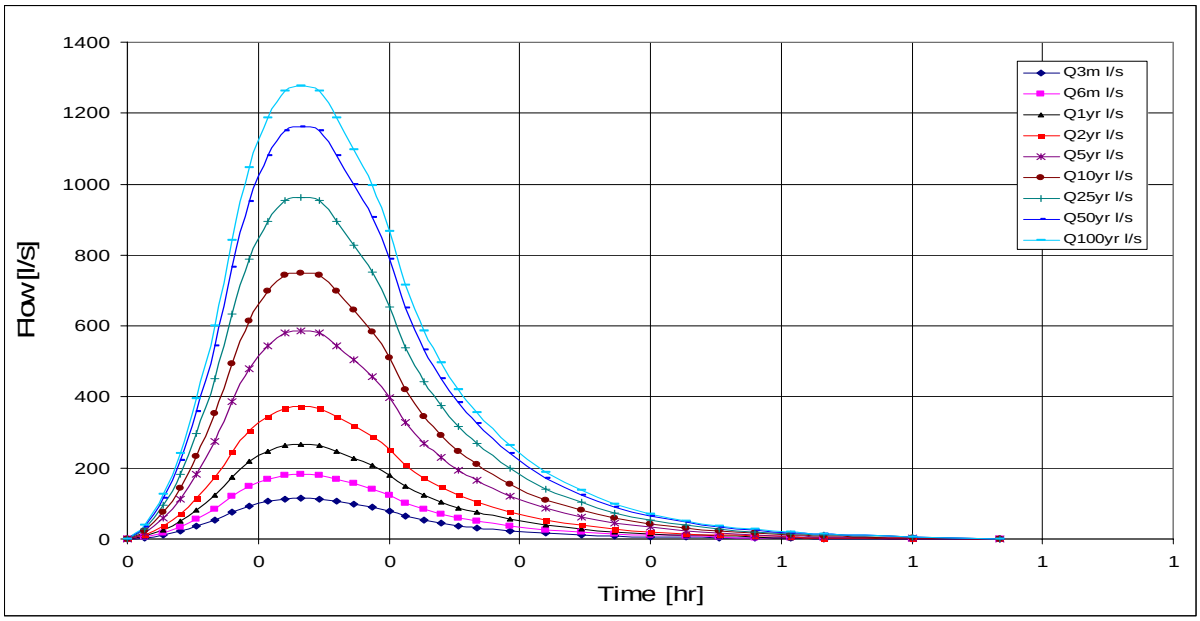


Figure 1: Hydrographs for Various Storm Events

Figure 2 shows the plot of peak flows for various return periods.

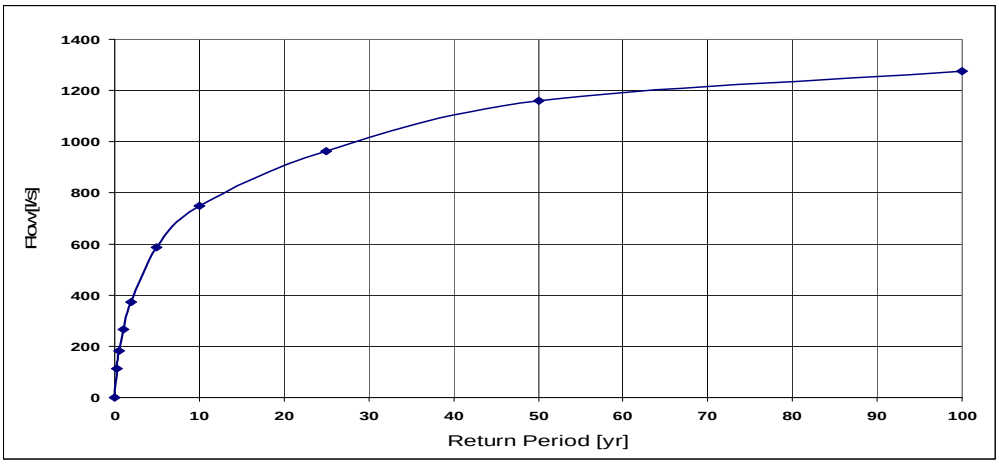


Figure 2: Approximate Flow Vs. Return Period

PERFORMANCE EVALUATION

Basis for CDS Removal Efficiencies

The independent third-party laboratory research performed at Portland State University (PSU) serves as the basis for the removal efficiency achieved by the CDS device. Under the direction of Professor Scott Wells, multiple tests were performed to establish the removal efficiencies achieved by a full-scale CDS device. The study was organized to evaluate the effectiveness of the CDS device for various operating levels up to 100 percent. The operating level is expressed as a percentage of device's design treatment capacity.

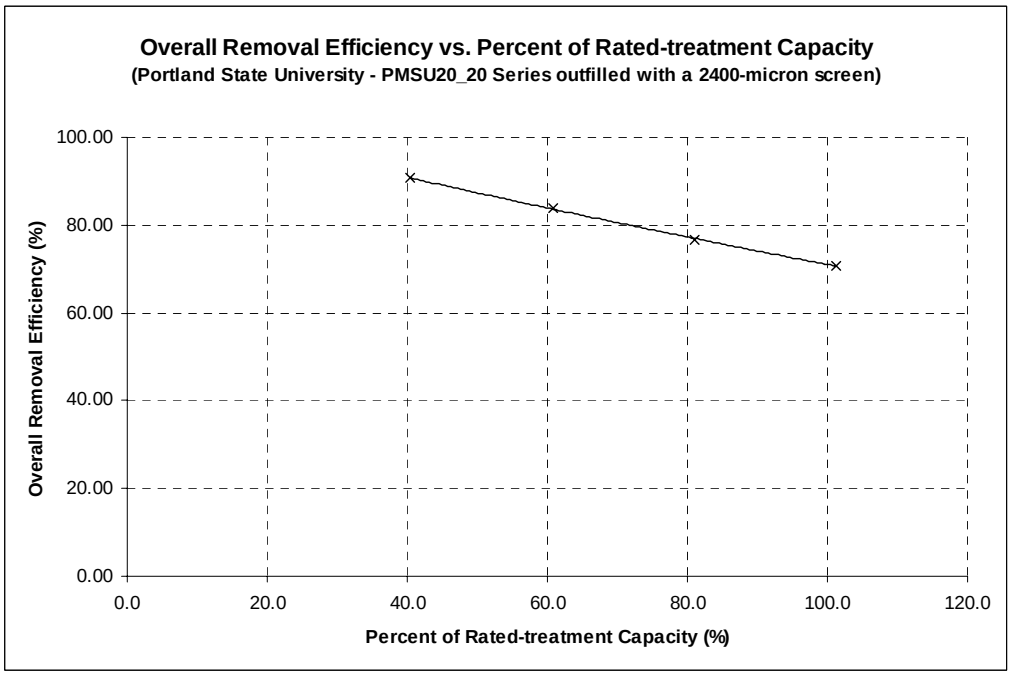


Figure 3: Plot of Removal Efficiencies versus Dimensionless Flow as determined by Portland State University.

Correlation to Field Data

The PSU study evaluated the CDS device's effectiveness in removing two (2) sand samples, the F-110 and #17 Silica. These samples consisted of particles ranging between 0 to 600 microns (0.0 to 0.6 millimeters) in size. These samples were selected to evaluate the effectiveness of our device for specific particle sizes. The F-110 sample was selected to target the 150-micron particle and the #17 Silica sample to target the 300-micron particle. The following particle size distribution (PSD) curves depict the gradation of the PSU samples compared to the PSDs from twenty-three (23) roadside sediments sampled at various locations in the country including the National Urban Runoff Program's (NURP) gradation. Upon comparison, one can readily see that the PSD used in the PSU study compares favorably with the sediment found in our urban catchments and that the PSU results provide a conservative basis for TSS reduction forecasts.

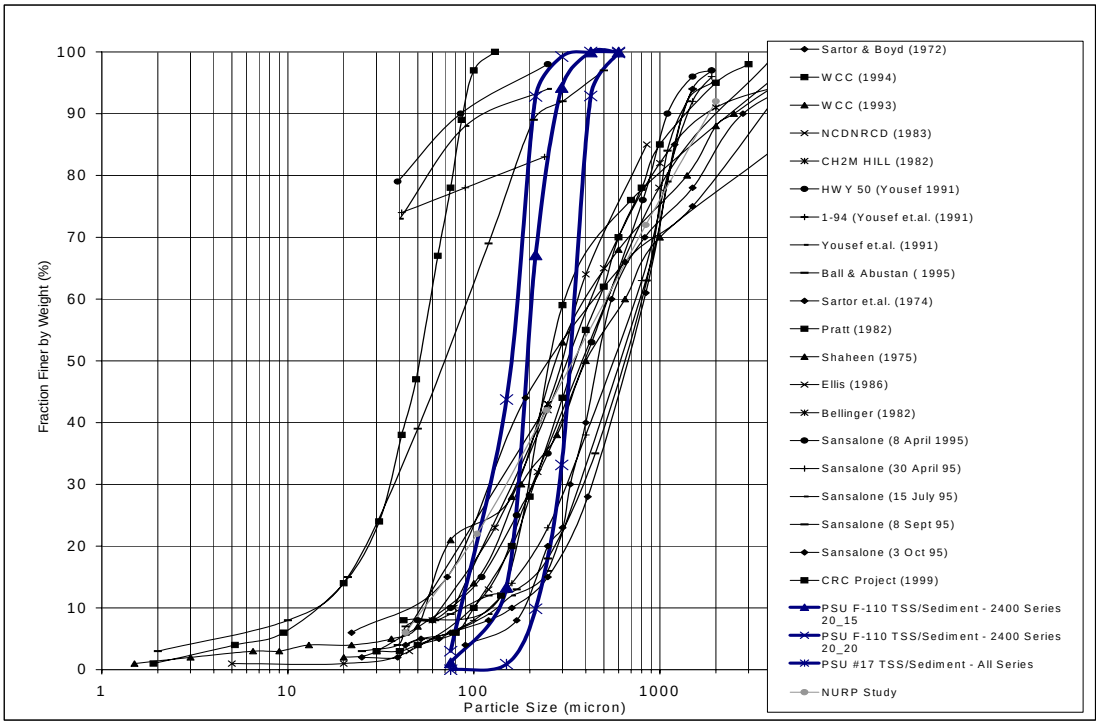


Figure 4: Particle Size Distribution of Solids Found on Street and Suspended in Road Runoff.

TOTAL SUSPENDED SOLIDS REMOVAL EFFECIENCY

The performance achieved by the CDS device is quantified by evaluating its ability to reduce the TSS load generated by the drainage basin it serves. Unfortunately, average annual hydrographs for storm water systems are practically never available. Therefore, this program evaluates the performance of the CDS device for storms likely to occur each year to simulate an average annual hydrograph. Once the removal efficiency is understood for these storms, the statistical frequency of each event is used to project the average removal efficiency the CDS device for the year. The following has been prepared to further discuss this procedure.

The analysis performed evaluates the storms events having a statistical probability of occurring in an average year of rainfall. Each storm is evaluated separately to identify the removal efficiency for each event. This is accomplished by developing a hydrograph for each event using SCS dimensionless ordinates and the peak discharge rates predicted by the Rational Method. Once the hydrograph is developed, an incremental analysis is executed to identify the average flow rate occurring within each time period. The removal efficiency of the CDS device is dependent on the operating level, which is expressed as a percentage of the device's rated-treatment capacity and expressed by the following equation.

$$Q_{\%} = \left(\frac{Q_i}{Q_{CDS}} \right) \cdot 100$$

where,

Q% = CDS rated-treatment capacity (%)
Q_i = incremental flow rate
Q_{CDS} = rated-treatment capacity
i = time increment count

When the level of operation is identified, the removal efficiency achieved can be determined for each time increment. This relationship is expressed in the following mathematical terms:

$$E_i = f\left(Q_{\%i}\right)$$

where,

E_i = incremental removal efficiency (%)
$Q_{\%i}$ = CDS rated-treatment capacity for i^{th} time increment (%)
i = time increment count

Once the removal efficiency is identified for each time increment, the overall removal efficiency for the storm event is determined by volumetrically proportioning the contribution of each increment. This is achieved by determining the volume of flow occurring within each time increment, the amount processed by the CDS device and any flow not processed. The product of the removal efficiency achieved and percentage of volume processed is determined for each time increment. The summation of the products of (T E V) for each hydrograph divided by the sum of the product (T V) represents the overall weighted average annual removal efficiency of the device, which is expressed by the following equation:

$$\Delta E_{HYDRO} = E_i \left(\frac{\Delta Vi}{V_t} \right)$$

$$E_{HYDRO} = \sum \Delta E_{HYDRO}$$

where,

$\Delta E_{HYDRO.}$ = incremental removal efficiency on flow treated (%)
E_{HYDRO} = total removal efficiency for the storm event (%)
ΔV_i = incremental volume treated
V_t = total volume under the event hydrograph
i = time increment count

This procedure is repeated for the 1-, 2-, 3-, 4-, 6-, 9- and 12-month storm events. The following table provides a summary of the results for the subject application. The results of this process are summarized in the following table.

Table 3

Summary of
Total Suspended Solids
Removal Efficiency

H	T [#]	P [%]	Q_P [L/S]	Q_{CDS} [L/S]	V_T [CU. M]	V_{CDS} [CU. M]	E [%]
1	2	3	4	5	6	7	8
1-m	12	100	49.93	49.93	32.10	32.1	90.8
2-m	6	99.75	86.98	86.98	55.92	55.9	88.1
3-m	4	98.17	114.05	114.05	73.32	73.3	84.4
4-m	3	95.02	139.28	127.44	89.54	87.8	79.2
6-m	2	86.47	181.14	127.44	116.46	101.9	69.3
9-m	1.33	73.64	228.02	127.44	146.60	113.1	60.6
1-yr	1	63.21	265.6	127.44	170.74	120.6	55.2
2-yr		39.35	371.8	127.44	239.06	136.7	44.3
5-yr		18.13	586.68	127.44	377.18	157.6	32.1
10-yr		9.52	749.81	127.44	482.05	168.1	26.7
Average Annual TSS Removal Efficiency= 80 %					Average Annual Treated Volume = 93.1 %		

Column Headings:

1-Storm Event Hydrograph, 2- Number of Annual Occurrences, 3- Annual Exceedance, 4- Hydrograph peak Flow, 5- CDS Flow, 6- Total Hydrograph Volume, 7- Treated Volume by CDS Unit, 8- CDS Event Removal Efficiency

Using the data summarized in the above table, the average annual TSS removal efficiency can be determined using the following mathematical relationship:

$$E_{w.a.} = \left(\frac{\sum T_i \bullet E_i \bullet V_i}{\sum T_i \bullet V_i} \right) 100$$

where,

$E_{w.a.}$ = weighted average removal efficiency for storm event (%)
E_i = incremental removal efficiency on flow treated (%)
V_i = incremental volume treated (cf)
Ti = Number of annual occurrences
i = ith hydrograph

Using the methodology discussed above, proposed CDS unit is expected to achieve an average annual TSS removal of 80-percent.

Burnac Development, Sydney, NS – 1.02ha Site

TSS REMOVAL DESIGN REPORT

March 03, 2005

INTRODUCTION

This report provides a summary of the methodology used to determine the annual removal efficiency of a CDS PMSU20_20 at the 1.02ha Burnac site in Sydney. This analysis projects that the PMSU20_20_5 is capable of achieving an 80.7 percent reduction in the total suspended solids (TSS) load based on a total area of 1.02 ha and an average runoff coefficient of 0.9. The following sections have been prepared to present the methodology used in identifying the performance of the CDS device.

DEVICE SELECTION / EVALUATION

In selecting a storm water treatment device, the design criteria may be based on annual TSS removal performance or design treatment flow.

Performance Based

Under the performance based approach, the device is selected due to it ability to achieve a specific TSS removal efficiency. A storm treatment device must meet Enhanced (80%), Normal (70%) or Basic (60%) levels of TSS removal.

Flow Based

For the flow-based approach, the device is selected based on its ability to provide a minimum treatment flow capacity. Since all CDS devices are rated to provide a specific minimum treatment capacity, a TSS calculation may not be required to select our device. However, it is often desirable to understand the treatment effectiveness this flow-based selection provides by projecting the average annual TSS removal efficiency achieved by the selected device.

For this application, It is understood that the CDS device was selected based on its ability to achieve an annual TSS removal efficiency of 80 percent. The CDS device selected to satisfy this requirement is the PMSU20_20_5, which provides a treatment capacity of 31 liters per second.

SITE-SPECIFIC DATA

The proposed design is based on site-specific data provided by Counterpoint Engineering and obtained from CDS design reference library. The following tables provide a summary of the hydrologic parameters specific to the application and rainfall data specific to the application's vicinity.

Table 1

Hydrologic Parameter Summary

Landuse Composition		
Total Area:	1.02	ha
Runoff Coefficient, $C_{10:}$	0.9	
Time of Concentration, $T_{C:}$	10	min.
Hydrologic Percentile:	100	%

Table 2

Summary of Local Rainfall Data

Storm Event	Rainfall Intensity	
2-year	45.7	mm/hr
5-year	58.9	mm/hr
10-year	67.6	mm/hr
25-year	78.5	mm/hr
50-year	86.9	mm/hr
100-year	95.0	mm/hr

PEAK FLOW GENERATION

This program can estimate the peak rate of runoff generated by the project's drainage basin using either of two methods, the rational method or the SCS Triangular Hydrograph method. While both of these methods are widely accepted, one may be favored for reasons which may including *an engineer's familiarity, availability of data or the desire to maintain consistency within the project.* For this application, the method selected to predict the peak rates of runoff is the Rational method.

Rational Method

The Rational Method is a relatively simple and accepted method of predicting the peak discharge rate generated by a given drainage area. The peak discharge rate predicted by this method is a function of a runoff coefficient, rainfall intensity and drainage area. The Rational Method is expressed mathematically by the following equation:

$$Q = C \cdot I \cdot A$$

where,

Q = peak discharge
C = runoff coefficient
I = rainfall intensity
A = drainage area

The rational method is effective in predicting discharge rate produced by a storm event of specific return frequency. In the analysis used to project the performance of a CDS device, it is necessary to predict the peak discharge rates produced by storms of varying return frequency. Therefore, this program uses an expanded version of the Rational Method described in the following section.

Probabilistic Rational Method

The Probabilistic rational method is an extension of the rational method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (i.e.: 2-year storm event). Under this method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters increase as the return frequency increases while the drainage area remains constant. The Rational Method is expressed by the following mathematical:

$$Q_f = P_H \cdot C_f \cdot C_{10} \cdot I_f \cdot A$$

where,

Q_f = peak discharge
C_f = runoff coefficient adjustment factor
C_{10} = runoff coefficient for the 10-year storm event
I_f = rainfall intensity
A = drainage area
P_H = hydrological percentile
"f" = statistical frequency (return period) of the subject event

The hydrographs generated using this method are shown in Figure 1 below:

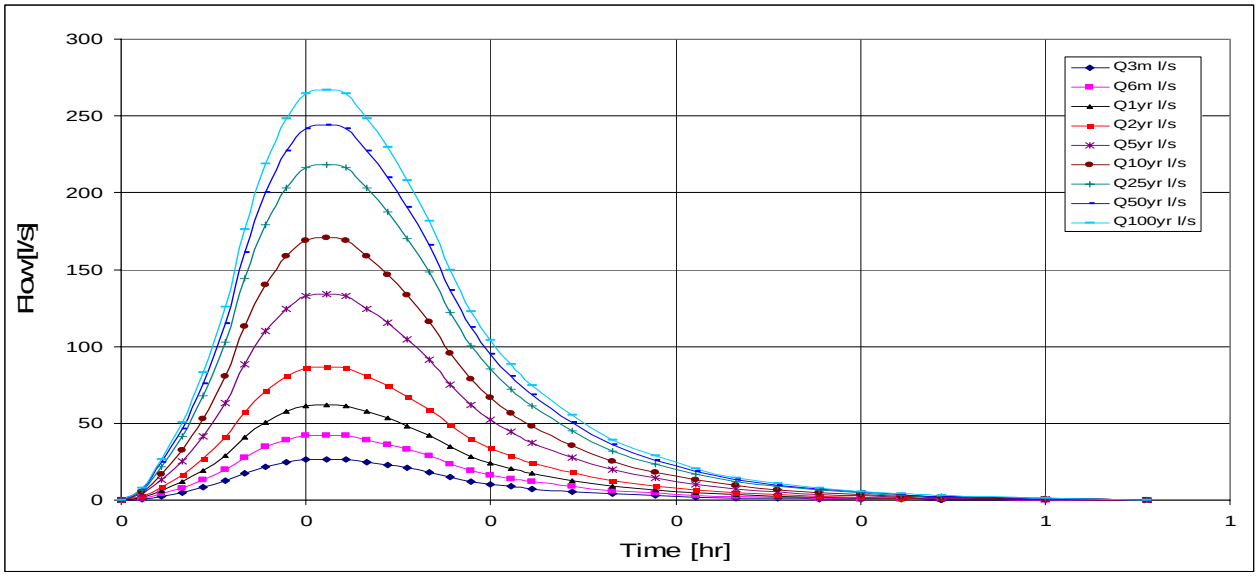


Figure 1: Hydrographs for Various Storm Events

Figure 2 shows the plot of peak flows for various return periods.

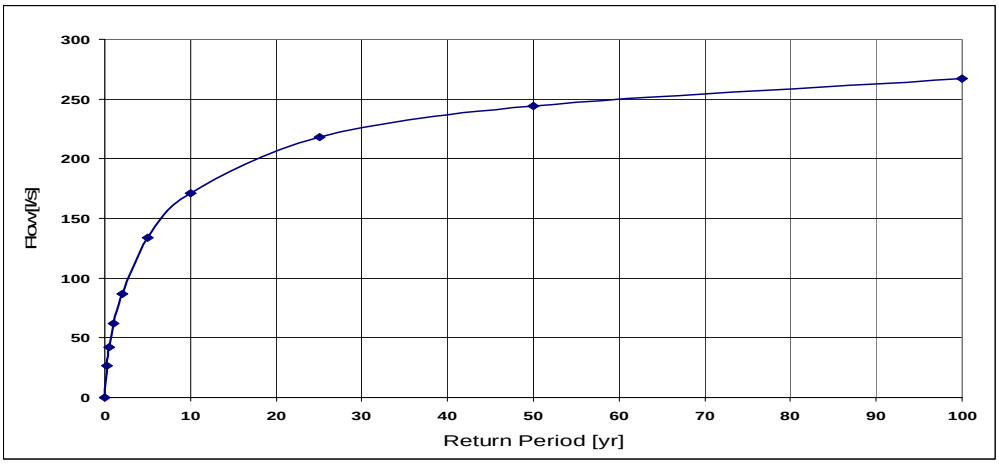


Figure 2: Approximate Flow Vs. Return Period

PERFORMANCE EVALUATION

Basis for CDS Removal Efficiencies

The independent third-party laboratory research performed at Portland State University (PSU) serves as the basis for the removal efficiency achieved by the CDS device. Under the direction of Professor Scott Wells, multiple tests were performed to establish the removal efficiencies achieved by a full-scale CDS device. The study was organized to evaluate the effectiveness of the CDS device for various operating levels up to 100 percent. The operating level is expressed as a percentage of device's design treatment capacity.

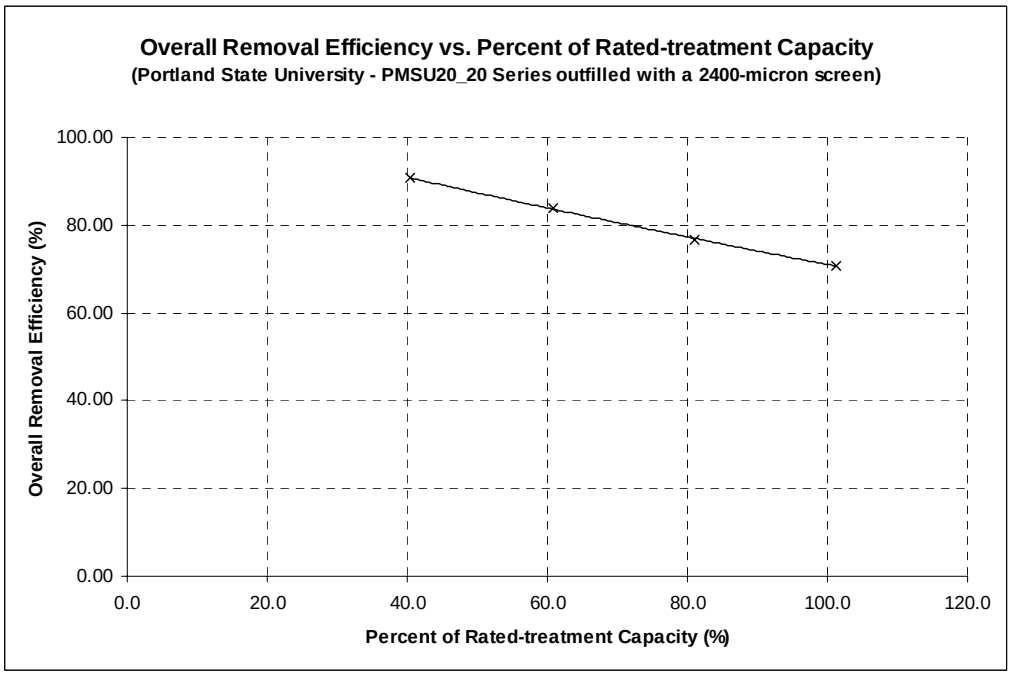


Figure 3: Plot of Removal Efficiencies versus Dimensionless Flow as determined by Portland State University.

Correlation to Field Data

The PSU study evaluated the CDS device's effectiveness in removing two (2) sand samples, the F-110 and #17 Silica. These samples consisted of particles ranging between 0 to 600 microns (0.0 to 0.6 millimeters) in size. These samples were selected to evaluate the effectiveness of our device for specific particle sizes. The F-110 sample was selected to target the 150-micron particle and the #17 Silica sample to target the 300-micron particle. The following particle size distribution (PSD) curves depict the gradation of the PSU samples compared to the PSDs from twenty-three (23) roadside sediments sampled at various locations in the country including the National Urban Runoff Program's (NURP) gradation. Upon comparison, one can readily see that the PSD used in the PSU study compares favorably with the sediment found in our urban catchments and that the PSU results provide a conservative basis for TSS reduction forecasts.

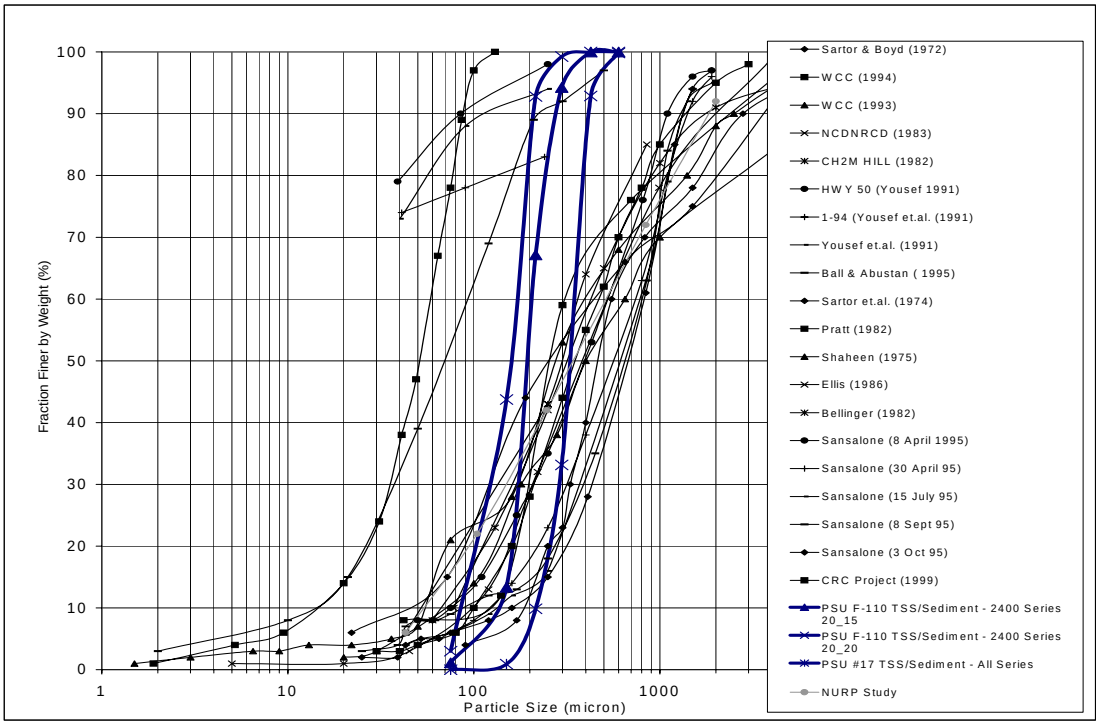


Figure 4: Particle Size Distribution of Solids Found on Street and Suspended in Road Runoff.

TOTAL SUSPENDED SOLIDS REMOVAL EFFECIENCY

The performance achieved by the CDS device is quantified by evaluating its ability to reduce the TSS load generated by the drainage basin it serves. Unfortunately, average annual hydrographs for storm water systems are practically never available. Therefore, this program evaluates the performance of the CDS device for storms likely to occur each year to simulate an average annual hydrograph. Once the removal efficiency is understood for these storms, the statistical frequency of each event is used to project the average removal efficiency the CDS device for the year. The following has been prepared to further discuss this procedure.

The analysis performed evaluates the storms events having a statistical probability of occurring in an average year of rainfall. Each storm is evaluated separately to identify the removal efficiency for each event. This is accomplished by developing a hydrograph for each event using SCS dimensionless ordinates and the peak discharge rates predicted by the Rational Method. Once the hydrograph is developed, an incremental analysis is executed to identify the average flow rate occurring within each time period. The removal efficiency of the CDS device is dependent on the operating level, which is expressed as a percentage of the device's rated-treatment capacity and expressed by the following equation.

$$Q_{\%} = \left(\frac{Q_i}{Q_{CDS}} \right) \cdot 100$$

where,

Q% = CDS rated-treatment capacity (%)
Q_i = incremental flow rate
Q_{CDS} = rated-treatment capacity
i = time increment count

When the level of operation is identified, the removal efficiency achieved can be determined for each time increment. This relationship is expressed in the following mathematical terms:

$$E_i = f\left(Q_{\%i}\right)$$

where,

E_i = incremental removal efficiency (%)
$Q_{\%i}$ = CDS rated-treatment capacity for i^{th} time increment (%)
i = time increment count

Once the removal efficiency is identified for each time increment, the overall removal efficiency for the storm event is determined by volumetrically proportioning the contribution of each increment. This is achieved by determining the volume of flow occurring within each time increment, the amount processed by the CDS device and any flow not processed. The product of the removal efficiency achieved and percentage of volume processed is determined for each time increment. The summation of the products of (T E V) for each hydrograph divided by the sum of the product (T V) represents the overall weighted average annual removal efficiency of the device, which is expressed by the following equation:

$$\Delta E_{HYDRO} = E_i \left(\frac{\Delta Vi}{V_t} \right)$$

$$E_{HYDRO} = \sum \Delta E_{HYDRO}$$

where,

$\Delta E_{HYDRO.}$ = incremental removal efficiency on flow treated (%)
E_{HYDRO} = total removal efficiency for the storm event (%)
ΔV_i = incremental volume treated
V_t = total volume under the event hydrograph
i = time increment count

This procedure is repeated for the 1-, 2-, 3-, 4-, 6-, 9- and 12-month storm events. The following table provides a summary of the results for the subject application. The results of this process are summarized in the following table.

Table 3

Summary of
Total Suspended Solids
Removal Efficiency

H	T [#]	P [%]	Q_P [L/S]	Q_{CDS} [L/S]	V_T [CU. M]	V_{CDS} [CU. M]	E [%]
1	2	3	4	5	6	7	8
1-m	12	100	11.64	11.64	6.24	6.2	90.9
2-m	6	99.75	20.28	20.28	10.86	10.9	88.5
3-m	4	98.17	26.60	26.60	14.24	14.2	85.2
4-m	3	95.02	32.48	31.152	17.39	17.3	80.8
6-m	2	86.47	42.24	31.152	22.62	20.3	71.1
9-m	1.33	73.64	53.17	31.152	28.48	22.5	62.3
1-yr	1	63.21	61.9	31.152	33.16	24.1	56.8
2-yr		39.35	86.7	31.152	46.44	27.4	45.7
5-yr		18.13	134.11	31.152	71.82	31.4	33.7
10-yr		9.52	170.85	31.152	91.50	33.7	28.1
Average Annual TSS Removal Efficiency= 80.7 %					Average Annual Treated Volume = 93.9 %		

Column Headings:

1-Storm Event Hydrograph, 2- Number of Annual Occurrences, 3- Annual Exceedance, 4- Hydrograph peak Flow, 5- CDS Flow, 6- Total Hydrograph Volume, 7- Treated Volume by CDS Unit, 8- CDS Event Removal Efficiency

Using the data summarized in the above table, the average annual TSS removal efficiency can be determined using the following mathematical relationship:

$$E_{w.a.} = \left(\frac{\sum T_i \bullet E_i \bullet V_i}{\sum T_i \bullet V_i} \right) 100$$

where,

$E_{w.a.}$ = weighted average removal efficiency for storm event (%)
E_i = incremental removal efficiency on flow treated (%)
V_i = incremental volume treated (cf)
Ti = Number of annual occurrences
i = ith hydrograph

Using the methodology discussed above, proposed CDS unit is expected to achieve an average annual TSS removal of 80.7-percent.

The proposed stormwater management strategy for the site is in conformance with the following document:

- *"Drainage Plan - Burnac Developments off Grand Lake Road" prepared by CBCL, for the design of the ditch along SPAR, dated December 2002.*

Existing Conditions:

Presently the site is vacant and composed of small trees and tall grasses. The proposed 6.96 ha commercial site is part of a 10.00 ha area that drains North-West towards the former Reserve Mines Railway and Sydney Port Access Road (SPAR) via an existing ditch that runs parallel to SPAR (see existing **Drainage Plan** prepared by CBCL). The existing ditch directs flow into four existing culverts that run under SPAR and convey flow to the west.

Proposed Drainage Conditions:

Quality Control

Two Oil/Grit separators (CDS Units) have been included in the design of this site to provide quality control for the site. Each unit is located immediately upstream of each storm sewer outlet and is sized to provide a minimum 80% particle removal from the stormwater flow. The sizing calculations for each CDS unit is included in the Stormwater Management Report, dated April, 2005. (Please see following pages for CDS required maintenance).

Quantity Control

The proposed onsite storm sewer system is designed to convey the 5-year storm event. There are two proposed outlets onsite. The first outlet conveys the flow from the southern 1.06 ha of the site into the ditch along SPAR, south of the front entrance to the commercial property. The second outlet conveys the flow from 5.27 ha of the northern part of the site. This second outlet discharges in the north-west corner of the site. The remaining 0.63 ha of the site is landscaped area (see **Drawing SW-D1**).

The total allowable flow for the site is 0.917 cms and occurs during the 100-year storm event. Rainfall events of up to the 100-year will be controlled onsite through a combination of two (2) orifice plates, parking lot storage and rooftop storage. Rooftop controls will be provided on the site building to release a peak release rate of 42 L/s/ha.

An emergency spillway has been provided to direct drainage into the ditch that drains parallel to SPAR for storm events greater than the 100-year return storm. This emergency spillway has been provided at a minimum of 0.30m below the proposed site building Finished Floor Elevation (FFE).

The 100-year post development flows will be controlled to the target release rates using orifice plate controls combined with onsite parking lot storage, and rooftop storage.

Additional details about the stromwater management strategy for this site can be found in the complete Stormwater Management Report, dated April 2005.

CDS UNIT CLEANOUT (complete Maintenance Guide available upon request)

The frequency of cleaning the CDS unit will depend upon the generation of trash and debris and sediments in your application. Cleanout and preventive maintenance schedules will be determined based on operating experience unless precise pollutant loadings have been determined. The unit should be periodically inspected to determine the amount of accumulated pollutants and to ensure that the cleanout frequency is adequate to handle the predicted pollutant load being processed by the CDS unit. The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. However, the sump may be completely full with no impact to the CDS unit's performance.

CDS Technologies Recommends The Following:

NEW INSTALLATIONS – Check the condition of the unit after every runoff event for the first 30 days. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), measuring the amount of solid materials that have accumulated in the sump, the amount of fine sediment accumulated behind the screen, and determining the amount of floating trash and debris in the separation chamber. This can be done with a calibrated "dip stick" so that the depth of deposition can be tracked. Refer to the "Cleanout Schematic" **(Appendix B)** for allowable deposition depths and critical distances. Schedules for inspections and cleanout should be based on storm events and pollutant accumulation.

ONGOING OPERATION – During the rainfall season, the unit should be inspected at least once every 30 days. The floatables should be removed and the sump cleaned when the sump is 75-85% full. If floatables accumulate more rapidly than the settleable solids, the floatables should be removed using a vactor truck or dip net before the layer thickness exceeds one to two feet.

Cleanout of the CDS unit at the end of a rainfall season is recommended because of the nature of pollutants collected and the potential for odor generation from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water from the CDS® unit during summer months.

USE OF SORBENTS – It needs to be emphasized that the addition of sorbents is not a requirement for CDS units to effectively control oil and grease from storm water. The conventional oil baffle within a unit assures satisfactory oil and grease removal. However, the addition of sorbents is a unique enhancement capability special to CDS units, enabling increased oil and grease capture efficiencies beyond that obtainable by conventional oil baffle systems.

Under normal operations, CDS units will provide effluent concentrations of oil and grease that are less than 15 parts per million (ppm) for all dry weather spills where the volume is less than or equal to the spill capture volume of the CDS unit. During wet weather flows, the oil baffle system can be expected to remove between 40 and 70% of the free oil and grease from the storm water runoff.

CDS Technologies only recommends the addition of sorbents to the separation chamber if there are specific land use activities in the catchment watershed that could produce exceptionally large concentrations of oil and grease in the runoff, concentration levels well above typical amounts. If site evaluations merit an increased control of free oil and

grease then oil sorbents can be added to the CDS unit to thoroughly address these particular pollutants of concern.

Recommended Oil Sorbents

Rubberizer® Particulate 8-4 mesh or OARS™ Particulate for Filtration, HPT4100 or equal. Rubberizer® is supplied by Haz-Mat Response Technologies, Inc. 4626 Santa Fe Street, San Diego, CA 92109 (800) 542-3036. OARS™ is supplied by AbTech Industries, 4110 N. Scottsdale Road, Suite 235, Scottsdale, AZ 85251 (800) 545-8999.

The amount of sorbent to be added to the CDS separation chamber can be determined if sufficient information is known about the concentration of oil and grease in the runoff. Frequently the actual concentrations of oil and grease are too variable and the amount to be added and frequency of cleaning will be determined by periodic observation of the sorbent. As an initial application, CDS recommends that approximately 4 to 8 pounds of sorbent material be added to the separation chamber of the CDS units per acre of parking lot or road surface per year. Typically this amount of sorbent results in a ½ inch to one (1") inch depth of sorbent material on the liquid surface of the separation chamber. The oil and grease loading of the sorbent material should be observed after major storm events. Oil Sorbent material may also be furnished in pillow or boom configurations.

The sorbent material should be replaced when it is fully discolored by skimming the sorbent from the surface. The sorbent may require disposal as a special or hazardous waste, but will depend on local and state regulatory requirements.

CLEANOUT AND DISPOSAL

A vactor truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30-40 minutes for most installations. Standard vactor operations should be employed in the cleanout of the CDS unit. Disposal of material from the CDS unit should be in accordance with the local municipality's requirements. Disposal of the decant material to a POTW is recommended. Field decanting to the storm drainage system is not recommended. Solids can be disposed of in a similar fashion as those materials collected from street sweeping operations and catch-basin cleanouts.

MAINTENANCE

The CDS unit should be pumped down at least once a year and a thorough inspection of the separation chamber (inlet/cylinder and separation screen) and oil baffle performed. The unit's internal components should not show any signs of damage or any loosening of the bolts used to fasten the various components to the manhole structure and to each other. Ideally, the screen should be power washed for the inspection. If any of the internal components is damaged or if any fasteners appear to be damaged or missing, please contact CDS Technologies to make arrangements to have the damaged items repaired or replaced:

CDS Technologies, Inc.
16360 Monterey Road, Suite 250
Morgan Hill, CA 95037-5406

Phone, Toll Free: (888) 535-7559
Fax: (408) 782-0721

APPENDIX B

Wetland Evaluation

1.0 INTRODUCTION

Project Description

The project consists of the construction of a Wal-Mart store. The construction work will include:

- clearing and grubbing, excavation of rootmat/topsoil and peat, removal of unsuitable organic material from the site, and placement of granular fill to raise the site to design elevations;
- excavations for foundations and services within the building area, and subsequent building component construction;
- excavation and installation of underground services outside the building, including water, sanitary and storm lines;
- construction of a paved parking area; and
- landscaping in specific areas of the site, including the future building expansion area.

The project will partially infill wetland habitat. Under the Activities Designation Regulations the infilling or alteration of wetlands requires approval from the Nova Scotia Department of the Environment and Labour (NSEL). A wetland evaluation is required to provide NSEL with the necessary information regarding the value of various wetland functions in relation to the value of the project so that NSDEL can make an informed decision as to whether or not approval will be granted. In this instance the size of the wetland affected is greater than two hectares in size. As such, the NSEL Wetland Directive indicates that the North American Wetlands Conservation Council Wetland Evaluation Guide must been used for this evaluation.

The wetland evaluation prepared for this project provides the following information:

- Wetland characteristics
- Human use of the wetland
- Project impacts on the wetland; and
- Possible mitigation

2.0 WETLAND CHARACTERISTICS

The wetland is a wetland complex consisting of coniferous treed basin swamp, mixedwood treed basin swamp, two types of tall shrub dominated basin swamp, graminoid dominated basin fen, and cat-tail dominated basin marsh (Figure 1). Approximately half of the wetland is located within the property. All but one of the wetland habitat types found in the wetland are present on the property. The only wetland habitat type not found on the property is cat-tail dominated basin marsh.

Spar Road Walmart
Sydney, Nova Scotia

Figure 1

Habitat Distribution

Map Features

Roads
- Road
- Unpaved Road
- Rail

Topography
- Contour (5m)
- Watercourse
- Property Boundary
- NSDR Surveyed Wetland

Wetland Habitat Types
- A — Coniferous Treed Basin Swamp
- B — Mixed Treed Basin Swamp
- C — Tall Shrub Dominated Basin Swamp
- D — Graminoid Dominated Basin Fen
- E — Cat-Tail Dominated Basin Marsh
- F — Mature Mixedwood Forest
- G — Tall Shrub Thicket

Future Development
- Subject Property Boundary

N

0 50 100 150

Metres

Map Parameters
Projection: UTM-NAD83-ZONE20
Scale - 1 : 3,000
Project Number: SS52938
Date: July 15, 2005

Jacques Whitford

Coniferous treed basin swamp

Coniferous treed basin swamp is found in drier areas of the wetland, It is characterized by a relatively dense tree canopy composed almost entirely of American larch (*Larix laricina*). The shrub understory is relatively sparse and consists mainly of speckled alder (*Alnus incana*), narrow-leaved meadow-sweet (*Spirea alba*), and shining rose (*Rosa nitida*).The ground vegetation consist largely of a mixture of tussock sedge (*Carex stricta*) and sphagnum moss (*Sphagnum* spp.) along with smaller amounts of sensitive fern (*Onoclea sensibilis*) dwarf red raspberry (*Rubus pubescens*), Canada goldenrod (*Solidago canadensis*), and three-leaf Solomon's plume (*Smilacina trifolia*).

Mixedwood treed basin swamp

Mixedwood treed basin swamp is found in wetter areas than the coniferous treed basin swamp and appears to be transitional between treed swamp and tall shrub swamp. The tree canopy is relatively sparse and consists mainly of American larch with some red maple (*Acer rubrum*). The shrub understory is dense and composed of a variety of tall and low shrub species including narrow-leaved meadow sweet, mountain holly (*Nemopanthus mucronata*), possum-haw viburnum (*Viburnum nudum*), speckled alder, rhodora (*Rhododendron canadense*), common Labrador tea (*Ledum groenlandicum*),and sheep laurel (*Kalmia angustifolia*). The ground vegetation consists of a carpet of sphagnum moss that is punctuated by patches of three-leaf Solomon's plume and blue-joint reedgrass (*Calamagrostis canadensis*)

Tall shrub dominated basin swamp

Two tall shrub dominated basin swamps are present in the wetland. Unfortunately, it is not possible to differentiate them on air photography of the property so it is not possible to display their distributions.

The first type if very similar in species composition to the mixedwood treed basin swamp It is characterized by a very diffuse tree canopy that consists of a few scattered American larch, black spruce (*Picea mariana*), and red maple. The shrub understory is very dense and consists mainly of narrow-leaved meadow sweet, possum–haw viburnum, and mountain holly along with small amounts of leatherleaf (*Chamaedaphne calyculata*) , rhodora, and mountain fly honeysuckle (*Lonicera villosa*).The ground vegetation layer is dominated by sphagnum moss, three-leaf Solomon's plume and dwarf dogwood (*Cornus canadensis*).

The second tall shrub dominated basin swamp is characterized by a very dense shrub canopy composed largely of speckled alder, narrow-leaved meadow sweet and willows (*Salix* spp.). The ground vegetation layer is rather sparse and consists mainly of some moss cover and

three-leaf Solomon's plume found around the margins of a myriad of small pools found under the shrub canopy. Tree cover consists of a few scattered American larch.

Graminoid dominated basin fen

Graminoid dominated basin fen is found in the center of the wetland immediately south of the abandoned tram line that passes through the wetland. This plant community lacks tree cover and contains only a light cover of shrubs which are found mainly around the margins of the plant community. Narrow-leaved meadow-sweet and speckled alder are the most abundant shrub species. The ground vegetation layer consists of a dense sward of blue-joint reedgrass and tussock sedge along with some parasol white-top (*Aster umbellatus*) and tall meadow-rue (*Thalictrum pubescens*).

Cat-tail dominated basin marsh

Cat-tail dominated basin marsh is found only in the northern half of the wetland. It appears that the hydrology of the wetland has been altered as a result of the construction of the abandoned tram line that bisects the wetland, resulting in the wetland becoming wetter in the north side of the road. This has resulted in the conversion of swamp to marsh. The vegetation of this plant community is dominated by graminoid species including broad-leaf cat-tail (*Typha latifolia*), black-girdle bulrush (*Scirpus cyperinus*) and tussock sedge. No tree cover is present in this plant community and shrub cover is often restricted to a fringe of narrow-leaved meadow-sweet, speckled alder and balsam willow (*Salix pyrifolia*) found around the margin of the marsh.

Rare Vascular Plants

A vascular plant survey was conducted in the wetland as part of the wetland evaluation. All species of vascular plant encountered during the field survey were identified and their population status in Nova Scotia were determined through a review of the species status reports prepared by the Nova Scotia Department of Natural Resources (NSDNR 2003; NSDNR 2004), Atlantic Canada Conservation Data Centre (ACCDC 2004) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2004). A list of the vascular plant species found on the site is presented in Appendix C of the accompanying EA Registration document. None of the species encountered during the field survey are considered to be rare in Nova Scotia (ACCDC 2004; NSDNR 2004) or in Canada (COSEWIC 2004), although one uncommon species, water loosestrife (*Lysimachia thyrsiflora*), listed as S3 by ACCDC was encountered during the survey. This species is considered to be secure in Nova Scotia by NSDNR. Approximately ten water loosestrife plants were encountered in the northwestern corner of the study area in a rich microsite in cat-tail dominated basin marsh. This area is outside of the property and will not be directly affected by construction activity.

2.1 Birds

A breeding bird survey conducted in the wetland (June 16, 2005) revealed the presence of 13 species of bird in the wetland. Bird species recorded in and near the wetland included Alder Flycatcher, American Crow, American Goldfinch, Black-and-white Warbler, Canada Warbler, Common Grackle, Common Yellowthroat, Dark-eyed Junco, Magnolia Warbler, Song Sparrow, Swamp Sparrow, White-throated Sparrow, and Yellow Warbler. There is suitable nesting habitat for all of these species in the wetland. Evidence collected during the field survey confirmed that Common Grackles nest in the wetland (attending young). Swamp and Song Sparrows were listed as probable nesters (male and female observed together in suitable nesting habitat). The remaining species with the exception of American Crow were considered to be possible nesters (males heard singing in suitable nesting habitat). There was no evidence to indicate that American Crows nest in the wetland although suitable habitat is present. A second survey conducted during spring migration (May 6, 2005) revealed the presence of three other species in the wetland including American Robin, Downy Woodpecker and Cedar Waxwing. None of these species was encountered during the later breeding bird survey, however, suitable nesting habitat is available in the wetland for all of these species.

None of the species recorded in or near the wetland is considered to be rare or sensitive nationally (COSEWIC 2004) or provincially (NSDNR 2004). However, Canada Warbler has been identified by the Canadian Wildlife Service (2003) as a species undergoing large scale population declines although it is still a relatively common species in Nova Scotia.

2.2 Mammals

Mammals recorded in the wetland included red squirrel (*Tamiasciurus hudsonicus*), varying hare (*Lepus americanus*), white-tailed deer (*Odocoileus virginianus*) meadow vole (*Microtus pennsylvanicus*), and raccoon (*Procyon lotor*). None of these species is considered to be rare or sensitive (COSEWIC 2004, NSDNR 2004), and are characteristic of the surrounding terrestrial habitats as well as wetland habitat.

2.3 Amphibians and Reptiles

The amphibians recorded in the wetland included green wood frog (*Rana sylvatica*), northern spring peeper (*Pseudoacaris crucifer*) and red-back salamander (*Plethodon cinereus*). All of these species are common.

No reptiles were observed in the wetland. The wetland has suitable habitat for a number of common reptile species such as maritime garter snake (*Thamnophis sirtalis*), smooth green snake (*Lilochlorophis vernalis*) and northern redbelly snake (*Storeria occipitomaculata*). The habitat might also be expected to support spotted salamander (*Ambystoma maculatum*).

2.4 Fish

The wetland does not provide suitable habitat for fish and none were observed in the wetland.

3.0 HUMAN USE OF THE WETLAND

The wetland appears to be used to a limited extent by humans. Tracks along the abandoned tramway indicated that some people walk along this route. ATV tracks were also present along the abandoned tramway. The wetland is located too close to existing buildings to be used for hunting and there is no suitable fish habitat in the wetland to provide sports fishing opportunities. The wetland does not contain large numbers of edible plants so it is unlikely that it is used extensively for berry picking or the collection of other edible species.

Several human activities have altered the size and hydrology of the wetland. An abandoned tramway bisects the wetland into two halves. Construction of the tramway resulted in a small loss of wetland habitat as a result of infilling, however, more importantly it has altered the hydrology of the wetland. Field observations indicate that water flows from the northern half of the wetland into the southern half of the wetland. The abandoned tramway interferes with the flow of water from north to south resulting in paludification of the northern half. The retention of water in the northern half has resulted in changes to the species composition of plant communities in the northern half of the wetland. Most notably, there has been mortality of trees in the northern half combined with colonization of this area by broad-leaved cat-tail. In essence, there has been a shift from late successional swamp habitat to early successional marsh habitat.

The tramway also serves as a power line corridor. The presence of power poles along the tram way does not appear to have had any significant adverse effect on the wetland. The presence of elevated power lines could result in occasional collisions of birds with the lines particularly during migration when many bird species are in flight after dark.

The western end of the wetland has been truncated as a result of construction of Spar Road. This has resulted in the direct loss of wetland habitat and potential alteration of the hydrology of the wetland. The ditch along Spar Road now conveys water from the wetland to the north. Seeps are present along the cut face of the wetland. Spar Road has not been in existence long enough to have any noticeable affect on the wetland such as changes in plant species composition. It is likely that over time the portion of the wetland south of the abandoned tram way will become drier, particularly at the western end of this half of the wetland.

In recent years the municipal landfill site has encroached upon the northern side of the wetland. This has resulted in increased inputs of wind blown trash into the wetlands. It may also result in increased inputs of sediment into the wetland which can be expected to alter the species composition of the wetland. Inputs of sediment can make the wetland more suitable for plant species more characteristic of marshes than peaty swamps. This combined with impounding of water associated with the abandoned tramway may be responsible for the higher abundance of marsh plant species on the northern side of the wetland.

4.0 PROJECT IMPACTS ON WETLAND AND MITIGATION

Construction of the proposed Wal-Mart will result in the direct loss of 3.3 ha of wetland habitat including 0.97 ha of coniferous treed basin swamp, 0.99 ha of mixedwood treed basin swamp, 1.22 ha of tall shrub dominated basin swamp, and 0.13 ha of graminoid dominated basin fen. This represents 45% of the total area of the wetland.

Construction of the store will also result in habitat fragmentation effects. In recent years, much of the forest habitat north of the wetland has been lost to expansion of the municipal landfill and the western end of the wetland has been truncated by Spar Road. Construction of the proposed store will result in the generation of a long narrow corridor of wetland habitat sandwiched between heavily disturbed areas that have little value as habitat. This can be expected to reduce the value of the remaining wetland habitat as wildlife habitat. Most of the bird and mammal species that occupy the wetland are characteristic of forested areas. The loss of adjacent forested areas will make the remaining habitat less suitable for these species. The loss of adjacent forested habitat will also increase the amount of edge habitat associated with the wetland. Edge habitat can be very attractive to wildlife but it can also lead to increased rates of mortality particularly for nesting birds since the edges tend to attract generalist predators such as crows, ravens, racoons, and feral cats. These areas are also attractive to Brown-headed Cowbirds that parasitize the nests of passerine birds. Edges near human habitation also attract European Starlings, an aggressive introduced species that often usurps nest holes from cavity nesting species such as chickadees and nuthatches.

In addition to direct loss of wetland habitat there is also potential for further alteration of the hydrology of the wetland through the impedance of water flow through the wetland and through alteration of the surface water flow patterns into the wetland as a result of infilling of wetland habitat and replacement of permeable surfaces with impermeable surfaces. Construction of the store could also increase inputs of contaminants into the wetland particularly road salt, hydrocarbons and metals.

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
LIFE SUPPORT VALUES: <u>Hydrological Values</u> Value of the wetland in contributing to surface and groundwater stocks				
* Does the wetland contribute to recharge of regional water supply aquifers?	N	NA	NA	No regional aquifer used for supply
* Does the wetland provide flood protection benefits?	P	L	L	The wetland provides minimal flow attenuation as the culvert outlet is located at a low point along the wetland floor which is gradually sloped toward the outlet. The flat topography, limited depression storage and vegetation does provide minimal flow detention. Also development plans will reduce peak flows to pre-development conditions.
Does the wetland contribute to usable surface water?	P	L	H	The wetland provides surface water to a stream network which feeds into incinerator Brook and MAID pond, which may be of limited usefulness. The water quality of the effluent from the site will be affected by salt and hydrocarbon contamination from the parking areas.
Does the wetland provide erosion control?	P	NE	L	The minimal flow attenuation provided by the wetland may reduce bank erosion locally by dampening flows.
Does the wetland provide flow augmentation to users through a headwater position in the catchment basin?	P	NE	L	The wetland provides little flow augmentation as it detains little standing water.
* Does the wetland reduce tidal impacts?	N	NA	NA	
LIFE SUPPORT VALUES: <u>Biogeochemical Values</u> Value of the wetland in contributing to surface and groundwater quality				
* Does the wetland receive significant pollution of a type amenable to amelioration by wetlands?	N	NA	NA	
Does the wetland provide storage for agricultural runoff?	N	NA	NA	
*Does the wetland provide for containment of toxics contained in surface run-off or through discharge flow?	P	L	L	

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
Does the wetland provide for sediment flow stabilization?	Y	L	L	The wetland traps sediment produced by ATV traffic along abandoned tram way. It may also trap sediment from disturbed areas in adjacent landfill.
Does the wetland have high nutrient levels which support significant wildlife populations?	N	NA	NA	Some areas of wetland exhibit increased nutrient levels, most of the wetland is low nutrient level. No significant wildlife populations are present.
LIFE SUPPORT VALUES: <u>Habitat Values</u> Role of the wetland in contributing to the well-being of important plant and animal values				
* Are there any rare, threatened or endangered animal or plant species present?	N	NA	NA	No rare or endangered species present. One uncommon plant species present (water loosestrife) and one bird species listed on CWS Maritimes priority list of landbirds (Canada Warbler). Both species listed as secure in Nova Scotia (NSDNR 2003).
* Does the wetland contain high quality significant habitats for migratory birds?	N	NA	NA	The wetland provides habitat for 25 species of bird but is not considered to be high quality or significant bird habitat relative to other wetlands in the province.
Does the wetland provide habitat for sport and/or commercial fish?	N	NA	NA	
Does the wetland provide significant habitat for reptiles and amphibians?	N	NA	NA	The wetland is known to provides habitat for three amphibian species. Other species are likely to be present. No rare or endangered herpetile species were noted nor are they likely to be present. The wetland does not support unusually high concentrations of reptiles or amphibians.
Does the wetland provide significant habitat for crustaceans?	N	NA	NA	
Does the wetland provide significant habitat for mammals?	N	NA	NA	
* Does the wetland support a significant animal or plant species in unusual abundance?	N	NA	NA	No unusually high concentrations of plant or animal species were noted in the wetland nor is the wetland characterized by unusually high species richness.

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
Does the wetland and its associated vegetation protect natural shorelines?	N	NA	NA	
* Is the wetland ranked as a Class I, II, or III wetland by Canada Land Inventory or other accepted evaluation system?	N	NA	NA	
LIFE SUPPORT VALUES: <u>Ecological Values</u> Role of the wetland in stimulating relations of plant and animal communities				
Does the wetland support an extensive ecosystem complex including uplands?	N	NA	NA	The wetland is currently flanked by forest habitat on the south and east sides. The forest habitat to the south is 150 m wide. The area to the north is occupied by a capped landfill and the area to the west is used for industrial and commercial purposes. The wetland currently drains into a roadside ditch on Spar Road.
* Has a regional threshold been reached where the significance of wetland ecosystems for the entire region will be compromised by further degradation?	N	NA	NA	
* Is the wetland considered a classic example of its type?	N	L	M	This wetland is similar to a many other basin swamps in the general area. While a "classic" example of this type in a certain sense, this wetland has not gained any national, local or provincial acclaim as a classic representative of its kind.
Are there few remaining natural, unimpacted wetlands of this type in the region?	N	NA	NA	This wetland type is well represented in the local area as well as the province as a whole.
Does the wetland contain, owe its existence to, or is it a part of or ecologically associated with, a geological feature which is an excellent representation of its type?	N	NA	NA	
Does the wetland form an integral part of an important water drainage system?	N	NA	NA	The wetland currently drains into a roadside ditch system.
* Does the wetland display biological diversity that is of interest?	N	NA	NA	This wetland lacks the size or extensive intersection of varied habitat features and nutrient levels that promote a particularly high level or unique aspect of biodiversity.

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
SOCIAL/CULTURAL VALUES: <u>Aesthetic Values</u> Role of the wetland in the quality of the scenic environment				
Is the wetland visible from a provincial/territorial highway, a designated scenic highway/road or a passenger railway?	Y	L	L	The western end of the wetland is visible from Spar Road which services the industrial park.
Does the wetland provide a valuable aesthetic or open space function?	Y	L	L	The wetland has been subjected to refuse dumping and is located next to a decommissioned landfill site. The abandoned tram way through the wetland provides access to more aesthetically pleasing areas. The wetland provides an aesthetic or open space function but the function is not particularly valuable.
Does the wetland add substantially to the visual diversity of the landscape?	N	NA	NA	Habitats in the wetland are similar in appearance to terrestrial habitats in the general area and do not add substantially to the visual diversity of the local landscape.
* Is the wetland an important sightseeing locale?	N	NA	NA	
SOCIAL/CULTURAL VALUES: <u>Recreational Values</u> Role of the wetland in the quality of the scenic environment				
Does the wetland provide a base for viewing or photographing large numbers of wildlife?	N	NA	NA	
Does the wetland provide opportunities for boating?	N	NA	NA	
Does the wetland provide winter recreation opportunities?	P	L	L	The wetland abandoned tram way that passes through the wetland could be used for cross country skiing or snowmobiling.
Does the wetland provide high quality sport hunting or fishing?	N	NA	NA	
SOCIAL/CULTURAL VALUES: <u>Education and Public Awareness Values</u> Role of the wetland in stimulating public values and understanding				
Is the wetland used for scientific research?	N	NA	NA	
* Is the wetland used for educational and interpretation purposes?	N	NA	NA	
Does the wetland exist close to a large urban population?	Y	L	H	The wetland is located within the city of Sydney.

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
Does the wetland receive large numbers of visitors?	Y	L	L	Evidence indicates that hikers, bicyclists and ATV riders make use of the abandoned tram way that passes through the wetland. However, the number of people using the tram way is unknown. None were observed during the three site visits.
SOCIAL/CULTURAL VALUES: <u>Public Status Values</u> Role of the wetland in creating a sense of public ownership				
Is the wetland part of the pattern of settlement and rural/urban lifestyle?	N	NA	NA	
Is the wetland a designated site of special public interest?	N	NA	NA	
* Is the wetland a unique national, provincial or regional resource?	N	NA	NA	
Are there policies/programs to support conservation/restoration of the wetland?	Y	P	H	NSDEL Wetland Directive, the Federal Policy on Wetland Conservation
Does the wetland provide for easy public access?	Y	L	L	The wetland is easily accessed by an abandoned tram way that runs through the length of the wetland.
Is the wetland public land?	N	NA	NA	
SOCIAL/CULTURAL VALUES: <u>Cultural Attribute Values</u> Role of the wetland in the identity of the people in the area				
Does the wetland form part of the historical/cultural heritage of a regional population?	N	NA	NA	
* Does the wetland contain archaeological or paleontological resources?	N	NA	NA	
Is the wetland utilised for cultural events or cultural renewal?	N	NA	NA	
*Does the wetland form part of a native traditional use area?	N	NA	NA	
WETLAND PRODUCTION VALUES: <u>Agricultural Values</u> Role of the wetland in contributing to agricultural production				
Does the wetland provide water for livestock?	N	NA	NA	
Does the wetland provide a source of forage?	N	NA	NA	
* Does the wetland provide a source of water for crop irrigation?	N	NA	NA	
Does the wetland serve to reduce topsoil erosion?	N	NA	NA	
Does the wetland serve to increase soil moisture and enhance agricultural crop production?	N	NA	NA	
WETLAND PRODUCTION VALUES: <u>Renewable Resource Values</u> Role of the wetland in contributing to the viability of renewable resource harvest				

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**
* Is the wetland used for commercial or subsistence hunting, trapping and fishing?	N	NA	NA	
Does the wetland provide opportunities for non-commercial uses of fish, wildlife, crustaceans and/or water resources?	Y	L	M	There is a possibly albeit limited for varying hare snaring.
Can forest resources of the wetland be harvested?	Y	L	M	Patches of American larch large enough to be harvested are present in the wetland
* Are there other commercial uses of the wetland, such as harvesting opportunities for wild rice, cranberries, or gathering crabs and oysters?	N	NA	NA	
WETLAND PRODUCTION VALUES: <u>Non-renewable Resource Values</u> Role of the wetland in contributing non-renewable resources for consumption				
* Is the wetland used as a commercial source of peat for horticulture or energy?	N	NA	NA	Average peat thickness in the wetland is estimated to be less than 25 cm.
Does the wetland occur over known mineral or gas and oil deposits?	N	NA	NA	
WETLAND PRODUCTION VALUES: <u>Tourism and Recreational Values</u> Role of the wetland in stimulating tourism and recreation economic benefits				
* Does the wetland represent an important local, regional, or provincial tourism or recreation attraction?	N	NA	NA	
Does the wetland contribute to the local, regional, or provincial tourism and recreation economy?	N	NA	NA	
Does the wetland contribute to national and international tourism development?	N	NA	NA	
WETLAND PRODUCTION VALUES: <u>Urban Values</u> Role of the wetland in contributing to urban economic values				
* Is the wetland used to provide water for industry?	N	NA	NA	
* Is the wetland used as a means of sewage treatment?	N	NA	NA	
* Is the wetland a direct source of domestic water supply?	N	NA	NA	
Does the wetland enhance residential, commercial or industrial development values?	N	NA	NA	
Does the wetland contribute to urban flood protection and associated land values?	P	L	L	The wetland may help to regulate ditch flow by storing and slowly releasing surface waters that enter it.

WETLAND VALUES				
	Are Criteria Present?	**Level of Criterion Significance**	**Expected Impact of Project Upon Wetland Values**	**Describe Function (Provide Highlights Only)**

Key:

Are Criteria Present?:
Y = Yes: confirmed presence
L = Likely: data suggests the presence but the presence is unconfirmed
P = Possibly: location and circumstance suggests presence but no data are available
N = No: not present
U = Unknown

Level of Criterion Significance:
N = National
P = Provincial
R = Regional
L = Local
NE = Negligible
NA = Not Applicable

Expected Impact of Project Upon Wetland Values:
H = High
M = Moderate
L = Low
NA = Not Applicable

SUMMARY OF WETLAND EVALUATION

Summary of Wetland Values Significance and Expected Impact

	Criteria Present				Level of Criterion Significance					Expected Impact		
	Y	L	P	C	N	P	R	L	NE	H	M	L
Life Support Values												
Hydrological	0	0	4	1	0	0	0	2	2	1	0	3
Biogeochemical	0	1	1	0	0	0	0	2	0	0	0	2
Habitat	0	0	0	0	0	0	0	0	0	0	0	0
Ecological	0	0	0	0	0	0	0	0	0	0	0	0
Social/Cultural Values												
Aesthetic	2	0	0	0	0	0	0	2	0	0	0	2
Recreational	0	0	1	0	0	0	0	1	0	0	0	1
Education and Public Awareness	2	0	0	0	0	0	0	2	0	0	1	1
Public Status	2	0	0	0	0	1	0	1	0	1	0	1
Cultural Attribute	0	0	0	0	0	0	0	0	0	0	0	0
Production Values												
Agricultural	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Resource	2	0	0	0	0	0	0	2	0	0	2	0
Non-renewable Resource	0	0	0	0	0	0	0	0	0	0	0	0
Tourism and Recreational	0	0	0	0	0	0	0	0	0	0	0	0
Urban	0	0	1	0	0	0	0	1	0	0	0	1
Total Occurrences	8	1	7	1	0	1	0	13	2	2	3	11

Key:
*=Critical Values

Are Criteria Present?:
Y = Yes: confirmed presence
L = Likely: data suggests the presence but the presence is unconfirmed
P = Possibly: location and circumstance suggests presence but no data are available
C = Critical value: value whose product, service or function is very important to society or where an important threshold may be exceeded, resulting in loss of the function and value.

Level of Criterion Significance:
N = National
P = Provincial
R = Regional
L = Local
NE = Negligible

Expected Impact of Project Upon Wetland Function:
H = High
M = Moderate
L = Low

Trigger Factors: a combination of factors may suggest wetland protection, project acceptance and/or mitigation of project **if** 3 or more critical criteria are marked “yes”, criteria are present **and/or** over 50% of criteria have national/provincial/regional significance **and/or** over one third of expected project impact is high **then,** the evaluator should recognize that the wetland has major significance and/or could be significantly affected by the proposed project.

5.0 SUMMARY OF CRITICAL VALUES

In the wetland evaluation process, some functions are considered more important than others and are identified as critical values marked with an asterisk (*) in the tables. Critical value notation indicates a wetland value whose product, service or function is very important to society or where an important threshold or function may by exceeded, resulting in the loss of the function and value (Bond et al. 1992). One critical value was identified for the wetland. This relates to the ability of the wetland to provide flood control benefits. The wetland provides a small amount of surface water retention due to its limited storage capacity and the presence of dense vegetation which physically slows the flow of water through the wetland. Project design will ensure that peak flows will be approximates the same as predevelopment conditions.

The wetland may also play a small role in stream flow augmentation by retaining and slowly releasing water. This function is limited due to the fact that it detains little water. The wetland probably also play a role in controlling erosion and retaining sediment.

The wetland does not provide habitat for any rare or endangered species, however, it does provide habitat for water loosestrife, an uncommon plant species and Canada Warbler, a bird species listed on CWS Maritimes priority list of landbirds (a species undergoing population declines but still relatively common). Both species are considered to be secure in Nova Scotia by NSDNR.(2004). The wetland has some recreational value. The abandoned tram way that passes through the wetland is used by hikers, bycyclists, ATV riders and snowmobilers.

Construction of the proposed store will result in the loss of 3.3 ha of wetland habitat representing 45% of the total area of wetland habitat. As such, the development would have an important effect on the wetland although the wetland is not a significant or particularly sensitive wetland.

6.0 MITIGATION

The water loosestrife will not be directly affected by construction activities since it is located north of the abandoned tram way. Wal-Mart has committed to minimizing the effects of the project on wetland hydrology which will help to maintain this population of this uncommon species. It is likely that the loss of treed swamp and adjacent upland forest habitat will make the wetland unsuitable as nesting habitat for Canada Warblers. Similarly other bird species that nest in the wetland that are associated with forested areas will also find the wetland unattractive as nesting habitat. It will not be possible to provide alternative habitat for these species. In order to reduce adverse effects on these species as well as to avoid contravention

of the *Migratory Birds Convention Act* clearing and grubbing of the site should be conducted outside of the breeding season for most bird species between April 1 and August 15. A few migratory bird species such as White-wing Crossbills and Red Crossbills also nest during the winter months. Prior to clearing, a survey should be conducted to ensure that no early nesting species protected by the *Migratory Birds Convention Act* are nesting on the site.

The footprint of the area to be cleared should be kept as small as possible and areas that must be revegetated should be revegetated with native plant species wherever possible. The best way to accomplish this would be to set aside wetland grubbings and place them in areas of the wetland that may need to be revegetated. The grubbings contain buried seed and vegetative propagules such as dormant buds on rhizomes that will re-establish the many of the species present in the wetland. This method is cost effective and provides plant material that is pre-adapted to conditions present in the wetland.

Information sources

Bond, W.K., K.W. Cox, T. Heberlein, E.W. Manning, D.R. Witty, and D.A. Young.1992. Wetland Evaluation Guide. North American Wetlands Conservation Council (Canada), Issues Paper No .1992-1

APPENDIX C

ACCDC 100 km Vascular Plant List and Phenology
Vascular Plants Recorded On Site

TABLE 1C Vascular Plants Recorded on Site

Common Name	Scientific Name	Rank
Balsam Fir	*Abies balsamea*	S5
Red Maple	*Acer rubrum*	S5
Rough Bentgrass	*Agrostis hyemalis*	S5
Spreading Bentgrass	*Agrostis stolonifera*	S5SE
Broad-Leaved Water-Plantain	*Alisma triviale*	S5
Speckled Alder	*Alnus incana*	S5
Bartram Shadbush	*Amelanchier bartramiana*	S5
Allegheny Service-Berry	*Amelanchier laevis*	S5
Serviceberry	*amelanchier Sp.*	
Running Serviceberry	*Amelanchier x quinti-martii*	HYB
Pearly Everlasting	*Anaphalis margaritacea*	S5
Great Angelica	*Angelica atropurpurea (A. atropurpurea x A. sylvestris)*	S4S5
Woodland Angelica	*Angelica sylvestris*	SE
Wild Sarsaparilla	*Aralia nudicaulis*	S5
Lesser Burdock	*Arctium minus*	SE
Red Chokeberry	*Aronia arbutifolia*	S4S5
Black Chokeberry	*Aronia melanocarpa*	S5
Common Wormwood	*Artemisia vulgaris*	SE
Whorled Aster	*Aster acuminatus*	S5
Farewell Summer Aster	*Aster lateriflorus*	S5
Bog Aster	*Aster nemoralis*	S5
New Belgium American-Aster	*Aster novi-belgii*	S5
Swamp Aster	*Aster puniceus*	S5
Rough-Leaved Aster	*Aster radula*	S5
Parasol White-Top	*Aster umbellatus*	S5
Lady-Fern	*Athyrium filix-femina*	S5
Heart-Leaved Paper Birch	*Betula cordifolia*	S5
Paper Birch	*Betula papyrifera*	S5
Devil's Beggar-Ticks	*Bidens frondosa*	S5
Blue-Joint Reedgrass	*Calamagrostis canadensis*	S5
Wild Calla	*Calla palustris*	S4
Black Sedge	*Carex arctata*	S5
Brownish Sedge	*Carex brunnescens*	S5
Hoary Sedge	*Carex canescens*	S5
Hoary Sedge	*Carex canescens*	S5
White-Edge Sedge	*Carex debilis*	S5
Softleaf Sedge	*Carex disperma*	S5
Little Prickly Sedge	*Carex echinata*	S5
Long Sedge	*Carex folliculata*	S5
A Sedge	*Carex gynandra*	S5
Shallow sedge	*Carex lurida*	S5
Black Sedge	*Carex nigra*	S5
New England Sedge	*Carex novae-angliae*	S5
Bog Sedge	*Carex papercula var. irrigua*	S5
Pointed Broom Sedge	*Carex scoparia*	S5
Stalk-Grain Sedge	*Carex stipata*	S5
Tussock Sedge	*Carex stricta*	S5
Three-Seed Sedge	*Carex trisperma*	S5
Black Starthistle	*Centaurea nigra*	SE
Leatherleaf	*Chamaedaphne calyculata*	S5
Spotted Water-Hemlock	*Cicuta maculata*	S5
Creeping Thistle	*Cirsium arvense*	SE
Clinton Lily	*Clintonia borealis*	S5
Goldthread	*Coptis trifolia*	S5
Alternate-Leaf Dogwood	*Cornus alternifolia*	S5
Dwarf Dogwood	*Cornus canadensis*	S5
Pink Lady's-Slipper	*Cypripedium acaule*	S5
Wild Carrot	*Daucus carota*	SE
Northern Bush-Honeysuckle	*Diervilla lonicera*	S5
Mountain Wood-Fern	*Dryopteris campyloptera*	S5

TABLE 1C Vascular Plants Recorded on Site

Common Name	Scientific Name	Rank
Spinulose Shield Fern	*Dryopteris carthusiana*	S5
Crested Shield-Fern	*Dryopteris cristata*	S5
Evergreen Woodfern	*Dryopteris intermedia*	S5
Least Spikerush	*Eleocharis acicularis*	S5
Blunt Spikerush	*Eleocharis obtusa*	S4S5
Creeping Spikerush	*Eleocharis palustris*	S5
Hairy Willow-Herb	*Epilobium ciliatum*	S5
Linear-Leaved Willow-Herb	*Epilobium leptophyllum*	S5
Field Horsetail	*Equisetum arvense*	S5
Woodland Horsetail	*Equisetum sylvaticum*	S5
Common Boneset	*Eupatorium perforatum*	S5
Flat-Top Fragrant-Golden-Rod	*Euthamia graminifolia*	S5
Flat-Top Fragrant-Golden-Rod	*Euthamia graminifolia*	S5
American Beech	*Fagus grandifolia*	S5
Hair Fescue	*Festuca filiformis*	SE
Meadow Rye Grass	*Festuca pratensis*	SE
Red Fesque	*Festuca rubra*	S5
Virginia Strawberry	*Fragaria virginiana*	S5
Rattlesnake Grass	*Glyceria canadensis*	S5
Fowl Manna-Grass	*Glyceria striata*	S5
Meadow Hawkweed	*Hieracium caespitosum*	SE
Wall Hawkweed	*Hieracium murorum*	SE
Tall Hawkweed	*Hieracium piloselloides*	SE
Canadian St. John's-Wort	*Hypericum canadense*	S5
A St. John's-Wort	*Hypericum perforatum*	SE
Black Holly	*Ilex verticillata*	S5
Spotted Jewel-Weed	*Impatiens capensis*	S5
Blueflag	*Iris versicolor*	S5
Jointed Rush	*Juncus articulatus*	S5
Narrow Panicled Rush	*Juncus brevicaudatus*	S5
Toad Rush	*Juncus bufonius*	S5
Canada Rush	*Juncus canadensis*	S5
Soft Rush	*Juncus effusus*	S5
Thread Rush	*Juncus filiformis*	S5
Slender Rush	*Juncus tenuis*	S5
Sheep-Laurel	*Kalmia angustifolia*	S5
Pale Laurel	*Kalmia polifolia*	S5
Vetchling Peavine	*Lathyrus palustris*	S5
American Larch	*Larix laricina*	S5
Common Labrador Tea	*Ledum groenlandicum*	S5
Twinflower	*Linnaea borealis*	S5
Mountain Fly-Honeysuckle	*Lonicera caerulea*	S4S4
Common Woodrush	*Luzula multiflora*	S5
Swamp Loosestrife	*Lysimachia terrestris*	S5
Water Loosestrife	*Lysimachia thyrsiflora*	S3S4
Purple Loosestrife	*Lythrum salicaria*	SE
Wild Lily-of-The-Valley	*Maianthemum canadense*	S5
Indian Pipe	*Monotropa uniflora*	S5
Small Forget-Me-Not	*Myosotis laxa*	S5
Mountain Holly	*Nemopanthus mucronata*	S5
Red Odontities	*Odontites serotina*	SE
Common Evening-Primrose	*Oenothera biennis*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Cinnamon Fern	*Osmunda cinnamomea*	S5
Interrupted Fern	*Osmunda claytoniana*	S5
Royal Fern	*Osmunda regalis*	S5
Reed Canary Grass	*Phalaris arundinacea*	S5
Meadow Timothy	*Phleum pratense*	SE
White Spruce	*Picea glauca*	S5
Black Spruce	*Picea mariana*	S5
Red Spruce	*Picea rubens*	S5

TABLE 1C Vascular Plants Recorded on Site

Common Name	Scientific Name	Rank
Nipple Seed Plantain	*Plantago major*	SE
Green-Fringe Orchis	*Platanthera lacera*	S4S5
Woods Bluegrass	*Poa nemoralis*	SE
Fowl Bluegrass	*Poa palustris*	S5
Arrow-Leaved Tearthumb	*Polygonum sagittatum*	S5
Quaking Aspen	*Populus tremuloides*	S5
Three-Leaved Rattlesnake-root	*Prenanthes trifoliolata*	S5
Fire Cherry	*Prunus pensylvanicus*	S5
Choke Cherry	*Prunus virginiana*	S5
Bracken Fern	*Pteridium aquilinum*	S5
Tall Butter-Cup	*Ranunculus acris*	SE
Creeping Butter-Cup	*Ranunculus repens*	SE
Little Yellow-Rattle	*Rhinanthes crista-galli*	S5
Rhodora	*Rhododendron canadense*	S5
Skunk Currant	*Ribes glandulosum*	S5
Shining Rose	*Rosa nitida*	S4
Virginia Rose	*Rosa virginiana*	S5
Smooth Blackberry	*Rubus canadensis*	S5
Bristly Dewberry	*Rubus hispidus*	S5
Red Raspberry	*Rubus idaeus*	S5
Dwarf Red Raspberry	*Rubus pubescens*	S5
Small Bristleberry	*Rubus setosus*	S4?
Water Dock	*Rumex orbiculatus*	S5
Bebb's Willow	*Salix bebbiana*	S5
Pussy Willow	*Salix discolor*	S5
Heart-Leaved Willow	*Salix eriocephala*	S5
Prairie Willow	*Salix humilis*	S5
Balsam Willow	*Salix pyrifolia*	S5
Red Elderberry	*Sambucus racemosa*	S5
Black-Girdle Bulrush	*Scirpus cyperinus*	S5
Maiden’s Tears Campion	*Silene vulgaris*	SE
Three-Leaf Solomon's-Plume	*Smilacina trifolia*	S4S5
Climbing Nightshade	*Solanum dulcamara*	SE
Canada Goldenrod	*Solidago canadensis*	S5
Rough-Leaf Goldenrod	*Solidago rugosa*	S5
Bog Goldenrod	*Solidago uliginosa*	S5
Field Sowthistle	*Sonchus arvensis*	SE
American Mountain-Ash	*Sorbus americana*	S5
European Mountain-Ash	*Sorbus aucuparia*	SE
Narrow-Leaved Meadow-Sweet	*Spiraea alba*	S5
Common Dandelion	*Taraxacum officinale*	SE
Tall Meadow-Rue	*Thalictrum pubescens*	S5
New York Fern	*Thelypteris noveboracensis*	S5
Marsh St. John’s-Wort	*Triadenum sp.*	S4S5
Northern Starflower	*Trientalis borealis*	S5
Red Clover	*Trifolium pratense*	SE
Colt's Foot	*Tussilago farfara*	SE
Broad-Leaf Cattail	*Typha latifolia*	S5
Late Lowbush Blueberry	*Vaccinium angustifolium*	S5
Large Cranberry	*Vaccinium macrocarpon*	S5
Velvetleaf Blueberry	*Vaccinium myrtilloides*	S5
Possum-Haw Viburnum	*Viburnum nudum*	S5
Tufted Vetch	*Vicia cracca*	SE
Smooth White Violet	*Viola macloskeyi*	S5
Violet	*Viola sp.*	

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Sanicula odorata	Black Snake-Root	Rich, alluvial woods and along intervales.	RED	S1	July to August
Arnica lonchophylla ssp. lonchophylla	Northern Arnica	Calcareous gravel ledges and cliffs	RED	S1	Flowers July to August, likely identifiable from June to September at least
Vaccinium ovalifolium	Oval-Leaf Huckleberry	Moist or mesic coniferous woods. An arctic/alpine species.	RED	S1	Late July to early September, can be identified when not in flower.
Utricularia resupinata	Northeastern Bladderwort	Ponds, lakes and river shores	RED	S1	Flowers July to September, likely little noticeable or identifiable out of flower
Salix candida	Hoary Willow	Calcareous bogs and thickets.	RED	S1	April to June, can be identified when not in flower or fruit.
Carex gynocrates OR Carex dioica	Northern Bog Sedge	Sphagnum bogs and Coniferous swamps (but with underlying calcareous nature	RED	S1	Fruit matures from June to August
Carex livida var. radicaulis	Livid Sedge	Calcareous bogs and meadows.	RED	S1	Seeds (perigynia) required for identification. Can be identified from June through September.
Carex tenuiflora	Sparse-Flowered Sedge	Wet woods and bogs	RED	S1	not given for NS, most members of Heleonastes group flower June to August
Carex viridula ssp. brachyrrhyncha OR *Carex lepidocarpa*	Little Green Sedge	Calcareous bogs and gravels	RED	S1	Not given for Nova Scotia, likely June to September in fruit
Rhynchospora capillacea	Horned Beakrush	Alkaline bogs, also wet calcareous ledges in NB.	RED	S1	Not given for Nova Scotia
Iris prismatica	Slender Blue Flag	Wet ground near the coast.	RED	S1	Mid-July.
Triantha glutinosa, (syn. Tofieldia glutinosa)	Sticky False-Asphodel	Swamps, bogs and rocky beaches	RED	S1	Flowers June to August, not readily noticeable until bloom, and likely later with fruit
Listera australis	Southern Twayblade	Among the shaded sphagnum moss of bogs or damp woods.	RED	S1	June. Quickly senesces after flowering.
Elymus wiegandii (syn. *Elymus wiegandii var wiegandii)*	Wiegand's Wild Rye	Rich stream banks and meadows	RED	S1	Flowers July and August. flowers required for identification
Arnica lonchophylla	Northern Arnica	Calcareous gravel ledges and cliffs	RED	S1	Flowers July to August
Artemisia campestris ssp. borealis	Boreal Wormwood	Talus slopes	RED	S1	July and August
Draba norvegica	Norwegian Whitlow-Grass	Calcareous ledges, gravel and turf	RED	S1	June to early August
Draba pycnosperma	Norwegian Whitlow-Grass		RED	S1	
Diapensia lapponica	Lapland Diapensia	In clumps on projecting shoulders, and in crevices of steep north-west facing slopes	RED	S1	June and July
Rhododendron lapponicum	Lapland Azalea	Calcareous ledges	RED	S1	dwarf, aromatic shrub
Oxytropis campestris	Northern Yellow Point-Vetch	Exposed cliff crevices, gravelly or rocky scree, exposed headlands	RED	S1	June to July
Gentianella amarella ssp. acuta	Northern Gentian	Moist dunes, borders of dirt roads, hollows and calcareous ledges	RED	S1	Summer. Floweres required for positive identification
Pinguicula vulgaris	Common Butterwort	Moist ledges, especially in limestone and shales	RED	S1	June to early August

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Anemone multifida	Hudson Bay Anemone	Shores and rocky banks, on calcareous soils	RED	S1	May and June
Anemone parviflora	Small-Flower Anemone	Wet limestone cliffs bordering waterfalls and gravelly bluffs	RED	S1	June to Aug
Salix reticulata	Net-Veined Willow	Calcareous barrens and cliffs	RED	S1	Readily identifiable throughout the growing season
Salix vestita	Rock Willow	humid north-facing cliff crevices, calcareous soil	RED	S1	Readily identifiable throughout the growing season
Saxifraga aizoides	Yellow Mountain Saxifrage	luxuriant on dripping cliffs	RED	S1	June to September
Saxifraga oppositifolia	Purple Mountain Saxifrage	Seeping areas or partly shaded rock faces	RED	S1	June and July
Pedicularis palustris	Purple Lousewort	Marshes and ,meadows	RED	S1	July
Carex rariflora	Loose-Flowered Sedge	Fens, calcareous coastal heaths, bogs,	RED	S1	Peryginia required for identification
Carex saxatilis	Russet Sedge	Damp peaty or gravelly soils	RED	S1	
Luzula spicata	Spiked Wood-Rush	Exposed headlands, over 3400 m above sea level. Tundra and rocky ledges elsewhere	RED	S1	June to August
Adiantum pedatum	Northern Maidenhair-Fern	Fertile or quite alkaline soils, under oak-birch-maple-elm trees in intervales	RED	S1	Readily identifiable throughout the growing season
Botrychium lunaria	Moonwort Grape-Fern	Open turf or gravelly slopes, shores and meadows, usually on basic soils	RED	S1	Spores produced June to August.Readily identifiable throughout the growing season
Arabis hirsuta var. pycnocarpa	Hairy Rock-Cress	Dry cliff crevices, ledges, talus slopes and gravels	RED	S1S2	May and June
Festuca prolifera	Proliferous Red Fescue		RED	S1S2	
Eupatorium dubium	Joe-Pye Thoroughwort	Rocky shores, swamps and damp thickets	RED	S2	August and September, can be identified when not in flower.
Caulophyllum thalictroides	Blue Cohosh	Deciduous and intervale forest	RED	S2	April to early June, can be identified when not in flower
Triosteum aurantiacum	Coffee Tinker's-Weed	Rich soils of river intervales, or rich forest on limestone	RED	S2	Flowers in July but identifiable from at least June to October
Vaccinium boreale	Northern Blueberry	Exposed headlands and barrens, has been found by JW teams in drier open bog near Moose River Gold Mines	RED	S2	Not given for NS, but likely from late May to June
Cypripedium reginae	Showy Lady's-Slipper	Alkaline swamps and bogs.	RED	S2	Flowers June through August., Can be identified some weeks prior to bloom and at least to early October.
Selaginella selaginoides	Low Spike-Moss	Moist areas bordering bog tussocks, peat bogs, and stream margins	RED	S2	Produces spores in July and August. Likely identifiable when not snow covered but very easily overlooked
Carex capillaris	Hair-Like Sedge	Seepy, exposed slopes of a cliff-top	RED	S2	Flowers in summer
Carex castanea	Chestnut-Colored Sedge	Swamps and wet meadows, cliff crevices and ledges	RED	S2	
Isoetes prototypus	Prototype Quillwort	Deep water in nutrient-poor, acidic lakes	RED	S2	Evergreen, spores in summer

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Bidens hyperborea	Estuary Beggar-Ticks	Estuarine, on tidal mudflats	YELLOW	S1	August
Polygonum viviparum	Viviparous Knotweed	alpine and sub alpine treeless rocky and loamy areas	YELLOW	S1	Summer
Juncus stygius ssp. americanus	Moor Rush	Open areas in wet moss, bogs and bog pools	YELLOW	S1	July and August
Juncus bulbosus	Bulbous Rush	Along borders of freshwater ponds, ditches, canals, and roadsides, especially in alkaline soils	YELLOW	S1	Flowers late July to September
Phleum alpinum	Mountain Timothy	River ledges	YELLOW	S1	Floweres July and August
Lobelia kalmii	Kalm's Lobelia	Open moist calcareous or marly substrates and dripping rock faces or outcrops , often along rivers. Annual and intolerant of competition.	YELLOW	S1S2	Flowers July to September, then easiest to notice can be identified from May to October, but is small and possible to overlook
Anemone virginiana var. alba	River Anemone	Intervales and streamsides. Calcareous and slaty ledges, shores and thickets.	YELLOW	S1S2	Early July.
Calamagrostis stricta ssp. stricta	Northern Reedgrass, Bentgrass	Around lakes and bogs, wet cliff faces, and landward edges of salt marshes	YELLOW	S1S2	Flowering time not given, summer
Sparganium hyperboreum	Northern Bur-Reed	Peaty pools	YELLOW	S1S2	Not Given for NS. Likely identifiable in late summer
Cryptogramma stelleri	Fragile Rockbrake	Shaded limestone cliffs, and shaded crevices in conglomerate cliff-face.	YELLOW	S1S2	Late May to September. Can be identified when sporangia are not present.
Woodsia alpina	Northern Woodsia	Dryish cliffs in Northern Cape Breton	YELLOW	S1S2	Spores form late June to August. Can be identified without sporangia.
Cornus suecica	Swedish Dwarf Dogwood	Sphagnum depressions, in barrens, gravelly shores, dry exposed headlands	YELLOW	S1S2	Flowers in late June
Dryopteris fragrans var. remotiuscula	Fragrant Fern	Dry, overhanging cliffs, and in cliff crevices along streams or near waterfalls.	YELLOW	S2	June to September. Can be identified without sporangia.
Senecio pseudoarnica	Seabeach Groundsel	Gravelly seashores	YELLOW	S2	Late July to August. Identifiable likely from June to October
Impatiens pallida	Pale Jewel-Weed	Rich alluvial soils, damp thickets, and along intervales	YELLOW	S2	July and August.
Arabis drummondii	Drummond Rockcress	Usually on dry slopes and talus, but occasionally in more fertile locations at lower elevations.	YELLOW	S2	May to July.
Draba arabisans	Rock Whitlow-Grass	Muddy soils or on calcareous rocks, in cliff crevices and ledges.	YELLOW	S2	May to July
Shepherdia canadensis	Canada Buffalo-Berry	Gypsum or talus slopes and along the coast within reach of salt spray.	YELLOW	S2	April to June. Can be identified when not in flower.
Vaccinium caespitosum	Dwarf Blueberry	Rocky cliffs and rock crevices. Dry or wet acidic sites	YELLOW	S2	Not given for NS. Likely identifiable in early summer on to October
Vaccinium uliginosum	Alpine Blueberry	Dry or wet organic and inorganic soils, tolerant of high copper concentrations.	YELLOW	S2	Not given for NS. Likely identifiable from early summer to October
Rumex salicifolius	Willow Dock	Beaches or along rivers	YELLOW	S2	Not Given, Summer

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Anemone canadensis	Canada Anemone	Damp thickets, meadows and gravelly shores, on calcareous or alluvial soils.	YELLOW	S2	May to July.
Anemone quinquefolia var. quinquefolia	Wood Anemone	Wooded riverbanks and shaded intervales.	YELLOW	S2	Late May to early June.
Caltha palustris	Marsh Marigold	Relatively rich swamps wet meadows and wet woods. In damp seepage areas and along creeks	YELLOW	S2	Flowers in early June but can be identified fro early May to late October
Salix pedicellaris	Bog Willow	Acid bogs and sphagnous lake shores.	YELLOW	S2	May to July.
Comandra umbellata	Umbellate Bastard Toad-Flax	Damp, sandy areas, dunes, and exposed headlands; open coniferous woods	YELLOW	S2	Flowering time not given, summer
Viola nephrophylla	Northern Bog Violet	Cool mossy bogs, the borders of streams, and damp woods.	YELLOW	S2	May to July.
Eriophorum gracile	Slender Cotton-Grass	Wet peat and inundated shores	YELLOW	S2	Flowers and fruits early summer, distinguishable on to
Juncus caesariensis	New Jersey Rush	Bogs and Fens along Cape Breton' south eastern coastal plain	YELLOW	S2	July to October. Is detectable before and after blooming period.
Asplenium trichomanes-ramosum	Green Spleenwort	Shaded cliffs along streams, on limestone or other basic rocks.	YELLOW	S2	Can be identified without sporangia.
Polystichum lonchitis	Northern Holly-Fern	Alkaline areas , on or near limestone or gypsum in rocky areas and cool shaded places	YELLOW	S2	Spores July to September. Evergreen and identifiable year round.
Woodsia glabella	Smooth Woodsia	Shaded vertical cliffs, and along streams in northern Cape Breton.	YELLOW	S2	Spores form June to August. Can be identified without sporangia.
Botrychium lanceolatum var. angustisegmentum	Lance-Leaf Grape-Fern	Rich wooded hillsides.	YELLOW	S2	July and August. Can be identified until early October if sporophore is present.
Cardamine parviflora	Small-Flower Bitter-Cress	Dry woods, shaded on exposed ledges, and in sandy soils	YELLOW	S2	April to August
Cardamine parviflora var. arenicola	Small-Flower Bitter-Cress		YELLOW	S2	
Hudsonia ericoides	Golden-Heather	Dry rocky and sandy barrens, recently disturbed areas	YELLOW	S2	Late May to early August, evergreen shrub
Viburnum edule	Squashberry	Cold woods and along streams	YELLOW	S2	May to early August
Coeloglossum viride var. virescens	Long-Bract Green Orchis	Boggy spots, damp native woods and fir or floodplain forests	YELLOW	S2	May to Aug
Platanthera macrophylla	Large Round-Leaved Orchid	Damp woods in deep shade	YELLOW	S2	August
Erigeron hyssopifolius	Daisy Fleabane	Exposed gypsum outcrops, damp stream banks between flood levels, banks ledges and cliffs.	YELLOW	S2S3	Flowers July and August but identifiable though less noticeable from May to October
Teucrium canadense	American Germander	Gravelly seashores, generally at crest of beach, above direct tidal influence	YELLOW	S2S3	Flowers July to September when easiest to identify but identifiable from June to October
Floerkea proserpinacoides	False Mermaid-Weed	Deciduous ravine slopes, river margins, and intervale forests.	YELLOW	S2S3	Late May to late June. Can be identified when not in flower.

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Polygala sanguinea	Field Milkwort	Poor or acidic fields, damp slopes, and open woods or bush.	YELLOW	S2S3	Late June to October.
Limosella australis	Mudwort	Low areas by ponds, gravel lakeshores, the muddy edges of ponds behind barrier beaches and muddy river margins.	YELLOW	S2S3	Late June to October.
Lilium canadense	Canada Lily	Rich river or stream intervale meadows and forest	YELLOW	S2S3	Flowers in July but identifiable from May to October
Goodyera oblongifolia	Giant Rattlesnake-Plantain	Deciduous climax forest. Slopes in damp, mixed forests, and ravines	YELLOW	S2S3	Flowers in late summer. Identifiable earlier and into fall by it's long leaf blades with white midvein and sparse blotching
Alopecurus aequalis	Short-Awn Foxtail	Muddy margins of rivers and shallow ponds, and gravel margins where competitor species are few	YELLOW	S2S3	Summer
Poa glauca	White Bluegrass		YELLOW	S2S3	
Poa glauca ssp. glauca	White Bluegrass	Cliff crevices, on shelves, and talus slopes.	YELLOW	S2S3	July and August. Can be identified post flowering until early October.
Potamogeton zosteriformis	Flatstem Pondweed	Lakes and deep rivers in less acid regions.	YELLOW	S2S3	July to September. Can be identified when not in flower.
Botrychium simplex	Least Grape-Fern	Usually on lakeshores or the mossy edges of streams or waterfalls although it has been reported in a wide variety of habitats.	YELLOW	S2S3	Late May and June. Can be identified until early October if sporophore is present.
Ophioglossum pusillum	Adder's Tongue	Sterile meadows, grassy swamps, and damp, sandy, or cobbly beaches of lakes.	YELLOW	S2S3	Late may to August. Can be identified until early October if stipe and sporangia are present.
Empetrum eamesii ssp. nigrum	Rock Crowberry	bogs, acidic barrens, sea cliffs	YELLOW	S2S3	July to September.
Empetrum eamesii ssp. atropurpureum	Purple Crowberry	bogs, acidic barrens, sea cliffs	YELLOW	S2S3	July to September.
Decodon verticillatus	Hairy Swamp Loosestrife	Quaking margins of ponds and lakes	YELLOW	S2S3	July or August, foliage turns pink or red in fall
Geocaulon lividum	Northern Comandra	Sterile soil, damp sand, acid or peaty locations	YELLOW	S2S3	Late May to early August
Lilium canadense	Canada Lily	Local in meadows and stream banks	YELLOW	S2S3	July
Polygonum raii (syn. P. oxyspermum)	Pondshore Knotweed	Coastal damp sands and gravels	YELLOW	S2S3SE	Not given, likely July to September
Megalodonta beckii or Bidens beckii	Beck Water-Marigold	Shallow quiet waters, slow flowing streams and ponds	YELLOW	S3	August and September, can be identified when not in flower.
Fraxinus nigra	Black Ash	Low ground, damp woods and swamps.	YELLOW	S3	May and June. Can be identified without flowers.
Epilobium strictum	Downy Willow-Herb	Boggy areas and wet meadows	YELLOW	S3	Flowers July to September. Likely identifiable from late May to October
Rhamnus alnifolia	Alderleaf Buckthorn	Calcareous bogs , swamps, swampy woods and meadows, marl bogs in rich alluvial soils	YELLOW	S3	Flowers mid -May to June. Identifiable from May to October and potentially year round.
Galium kamtschaticum	Boreal Bedstraw	Rich, deciduous forests and ravines. In fir-birch associations on Cape Breton Plateau	YELLOW	S3	Flowers June to August. Can be identified post-flowering until early October.

Table 2C ACCDC 100 km Vascular Plant List and Phenology

Binomial	Common Name	Habitat	NSDNR RANK	ACCDC RANK	Phenology and Ease of Identification
Carex eburnea	Ebony Sedge	Cliffs and talus slopes, under conifers , particularly on Calcareous substrates	YELLOW	S3	Flowering time not given, summer
Cypripedium calceolus var parviflorum	Small Yellow Lady's-Slipper	Most often associated with gypsum or open calcareous soils	YELLOW	S3	Flowers in June. Plant identifiable from late May to October
Platanthera orbiculata var macrophylla	Large Roundleaf Orchid	Damp woods in deep shade, in rich old deciduous or mixed woods	YELLOW	S3	Blooms in August
Isoetes lacustris	Lake Quillwort	Cobbly bottoms and gravel bottoms of water bodies, usually in deep water of nutrient poor lakes in the Pre-Cambrian Shield	YELLOW	S3	Megaspores required for identification.
Campanula aparinoides	Marsh Bellflower	Meadows, ditches and river banks.	YELLOW	S3	August
Isoetes acadiensis	Acadian Quillwort	Water up to 1 m deep, bordering lakes or ponds, and occasionally along rivers.	YELLOW	S3	Megaspores required for identification.
Isoetes lacustris	Lake Quillwort	Cobbly margins and gravel bottoms of water bodies, Usually in deep water of nutrient-poor lakes in the Precambrian shield	YELLOW	S3	
Anemone quinquefolia	Wood Anemone	Wooded riverbanks and shaded intervales	YELLOW	S2	Late May to early June
Betula pumila	Dwarf Birch	Bogs and bog meadows, often mixed with alders	YELLOW	S2S3	May and June. Can be identified without flowers.
Equisetum pratense	Meadow Horsetail	Open woods and wet meadows, circumneutral soils	YELLOW	S2	very fine, unbranched branches and long-pointed, light brown sheath on main stem
Betula borealis	Northern Birch	Rocky and peaty barrens of sub alpine summits or boreal forest openings	YELLOW	S2	Not given, identifiable