ENVIRONMENTAL ASSESSMENT REPORT

PROPOSED WAL-MART
YARMOUTH, NOVA SCOTIA

Submitted to:
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1.0 INTRODUCTION

Wal-Mart Canada Corp. (Wal-Mart), through Stantec Consulting Ltd. (Stantec), is considering purchasing property in a commercial zone located near the corner of Starrs Road and Highway 101 in Yarmouth, Nova Scotia. Plaza BNG Inc. (the Proponent) is organizing the purchase of the said property and obtaining all applicable permits and approvals. The Proponent will then sell the property to Wal-Mart for development and transfer all permits and approvals that have been obtained. A portion of the property consists of a wetland and an associated stream (Broad Brook). Preliminary plans indicate that Wal-Mart intends on developing much of the property should the purchase be finalized.

The purpose of this Environmental Assessment Report is to provide a document that will address potential environmental effects of the proposed development on resources in the environment, evaluate the significance of potential effects and to provide mitigation to minimize those effects.

The provincial approval process for altering a wetland requires an application for a Wetland Alteration accompanied by a wetland evaluation as per Section 50 of the *Nova Scotia Environment Act* under the Wetland Directive (1995). These have been submitted to the Nova Scotia Department of Environment and Labour (NSDEL) and are being evaluated before any approvals are issued.

The Nova Scotia *Environmental Assessment Regulations* requires that any enterprise, activity, project, structure or work, which disrupts a total of 2 hectares or more of any wetland, requires an environmental assessment to be completed. Approximately 1.54 hectares of the 2.58-hectare wetland will be filled in, however the Nova Scotia Department of Natural Resources (NSDNR) has determined that the potential impacts to the remaining portions of the wetland will exceed the 2-hectare limit.

1.1 PURPOSE OF THE PROJECT

The purpose of the project is to provide the Town of Yarmouth with a large retail development, and provide commercial economic development in the community.

1.2 PUBLIC FUNDING

There will be no public funding needed during the construction, operation or decommissioning stages of this project.

2.0 PROJECT DESCRIPTION

The name of the project is the Proposed Wal-Mart Development (Project), Yarmouth, Nova Scotia.

2.1 CONTACT INFORMATION

The following is a list of contacts for the Project and the environmental assessment.

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2.2 LOCATION OF THE PROJECT

The proposed project is located in a commercial zone approximately 250 metres northeast of the Starrs Road and Highway 101 intersection in Yarmouth, Nova Scotia (Figure 1). The property (Site) is situated on 4.5 hectares of land, which is made up of a 2.54-hectare wetland and a stream (Broad Brook) bisecting the wetland (Figure 2). The Site is located within the headwaters of the Broad Brook Watershed, which flows south through the Town of Yarmouth.

FIGURE 1 General Site Location

2.3 ALTERNATE LOCATIONS FOR THE PROJECT

Over the past few years, the Proponent, on behalf of Wal-Mart has considered a number of potential locations in Yarmouth for a new Wal-Mart store as shown in Figure 3. The locations are as follows:

1. Canadian Tire/Yarmouth Auto Mart – These properties have been vacated by the owners and are for sale. A suitable price was established for the properties however it was eventually concluded that the site was not large enough for Wal-Mart's future expansion requirements.
2. Clement Avenue Property – This location required the assembly of several separate properties and the closure and/or relocation of Clements Avenue and James Street. Complications included high pricing by the vendors, legal control over one of the large parcels, unsuitable soil conditions and a compromised site plan. Wal-Mart turned this site down.
3. Tri-County Mall – At the beginning of the negotiations with the owner of the mall, it was concluded that the site could work, after the demolition of approximately 50% of the center. One of the tenants (Sobeys – Price Chopper) had certain restrictive use covenants on the property and would not agree to lift the restrictions, which prevented Wal-Mart from operating a store at this location. Also, during this time the size requirements for Wal-Mart increased and the Tri-County Mall site had become unsuitable.
4. Proposed Site (Starrs Road & Highway 101) – An agreement was signed between the Proponent and the Nova Scotia Department of Transportation and Public Works (NSTPW) to acquire the land necessary for the project. This Project will be located adjacent to a new Loblaws store and an expanded Kent store. The Site is considered by these retailers to be the best location in Yarmouth for their developments. It has exposure, good access, located adjacent to existing retail.

2.4 NATURE OF THE PROJECT

The nature of the project is to infill 1.54 hectares of a 2.58-hectare wetland and enclose 175 metres of Broad Brook with two 1,200-millimetre diameter concrete culverts to allow for a commercial development (Wal-Mart) in Yarmouth, Nova Scotia. Fill material will be used to raise the elevation of the Site with adjacent commercial properties to the southwest (i.e. Superstore and Kent Building Supplies). The parking lot area will be paved with asphalt and connected to the adjacent properties.

FIGURE 2 Detailed Site Plan

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FIGURE 3 Alternate Site Locations

2.5 PROJECT INFRASTRUCTURE AND ACTIVITIES

The project includes the construction and operation of a Wal-Mart store on a property of approximately 4.4 hectares. The structure is proposed to be approximately 8,300 square metres with a future proposed expansion of approximately 4,680 square metres, as shown in Figure 4.

Approximately 175 metres of Broad Brook intersects the Site. To develop the area, Broad Brook will be enclosed within two 1,200-millimetre concrete culverts of an equivalent length. The project activities will consist of clearing the site of existing vegetation, stripping topsoil and importing approximately 60,000 cubic metres of fill to raise the existing elevation, thus allowing the development to connect to existing services. Access to this property will be through the adjacent Atlantic Superstore parking lot. Grading of the Site will consist of minimum parking lot slopes of 1.5% and maximum slopes of 3%. Site boundaries (where applicable) will be sloped to match to existing grades with a maximum 3:1 slope.

With respect to Broad Brook, the project proposes temporarily damming water upstream, to work in the dry, excavating organic soils, installing the two 1,200 millimetre concrete culverts at an approximate grade of 0.15%, backfilling with granular material and paved surface, resuming flow of the stream. A ditch-inlet catch basin will be installed at the inlet and a headwall will be placed at the outlet. The project will conform to current Nova Scotia Municipal Services Specifications with piping commencing downstream and progressing upstream. Also, NSDEL Guidelines will be followed for the culvert construction.

Onsite services will consist of the following:

- Sanitary services - approximately 125 m of 200 mm diameter sewer;
- Storm sewer - approximately 450 m of 1,050 mm diameter concrete sewer, 175 m of 1,200 mm diameter concrete sewer, 90 m of 600 mm diameter concrete sewer, 50 m of 450 mm diameter PVC sewer, 15 m of 300 mm diameter PVC sewer, and 80 m of 250 mm diameter PVC sewer;
- Stormceptor (model 1500) to accommodate the Wal-Mart site flow prior to connecting to Broad Brook; and
- Water main - approximately 130m of 200mm diameter PVC main, 5m of 150mm diameter PVC main, and 5m of 100mm diameter PVC main.

2.6 PROJECT SCHEDULE

The anticipated schedule construction of the Wal-Mart store is April 2005 to October 2005. A breakdown of the design work, permitting, tender preparation, construction, and operation is included in Appendix A.

FIGURE 4 Proposed Development Plan

A construction day will be typically 7am - 7pm, Monday to Friday, but may vary depending on the Town of Yarmouth regulated working hours. A workday is dependent on the state of the project schedule as well, whether it is ahead or behind schedule. It is also the contractor's decision whether or not they work weekends.

Typical operating hours for Wal-Mart stores are Monday to Saturday, 8am to 10pm, and the store is closed on Sundays.

2.7 EMISSIONS AND WASTE DISCHARGES

The project will meet or improve upon the compliance standards outlined in applicable regulations or standards with respect to emissions and waste management. The project will employ good engineering practices and standard industry controls to minimize the environmental impact from construction and operation.

2.7.1 Construction

Construction of the Wal-Mart store will involve stockpiling some of the topsoil for landscaping the Site after construction. The remainder of the topsoil will be the responsibility of the contractor to remove from the site. Construction waste, including hazardous waste, will be the responsibility of the local contractor to dispose of off Site as per the local Town requirements.

There is also potential for erosion and siltation of Broad Brook associated with land-based construction activities. Stantec has prepared an Erosion and Sediment Control Plan that adheres to the NSDEL Erosion and Sedimentation Control Handbook for construction sites in accordance with municipal and provincial stipulations to minimize impacts to water quality from construction activities. The Erosion and Sediment Control Plan is included in Appendix B.

2.7.2 Operation

Parking lot maintenance will be contracted to a local contractor and will consist of plowing when necessary and sanding or salting the parking lot when necessary. It is the contractor's responsibility to follow the local municipal standards for salting or sanding.

Two thirds of the parking lot lighting will be lit from dusk to 10:30 pm. The remaining lights will be on from dusk to dawn for the night staff safety and store deliveries.

Storm water quality control will be provided for the site to reduce the sediment loading and to prevent oil and litter from leaving the site. A Stormceptor was sized using a Stormceptor sizing tool to remove a minimum of 70% of total suspended solids for the main parking area and controlled roof area runoff. A copy of the Storm Water Management Plan prepared by Stantec is provided in Appendix C.

2.7.3 Solid and Hazardous Waste

Potential sources of non-hazardous or solid wastes generated by project activities include scrap metals, insulation waste, packing/crating materials, and domestic wastes. These wastes will be segregated as recyclable and non-recyclable, with recyclable material collected and transported to a licensed recycling facility using authorized local services. An effort will be made to minimize the amount of waste generated by application of 4-R principals (reduce, reuse, recycle, recover) to the extent practical. Non-recyclable wastes will be transported off Site to a permitted landfill.

Hazardous waste generated from project construction and operation sources will be minimal and includes small quantities of waste oils, paint wastes, and solvent wastes. Hazardous waste will be stored onsite in a separate temporary hazardous waste storage area provided with full containment. Hazardous wastes will be removed from the site by a licensed contractor and disposed at an approved facility.

2.8 NOISE EMISSIONS

Project construction noise will be intermittent, as equipment is operated on an as needed-basis depending on Site activities. Noise emissions generated during facility construction and operations will not exceed the provincial guidelines of 65 decibels (dBA) between 0700-1900 hours, 60 dBA between 1900-2300 hours, and 55 dBA between 2300-0700 hours, at the property boundaries.

Common noise levels and typical reactions are summarized in Table 1. Noise typically generated from highway traffic noise is approximately 70 dB when measured at 15 m. At 65 m from the edge of the highway lane (i.e. edge of the right of way) the traffic induced noise would likely be less than 60 dB, due to the attenuating affect of distance (i.e. every doubling of distance results in a 3 dB decrease in the noise level), topography, and vegetation.

TABLE 1 Common Noise Levels and Typical Reactions

Sound Source	Noise Level (dB)	Apparent Loudness	Typical reaction
	135		Painfully load
Military Jet	130	Sixty-four times as loud	Limit amplified speech
Jet takeoff at 50 m	120	Thirty-two times as loud	
	110	Sixteen times as loud	Maximum vocal effort
Jet takeoff at 500 m	100	Eight times as loud	
Heavy truck at 15 m / Busy city street	90	Four times as loud	Very annoying
	80	Twice as load	Annoying
Highway traffic at 15 m	70	Base reference	Telephone use difficult
	60	Half as load	Intrusive
Noisy office	50	Quarter as load	Speech interference
Public library	40	Eighth as load	Quiet
Soft whisper at 5 m	30	Sixteenth as load	Very quiet
	10	Sixty-fourth as load	Just audible

Source: Canadian Mortgage and Housing Corporation, 1981

2.9 OTHER PROJECTS IN THE AREA

Other projects in the area include the construction of a new Superstore by Atlantic Wholesalers Limited. The construction is currently taking place within the existing commercial block, immediately adjacent to the Site. This project also requires that a portion of the 2.58 wetland be in-filled with material to include the footprint of the building and parking area. NSDEL permits have been issued and construction of this project is nearing completion.

It is anticipated that existing farmland immediately adjacent to the new Superstore and the proposed Wal-Mart will be redeveloped for commercial land use in the near future. Currently there have been no developments proposed for this land.

NSTPW currently owns the proposed Site. This is the where the proposed Yarmouth Interchange would link Highway 101 with Highway 103. The Proponent has purchased the property north of the proposed Site and will be used in a land swap with NSTPW once all approvals have been obtained.

3.0 ENVIRONMENTAL SETTING

This section provides an overview of the biophysical and socioeconomic setting in the project area. This information is based on previous studies conducted in the area as well as preliminary field studies conducted for the project. This information will be used in conjunction with the project description information to identify the potential project-related biophysical and socioeconomic effects, including cumulative effects, mitigative measures, and follow-up activities.

3.1 BIOPHYSICAL ENVIRONMENT

3.1.1 Previous Site Disturbances

The vegetation types present in this wetland represent the current associations and level of succession in a wetland that has been subject to frequent anthropogenic alteration, going back at least to the 1950s and beyond, including past livestock grazing, successive channelization, man-made ponds, impoundment's, and in-filling. The aerial photographs described in the following text are available in Appendix D.

The 1955 air photography (A14753-58) of the area shows no significant straightening of the stream channel in the wetland or any impoundments or dug out ponds present. Farmland is present along the wetland and it is possible even in the 1950s, the wetland was used as pasturage.

In a 1967 air photo, the wetland shows a large pond dug out or impounded along the portion of the brook above where it flows under Starrs Road.

In the 1978 air photo (78304205), the large pond is still present, but the existing watercourse through the wetland has been re-routed and channelized with fresh, poorly vegetated spoil banks from the ditching excavation still in evidence. Between 1970 and 1978, the new connection of Highway 101 was constructed to the east of the wetland.

In the 1989 air photo (SW Cor., 89312-07), a massive area of infilling and land clearing occurred adjacent to and in a portion of the wetland. The large pond was completely filled over and the present Kent Building Supplies under construction and/or the lumberyard was in place over the former pond area. The channelized watercourse has been shifted to the east and its lower section closely parallels Highway 101 before crossing under Starrs Road. The land is currently owned by the Nova Scotia Department of Transportation and Public Works and it is the proponent's understanding that they had planned to use the land for a future interchange.

3.1.2 Aquatic Habitat

A Site visit by a Jacques Whitford Aquatic Ecologist was performed on June 16, 2004 to assess the potential of Broad Brook as fish habitat. Jackie Mercer, of the Yarmouth NSDEL office, accompanied the Aquatic Ecologist. Site photographs referred to in the following text are available in Appendix E.

The upper reach of Broad Brook is situated in an area that is zoned or being rezoned for commercial development. Originally, these lands were used for agriculture. One cattle farm remains in operation in the headwaters of Broad Brook. The 300 metre section of Broad Brook described below is located between the downstream end of the Starrs Road culvert and 50 metres upstream of a dirt road used by a farmer to access fields (Photo 1). The habitat survey commenced at the upstream end of the brook.

The culvert under the dirt road is perched and undersized. At the time of the survey only a trickle of water flowed onto rocks at its downstream end (Photo 2). This situation presents a fish passage barrier.

Immediately downstream of this culvert, a small pool has formed from scour during high flows, a symptom of perched culverts. The pool was small (less than two metres across) and shallow (less than 25 centimetres) at its deepest point (Photo 1). The outlet of this pool was a small channel approximately 20 centimetres wide and 10 centimetres deep. Bank vegetation consisted of graminoids, there was no vegetated canopy due to clearing. ATV tracks crossed through the brook in this section.

A few metres downstream, the channel of the brook widened to about 30 to 50 cm as it flowed beneath a dense canopy of alders (Photo 3) for approximately 30 metres before emerging into open space and widening to 2 to 3 metres (Photo 4). It was very obvious in this section that the stream was channelized as it flows in a straight line and has a dogleg turn.

It is important to note that the whole section of the stream surveyed was likely channelized at some point. This 45 metre open section of the brook was choked with aquatic algae and has become eutrophic. The water flow was stagnant in the section of stream located from the culvert underneath the dirt road to an area located between the Kent Building Supplies store and Highway 101. This stretch of the brook was composed mainly of soft deep substrate, which in some sections was up to 60 centimetres deep.

Further downstream, the channel was the same width, however a riparian canopy cover of alders was present. This canopy cover was less dense than in the upstream section. Overhead vegetation is reduced as the brook flows between the Kent Building Supplies and Highway 101 (Photo 5). A small branch flowing underneath Highway 101 converges with Broad Brook in this vicinity (Photo 6)

Once past this small stream, the channel of the brook narrows down to 30 to 50 centimetres wide and in some sections riffles appeared and a cobble substrate was present (Photo 7). Surface water from the Kent parking lot drains directly into the stream via an asphalt apron (Photo 8). Broad Brook flows under Starrs Road through a concrete culvert, which is perched on the downstream side (Photo 9) and presents a barrier to fish passage.

At the time of the survey, the stream had a pH range of 7 and 7.2, a temperature range of 22 and 24.8°C and dissolved oxygen between 5.5 to 7.5 mg/L. The elevated temperature is a function of loss of riparian habitat by commercial and agricultural alteration of the watercourse and will not support cold-water fish species. The lower dissolved oxygen level is at the limit to support fish life and it likely lowers further with summer air temperatures. The chronic discharge of farm drainage is a main source for the eutrophic conditions and high biochemical oxygen demand (BOD).

A qualitative spot-check electro fishing survey to census fish species was originally planned. However, the temperature of the stream at the time of the survey was above the limit set by DFO in Jacques Whitford's experimental electro fishing license. Alternatively, the Aquatic Ecologist used minnow traps in five locations of the stream (where water depth was suitable) to gather information on fish species present in this section of Broad Brook. After an hour at each location, the minnow traps were removed from the water and each fish was identified and released back to Broad Brook. Three species were observed within the 300-metre section of Broad Brook including creek chub, golden shiner and banded killifish (Photos 10 and 11). This survey confirms Broad Brook as fish habitat, albeit of poor quality. Invertebrate groups present in this section of Broad Brook were qualitatively assessed and included diptera, chironomids, isopods and amphipods.

3.1.3 Wetland Habitat

A Jacques Whitford Aquatic Ecologist conducted field reconnaissance on June 16, 2004. Peter MacDonald from the NSDNR accompanied the Aquatic Ecologist for confirmation of the delineation and evaluation. Delineation of the wetland boundary determined that it is 2.58 hectares in size; therefore, the North American Wetlands Conservation Council Wetland Evaluation Guide has been used for this evaluation. This level of wetland evaluation is a more in-depth evaluation than the provincial 10-step evaluation process (Appendix F).

Regionally, the area surrounding Yarmouth is rich in wetland habitat. Salt marshes flank the shores along the Tusket River Estuary, the Chebogue River Estuary, and are found in lagoon areas along the coast. According to more recent NSDNR digital mapping that delineates wetlands in the province, there is no wetland delineated on the actual project site (Figure 5). To the immediate north of the project site there are three treed bogs identified, each less than five hectares in area. This discrepancy may relate to the likelihood that as past agricultural / pasture land, with evident alteration of the drainage, and past partial filling and pond creation, the wetland was overlooked or discounted during air photo interpretation.

The wetlands in the project watershed have no special status. None of the wetlands in the upper or lower watershed have been identified as having exceptional ecological significance, both in terms of their value to migratory birds and the plant communities found therein (CWS 1994 Wetland Atlas). Immediately north of the project site, three treed bogs (each less than 5 hectares in area) are indicated. One of these DNR indicated treed bogs, located west of Highway 101, and north of the wetland is close to and indeed abuts the wetland concerned. While the immediate northern margins of the wetland can be described as treed bog, the extent is limited and as one moves north the habitat becomes dominated by more upland species in the ground flora. Given this, much of the "treed bog" of this area is better characterized as hygric coniferous tree dominated forest, and not wetland habitat. Perhaps various drainage schemes imposed on the Broad Brook wetland, immediate to this area, and over the years, have reduced water availability to this forested area leading it to transition to a presently hygric forest condition.

The wetland of concern is a headwater feature of Broad Brook and occurs around a channelized portion of that watercourse, northeast of Starrs Road, and west of Highway 101. The wetland is a complex of wetland types.

To the south of the wetland along Broad Brook, there are several successive areas of shrub bog, open fen, and shrub fen. These wetland areas flank about 4 kilometres of Broad Brook and have a total area of approximately 30 hectares.

3.1.3.1 Vegetation

The entire wetland is vegetated, with exception of the recent ablated portion from construction on the Atlantic Wholesalers Limited property. Though relatively minor in area, the open water of Broad Brook, old channel remnants, and seepage inflows are choked with emergent plants, and in some instances aquatic *Sphagnum* sp. moss. Plant community / wetland types that are present within the greater wetland complex include five basic types as follows:

Open Low Shrub Swamp

Higher shrub margin and some interspersion (*e.g.* Wp41, by wet area with small open pool and drainage line, representing a remnant of the old stream channel, prior to post-1970 canalization).

Trees are not present except at the margin of this type of habitat where treed bog or hygric forest is present. Dominant shrubs include *Alnus incana* (10%), *Rosa nitida* (8%), *Spiraea tomentosa* (5%), *Rhododendron canadense* (5%), *Kalmia angustifolia* (5%), *Viburnum nudum* (5%), and some *Aronia spp.* (1%). The ground vegetation is lush with complete coverage except for small open water flows and pools along an old channel of Broad Brook. This remnant of the original watercourse is still fed by seepage flow from surrounding treed bog and hygric forest in the surrounding upland. Dominant ground vegetation includes sedges (*Carex*

FIGURE 5 NSDNR 2004 Wetlands Mapping

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spp.) (40%), *Calamagrostis canadensis* (15%), *Rubus hispidus* (20%), *Sphagnum* spp. (10%), *Juncus effusus* (5%), and scattered *Aster umbellatus*, *Solidago uliginosa*, *Solidago rugosa*, *Osmunda cinnamomea*, and *Dryopteris cristata* (each cover 3% or less individually).

Treed Swamp/Bog & Tall Shrub Swamp/Bog

Dominant trees include *Picea mariana* (10%), *Acer rubrum* (10%), and *Larix laricina* (5%). Tall shrub cover includes *Alnus incana* 30%, *Nemopanthus mucronata* (10%) and *Viburnum nudum* (5%). The ground vegetation consists of *Sphagnum* spp. (80%), *Osmunda cinnamomea* (55%), *Smilacina trifolia* (10%), *Rubus hispidus* (5%), and *Mainthemum canadense* (5%).

Tall Shrub Swamp Transitioning to Hygric Thicket

No trees are present (*e.g.* at Wp126). A single species of shrub (*Alnus incana)* dominates at 70% coverage. Some minor amounts of *Rosa* sp. are evident in the *A. incana* under story. The ground vegetation consists of *Thalictrum pubescens* (35%), *Solidago rugosa* (15%), *Calamagrostis canadensis* (10%), *Aster umbellatus* (10%), leaf litter 15%, and mosses, including *Sphagnum* sp. (5%). The particular patch described above was near the edge of a farm field and perhaps increased nutrient flow off the field resulted in the dominance of *Thalictrum* in the ground layer. In other areas where *Alnus incana* dominated tall shrub swamp patches there was less to an apparent absence of *Thalictrum pubescens* and its place was taken by a variety of sedges (*Carex* spp.*)*, and *Osmunda cinnamomea*, in addition to the other species described above

Open Calamagrostis canadensis Dominated Fen/Marsh with Scattered Shrubs

No trees are present. Shrubs scattered and marginal in this habitat include *Alnus incana* (5%), *Spiraea alba* (4%), and *Rosa nitida* (2%). The dense ground cover is dominated by thick *Calamagrostis canadensis* (80% live and 20% dead bases and litter), *Onoclea sensibilis* (5%), and some *Solidago rugosa* (1%).

Open Stream Channel with Emergent Plants and Aquatics

This habitat varied along the length of the narrow, not overly deep, channelized brook. In areas of the brook densely shaded by alder and other shrubs, the open water is high and the cover of emergent plant species and aquatics is low. In the little shaded or not shaded shallow portions of the stream, emergent plant species dominate and often appear to ‘choke’ the streambed. The following description is of an open, little shaded portion of the channlized brook.

Trees are not present. Shrubs occur only along or off the brook edges. The dominant emergent plants include *Ludwigia palustris* (20%), *Sparganium* spp. (15%), *Glyceria* sp. (10%), *Callitriche* spp. (15%), and *Polygonum* sp. (5%). *Scirpis subterminalis* and *Callitriche* species are the most evident aquatic plants. Along the sunny edges of the brook, white flowered,

Eurasian species (*Cardamine pratensis*), are apparent. The plant community is diverse in the wetland with 103 species of vascular plants recorded (Appendix G).

3.1.3.2 Wildlife

Wildlife observations at the wetland included mammals such as white-tailed deer (*Odocoileus virginianus*), red squirrel (*Tamiascurius hudsonicus*), meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudzonius*), porcupine (*Erethizon dorsatum*), varying hare (*Lepus americanus*), muskrat (*Odonatra zibethicus*), and raccoon (*Procyon lotor*). None of these species are listed as rare, endangered, threatened or species of concern at the provincial or national levels.

Bird species noted in the wetland include Common Yellowthroat (*Geothlypus trichas*), Yellow Warbler (*Dendroica petechia*), American Robin (*Turdus migratorius*), Alder Flycatcher (*Empidonax alnrum*), Black-capped Chickadee (*Poecile atricapilla*), Song Sparrow (*Melospiza melodia*), and Swamp Sparrow (*Melospiza georgiana*). Common Crow (*Corvus brachyrhynchos*) were noted in the vicinity and some geese, likely Canada Geese (*Branta canadensis*), were heard somewhere upstream of the wetland boundary. A list of the known breeding birds within a 10-kilometre radius of the proposed Site can be found in Table 2.

Amphibian species noted included northern spring peeper (*Pseudacris crucifer*), and green frog (*Rana clamitans*). Nesting habitat was marginal for four-toed salamander (*Hemidactylium scutatum*), at best and searches of the better potential sites yielded no discoveries. This wetland is of marginal value to any turtle species. Only painted turtle (*Chrysemys picta*) or common snapping turtle (*Chelydra serpentina*) would potentially be present; however, turtles were not observed.

Fish collection and visual efforts revealed three species of fish to be present in the brook, including creek chub (*Semotilus atromaculatus*); golden shiner (*Notemigonus crysoleucas*); and banded killifish (*Fundulus diaphanus*).

3.1.3.3 Hydrology

Over the years, the hydrologic pattern of the wetland has been significantly altered through anthropogenic encroachment and usage. Land use within the wetland catchment area includes agriculture, commercial and residential developments. The wetland is within the headwater of Broad Brook. Agricultural practices and urbanization has decreased interception of rainfall, reduced soil infiltration, and increased overland flow. Nutrient loading from the cattle farm above the wetland is likely the most significant local source to Broad Brook.

TABLE 2 Known Breeding Birds Within 10 Km Radius of Site

Common Name	Scientific Name
Common Loon	*Gavia immer*
Double-Crested Cormorant	*Phalacrocorax auritus*
Green-Winged Teal	*Anas crecca*
American Black Duck	*Anas rubripes*
Mallard	*Anas platyrhynchos*
Ring-Necked Pheasant	*Phasianus colchicus*
Ruffed Grouse	*Bonasa umbellus*
Killdeer	*Charadrius vociferus*
Willet	*Catoptrophorus semipalmatus*
Common Snipe	*Gallinago gallinago*
American Woodcock	*Scolopax minor*
Herring Gull	*Larus argentatus*
Common Tern	*Sterna hirundo*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Great Horned Owl	*Bubo virginianus*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Northern Flicker	*Colaptes auratus*
Tree Swallow	*Tachycineta bicolor*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Blue Jay	*Cyanocitta cristata*
Common Raven	*Corvus corax*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Northern Mockingbird	*Mimus polyglottos*
Starling	*Sturnus vulgaris*
Northern Parula Warbler	*Parula americana*
Yellow Warbler	*Dendroica petechia*
Northern Cardinal	*Cardinalis cardinalis*
Sharp-Tailed Sparrow	*Ammodramus nelsoni*
Song Sparrow	*Melospiza melodia*
White-Throated Sparrow	*Zonotrichia albicollis*
Dark-Eyed Junco	*Junco hyemalis*
Red-Winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Brown-Headed Cowbird	*Molothrus ater*
Northern Oriole	*Icterus galbula*
House Finch	*Carpodacus mexicanus*

Source: ACCDC, 2004

As urban development increases in the watershed, there is increased potential for storm water pollutants to further impair the water quality. The channelization of Broad Brook, and the wetland portion of it, isolated the floodplain (intervale), which directs more water downstream, thus increasing the size and frequency of floods downstream and reducing the base flow. The magnitude of the effect of extreme storm events is increased by decreasing upstream storage capacity and accelerating water delivery. The culvert under Starrs Road is perched, thus forming a barrier to fish passage and fragmenting the aquatic habitat. In brief, the hydrology of Broad Brook becomes "flashier" in nature with storm events. The wetlands downstream of Starrs Road are considerably larger and more extensive than this project wetland and are likely capable of assimilating the additional flows.

3.1.4 Areas And Species Of Significance

3.1.4.1 Areas of Significance

The Tusket River Nature Reserve is a 22 hectare protected area approximately 20 kilometres northeast of the Project area that is home to a number of rare coastal plain plants including 6 rare plants, and the largest populations of Coreopsis and Sabatia along the river. A small woodland buffer protects the rich shoreline-beach plant community where research and education is often undertaken (NSDEL Protected Areas, 2004).

The Tusket River Estuary and adjacent salt marshes are deemed high use areas for migratory birds (more than 1,000 migratory birds) and are considered to be of great local and international significance. The Project area is located approximately 3 kilometres northwest of this significant area.

The Chebogue River Estuary and adjacent wetlands, located approximately 8 kilometres south of the Project area, are considered to be moderate use areas for migratory birds, which are defined as a location where 500 to 1,000 migratory birds concentrate during one or more seasons of the year.

The Atlantic Canada Conservation Data Centre (ACCDC) has identified three other managed areas within a 5-kilometre radius of the proposed Site. None of the following areas are within the footprint of the proposed project:

- Yarmouth Indian Reserve, approximately 1.5 kilometres southeast of the Site;
- Sand Beach, approximately 4 kilometres southwest of the Site; and
- Pembroke Beach, approximately 5 kilometres northwest of the Site.

During the biological survey of the wetland within the Project area, no exceptional ecological significance was noted.

3.1.4.2 Species-At-Risk

To determine whether any species at risk are likely to be present at the Site, AMEC reviewed the priority species lists from three federal/provincial species databases. The three databases are from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the Nova Scotia Endangered Species Act (NSESA), and the Nova Scotia General Status of Wild Species.

The species information from the three databases was used to create the Priority Species of Nova Scotia Table as shown in Appendix H. The priority species table was assessed for those species that are known to exist in the western region of Nova Scotia and compiled in Appendix I. AMEC then assessed the regional species and compared their known distribution and habitat requirements to the existing habitat at the Site and developed a short-list of potential species for the Site, as shown in Tables 3 through 8, respectively.

TABLE 3 Short-List of Potential Plant Species-At-Risk

Common Name	Scientific Name	Status Rank	Aquatic	Bog	Disturbed Sites	Fen	Marsh	River or Stream	Swamp	Flowering Period
Purple-Stem Swamp Beggers Tick	Bidens connata	Yellow		X						August – September
Marsh Marigold	Caltha palustris	Yellow						X	X	July - August
Purple Clematis	Clematis occidentalis	Red						X		July – September
Long-Bract Green Orchid	Coeloglossum viride var	Yellow		X						September – October
Capitate Spikerush	Eleocharis flavescens	Yellow							X	July – October
Slender Cotton-Grass	Eriophorum gracile	Yellow		X					X	August – September
Prototype Quillwort	Isoetes prototypus	Red	X							August – October
Bulbous Rush	Juncus bulbosus	Yellow			X					Unknown?? (July – September)
Mudwort	Limosella subulata	Yellow						X		July-August
Southern Twayblade	Listera australis	Red		X						late July – October
Golden Crest**	Lophiola aurea	Red / Threatened* / Threatened**		X		X				June - early July
Farwell's Water-Milfoil	Myriophyllum farwellii	Yellow						X		June – September
Adder's Tongue	Ophioglossum pusillum	Yellow							X	late May – August
Philadelphia Panic Grass	Panicum philadelphicum	Yellow		X				X		August – October
Purple Lousewort	Pedicularis palustris	Red					X			August – September

TABLE 3 Short-List of Potential Plant Species-At-Risk

Common Name	Scientific Name	Status Rank	Aquatic	Bog	Disturbed Sites	Fen	Marsh	River or Stream	Swamp	Flowering Period
Alderleaf Buckthorn	Rhamnus alnifolia	Yellow		X					X	July – September
Long's Bulrush	Scirpus longii	Red / Vulnerable* / Special Concern**				X				July – September
Low Spike-Moss	Selaginella selaginoide	Red		X				X		June - early July
Northern White Cedar	Thuja occidentalis	Red							X	July – September
Humped Bladderwort	Utricularia gibba	Yellow		X						late June – September
Northeastern Bladderwort	Utricularia resupinata	Red						X		July – September
Netted Chainfern	Woodwardia areolata	Yellow		X				X	X	spores mature

Source: NSDNR Plant Phenology Database, NSDNR General Status Rank Database, NSESA, COSEWIC, 2004
Note: * denotes species ranking under the NSESA; ** denotes species ranking under COSEWIC

TABLE 4 Short-List of Potential Butterfly Species-At-Risk

Common Name	Scientific Name	Priority List	Status	Habitat	Region
Monarch	*Danaus plexippus*	NSDNR General Status / COSEWIC	Yellow / Special Concern	Monarchs in Canada exist primarily wherever milkweed (Asclepius) and wildflowers (such as Goldenrod, asters, and Purple Loosestrife) exist. This includes abandoned farmland, along roadsides, and other open spaces where these plants grow.	The eastern population includes all Monarchs east of the Rocky Mountains, from the Gulf coast to southern Canada, and from the Great Plain States and Prairie Provinces east to the Atlantic coast.

Source: NSDNR General Status Rank Database; NSESA, COSEWIC, 2004

TABLE 5 Short-List of Potential Dragonfly and Damselfly Species-At-Risk

Common Name	Scientific Name	Priority List	Status	Habitat	Region
Black Meadowfly	*Sympetrum danae*	NSDNR General Status	Yellow	occurs primarily near bogs, but also near marshy ponds and lakes	
Elfin Skimmer	*Nannothemis bella*	NSDNR General Status	Yellow	Stagnant pools in marshy places, bogs	
Muskeg Emerald	*Somatochlora septentrionalis*	NSDNR General Status	Yellow	fens and marshes	
Zorro Clubtail	*Lanthus parvulus*	NSDNR General Status	Yellow		
Greenstripped Darner	*Aeshna verticalis*	NSDNR General Status	Yellow	Open marshy areas and open fields	

TABLE 5 Short-List of Potential Dragonfly and Damselfly Species-At-Risk

Zigzag Darner	*Aeshna sitchensis*	NSDNR General Status	Yellow	High elevation sedge marshes near lakes and streams	
Mottled Darner	*Aeshna clepsydra*	NSDNR General Status	Yellow	edges of ponds and lakes, most often with emergent vegetation	
Harlequin Darner	*Gomphaeschna furcillata*	NSDNR General Status	Yellow	swamps or bogs	
Little Bluet	*Enallagma minusculum*	NSDNR General Status	Yellow	Ponds	

Source: NSDNR General Status Rank Database; NSESA, COSEWIC, 2004

TABLE 6 Short-List of Potential Fish Species-At-Risk

Common Name	Scientific Name	Priority List	Status	Habitat	Region
Pearl Dace	*Margariscus margarita*	NSDNR General Status	Yellow	lakes, cool bog ponds, creeks, and cool springs	

Source: NSDNR General Status Rank Database; NSESA, COSEWIC, 2004

TABLE 7 Short-List of Potential Reptile Species-At-Risk

Common Name	Scientific Name	Priority List	Status	Habitat	Region
Northern Ribbon Snake	*Thamnophis sauritus septentrionalis*	NSDNR General Status / NSESA / COSEWIC	Yellow / Threatened / Threatened	Quiet, Vegetated ponds, coves of lakes and grassy places along streams. Enjoy an abundance of aquatic vegetation.	Southwestern, Nova Scotia - Queens County and Lunenburg County.

Source: NSDNR General Status Rank Database; NSESA, COSEWIC, 2004

TABLE 8 Short-List of Potential Bird Species-At-Risk

Common Name	Scientific Name	Priority List	Status	Habitat	Region
Northern Goshawk	*Accipiter gentiles*	NSDNR General Status	Yellow	Forested areas, farms and woodlots.	Scattered throughout NS

Source: NSDNR General Status Rank Database; NSESA, COSEWIC, 2004

The NSDNR Significant Species and Habitat Database was reviewed to identify any high priority areas within a 100-kilometre radius of the proposed Site. Figure 6 shows that the proposed Site is over 1 kilometer away from the nearest priority area. Other species agencies that were consulted include the Nova Scotia Museum (NSM) and the ACCDC for any information they may have on the proposed Site location. The species lists from these agencies are included in Tables 9 and 10, respectively.

FIGURE 6 Significant Habitats of Yarmouth

TABLE 9 Known Plant Species of Special Status Within 10 Km Radius

Species	Scientific Name	General Status Rank in Nova Scotia
Northern Maidenhair –fern	*Adiantum pedatum*	Red
Salt-Marsh False-Foxglove	*Agalinis maritima*	Yellow
Rose Coreopsis	*Coreopsis rosea*	Red
Joe-Pye Thoroughwort	*Eupatorium dubium*	Red
Grass-Leaved Goldenrod	*Euthamia tenuifolia*	Yellow
Many-Flowered Pennywort	*Hydrocotyl umbellata*	Red
Grassleaf Rush	*Juncas marginatus*	Red
Eastern Lilaeopsis	*Lilaeopsis chinensis*	Red
Adder's Tongue	*Ophioglossum pusillum*	Yellow
Speading Panic-Grass	*Panicum dichotomiflorum*	Red
Southern Rein Orchid	*Platanthera flava*	Yellow
Comb-Leaved Mermaid-Weed	*Proserpinaca pectinata*	Yellow
Virginia Meadow-Beauty	*Rhexia virginica*	Yellow
Pennsylvania Blackberry	*Rubus pensilvanicus*	Yellow
Plymouth Gentain	*Sabatia kennedyana*	Red
Long's Bulrush	*Scirpus longii*	Yellow
Seabeach Groundsel	*Senecio pseudo-anrica*	Yellow
Yellow Nodding Ladies'-Tresses	*Spiranthes ochroleuca*	Yellow
American Germander	*Teucrium canadense*	Yellow

Source: NS Museum, 2004

TABLE 10 Known Species of Special Status Within 5 Km Radius

Species	Scientific Name	General Status Rank in Nova Scotia
Plants		
Rose Coreopsis	*Coreopsis rosea*	Red
Joe-Pye Thoroughwort	*Eupatorium dubium*	Red
Marsh Elder	*Iva frutescens ssp. oraria*	Undetermined
Seabeach Groundsel	*Senecio pseudoarnica*	Yellow
American Germander	*Teucrium canadense*	Yellow
Zigzag Bladderwort	*Utricularia subulata*	Green
Bird's-Eye Primrose	*Primula laurentiana*	Undetermined
Howe Sedge	*Carex atlantica ssp. capillacea*	Undetermined
Swan Sedge	*Carex swanii*	Undetermined
Beaked Spikerush	*Eleocharis rostellata*	Undetermined
Three-Square Bulrush	*Schoenoplectus americanus*	Undetermined
Checkered Rattlesnake-Plantain	*Goodyera tesselata*	Green
Southern Bog Clubmoss	*Lycopodiella appressa*	Green
Cutleaf Grape-Fern	*Botrychium dissectum*	Green
Dragonflies and Damselflies		
Saffron-Winged Meadowhawk	*Sympetrum costiferum*	Green
Birds		
Red-necked Grebe	*Podiceps grisegena*	Green
Common Tern	*Sterna hirundo*	Yellow
Common Loon	*Gavia immer*	Yellow
Sharp-Tailed Sparrow	*Ammodramus nelsoni*	Yellow
Northern Mockingbird	*Mimus polyglottos*	Green
Northern Cardinal	*Cardinalis cardinalis*	Green

TABLE 10 Known Species of Special Status Within 5 Km Radius

Species	Scientific Name	General Status Rank in Nova Scotia
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	N/A
Bobolink	*Dolichonyx oryzivorus*	Yellow
Baltimore Oriole	*Icterus galbula*	Green

Source: ACCDC, 2004
Note: N/A denotes that the species is not listed in the General Status Rank Database

3.1.4.3 Species-At-Risk Surveys

Based on the field surveys carried out by JW on June 16, 2004, no species-at-risk were located within the proposed Site. It should be noted that the flowering period for 15 of the 22 potential plant species-at-risk identified in Table 2 occur later in the year (i.e. July – October) and cannot be confirmed as not present at the Site. It is likely however that due to previous Site disturbances dating back the 1960's, that these species do not inhabit the Site.

The Bulbous Rush (*Juncus bulbosus)* however, is known to occur at disturbed sites. The NSDNR Phenology Database has indicated that the flowering period for this plant is unknown. According to Roland's Flora of Nova Scotia (Zinck, 1998) the Bulbous Rush flowers in late July to September and occurs on Sable Island, near Sydney, Louisbourg National Historic Site, and possibly Guysborough. Based on this review, it is unlikely that the Bulbous Rush inhabits the Site.

3.2 SOCIO-ECONOMIC ENVIRONMENT

3.2.1 Land Use

There was little present human usage of the wetland in evidence. A ground blind and apparent tree stand, in the northern, treed portion suggested probable deer hunting effort. Old onion bags for bait, such as apples, tended to confirm this supposition. The proximity of the deer stand's location to both residential and commercial properties, as well as being within town limits, makes it almost certain that hunting in the area would be illegal. In an upland forest just out of the wetland near Highway 101, a mounted deer skull top and antlers was found fallen from its wooden base, which was nailed on a young spruce tree. The human use this signified is only conjecture. Fishing is unlikely in the wetland, as the species of fish present are not typically considered angling species. No significant numbers of edible berry bushes were present in the wetland.

The Municipal Land Use By-Law (LUB) was not available for review when this report was being prepared. Personal communications with the Town of Yarmouth's Municipal Development Officer (Ms. Joanne Earle) confirmed that the proposed Site is zoned for general commercial (C2) land use. Previously, the Site was zoned for residential holding (R-H) land use, however the Town of Yarmouth recently approved an application from the Proponent in 2003 to have the property re-zoned.

3.2.2 Population

The population for the Town of Yarmouth, Yarmouth County, and Nova Scotia is shown in Table 11. As shown in Table 10, the Town of Yarmouth and Nova Scotia both exhibited a slight decrease in population (-0.1%) between 1991 and 1996.

TABLE 11 Population Statistics

Area	1996	2001	% Change
Yarmouth	7,568	7,561	-0.1
Nova Scotia	909,282	908,007	-0.1

Source: Statistics Canada, 2001

3.2.3 Education

Education levels as reported in the 2001 Census for Yarmouth and Nova Scotia are shown in Table 12. This summary shows that for each age group, the Yarmouth population is above the provincial rate for people with less than a high school certificate. Yarmouth is also below the provincial rate in all other categories with the exception of 35 – 44 year olds with a college certificate or diploma, and 45 – 64 year olds with a high school graduation certificate or some post graduate education.

TABLE 12 Education Trends

	Yarmouth	Nova Scotia
Total Population aged 20 – 34	1,380	170,615
% of population aged 20-34 with less than a high school graduation certificate	31.5	16.1
% of the population aged 20-34 with a high school graduation certificate and/or some postsecondary	27.5	28.3
% of the population aged 20-34 with a trades certificate or diploma	10.9	13.9
% of the population aged 20-34 with a college certificate or diploma	18.5	18.9
% of the population aged 20-34 with a university certificate, diploma or degree	11.2	22.8
Total population aged 35-44	1,140	151,650
% of the population aged 35-44 with less than a high school graduation certificate	32.5	23.0
% of the population aged 35-44 with a high school graduation certificate and/or some postsecondary	15.8	19.1
% of the population aged 35-44 with a trades certificate or diploma	14.0	18.9
% of the population aged 35-44 with a college certificate or diploma	21.9	19.4
% of the population aged 35-44 with a university certificate, diploma or degree	16.2	19.6
Total population aged 45-64	1,630	229,300
% of the population aged 45-64 with less than a high school graduation certificate	43.3	33.7
% of the population aged 45-64 with a high school graduation certificate and/or some postsecondary	18.7	16.0
% of the population aged 45-64 with a trades certificate or diploma	10.7	17.0
% of the population aged 45-64 with a college certificate or diploma	12.9	15.2
% of the population aged 45-64 with a university certificate, diploma or degree	14.1	18.1

Source: Statistics Canada, 2001

3.2.4 Labour Force

Employment by industry for Yarmouth is presented in Table 13. The employment profiles indicate that the two largest industries in Yarmouth are the other services category (28.7%) and the wholesale and retail trade (18.9%). For Nova Scotia, the two largest is the other services category (22.6%) and the health and education trades (18.2%).

TABLE 13 Employment by Industry

	Yarmouth	Nova Scotia
Total - Experienced Work Force	3,225	442,425
Agriculture / Resource Based	240 (7.4%)	29,000 (6.6%)
Manufacturing & Construction	425 (13.2%)	70,955 (16%)
Wholesale and Retail Trade	610 (18.9%)	71,085 (16.1%)
Finance and Real Estate	135 (4.2%)	20,620 (4.7%)
Health and Education	575 (17.8%)	80,700 (18.2%)
Business Services	320 (9.9%)	70,270 (15.9%)
Other Services	925 (28.7%)	99,790 (22.6%)

Source: Statistics Canada, 2001

As shown in Table 14, the labour force for Yarmouth compared to Nova Scotia shows a lower total participation rate of 55.3% compared to 61.6%, a lower total employment rate of 49.0% compared to 54.9%, and a higher total unemployment rate of 11.3% compared to 10.9%.

TABLE 14 Labour Force Indicators

	Yarmouth	Nova Scotia
Male Participation Rate	63.1	68.0
Male Employment Rate	57.4	60.3
Male Unemployment Rate	9.1	11.3
Female Participation Rate	48.6	55.8
Female Employment Rate	42.1	50.0
Female Unemployment Rate	13.8	10.4
Total Participation Rate	55.3	61.6
Total Employment Rate	49.0	54.9
Total Unemployment Rate	11.3	10.9

Source: Statistics Canada, 2001

3.2.5 Income Levels

As shown in Table 15, average income levels for Yarmouth are lower than those for all of Nova Scotia.

TABLE 15 Average Income

	Yarmouth	Nova Scotia
Average Male Employment Income ($)	36,467	43,166
Average Female Employment Income ($)	27,050	30,601
Average Total Employment Income ($)	32,804	37,872

Source: Statistics Canada, 2001

3.2.6 Road Infrastructure

ARTM was tasked to undertake a Traffic Impact Study (TIS) as a result of the Superstore, Wal-Mart, and Kent developments. The entire TIS is included in Appendix J. The existing road infrastructure near the Site consists of the section of Starrs Road between Highway 101 and Brooklyn Street.

The existing driveway and street intersections examined in the TIS include Highway 101, Kent Driveway, Superstore East Driveway, Superstore West Driveway and Shell East Driveway, Burton Avenue, Shell West Driveway, Comfort Inn Driveway, and Brooklyn Street.

Highway 101 intersection is controlled with fully actuated traffic signals and all other intersections are controlled with "Stop" signs or assumed stop conditions expected where a driveway meets an arterial street (TIS, 2004).

Starrs Road is a two lane arterial street and a concrete sidewalk on the north side, and gravel shoulder and an open ditch on the south side. The speed limit along Starrs Road is 50 km/h. A two-way left turn lane exists throughout Starrs Road between Highway 101 and Brooklyn Street. Highway 101 and Brooklyn Street both have dedicated left turn lanes for traffic approaching Starrs Road (TIS, 2004).

Collision statistics from NSTPW, for the section of Starrs Road between Highway 101 and Brooklyn Street through the years of 1999 and 2003 totaled 14 collisions. Six collisions occurred at the Highway 101 traffic lights, two at Comfort Inn intersection, two at Superstore, and four rear end collisions along Starrs Road (two at Kent, one at Superstore, one at Burton Avenue) (TIS, 2004).

Traffic counts provided by NSTPW for Starrs Road during September 2003 were obtained just west of Highway 101 and just east of Pleasant Street. The annual average daily traffic (AADT) volume on Starrs Road just west of Highway 101 was estimated to be 16,300 vehicles per day (vpd) and the average weekday volume was estimated 19,700 vpd (TIS, 2004).

3.2.7 Cultural Heritage / First Nations Resources

The NS Museum was consulted with regards to possible cultural heritage resources at the Site and surrounding areas in Yarmouth. A review of their files indicated that the Site has little potential for the presence of First Nations archaeological resources based on landform attributes. There are however, a number of First Nations archaeological sites in the surrounding areas. The NS Museum requested that a background study on Yarmouth's settlement history to determine if the Site was used during the 18th and 19th centuries.

Davis Archaeological Consultants Ltd. (DAC) was retained by AMEC to undertake the background study on Yarmouth's settlement history as requested by the NS Museum. The

results of the study indicated that it is unlikely that heritage resources exist within the development area, and that no further archaeological investigations are recommended. DAC does recommend that if such resources are encountered during construction, the NS Museum must be notified immediately so that the proper mitigation can be applied. A copy of the letter from the NS Museum and Archaeological Background Study from DAC are both available in Appendix K.

Both the Confederacy of Mainland Mi'kmaq (CMM) and the Union of Nova Scotia Indians (UNSI) were contacted by AMEC to discuss the project and proposed Site to determine if either organization had any traditional ecological knowledge (TEK) of the area. Due to timing constraints, the CMM could not provide Project related comments prior to registration. CMM did state that they would review the document during the regulatory review period. AMEC did not receive a response from UNSI prior to registration of this document. Chief Debbie Robinson from the Acadia First Nation was also contacted by phone to notify her of the Project.

4.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

An Environmental Assessment (EA) is a complete process, which should begin at the earliest stages of planning and remain in force throughout the life of a project, moving through a series of stages:

- Describing the project and establishing environmental baseline conditions;
- Scoping the issues and establishing the boundaries of the assessment;
- Assessing the potential environmental effects of the project, including residual and cumulative effects;
- Identifying potential mitigative measures to eliminate or minimize potential adverse effects; and
- Environmental effects monitoring and follow-up programs.

The EA focused on the evaluation of potential interactions between project components and activities, and Valued Ecosystem Components (VECs) that were identified through an issues scoping process. The assessment of the potential effects of the environment on the Project, including extreme weather events, was conducted during the Project design phase. Any mitigative Project design modifications that may have been required were incorporated in the final Project design that is described in this document.

The technique of Beanlands and Duinker (1983) and the guidance provided by various federal and provincial documents were employed to assist in the design and conduct of the EA. This approach emphasizes the use of VECs as the focal points for impact assessment. Generally, VECs are defined as those aspects of the ecosystem or associated socio-economic systems that are important to humans.

Two approaches were taken to identify the potential VECs. First, those parameters for which provincial or federal regulations are in place were identified. The second approach used for the identification of VECs involved a scoping exercise based on experience gained during other comparable environmental assessments; consultation with the public and the scientific community, supplemented by available information on the environment surrounding the proposed project; and the technical and professional expertise of AMEC.

For the purpose of this EA, the potential interactions (effects) between project activities and VECs are examined to select a defined set of VECs that will be assessed. The significance of potential interactions and the likelihood of the interactions are also considered. Possible measures to mitigate impacts are identified, and where residual impacts are identified, measures to compensate have been considered.

4.1 BOUNDARIES

The traditional approach to project bounding involved assessing changes to the environment within the physical boundaries of development. Beanlands and Duinker (1983) determined that in order to properly evaluate impacts, physical and biological properties must be determined temporally and spatially. This approach has been taken for the determination of bounds for the assessment of the proposed project.

Temporal project bounding for the proposed Project includes the short-term construction activities (Spring 2005 to December 2005) as well as the long-term operation of the commercial facility. The spatial bounds include the boundaries of the site as shown on Figure 2.

4.2 CONSULTATION PROGRAM

The following sections outline the components of the consultation process that has been undertaken as part of the Project development.

4.2.1 Regulatory Consultation

AMEC and the Proponent have consulted with representatives from several local regulatory agencies, local government representatives, and resource managers, in order to identify any issues specific to the proposed project and identify appropriate mitigation strategies. The agencies/individuals consulted, and the results of these consultations are noted in Table 16.

4.2.2 Public Consultation

The Proponent has conducted a public consultation program as part of their application to re-zone the proposed Site from residential holding (R-H) to general commercial (C2). This program consisted of public meetings as require under the Municipal Planning Strategy (MPS). The members of the public that participated in the public meetings and their comments/concerns with the proposed project are noted in Table 17.

As a follow up to the public meetings, a Site visit was arranged with Dan Earle, President of the Tusket River Environmental Protection Association (TREPA) to further discuss their concerns with the project. TREPA's main concerns with the Project include the loss of wetland habitat, and the water quantity and quality of Broad Brook.

TABLE 16 Regulatory Consultation Results

Contact	Means of Consultation	Issues or Concerns
Victoria Burdett-Coutts – DFO	Consultation has taken place several times in meetings, by phone and during a Site visit to discuss compensation issues related to fish habitat loss. Consultation took place on October 14, 25, and November 9, 2004.	DFO is the lead Regulatory Authority (RA) under the *Canadian Environmental Assessment Act* (CEAA). DFO has concerns with the installation of the culvert in Broad Brook and has required the proponent to apply for a HADD authorization.
Thomas Wheaton – DFO	Consultation has taken place several times in meetings, by phone and during a Site visit to discuss compensation issues related to fish habitat loss. Consultation took place on October 14, 25, and November 9, 2004.	Mr. Wheaton's concern is that the culvert installation will result in the HADD of fish habitat in Broad Brook and that compensation is needed.
Anita Hamilton – DFO	Consultation has taken place by phone and email with regards to developing a Fish Habitat Compensation Plan to help mitigate the impacts of installing a culver in Broad Brook. Consultation took place on October 25, 2004.	Commented that the design of the culvert should not impede fish passage. Design should include open-bottom or baffles. Also that a long dark culvert may preclude fish passage. Options for mitigation include installing skylights in the culvert. Compensation for loss of habitat could include providing fish passage at Starrs Road Culvert, and in stream and/or bank restoration along its course and/or in the area of the construction
Bob Petrie – NSDEL	Consultation has taken place several times in meetings, by phone and during a Site visit to discuss the project impacts. Consultation took place on October 14, and November 9, 2004.	Concerned with impacts to Broad Brook watershed caused by infilling 1.54 hectares of wetland at proposed Site. Wetland Alteration Permit must be issued by NSDEL following EA approval.
Jackie Mercer – NSDEL	Consultation has taken place several times in meetings, by phone and during a Site visit to discuss the project impacts. Consultation took place on October 14, 25, and November 9, 2004.	Concerned with impacts to Broad Brook watershed caused by infilling 1.54 hectares of wetland at proposed Site. Wetland Alteration Permit must be issued by NSDEL following EA approval.
Peter Geddes – NSDEL	Consultation has taken place several times in meetings, and by phone. Consultation took place on October 14 and 25, 2004.	Provided comments on the types of information needed in the EA Registration Document, guidance with the EA process timeframes and regulations.
Randy Milton – NSDNR	Consultation has taken place by telephone on October 15 and December 10, 2004.	Concerned with impacts to Broad Brook watershed and the loss of wetland functions caused by infilling 1.54 hectares of wetland at proposed Site. Stated that compensation will need to be a component of mitigation for wetland loss. Compensation at 5:1 ratio will be requested by NSDNR as condition of the EA Approval.
Glen Parsons – NSDNR	Consultation has taken place during a Site Visit and by phone on November 9, and December 10, 2004.	Conducted a site visit at a location for wetland restoration as proposed by TREPA. NSDNR is concerned that restoration of the site may cause flooding to surrounding areas and that a hydrological survey of the watershed needs to be carried out to identify a potential site for restoration.
Peter MacDonald – NSDNR	Consultation with AMEC has taken place by phone on December 14, 2004. Mr. MacDonald was on Site with Jacques Whitford on June 16, 2004 during the initial wetland assessment.	Provided information to AMEC with regards to significant habitats and species of concern in the area of the proposed Site.

TABLE 16 Regulatory Consultation Results

Contact	Means of Consultation	Issues or Concerns
Mark Elderkin – NSDNR	Consultation has taken place by phone on December 9, 2004.	Mr. Elderkin has some concern that only one field survey (June 16, 2004) has been undertaken at the Site by JW. Mr. Elderkin forwarded a copy of the following document to be followed during the EA: *Standards and Process Applied to Provincial Environmental Impact Assessments: Wild Species Priorities, Inventory and Mitigation Standards for Reporting*.
Mark McLean – CEAA	Consultation has taken place during a meeting on October 25, 2004..	Mr. McLean did not have any concerns with the project. He explained CEAAs role during a harmonized EA and explained that for this project, harmonization would not be an option.
Robert Ogilvie – NS Museum	Consultation was done through fax on November 2, 2004. Mr. Ogilvie provided AMEC with information regarding Cultural and Natural Heritage on November 19, 2004.	Mr. Ogilvie had no concern for potential First Nations archaeological resources at the Site, however recommended that a Background Study on Yarmouth's settlement history be undertaken to confirm whether the Site was used during the 18th and 19th centuries. A list of known plant species-of-concern within 10 km of the Site was provided by the NS Museum.
Stefen Garriets – ACCDC	Consultation was done through email on December 9, 2004.	Mr. Garriets has no concern with the project. AMEC contacted the ACCDC to request any information they may have on the Site and surrounding areas with regards to significant areas / species.
Arthur MacDonald – Town of Yarmouth	Consultation was through a Site Visit on November 9, 2004.	Mr. MacDonald has been aware of the project since the application to re-zone the land from residential holding (R-H) to general commercial (C2) in 2003. Mr. MacDonald has concerns with the potential for downstream flooding caused from increased overland flow into Broad Brook, and the potential for an increase in traffic along Starrs Road. There was some concern with the proposed location for wetland restoration by TREPA, as the Town of Yarmouth owns the area and the site has historically been used as a dumping ground for construction and demolition waste. Mr. MacDonald would rather see the wetland compensation include the restoration and enhancement to the existing floodplain/wetland adjacent to the sports fields.
Lorne Cushing – Town of Yarmouth	Consultation was through a Site Visit on November 9, 2004.	Mr. Cushing has no concerns with the project. There was some concern with the proposed location for wetland restoration by TREPA, as the Town of Yarmouth owns the area and the site has historically been used as a dumping ground for construction and demolition waste. Mr. Cushing would rather see the wetland compensation include the restoration and enhancement to the existing floodplain/wetland adjacent to the sports fields.
Dave Ernst – Town of Yarmouth	Consultation was through a Site Visit on November 9, 2004.	Mr. Ernst has no concerns with the project.
Joanne Earle – Town of Yarmouth	Consultation was by phone and fax on December 13, 2004.	Ms. Earle provided information on the Land-Use Bylaws for Yarmouth, and provided maps showing the re-zoning of the proposed Site from R-H to C2.
Maya Bevans – CMM	Consultation was by phone on December 13, 2004.	Would not have time to review the project before it was registered. Will review the project during the regulatory review period.
Louis Joe – UNSI	Left message on December 13, 2004.	Did not return call.
Debbie Robinson – Acadia First Nation	Left message on December 16, 2004	Did not return call.

TABLE 17 Public Consultation Results

Contact	Issues or Concerns
Stephen Sollows – Woodlot Owner	He was opposed to developing the marsh and voiced concerns about destroying the plant and animal life in the mash, and about the downstream flooding as a result of the development.
Margrit Robinson – Vice Chair of TREPA	She read a statement on behalf of TREPA. TREPA is opposed to any filling and draining of the marshes and wetlands and suggested that the Committee make a recommendation to Council to designate the lands as a greenbelt and incorporate provisions to fully protect them from any residential or commercial development. She suggested that the applicant should consider other commercially zoned lands in the town. Ms Robinson was asked by John Ryan if TREPA would be willing to negotiate with the developer, however, she responded that she did not wish to see any development of the marsh, either residential or commercial, as she did not feel there was any way the developer could eliminate all downstream effects.
John Goudy	He voiced concerns about flooding and mosquito problems on Chestnut and Elm Streets from another marsh in the Town. He stated that he has asked the Town several times in the past to look into correcting this problem, however, nothing has been done.
David Sollows – Property Owner	He stated that the development of the marsh would cause water to drain at a higher rate, resulting in flooding. He mentioned that the water draining off from a paved parking lot would be carrying pollutants downstream which would affect the water quality in the lower level of the brook. He added that the plants in the marsh would be at risk and also suggested that the developer consider other commercially zoned lands.
Charlie Trask – Property Owner & TREPA member	He spoke against the application. He had concerns about the destruction of animal life and did not feel that the developer could construct dams adequate to prevent flooding. He recommended that the Town not proceed with the application until an environmental assessment has been completed.
Eric Ruff	He had concerns about the loss of bird species as a result of any development. He would prefer the lands remain residential, as he did not feel that it would be feasible for any developer to develop the lands for residential purposes due to the costs involved. He also has concerns with flooding.
Cliff Hood – Property Owner	He was in favour of the application. He felt that the Town is in need of a large retail development in order to establish Yarmouth as a regional retail center. He spoke of the job opportunities that such a development would create for the Town and stated that the environmental issues should be left for the federal and provincial governments.

Source: Yarmouth Town Council Public Meeting Minutes, 2004.

4.3 PREDICTING ENVIRONMENTAL EFFECTS

Methodologies used in the identification and assessment of impacts may be specific to each discipline. They can be grouped in the following categories:

- Review of published literature;
- Interviews with resource persons and knowledgeable individuals;
- Stakeholder consultations; and
- Formulation of impact hypotheses and linkages for each VEC deemed to be vulnerable to impact from project activities.

Predictions are based on a combination of objective (measurable) and subjective (deduced) experience based on professional judgment and evaluation. Impacts are assessed using a defined impact rating as discussed in Section 4.4.

Reference to environmental assessments undertaken for similar projects is a useful method of checking the spectrum and intensity of anticipated impacts. Comparative analysis can be used to prepare checklists and to draw analogies.

4.4 IMPACT SIGNIFICANCE RATING

A common scale of reference for rating an impact is needed to compare the relative importance of various environmental effects. An impact is defined as "the change effected on one or more of the VECs as a result of project activities". It affects specific groups, populations or species, and results in the state of the VEC being modified in terms of an increase or decrease in its nature (characteristics), abundance, or distribution. It is categorized as negative (adverse) or positive

The scoping exercise used to describe the VECs (including definition of spatial and temporal bounds) included an element of likelihood of interaction between the VEC and project activities. The focus of the environmental assessment is, therefore, on these interactions. The following considerations have been applied when evaluating the significance of potential impacts on the VECs:

- The geographic extent - the area affected;
- Duration - the length of time that the impact will be experienced;
- The magnitude - the fraction of the population or the resource base that will be affected; and
- The sensitivity and the ability of the VEC to recover.

The framework for determining whether environmental effects are adverse, significant, and likely consists of the following:

- Determine whether the environmental effect is adverse;
- Determine whether the adverse environmental effect is significant or, in other words, determine the impact rating; and
- Determine whether the significant environmental effect is likely (i.e., the likelihood or probability of occurrence of significant adverse environmental effects).

Based on these criteria, where adverse effects are likely, mitigation or intervention on the part of the Proponent is required. Effects that are not considered adverse or likely require no mitigative response. If residual impacts remain after the application of mitigation, these impacts need to be assessed for significance.

Determination of "significance" should also consider scientific determinations, social values, public concerns, and economic judgments. Significance is assessed in two ways:

- Where available/applicable environmental standards, guidelines, and objectives are used to assess significance; and
- Where environmental standards, guidelines and objectives are not applicable experience and professional judgment are used to assess significance in the context of population level effects and VEC function.

5.0 VALUED ECOSYSTEM COMPONENTS

Issues scoping is an important part in the VEC identification process. The issues scoping process for this assessment included: review of past, relevant environmental reports; review of public concerns; regulatory agency consultation; and the study team's professional judgment.

From this input, a preliminary list of environmental and socio-economic components of concern (ECCs) is developed and the Project VECs are selected as shown in Table 19. The approach to the selection of VECs involves an initial evaluation to determine the likelihood of an interaction or linkage between ECCs and project activities, including all the components of the Project. Where linkages between ECCs and project activities exist and potential effects are of concern, these components are selected as VECs and subject to further analysis. Where a linkage between proposed project activities and the ECCs is absent, or is deemed unlikely to result in an effect, no further analysis is required.

The Project VECs (valued environmental and socio-economic components) list, which was derived from an evaluation of the ECC's, is as follows:

- Wetland habitat and function, including:
  - Loss of wetland function
  - Loss of habitat for flora and fauna
- Fish and fish habitat
- Surface water quality and quantity
- Economy, including:
  - Local job creation
- Transportation infrastructure, including:
  - Upgrade in roads and infrastructure

TABLE 19 Summary of Potential VECs

Environment / Resources	Environmental/ Socio-Economic Components of Concern (ECC)	Pathway		ECC Avoided During Site Selection		VEC/VSC		Possible Pathways	Rationale for Inclusion/Exclusion as Valued Environmental/Socio-Economic Component (VEC/VSC)
		Yes	No	Yes	No	Yes	No		
Environmental Setting:									
Atmospheric Environment	Human health & safety		X		X		X		Excluded – no pathway of concern
	• Ozone depleting substance (ODS)	X			X		X	Refrigerated equipment used onsite contain ODS	Excluded – pathway not a concern. Minor quantities of ODS generated.
	• Greenhouse gases	X			X		X	Construction equipment and customer vehicles release greenhouse gases.	Excluded – pathway not a concern/
Terrestrial Environment	• Wildlife (mammals, reptiles, herpitiles, birds, invertebrates) • Plants	X			X		X	Infilling of Site.	Excluded – pathway not a concern (minimal terrestrial habitat and limited use due to proximity to surrounding commercial land use)
	• Species of special status (flora & fauna)		X		X		X		Excluded – no pathway of concern (i.e. not present on Site)
	• Designated areas and other critical habitat features		X		X		X		Excluded – no pathway of concern (i.e. not present on Site)
	• Ongoing management initiatives (i.e. permanent forest sample plots)		X		X		X		Excluded – no pathway of concern (i.e. none present)
	• Groundwater quality and quantity	X			X		X	Hazardous spills during construction. Reduction in groundwater recharge from impervious cover (asphalt).	Excluded – no receptors. Limited interaction.
	• Soil quality	X			X		X	Hazardous spills during construction. Excavating contaminated soils during construction.	Excluded – no receptors. Limited interaction.
Wetland Environment	• Wildlife (mammals, reptiles, herpitiles, birds, invertebrates) • Plants	X			X	X		Infilling of wetland.	Included – Site is known to be habitat for birds, plants, and small mammals
	• Species of special status (flora & fauna)		X		X		X		Excluded – no pathway of concern (i.e. not present on Site)
	• Wetland habitat function	X			X	X		Infilling of wetland.	Included – Wetland habitat functions will be lost from infilling.

TABLE 19 Summary of Potential VECs

Environment / Resources	Environmental/ Socio-Economic Components of Concern (ECC)	Pathway		ECC Avoided During Site Selection		VEC/VSC		Possible Pathways	Rationale for Inclusion/Exclusion as Valued Environmental/Socio-Economic Component (VEC/VSC)
		Yes	No	Yes	No	Yes	No		
	• Nesting and breeding sites	X			X	X		Infilling of Wetland	Included – potential breeding and nesting sites will be lost during construction.
	• Ongoing management initiatives, including DU and EHJV		X		X		X		Excluded – no pathway of concern (i.e. none present)
	• Water quality	X			X		X	Runoff from the Site.	Excluded – Remainder of wetland is upstream of Site.
Aquatic Environment	• Fish species	X			X	X		Enclosing 175 metre length of Broad Brook in a culvert	Included – Culvert likely to preclude fish passage
	• Species of special status		X		X		X		Excluded – no pathway of concern (i.e. not present on Site)
	• Fisheries (recreational)		X		X		X		Excluded – no pathway of concern (i.e. not present on Site)
	• Fish habitat	X			X	X		Enclosing 175-metre length of Broad Brook in a culvert.	Included – Culvert likely to impact fish habitat.
	• Ongoing management initiatives, including habitat enhancement and stocking		X		X		X		Excluded – no pathway of concern (i.e. none present)
	• Surface water quality and quantity	X			X	X		Runoff from the Site	Included – potential increase in post-development flows and increase in contaminants.
	• Hydrology	X			X	X		Installing culvert in Broad Brook.	Included – Portion of Broad Brook will be enclosed within a culvert under parking lot.
Socio-Economic Setting:									
Economic	• Local economy (expenditures and employment	X			X	X		Expenditures by construction workers. Construction and operation jobs to be filled.	Included – Potential to benefit local economy.
	• Access to property	X			X		X	Currently no access	Excluded – no pathway of concern

TABLE 19 Summary of Potential VECs

Environment / Resources	Environmental/ Socio-Economic Components of Concern (ECC)	Pathway		ECC Avoided During Site Selection		VEC/VSC		Possible Pathways	Rationale for Inclusion/Exclusion as Valued Environmental/Socio-Economic Component (VEC/VSC)
		Yes	No	Yes	No	Yes	No		
Land Use	• Proximity to institutional facilities								
	- Hospitals / nursing homes		X	X			X		Excluded – no pathway / ECC avoided
	- Churches		X	X			X		Excluded – no pathway / ECC avoided
	- Schools		X	X			X		Excluded – no pathway / ECC avoided
	- Cemeteries		X	X			X		Excluded – no pathway / ECC avoided
	• Residential	X			X		X	Land re-zoned from residential (R-H) to commercial (C2).	Excluded – pathway not a concern (i.e. issues dealt with during re-zoning meetings)
	• Commercial	X			X		X	Land re-zoned from residential (R-H) to commercial (C2).	Excluded – pathway not a concern (i.e. issues dealt with during re-zoning meetings)
	• Industrial		X	X			X		Excluded – no pathway / ECC avoided
	• Recreational		X	X			X		Excluded – no pathway / ECC avoided
	• Agriculture		X	X			X		Excluded – no pathway / ECC avoided
	• Forestry		X	X			X		Excluded – no pathway / ECC avoided
	• Mineral aggregate resources / mining operations		X	X			X		Excluded – no pathway / ECC avoided
Infrastructure	• Roads and sidewalks	X			X	X		Increase in vehicle traffic	Included – potential increase in traffic may require upgrades in roads.
	• Military bases		X	X			X		Excluded – no pathway / ECC avoided
	• Airports		X	X			X		Excluded – no pathway / ECC avoided
	• Underground infrastructure		X	X			X		Excluded – no pathway / ECC avoided
	• Transportation infrastructure	X			X			Increase in vehicle traffic	Included – potential increase in traffic may require upgrades to infrastructure.
	• Reservoirs		X	X			X		Excluded – no pathway / ECC avoided
	• Water supply areas		X	X			X		Excluded – no pathway / ECC avoided
Archaeological and Heritage Resources	• Archaeological / Heritage resources	X			X		X	Excavation of resource area	Excluded – area was considered low potential for archaeological / heritage resources.

6.0 POTENTIAL ENVIRONMENTAL EFFECTS AND MITIGATION

The approach to analysis of environmental effects considers whether or not an effect is considered adverse and significant, and whether the identified significant adverse effect is likely to occur if appropriate mitigative measures are implemented. The significance of an effect is determined by its magnitude, geographic extent, duration and reversibility.

The VECs that have be selected for further assessment are:

- Wetland habitat and function, including:
  - Loss of wetland function
  - Loss of habitat for flora and fauna
- Fish and fish habitat
- Surface water quality and quantity
- Economy, including:
  - Local job creation
- Transportation infrastructure, including:
  - Upgrade in roads and infrastructure

The following sections outline the assessment of potential environmental effects, the proposed mitigation and the residual effects for each of these selected VECs.

6.1 WETLAND HABITAT AND FUNCTION

There is a potential for the loss of and degradation of wetland habitat and function during construction and operation of the Project.

6.1.1 Construction

During the construction phase, potential interactions with wetland habitat and function may be attributed to the following activities:

- Clearing of riparian and wetland vegetation; and
- Excavation of wetland and infilling with granular materials.

The potential and most likely effect of these activities includes the loss of wetland habitat (i.e. for breeding birds, etc.) and functions within the footprint of the Site. There is the potential for degradation of wetland habitat and function in the remainder of the wetland that is adjacent to the Site.

The loss of the wetland was evaluated during a wetland evaluation submitted to NSDEL in July 2004 (Jacques Whitford, 2004). The conclusions of the report were that the wetland is not

valuable from an ecological perspective, nor is it hydrologically functional to warrant restoration of the areas to be in-filled. The wetland complex below Starrs Road should however be protected by controlling water quality and quantity generated from this commercial zone.

NSDNR has stated that they are not in agreement with the wetland evaluation and that mitigation is needed through compensation.

Recommended Mitigation

Clearing of riparian and wetland vegetation will occur outside of the May 1 to August 31 period as this time frame can be a sensitive breeding period for migratory birds. The proponent will comply with the *Migratory Birds Convention Act* (MBCA) during all stages of the Project.

Mitigating the loss of wetland habitat and functions within the footprint of the Site will be done through a compensation agreement between NSDNR and NSDEL. The Proponent is committed to restoring wetland habitat and functions as described in the Wetland Evaluation completed by Jacques Whitford in 2004 (Appendix G) within the Broad Brook Watershed. If it is not feasible to carry out such a plan within the Broad Brook Watershed, the Proponent in cooperation with NSDNR and NSDEL will consider other watershed areas. Wetland compensation will be carried out in coordination with the *Federal Policy on Wetland Conservation* (FPWC).

Mitigation for the remaining portion of wetland will be undertaken through the use erosion and sediment control measures as shown in the Erosion and Sediment Control Plan (Appendix B). In general, the Site should be sloped so that surface drainage is directed away from the working area, where possible. Sediment and erosion control measures will be installed prior to construction, natural buffers will be left in place where possible, exposed soils will be stabilized as soon as possible following disturbance (i.e. re-vegetation), earth works will cease during extreme precipitation events, and control measures will be maintained following such events.

Significance of Residual Effects

These effects are expected to be of small magnitude, and of short duration. It is not likely that that there will be any significant adverse residual effects to wetland habitat and function with proper implementation of the above mitigation measures.

6.1.2 Operation

During the operation phase, potential interactions with remaining portion of wetland may be attributed to the following activities:

- Surface water drainage.

The potential effect of this activity includes an increase in water quantity and degradation in water quality entering the remaining wetland.

Recommended Mitigation

Reinstate vegetation to all areas that have been disturbed during construction and maintain/repair areas of vegetation as needed.

Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C.

Significance of Residual Effects

These effects are expected to be of small magnitude, short duration, and localized. It is not likely that that there will be any significant adverse residual effects to the remaining wetland habitat and function with proper implementation of the above mitigation measures.

6.2 FISH AND FISH HABITAT

There is a potential for impacts to fish and fish habitat during the construction and operation of the Project.

6.2.1 Construction

During construction activities, potential interactions with fish and fish habitat may be attributed to the following activities:

- Clearing of riparian vegetation and wetland habitat;
- Installation of the culvert in Broad Brook;
- Construction and reclamation of watercourse approaches and banks; and
- Fuel or hazardous materials spills during construction.

The potential effects of these activities include fish mortality, and fish habitat alteration, disruption, or destruction.

Recommended Mitigation

Compensation is required for this project because relocation and redesign prove impractical and mitigation measures fail to avoid harmful alteration, disruption or destruction of fish habitat (T. Wheaton, DFO, pers. comm., 2004). Compensation involves replacing the damaged habitat with newly created habitat or improving the productive capacity of some other natural habitat. Measures to compensate for the harmed habitat are developed following a hierarchy of preferred compensation options and included in a Fisheries Act Authorization (Subsection 35(2)) for implementation. The hierarchy of preferred compensation options is:

- create similar habitat at or near the development site within the same ecological unit;
- create similar habitat in a different ecological unit that supports the same stock or species;
- increase the productive capacity of existing habitat at or near the development site and within the same ecological unit;
- increase the productive capacity of a different ecological unit that supports the same stock or species;
- increase the productive capacity of existing habitat for a different stock or a different species of fish either on or off site.

Approximately 525 square metres of Broad Brook will be altered as a result of the Project. The aquatic habitat surveyed in 2004 (Jacques Whitford, 2004) has been documented as poor quality fish habitat. A Fish Habitat Compensation Plan has been submitted to DFO for review and includes the restoration of fish passage at the Starrs Road culvert on Broad Brook, and restoring fish habitat along 700 metres . Conditions regarding the compensation measures will be formalized through a legal agreement between the Proponent and DFO.

To minimize potential construction effects on fish and fish habitat, erosion and sediment control measures will be installed as shown in the Erosion and Sediment Control Plan in Appendix B. In general, the Site should be sloped so that surface drainage is directed away from the working area, where possible. Sediment and erosion control measures will be installed prior to construction, natural buffers will be left in place where possible, exposed soils will be stabilized as soon as possible following disturbance (i.e. re-vegetation), earth works will cease during extreme precipitation events, and control measures will be maintained following such events.

Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C. A Contingency Plan should be developed, that will describe the process to take place should a hazardous material spill occur during construction.

Significance of Residual Effects

These effects are expected to be of small magnitude, and short duration. It is not likely that that there will be any significant adverse residual effects to fish and fish habitat with proper implementation of the recommended mitigation measures.

6.2.2 Operation

During the operation of the Project, potential interactions with Broad Brook may be attributed to the following activities:

- Fuel spills and suspended materials collecting in surface water drainage.

The potential effect of this activity is fish mortality.

Recommended Mitigation

Reinstate vegetation to all areas that have been disturbed during construction and maintain/repair areas of vegetation as needed.

Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C. A Contingency Plan should be developed, that will describe the process to take place should a hazardous material spill occur during operation. Contractors that are hired to maintain the property (i.e. snow clearing, etc.) should adopt best management practices for road salt applications and use of all hazardous materials.

Significance of Residual Effects

These effects are expected to be of small magnitude, and of short duration. It is not likely that that there will be any significant adverse residual effects to fish and fish habitat with proper implementation of the recommended mitigative measures.

6.3 SURFACE WATER QUALITY AND QUANTITY

There is a potential for impacts to surface water quality and quantity during the construction and operation of the Project.

6.3.1 Construction

During construction activities, potential interactions with surface water quality and quantity may be attributed to the following activities:

- Clearing of riparian vegetation and wetland habitat;
- Installation of the culvert in Broad Brook;

- Construction and reclamation of watercourse approaches and banks; and
- Fuel or hazardous materials spills during construction and operations.

The potential effects of these activities include erosion, sedimentation, water quality degradation, and flooding.

Recommended Mitigation

Erosion and sediment control measures will be installed as shown in the Erosion and Sediment Control Plan to avoid potential impacts (Appendix B). In general, the Site should be sloped so that surface drainage is directed away from the working area, where possible. Sediment and erosion control measures will be installed prior to construction, natural buffers will be left in place where possible, exposed soils will be stabilized as soon as possible following disturbance (i.e. re-vegetation), earth works will cease during extreme precipitation events, and control measures will be maintained following such events.

Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C. A Contingency Plan should be developed, that will describe the process to take place should a hazardous material spill occur during construction.

Significance of Residual Effects

These effects are expected to be of small magnitude, and short duration. It is not likely that that there will be any significant adverse residual effects to surface water quality and quantity with proper implementation of the recommended mitigation measures.

6.3.2 Operation

During the operation of the Project, potential interactions with surface water quality and quantity may be attributed to the following activities:

- Fuel spills and suspended materials collecting in surface water drainage;
- Collection and discharge of surface water drainage from an impervious surface area directly into Broad Brook.

The potential effects of this activity include degradation of water quality, and increases to post development flows into Broad Brook.

Recommended Mitigation

Reinstate vegetation to all areas that have been disturbed during construction and maintain/repair areas of vegetation as needed.

Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C. A Contingency Plan should be developed, that will describe the process to take place should a hazardous material spill occur during operation. Contractors that are hired to maintain the property (i.e. snow clearing, etc.) should adopt best management practices for road salt applications and use of all hazardous materials.

Significance of Residual Effects

These effects are expected to be of small magnitude, and of short duration. It is not likely that that there will be any significant adverse residual effects to surface water quality and quantity with proper implementation of the recommended mitigative measures.

6.4 ECONOMY

Throughout the construction, operation, and decommissioning of the proposed Project, the purchase of materials and services from local businesses and industries, and the employment of employees and local contractors constitute a project interaction. These activities introduce a direct economic impact at the local community level (Town of Yarmouth) over the project period. Economic effects from the Project will be noted in local purchasing; service contracts; employment, and workforce spending.
The impacts to the economy are expected to be positive therefore, mitigation is not required.

Significance of Residual Effects

It is not likely that that there will be any significant adverse residual effects to the local economy. Positive interactions as described above, are anticipated.

6.5 TRANSPORTATION INFRASTRUCTURE

During the construction and operation of the Project, potential interactions with Starrs Road may be attributed to an increase in traffic. Starrs Road is a two-lane arterial street with a posted speed limit of 50 km/h. There is a concrete sidewalk along the north side and a gravel shoulder and open ditch along the south side. There is a two-way left turning lane along Starrs Road, and dedicated eastbound left turning lanes for Brooklyn Street and Highway 101.

The Site will be serviced with three accesses to Starrs Road including, the primary Site entrance (existing Superstore/Shell entrance), and two secondary entrances (Kent entrance and Brooklyn Street entrance).

It has been determined in the TIS (Appendix J) that the existing commercial development generates a combined 580 vehicles per hour (vph). It is estimated that the Project as part of the entire commercial development will generate approximately 1175 vph during the PM peak hour of an average weekday.

Recommended Mitigation

The primary Site entrance will be reconstructed to include four lanes and appropriate clear throat distances, as well as a right turning lane into Starrs Road. Traffic signals will be also be installed at the primary Site entrance and Starrs Road intersection, complete with a separate eastbound left turning lane. The two Kent entrances will be reconstructed to provide a combined Kent entrance, complete with appropriate clear throat distances. The left turning lane markings will be re-marked to provide dedicated left turning lanes for both the primary and Kent entrances.

Significance of Residual Effects

It is not likely that that there will be any significant adverse residual effects to the transportation infrastructure with proper implementation of the recommended mitigative measures. Analyses done on the mitigation measures indicate that the primary Site intersection will operate at a very good level of service, and the other intersections will operate at an excellent level of service.

7.0 MONITORING AND REPORTING

There are two general types of monitoring which are considered in environmental planning and impact assessment: environmental compliance monitoring (ECM); and environmental effects monitoring (EEM). Compliance monitoring refers to demonstration of adherence to environmental regulations while effects monitoring refers to demonstrating the accuracy of predictions and the effectiveness of proposed mitigation measures.

ECM and EEM programs will be implemented to ensure that pre-construction commitments are fulfilled. The detailed ECM and EEM programs, a Contingency Plan, and an Environmental Management Plan (EMP), will be developed prior to construction of the Project. The EMP will include a general Environmental Protection Plan (EPP), a specific Environmental Construction Plan (ECP), a detailed monitoring program, and a contingency plan, which will be put in place based on the results of the monitoring program.

7.1 ENVIRONMENTAL COMPLIANCE MONITORING

A detailed ECM program will be developed during the detailed design stage for construction and operation of the proposed Project with the objectives of:

- Ensuring compliance with all applicable government acts, regulations, and permits issued in respect of the Project;
- Ensuring that the environmental commitments are met; and
- Ensuring that established environmental policies and standards are maintained.

The ECM program will ensure that pre-construction commitments made to regulatory agencies and other stakeholder groups are fulfilled during construction. This will include, but is not limited to, for example, watercourse alterations, or stakeholders' request to be notified in advance of construction in a particular area. Compliance monitoring will ensure that preventative and protective environmental measures are in place throughout construction.

7.2 ENVIRONMENTAL EFFECTS MONITORING

A detailed EEM will be developed to validate impact predictions, and to evaluate the effectiveness of and identify the need to alter or improve mitigative measures. An EEM program normally involves the collection of repetitive measurements of environmental variables to detect changes caused by external influences directly or indirectly attributable to a specific human activity or development.

7.3 CONTINGENCY PLANS

The purpose of the EEM and ECM programs described above are to check the effectiveness of impact mitigation. Nonetheless, a contingency plan will be required that outlines the additional

actions needed in the event that the impact predictions put forward in this document are inaccurate, or if mitigation fails to reduce impacts, or if the case of an unforeseen occurrence (accident).

The goal of such a plan will be to reduce the frequency, extent and duration of accidental events and to reduce the risk to the environment from such events. A contingency plan will be prepared for both the construction and operation phases of the Project.

Contingency and emergency response plans will maximize the efficiency of response to unforeseen events, and therefore minimize the potential magnitude and extent of resulting impacts. This will be achieved by ensuring that personnel are trained in emergency response procedures, that response resources are available, and that an effective communications and reporting system is in place.

Contingency and response plans will be incorporated into the ECP prepared for this Project, to ensure that prevention and response measures are integrated with environmental protection procedures. Specific actions to be taken by Project personnel, including first response, reporting, coordination, development, personnel contact, and priorities for action will be clearly stated.

8.0 OTHER APPROVALS AND AUTHORIZATIONS

Other approvals needed by the Proponent prior to proceeding are as follows:

Federal

- HADD Authorization - Section 35(2) of the *Fisheries Act*

Provincial

- Water Approval – Section 66(5) of the *Environment Act*

Municipal

- Building Permit - Town of Yarmouth

9.0 CONCLUSIONS

It is unlikely that there will be any significant adverse effects from the Project, with proper implementation of the following mitigation measures:

- Clearing riparian and wetland vegetation outside of the May 1 to August 31 period as this time frame can be a sensitive breeding period for migratory birds. The proponent will comply with the *Migratory Birds Convention Act* (MBCA) during all stages of the Project;
- Restoring similar wetland function in the Broad Brook Watershed through a wetland compensation agreement between the Proponent, NSDNR, and NSDEL. If it is not feasible to carry out such a plan within the Broad Brook Watershed, other watershed areas will be considered.
- Implementing erosion and sediment control measures as shown in the Erosion and Sediment Control Plan (Appendix B). In general, the Site should be sloped so that surface drainage is directed away from the working area, where possible. Sediment and erosion control measures will be installed prior to construction, natural buffers will be left in place where possible, exposed soils will be stabilized as soon as possible following disturbance (i.e. re-vegetation), earth works will cease during extreme precipitation events, and control measures will be maintained following such events.
- Reinstate vegetation to all areas that have been disturbed during construction and maintain/repair areas of vegetation as needed.
- Storm water generated on-Site will be collected, stored, and treated on-Site as detailed in the Storm Water Management Plan in Appendix C. A Contingency Plan should be developed, that will describe the process to take place should a hazardous material spill occur during construction. Contractors that are hired to maintain the property (i.e. snow clearing, etc.) should adopt best management practices for road salt applications and use of all hazardous materials.
- Providing fish passage at the Starrs Road culvert, and restoring 700 metres of fish habitat downstream of Starrs Road through a fish habitat compensation agreement between the Proponent and DFO
- The primary Site entrance will be reconstructed to include four lanes and appropriate clear throat distances, as well as a right turning lane into Starrs Road. Traffic signals will be installed at the primary Site entrance and Starrs Road intersection, complete with a separate eastbound left turning lane. The two Kent entrances will be reconstructed to provide a combined Kent entrance, complete with appropriate clear throat distances. The left turning lane markings will be re-marked to provide dedicated left turning lanes for both the primary and Kent entrances.

10.0 REFERENCES

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APPENDIX A

PROJECT SCHEDULE

APPENDIX B

EROSION AND SEDIMENT CONTROL PLAN

APPENDIX C

STORM WATER MANAGEMENT PLAN

APPENDIX D

AERIAL PHOTOGRAPHS

APPENDIX E

SITE PHOTOGRAPHS

APPENDIX F

WETLAND EVALUATION

APPENDIX G

VASCULAR PLANT SPECIES LIST

APPENDIX H

NOVA SCOTIA PRIORITY SPECIES TABLE

APPENDIX I

NOVA SCOTIA (WESTERN REGION) PRIORITY SPECIES TABLE

APPENDIX J

TRAFFIC IMPACT STUDY

APPENDIX K

ARCHAEOLOGICAL RESOURCES LETTER
AND BACKGROUND STUDY REPORT