MARITIME TESTING
Consulting Engineering & Environmental Services

PHASE I and II
ENVIRONMENTAL SITE ASSESSMENT
CIVIC NO. 5 COLLINS STREET
YARMOUTH, NOVA SCOTIA

Prepared for

Town of Yarmouth
400 Main Street
Yarmouth, Nova Scotia
B5A 1G2

By

Maritime Testing (1985) Limited
97 Troop Avenue
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December 4, 2009

MTL PROJECT NO. 10516

MARITIME TESTING
Consulting Engineering & Environmental Services

December 4, 2009

Mr. J. Gushue
Town of Yarmouth
400 Main Street
Yarmouth, NS
B5A 1G2

MTL No.: 10516

Dear Sir:

RE: Phase I and II Environmental Site Assessment –
Civic No. 5 Collins Street, Yarmouth, NS

Enclosed please find our report prepared following a Phase I and II Environmental Site Assessment of the above-mentioned property.

Should you have any questions, please contact the undersigned at your convenience.

Sincerely Yours,
Maritime Testing (1985) Limited

Ryan Pellerin, B.Sc., A.Sc.T.
Project Manager, Environmental Division

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EXECUTIVE SUMMARY

Maritime Testing (1985) Limited (MTL) was retained by the Town of Yarmouth to undertake a Phase I Environmental Site Assessment (ESA) of the property identified as Civic No. 5 Collins Street in Yarmouth, Nova Scotia. The Phase I ESA carried out by MTL was based on the principles and practices outlined in the Canadian Standards Association (CSA) Z768-01, "Phase I Environmental Site Assessment".

A background study of the site was conducted, followed by a site inspection on November 9, 2009 at which time the property was visually inspected for the presence of potential environmental concerns such as petroleum storage tanks, hazardous materials and waste storage, surface staining and potential contamination from adjacent properties.

The subject property is an asphalt-paved parking lot operated by the Town of Yarmouth and occupies the entire block of land bounded by Collins, First, Second and Alma Streets with the exception of a two-unit residential dwelling (separate PID) on the west side of the block. The assessment indicates that the property was historically divided into several separate residential and commercial properties, including a fire engine house at the southwest corner, a contractor's yard and workshop on the east side, and a gasoline service station at the northwest corner. Two small wooden buildings, that are identified on fire insurance plans as the contractor's workshop, are still present in the central portion of the property.

Due to the nature of past use of portions of the property (i.e., gasoline service station and fire engine house with associated underground petroleum storage tanks), MTL recommended a Phase II ESA to assess the potential for residual petroleum hydrocarbon impacts in soil and groundwater at the property.

In conjunction with a geotechnical investigation requested by the Town of Yarmouth and provided under separate cover, fourteen exterior boreholes were advanced and four monitor wells were installed to assess the environmental quality of soil and groundwater. Both soil and groundwater samples were collected and analyzed for petroleum hydrocarbons.

The Phase II ESA has revealed that petroleum hydrocarbons resembling gas were detected in a soil sample collected from the northwest portion of the property (former gasoline service station location) that exceed the generic Tier I commercial RBSLs but satisfy the Tier II PSSLs (outdoor air) since no free phase petroleum product was observed The soil impacts would require reassessment if any future re-development of the property involved construction of a building in the northwest portion of the property and petroleum vapour intrusion became a possibility. Further assessment of the impacts would also be required if the subject property were re-developed in a residential capacity. It should be noted that any petroleum-impacted soils that are to be removed

from the property during future re-development of the site must be transported to a licensed contaminated soil facility for disposal.

Petroleum hydrocarbons (TPH and BTEX parameters) were detected in soil and groundwater at the southwest portion of the property at concentrations that satisfy the commercial Tier I RBSLs.

Based on the age of the two current site structures, asbestos and lead-containing materials may be present and may underlie more recent building materials. The concerns associated with hazardous building materials are their proper handling, storage and disposal upon decommissioning for renovation or demolition. The recommended approach is to conduct a hazardous materials survey to test materials suspected of containing hazardous substances prior to their disturbance. Fluorescent light ballasts, if present, may contain PCBs. These are considerations for maintenance or disposal of the units.

1.0 INTRODUCTION

A Phase I Environmental Site Assessment (ESA) was conducted by Maritime Testing (1985) Limited (MTL) at the property identified as Civic No. 5 Collins Street in Yarmouth, Nova Scotia. The request for this assessment was made by Mr. Jeffrey Gushue of the Town of Yarmouth. At the time of the assessment, re-development of the property was proposed.

The purpose of the Phase I Environmental Site Assessment is to present factual environmental information and render an opinion regarding the environmental data collected and information reviewed for the site and adjacent properties. This was done by a review of information collected from existing documentation, a site visit and interviews with persons familiar with the site. The assessment is useful in reducing uncertainty about potential environmental liabilities and may form the basis for further investigation of the property.

Based on the preliminary findings of the Phase I ESA, a Phase II ESA was conducted to address potential environmental concerns related to former on-site petroleum handling and storage. This report presents the findings of the Phase I and II ESA.

2.0 SCOPE OF THE ASSESSMENT

The Phase I ESA carried out by MTL was based on the principles and practices outlined in the Canadian Standards Association (CSA) Z768-01, "*Phase I Environmental Site Assessment*". As part of the assessment, aerial photographs of the area on file with Service Nova Scotia and Municipal Relations (SNSMR) were reviewed, as was property ownership information at the Registry of Deeds (online). Occupational history was reviewed in fire insurance plans at Nova Scotia Public Archives and municipal directories at the Yarmouth County Museum and Archives. Information was requested from the Nova Scotia Environment (NSE) *Environmental Registry* regarding past petroleum storage and handling. Interviews were held with Mr. Bruce Bishop (Director, Yarmouth County Museum and Archives) and Mr. Jeffrey Gushue (Chief Administrative Officer, Town of Yarmouth) regarding the current and past use of the subject property.

A site inspection was conducted to visually assess the site for evidence of actual or potential environmental concerns, including the following:

- petroleum storage tanks,
- asbestos, lead, PCBs, CFCs, UFFI, stored wastes and chemicals, radon, and other hazardous substances,
- surface stains, and

- neighbouring land uses that have the potential to impact the environmental condition of the subject property.

It should be noted that information and opinions in this report are based on the above-noted research and visual observations during a walkabout of the property on November 9, 2009, and that sampling, testing or moving large objects is typically not included in the scope of work for a Phase I Environmental Site Assessment.

Based on preliminary findings of the Phase I ESA, a Phase II ESA was conducted to investigate potential environmental concerns related to historical on-site petroleum handling and storage practices. The Phase II ESA was carried out by MTL based on the principles and practices outlined in the CSA Z769-00, "*Phase II Environmental Site Assessment*". The Phase II ESA consisted of a soil and groundwater investigation involving the drilling of fourteen exterior boreholes and installation of four monitor wells.

Select soil and groundwater total petroleum hydrocarbon (TPH) analyses were conducted by Maxxam Analytics Inc. laboratory and analytical results were compared to the provincial guidelines for petroleum impacts (i.e. 2003 Atlantic PIRI Tier I Risk Based Screening Levels (RBSLs) and Tier II Pathway Specific Screening Levels (PSSLs)) for a commercial property.

3.0 PROPERTY DESCRIPTION

3.1 Site Description

The current area of interest is identified as PID No. 90207622 (Civic No. 5 Collins Street). The property is an irregular-shaped parcel with a land area of approximately 4,663 square metres (50,193 ft^2) in the Town of Yarmouth. A property map and a parcel information report from SNSMR are provided in Appendix A. Site photos are provided in Appendix B. A site location map is presented on the following page.

The subject property is currently used as an asphalt-paved public parking lot. Access to the lot is via driveways from First Street to the west and Second Street to the east. Two wooden buildings are present on a grassy area in the central portion of the property and are used by the Town of Yarmouth for storage of special events equipment (i.e. tables, holiday decorations, etc.). The buildings have pitched, asphalt-shingle roofs and are constructed on concrete blocks (i.e. no foundations). The buildings are clad with wood shingles and plywood sheeting. Several concrete sidewalks are present at the subject property, including around the perimeter of the parking lot.

Site Location Map: Civic No. 5 Collins Street, Yarmouth, NS

A two-unit residential building is present on the neighbouring parcel of land located at Civic Nos. 7 and 9 First Street within the same block as the subject property. Surrounding properties are occupied by a mixture of residential and commercial developments, including a wellness center, a printing shop and a Knights of Columbus building across Collins Street to the north, professional offices (i.e. dentist, accountant) and residential dwellings across Second Street to the east, the Yarmouth Vanguard (newspaper) office and distribution center across Alma Street to the south and a pharmacy, a stationary store, restaurant, residential apartments and an art gallery across First Street to the west.

The subject property slopes slightly from northeast to southwest; local regional topography slopes downward to the west towards Yarmouth Harbour. This area of Yarmouth is serviced by municipal water and storm and sanitary sewer infrastructure provided by the Town of Yarmouth. Several catch basins are present on the southern portion of the property.

3.2 Geology

Surficial geological mapping of this area of Yarmouth County indicates that the subject area is underlain by a glacial deposit known as the Beaver River Till. Beaver River Till is comprised of quartzite with light bluish-grey loose sands and/or silty sands.

Geological mapping indicates bedrock underlying the site is the White Rock Formation. Specifically, the site is underplayed by formations consisting of quartzite, slate, siltstone with rhyolitic tuff and basalt at the base.

4.0 BACKGROUND INVESTIGATION

At the outset of the project, a background study of the property was undertaken. The purpose of this work was to obtain information on previous land use activities and possible types of contamination or hazardous materials arising from past operational practices. Information collected has been based largely on a review of aerial photographs, deeds, fire insurance plans, a survey plan and municipal directories.

A preliminary title search was conducted at the Registry of Deeds (online service) where deeds were reviewed. Aerial photographs for the years 1954, 1959, 1967, 1970, 1978, 1989, 2000 and 2006 were available for viewing and copies of years 1970, 1978, 1989 and 2006 are provided in Appendix C. Fire insurance plans were available for the years 1891, 1900, 1906, 1914, 1921, 1927, 1947 and 1955 and copies of the years 1900, 1927 and 1955 are provided in Appendix D. A copy of a 1981 survey plan for the property is provided in Appendix E.

4.1 Property Ownership

The property is currently owned by Yarmouth Development Corporation Limited. It is the result of the acquisition and consolidation of several parcels of land by the Town of Yarmouth. The available ownership history of these parcels, with the civic address of the properties as indicated on the 1955 fire insurance plan, is summarized below.

Civic Address	Grantor	Grantee	Year of Deed
3 Collins Street	Estate of Charles Roy	Town of Yarmouth	1973
	John and Mary Moir	Charles and Alice Roy	1925
3 First Street	James Harris	Town of Yarmouth	1904
5 First Street	Leighton and Helen Smith	Town of Yarmouth	1969
	Norma and Samuel Tompkins	Leighton and Helen Smith	1965
	Clara Utley and Jeanette Horton	Norma and Samuel Tompkins	1953
	Deborah Horton	Clara Utley	1922
7 & 9 First Street	William Bailey	Clifford Roach	1949
11 First Street	Petrofina Canada Ltd.	Corporation of the Town of Yarmouth	1972
	Super Service Stations Limited	Petrofina Canada Ltd.	1971
	Gordon and Beatrice Innes	Super Service Stations Limited	1936
	Ella Wenzell, Delina Moir and Isabel Whittier	Gordon and Beatrice Innes	1936
4 Second Street	Frances S. LeBlanc	Town of Yarmouth	1974

	Louise Amiro	Frances S. LaBlanc	1939
6 Second Street	Burns Bike Barn & Hobby Centre Limited	Town of Yarmouth	1978
	Walter and Olive Quickfall	Burns Bike Barn & Hobby Centre Limited	1977
	C. Asa Doane	Walter Quickfall	1965
8 Second Street	Anne MacDonald	Town of Yarmouth	1973
	C. Asa and Mildred Doane	Anne MacDonald	1971
	Mildred Doane	Asa Doane	1958
10 Second Street	Annie M. Reid	Town of Yarmouth	1973

4.2 Historical Land Use

Based on fire insurance plans for the town of Yarmouth, in 1891 the majority of the subject site was occupied by residential dwellings. A fire engine house was present at the southwest corner of the property (at the corner of Alma and First Streets). By 1900, a larger engine house was present. According to information gathered at the Yarmouth Firefighters Museum, the original engine house was removed from the site in 1896 and was replaced with the larger building, which also housed a police court in 1900. By 1927, based on the fire insurance plan, an automotive service garage had been constructed on the northwest corner of the site (at the corner of First and Collins Streets). The 1955 fire insurance plan shows that a contractor's yard and workshop occupied a parcel on the east side if the subject property (along Second Street). According to the 1954, 1959, 1967 and 1970 aerial photographs, land use of the property was consistent with that shown on the 1955 fire insurance plan.

Historic deed information researched for the current assessment indicates that the Town of Yarmouth began acquiring most of the individual land parcels in the area of interest in the late-1960s. According to the 1978 aerial photograph, the service station and residential dwellings along Collins Street on the north side of the property and several dwellings along Second Street on the east side of the property had been demolished and an asphalt-paved parking lot was present on the northern portion of the property. The dwelling at Civic Nos. 7 and 9 First Street was still present (and is still present today), as was the contractor's workshop on Second Street and the engine house and police station at the corner of First and Alma Streets (information from the Firefighters Museum indicated that the engine house was demolished in 1978). The 1989 aerial photograph shows that property much as it is today, with the majority of the parcel used as a parking lot and the former contractor's workshop buildings present in the central portion of the site.

Surrounding property usage has been a mixture of residential and commercial since 1891, when lands between First Street and Main Street (one block to the west of the subject site) were occupied by businesses including a pharmacy, grocers and a paint shop and lands to the north and east were

single-family residences. By 1914, according to the fire insurance plan, additional commercial businesses, including a printing shop, a restaurant, a bank and warehouses were present to the west of the subject property and a public library, cabinet shop and wallpaper store were present on the north side of Collins Street between Main and First Streets. The 1927 fire insurance plan shows a bottling operation across Collins Street to the north and a battery service shop on the northwest corner of the intersection of Collins and First Streets. By 1947, a gasoline service station occupied the land on the north side of Collins Street between Main and First Streets and an undertakers business occupied the former bottling company building. A Canadian Tire automotive service garage was present across Collins Street to the north of the subject property service station in 1955. Since then, several of the residential dwellings along Collins and Second Streets were converted to small business offices.

5.0 SITE RECONNAISSANCE

MTL conducted a site inspection on November 9, 2009 to visually inspect the property for the presence of potential environmental concerns such as petroleum storage tanks, surface soil staining, hazardous materials, chemicals and waste storage, and potential contamination from adjacent properties.

5.1 Petroleum Storage Tanks

No petroleum storage tanks were noted at the subject property during the site inspection. The two wooden structures in the central portion of the site are reportedly unheated.

According to review of historic fire insurance plans, an underground gasoline storage tank (UST) was present at the former engine house at the southwest corner of the subject site (the UST is visible in the 1927, 1947 and 1955 fire insurance plans). A photograph of the engine house from 1978, supplied by Mr. Jeffrey Gushue of the Town of Yarmouth and provided in Appendix B, shows a large aboveground storage tank, likely used to store heating oil, on the north side of the former engine house.

The 1927, 1947 and 1955 fire insurance plans also show gasoline USTs at the former automotive service station at the northwest corner of the subject property (the 1927 plan shows three USTs at the station; the 1947 and 1955 plans show two USTs). The 1972 deed for the transfer of the property from Petrofina Canada Ltd. to the Corporation of the Town of Yarmouth indicates that two 2,000-gallon USTs were included in the sale of the property. No information related to the fate of the USTs following the sale of the property in 1972 was available from representatives of the Town of Yarmouth.

As part of the background study, information including the registration of petroleum storage tanks was requested from the NSE *Environmental Registry* for the former service station and engine house parcels, using their inferred former civic addresses as references. The NSE reported that no information on petroleum storage tanks was located in their records for the subject property. The Town of Yarmouth had also requested information for the property from *the Environmental Registry*, using the current property address as a reference (Civic No. 5 Collins Street). The response from NSE, provided to MTL by Mr. Gushue, indicated no information was located. Copies of the NSE response letters are provided in Appendix F.

Based on the historic site information, we recommended an intrusive investigation (i.e., subsurface soil and groundwater assessment) at the northwest and southwest portions of the subject property to investigate the potential for residual petroleum hydrocarbon impacts related to the petroleum storage tanks at the former service station and engine house.

5.2 Asbestos

Asbestos has been used in many areas of building construction. Materials found in buildings constructed or renovated prior to the late-1970s that commonly contain asbestos fibres include flooring (vinyl tiles, sheet flooring, mats under hardwood), wall and ceiling materials (shingles, siding, suspended tiles, plaster, stucco, drywall filler compound), mechanical insulation (pipes, fittings, boilers, gaskets), fireproofing (panels, texture coats) and miscellaneous materials such as wallpaper, paints, and adhesives. Asbestos use in building construction was reduced in the late-1970s due to the hazards associated with inhalation of asbestos fibres.

Due to the age of the current site structures, it is possible that asbestos-containing materials (ACMs) may be present in some building materials at the site.

It should be noted that the majority of ACMs present in most buildings, if properly maintained, do not pose a hazard to building occupants. The main concern is the health of building maintenance personnel who may disturb the materials in the course of renovations, thus affecting themselves and possibly other occupants. The recommended approach is to test suspected ACMs prior to their disturbance. The NSE has adopted codes-of-practice for safely working with ACMs.

5.3 UFFI

Due to the age of the site structures, urea formaldehyde foam insulation (UFFI) may have been installed during property development or subsequent renovations. If present, the main concerns associated with UFFI would be off-gassing of the chemicals. In general, off gassing of UFFI is no

longer considered to be a concern due to the considerable time that has elapsed since UFFI has been in use.

5.4 PCBs

Polychlorinated biphenyls (PCBs) are normally associated with old transformers and fluorescent light ballasts. By 1979 Canadian regulations had banned the use of PCBs in the manufacturing of these items. Electricity is supplied to the two storage buildings by Nova Scotia Power (NSP) pole-mounted power transformers.

If fluorescent light ballasts are present in the buildings, they should be suspected of containing PCBs unless the serial number identifies it as non-PCB. The ballasts should be inspected for their serial numbers and label type prior to disposal. The concerns associated with PCBs are their proper disposal if light ballasts or other PCB-containing equipment are decommissioned. PCB-containing materials require controlled storage in accordance with *PCB Management Regulations*.

5.5 Lead

Lead is normally associated with old paints, weather flashing, old pipes and lead solder on copper pipes. By 1976, Canadian regulations had restricted the use of lead in interior paints to 0.5% by weight. Due to the age of the buildings, lead-containing materials are likely present and lead containing paint may be in one or more of the underlying layers. Two concerns associated with lead-containing materials are the disturbance of lead dust during renovation or demolition and the disposal of materials containing leachable lead. The NSE has codes of practice for safe handling of lead-containing materials, such as paint, and regulations regarding their disposal, depending on the concentration of lead. The recommended approach is to test materials suspected of containing lead prior to disturbance and disposal of the materials.

5.6 Ozone-Depleting Materials

Chlorofluorocarbons (CFCs) and other ozone-depleting substances are typically used as coolants in air conditioning and refrigeration systems. No air-conditioning or refrigeration systems were observed during the site inspection. The main concerns associated with these units are the prevention of coolant leaks and proper disposal of the coolants when the units are decommissioned. A certified air conditioning/refrigeration technician is required for any maintenance and disposal of CFC-containing units in accordance with the *Ozone Layer Protection Regulations*.

5.7 Waste and Hazardous Chemical Storage

Several bags of refuse and three plastic organics and recyclable waste collection bins were noted on the south side of the storage buildings. The refuse is likely collected by the Town of Yarmouth from public garbage cans in the area and sorted at the subject property prior to disposal. No other hazardous chemicals or wastes requiring special handling are generated or stored at the property.

5.8 Water and Sewer

The subject area of Yarmouth is serviced with municipal water and sewer infrastructure provided by the Town of Yarmouth. Several catch basins were noted on the southern portion of the property.

5.9 Surface Staining

At the time of the site inspection, several minor surface stains were noted in the asphalt-paved parking areas of the property. These are likely due to minor engine leaks from vehicles and do not present a significant environmental concern.

5.10 Radon

Radon is a colourless, odourless and radioactive gas that is naturally occurring. It is produced from the breakdown of uranium contained in soil and bedrock, which is slowly released into the surrounding soil. Geologic settings that typically contain more uranium and resulting radon gas are those comprised of shale and granite. However, all soils carry the possibility of releasing some amount of radon gas, as the concentration of uranium in any soil is inherently uncertain without appropriate testing.

Radon gas typically collects in the lower parts of a building (i.e. basement) as it enters through the foundation of the structure. The entry points may include (but are not limited to), openings in the foundation for services, floor drains, foundation cracks and unsealed joints in the concrete foundation. Thus the amount of radon gas that enters a building depends on a variety of factors including the actual amount of radon available in the underlying soil (geologic setting) and the construction details of the building. Buildings without conventional foundations (concrete walls and slab) are at greater risk. Since there are many factors that contribute to elevated radon gas concentrations, it is difficult to predict the amount of exposure without completing radon testing.

The subject property is currently unoccupied. The recommended approach would be to conduct radon testing as a precautionary measure if the site is developed for residential occupation in the future.

5.11 Potential Sources of Off-Site Contamination

The surrounding properties are a mixture of commercial and residential land use, and have been since prior to 1891. Potential sources of off-site contamination may be migration of petroleum products or other chemicals from accidental leaks or spills on upgradient neighbouring properties. A former Canadian Tire automotive service garage was located across Collins Street to the north of the subject property (slightly up-gradient of the northwest corner of the subject property). Any potential impacts from this off-site property to the subject property would be assessed during the intrusive investigation recommended by MTL for the subject property (due to the former service station at the northwest corner of the subject property).

6.0 PHASE II ESA

6.1 Field Program

6.1.1 Drilling Program

The exterior drilling program was conducted on November 18 and 19, 2009 in conjunction with the geotechnical investigation and consisted of the advancement of fourteen exterior boreholes. The test locations are identified as AP1 to AP5 (auger probes), BH1 to BH5 (geotechnical boreholes) and MW1 to MW4 (monitor wells) on Figure 1, attached. The test locations were referenced to existing site features. The boreholes were drilled using a track-mounted drill rig supplied to the project by Lantech Drilling Services of Dieppe, New Brunswick. Findings of the geotechnical investigation are provided under separate cover.

The field investigation was carried out by qualified technical personnel who positioned and logged the boreholes and sampled the *in situ* soils. Test locations were chosen to provide an indication of subsurface conditions and assess the potential for petroleum contamination as noted during the Phase I ESA.

An explanation of terms and symbols used in the report is provided in Appendix G. A summary of encountered geologic conditions is provided in the Borehole and Monitor Well Logs in Appendix H. It should be noted that the stratigraphic boundaries on the Borehole and Monitor Well Logs typically represent a transition of one soil type to another and do not necessarily indicate an exact plane of geologic change. Subsurface conditions may vary between and beyond the test locations.

The boreholes were advanced through the overburden using solid stem augers. Standard Penetration Testing and soil sampling were performed in the overburden using a 50-mm OD split-spoon

sampler. Soil samples were taken at nominal depth intervals of 0.6 metres, often continuously. Soil samples from the boreholes were placed in lab-supplied teflon-lined glass containers and stored in ice-packed coolers. Six select soil samples were submitted to Maxxam Analytics Inc. laboratory in Bedford for analysis of total petroleum hydrocarbons (TPH) including benzene, toluene, ethylbenzene and xylenes (BTEX) parameters.

6.1.2 Monitor Well Installation and Groundwater Sampling

During the drilling program, four monitor wells were installed for the purpose of providing water quality sampling stations. The wells consisted of 50-mm OD polyvinyl chloride (PVC) threaded Schedule 40 casing and 20 slot screen. The screened intervals were positioned to intersect the groundwater table and the annular space around the screen was filled with clean No. 2 silica sand. Each installation was sealed with a bentonite plug, a minimum thickness of 0.6 metres, above the sand pack to prevent migration of the surface flow into the well. The wells were capped with J-plugs and flush-mounted covers. Monitor well construction details are included on the logs in Appendix H.

On November 19, 2009 MTL personnel measured the static water levels in the monitor wells using a *Solinst* water level indicator. The wells were developed by purging a minimum of three well pore volumes using dedicated hand bailers. Following well recovery, groundwater samples were collected in lab-supplied teflon-lined glass jars, immediately placed in an ice-packed cooler and transported to Maxxam Analytics Inc. laboratory in Bedford for TPH/BTEX analysis.

6.2 Results

6.2.1 Geologic Conditions

Geologic conditions observed at the site consisted of fill and till deposits underlying the asphalt surface. The fill consisted of silty sand with some gravel, was loose to compact, moist and brown in colour and was noted at all borehole locations. At boreholes AP3, BH5, MW1 and MW4, a layer of sandy gravel fill with trace to some silt that was loose to compact, moist and brown in colour was encountered beneath the asphalt and above the silty sand fill. At boreholes BH1 through BH4, only the sandy gravel fill was encountered between the asphalt surface and the till layer. Fill deposits were proven to depths of between 0.9 metres and 2.4 metres below ground surface. The till deposit was encountered beneath the fill at all borehole locations except MW1 and consisted of silty sand with some gravel and occasional cobbles, was compact, moist to wet and greenish grey in colour. Till was not encountered at borehole MW1. Petroleum hydrocarbon odours were noted in the fill deposit at borehole AP2 and in the till deposits at boreholes AP4 and MW4.

Slate bedrock was encountered at boreholes BH1 through BH5, MW1 and MW2 at depths of between 1.8 metres and 4.0 metres below ground surface.

6.2.2 Hydrogeologic Assessment

Groundwater was encountered at depths below ground surface ranging from 1.51 metres to 2.47 metres. Table 5.1, below, presents the results of the groundwater survey conducted on November 19, 2009. Based on the groundwater survey, the suspected groundwater flow direction is southwesterly and is presented on Figure 1, attached.

Table 5.1. Groundwater Elevations at 5 Collins Street, Yarmouth, NS on November 19, 2009.

Location	Depth to Groundwater (metres)	Ground Surface Elevation (metres)	Groundwater Elevation (metres)
MW1	1.77	100.13	98.36
MW2	1.51	100.38	98.87
MW3	1.96	100.90	98.94
MW4	2.47	100.14	97.67

Note: Ground surface elevations referenced to catch basin at the intersection of First and Collins Streets, assigned elevation of 100.0 metres.

6.2.3 Petroleum Assessment

Laboratory petroleum hydrocarbon analytical results obtained during the Phase II ESA are provided in Tables 1 and 2 (Appendix I). TPH analytical results are presented in conjunction with the 2003 Atlantic PIRI Tier I Risk-Based Screening Levels (RBSLs) and Tier II Pathway-Specific Screening Levels (PSSLs) for a commercial property with non-potable groundwater and coarse-grained soil. Laboratory certificates of analysis are provided in Appendix J.

Soil

The laboratory reported a modified TPH concentration in soil sample AP2/2 of 1,800 mg/kg (as gas/fuel oil), which exceeds the Tier I RBSL of 450 mg/kg modified TPH (as gas); however, since the source of the soil sample (northwest portion of the property) is an exterior location (i.e., away from any site structures) and is not in the footprint of the proposed development for the site (reportedly at the southern portion of the property), this result satisfies the Tier II PSSL for outdoor air exposure since no free petroleum product was observed. No BTEX parameters were detected in soil sample AP2/2.

Modified TPH was detected in soil samples AP4/2 (860 mg/kg as fuel/lube oil), MW2/3 (450 mg/kg as weathered fuel oil/lube oil) and MW4/2 (140 mg/kg as fuel/lube oil), which satisfy the Tier I

RBSLs of 7,400 mg/kg and 10,000 mg/kg modified TPH (as fuel oil and lube oil, respectively). Trace levels of xylenes were detected in soil sample AP4/2 at a concentration of 0.18 mg/kg, which satisfies the Tier I RBSL of 200 mg/kg for xylenes. No BTEX parameters were detected in soil samples MW2/3 and MW4/2.

No TPH/BTEX parameters were detected in soil samples AP3/3 and AP5/1.

Groundwater

The laboratory reported trace modified TPH concentrations in the groundwater at MW2 (0.2 mg/L) and MW4 (0.5 mg/L) resembling fuel oil. Trace levels of benzene (0.002 mg/L at MW1 and 0.001 mg/L at MW4) and toluene (0.002 mg/L at MW1 and 0.001 mg/L at MW4) were also detected. These results satisfy the Tier I RBSLs for modified TPH (20 mg/L as fuel oil), benzene (6.9 mg/L) and toluene (20 mg/L).

No TPH/BTEX parameters were detected in groundwater at MW3.

7.0 CONCLUSIONS and RECOMMENDATIONS

The Phase II ESA has revealed that petroleum hydrocarbons resembling gas were detected in a soil sample collected from the northwest portion of the property (former gasoline service station location) that exceed the generic Tier I commercial RBSLs but satisfy the Tier II PSSLs (outdoor air) since no free phase petroleum product was observed The soil impacts would require reassessment if any future re-development of the property involved construction of a building in the northwest portion of the property and petroleum vapour intrusion became a possibility. Further assessment of the impacts would also be required if the subject property were re-developed in a residential capacity. It should be noted that any petroleum-impacted soils that are to be removed from the property during future re-development of the site must be transported to a licensed contaminated soil facility for disposal.

Petroleum hydrocarbons (TPH and BTEX parameters) were detected in soil and groundwater at the southwest portion of the property at concentrations that satisfy the commercial Tier I RBSLs.

Based on the age of the two current site structures, asbestos and lead-containing materials may be present and may underlie more recent building materials. The concerns associated with hazardous building materials are their proper handling, storage and disposal upon decommissioning for renovation or demolition. The recommended approach is to conduct a hazardous materials survey to test materials suspected of containing hazardous substances prior to their disturbance. Fluorescent

light ballasts, if present, may contain PCBs. These are considerations for maintenance or disposal of the units.

8.0 REPORT USE AND CONDITIONS

This report was prepared for the exclusive use of the Town of Yarmouth. It is based on data and information obtained during a site visit by MTL on the subject property, including the drilling of fourteen exterior boreholes, installation of four monitor wells and select chemical analysis, and is based solely upon the condition of the property on the dates of such inspection, supplemented by information obtained and described herein.

The evaluation and conclusions contained in this report have been prepared in light of the expertise and experience of MTL. In evaluating the property, MTL has relied in good faith upon representation and information furnished by individuals noted in the report with respect to operations and existing property conditions and the historic use of the property to the extent that they have not been contradicted by data obtained by other sources. Accordingly, MTL accepts no responsibility for any deficiency or inaccuracy in this report as a result of omissions, misstatements or misrepresentations of the persons interviewed. In addition, Maritime Testing (1985) Limited will not accept liability for loss, injury, claim or damage arising from any use or reliance on this report as a result of misrepresentation or fraudulent information.

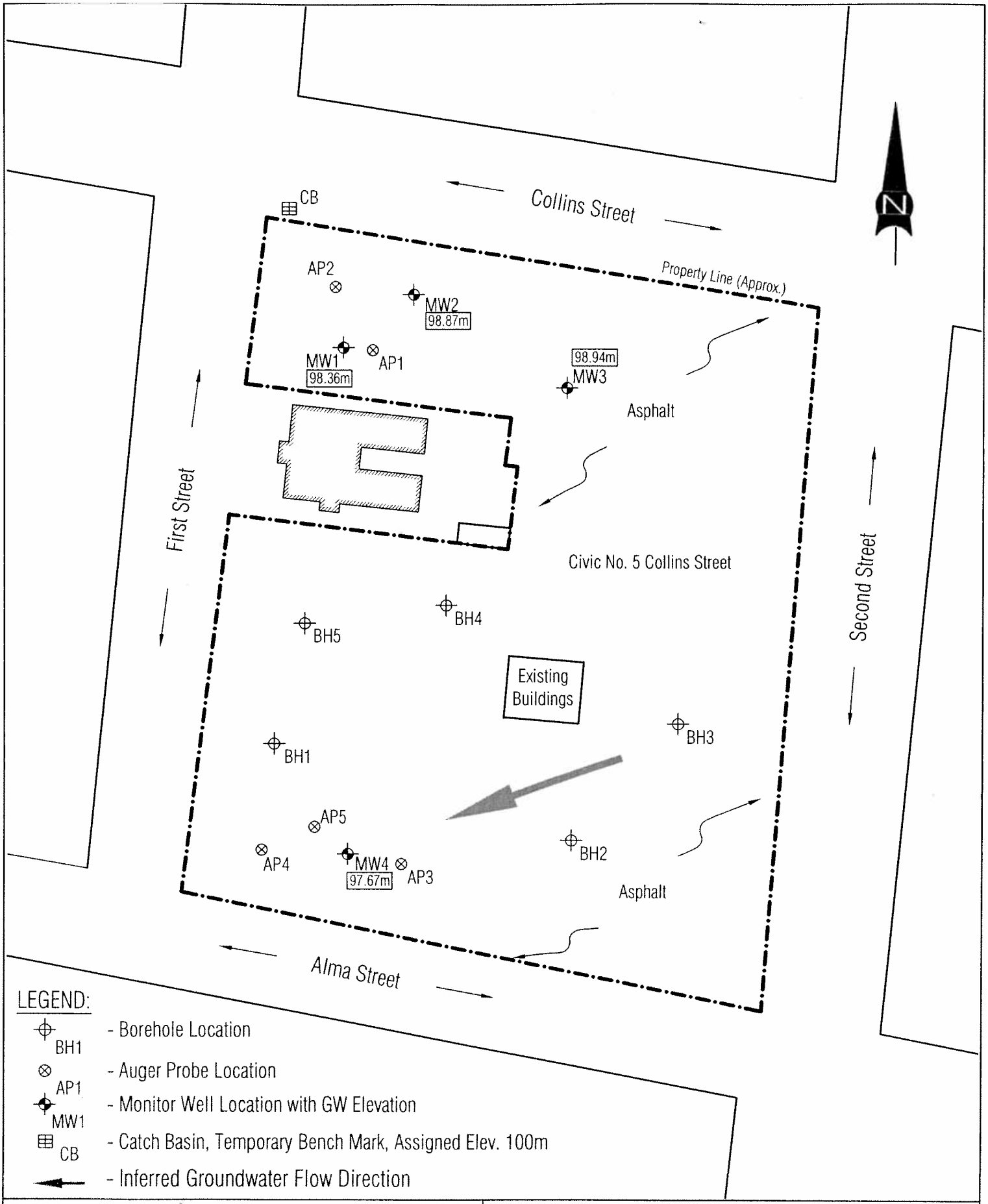
Environmental conditions are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

This report has been prepared by Ryan Pellerin, A.Sc.T., with review and contributions by Charlotte Clark, P.Eng.

Respectfully submitted,
Maritime Testing (1985) Limited

Ryan Pellerin, B.Sc., A.Sc.T.
Project Manager, Environmental Division

Charlotte Clark, P.Eng.
Project Engineer



MARITIME TESTING
Consulting Engineering & Environmental Services

Site Sketch Showing Monitor Well and Borehole Locations
Phase I/II Environmental Site Assessment
Civic No. 5 Collins Street, Yarmouth, NS

DATE: Dec. 2009	SCALE: 1:600	DRAWN BY: JJ	CKD BY: BM	JOB No. 10516	FIGURE 1

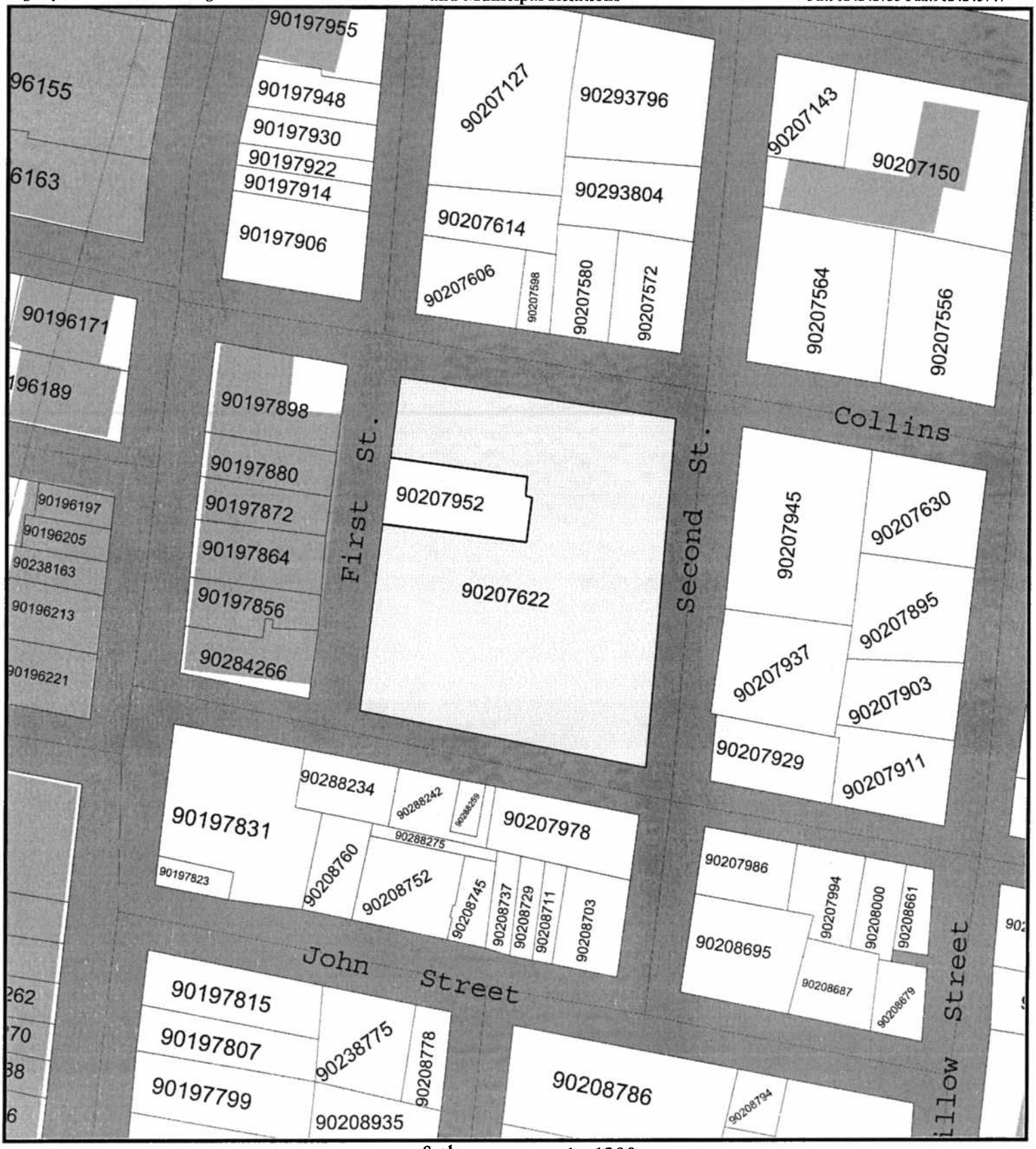
APPENDIX A

Property Map, Parcel Information Report

MAP LIBRARY - CENTRAL REGION
Registry and Information Management Services Division

Service Nova Scotia
and Municipal Relations

780 WINDMILL RD DARTMOUTH
Ph:9024242735 Fax:9024245747



Scale **1 : 1200**

0 24 48 72 meters

0 60 120 180 240 feet

Printed for:
Date Printed: Friday, November 6, 2009
Time Printed: 3:06:51 PM

This map is a graphical representation of property boundaries which approximate the size, configuration and location of properties. Care has been taken to ensure the best possible quality, however, this map is not a land survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area.

THIS IS NOT AN OFFICIAL RECORD

PARCEL DETAIL REPORT

Title: CENHALMAP9
Date: 2009-11-06 15:05:53

NOT LAND REGISTRATION

PID: 90207622

* Indicates interests inherited on subdivision or re-configuration of parcel

PARCEL INTEREST HOLDER INFORMATION

Manner of Tenure: NOT APPLICABLE

Name	Interest Type	Assessed Owner Address
YARMOUTH DEVELOPMENT CORP LTD	FEE SIMPLE	PO BOX 131 YARMOUTH , NS CA B5A4B1

Textual Qualification:

PROPERTY INFORMATION

Area: 50193 SQUARE FEET Source: UNKNOWN Parcel Access Code:

Location: 5 COLLINS STREET YARMOUTH

Lot No: Phased Development: Phase #: N/A

Property Status: Active(as of: 1996-03-01 00:00:00)

Land Registration Status: NOT LAND REGISTRATION

Parcel Description Cert.
No Description

PID Assigned: 1996-03-01 00:00:00 Last Update: 2001-11-07 00:00:00

Last CRO:

Management Unit: MU1809

Municipal Unit #	Municipal Unit
98	TOWN OF YARMOUTH

ASSESSMENT INFORMATION

AAN	Roll Year	Assessment Value	Tax District	Tax Sub Dist.	Field Card
5023211	2009	$ 285,200.00	000		14250000

PUBLIC COMMENTS: LOC:PARKING LOT
MAP:0143835066110

DOCUMENTS

Date	Code	Number	Book	Page	Type	System	Problem
2001-11-06	201	2877	621	240	MORTGAGE	RoD	
2004-11-09	201	76624650	691	870	MORTGAGE	RoD	
2004-11-17	301	76657833	692	395	RELEASE OF MORTGAGE	RoD	

PLANS

Date	Type	Orientation	Number	Drawer Number	System
1981-01-01	1203	ASTRONOMIC RETRACEMENT	P1539		RoD

DISCLAIMER:

Registry of Deeds ARE NOT REGISTERED PURSUANT TO THE Land Registration Act. As such, ownership and all information in this report is believed to be an accurate reflection of registered documents affecting the parcel of land to which it relates, however, it is not intended to be relied upon by the reader as advice on the current state of any title to land. A search of the records at the appropriate Registry of Deeds office may be required to determine the current owner(s) of the parcel of land under consideration. THESE ARE NOT OFFICIAL RECORDS.

Land Registration parcels ARE REGISTERED PURSUANT TO THE Land Registration Act. The registered owner of the registered interest owns the interest defined in this register in respect of the parcel described in the register, subject to any discrepancy in the location, boundaries or extent of the parcel and subject to the overriding interests [Land Registration Act subsection 20(1)].
No representations whatsoever are made as to the validity or effect of recorded documents listed in this parcel register. The description of the parcel is not conclusive as to the location, boundaries or extent of the parcel [Land Registration Act subsection 21(1)].

PARCEL DETAIL REPORT

Title: CENHALMAP9
Date: 2009-11-06 15:05:53

NOT LAND REGISTRATION

PID: 90207622

NON-REGISTERED DOCUMENTS

Date	Type	Number	Office	File Ref	County
1800-01-01	1203	501338871		CN/58	YARMOUTH COUNTY

END OF REPORT

DISCLAIMER:

Registry of Deeds ARE NOT REGISTERED PURSUANT TO THE Land Registration Act. As such, ownership and all information in this report is believed to be an accurate reflection of registered documents affecting the parcel of land to which it relates, however, it is not intended to be relied upon by the reader as advice on the current state of any title to land. A search of the records at the appropriate Registry of Deeds office may be required to determine the current owner(s) of the parcel of land under consideration. THESE ARE NOT OFFICIAL RECORDS.

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No representations whatsoever are made as to the validity or effect of recorded documents listed in this parcel register. The description of the parcel is not conclusive as to the location, boundaries or extent of the parcel [Land Registration Act subsection 21(1)].

APPENDIX B

Site Photographs

Photo 1: Taken November 9, 2009. Parking lot on the north portion of the subject property. An automotive service station occupied the northwest corner of the property until the 1970s. Photo taken facing east.

Photo 2: Taken November 9, 2009. Two small wooden buildings, located in the central portion of the subject property, are used by the Town of Yarmouth for storage of special events equipment (i.e., tables, holiday decorations, etc.). Photo taken facing south.

Photo 3: Taken November 9, 2009. A residential building (Civic Nos. 7 and 9 First Street) occupies a separate parcel on the west portion of the block of land occupied by the subject property. Photo taken facing southeast.

Photo 4: Taken November 9, 2009. Eastern portion of the subject property, along First Street. Note the commercial buildings located to the west, across First Street. Photo taken facing north.

Photo 5: Taken November 9, 2009. Southern portion of the subject property, along Alma Street. The Yarmouth Vanguard (newspaper) offices and distribution center are located to the south across Alma Street. Photo taken facing west.

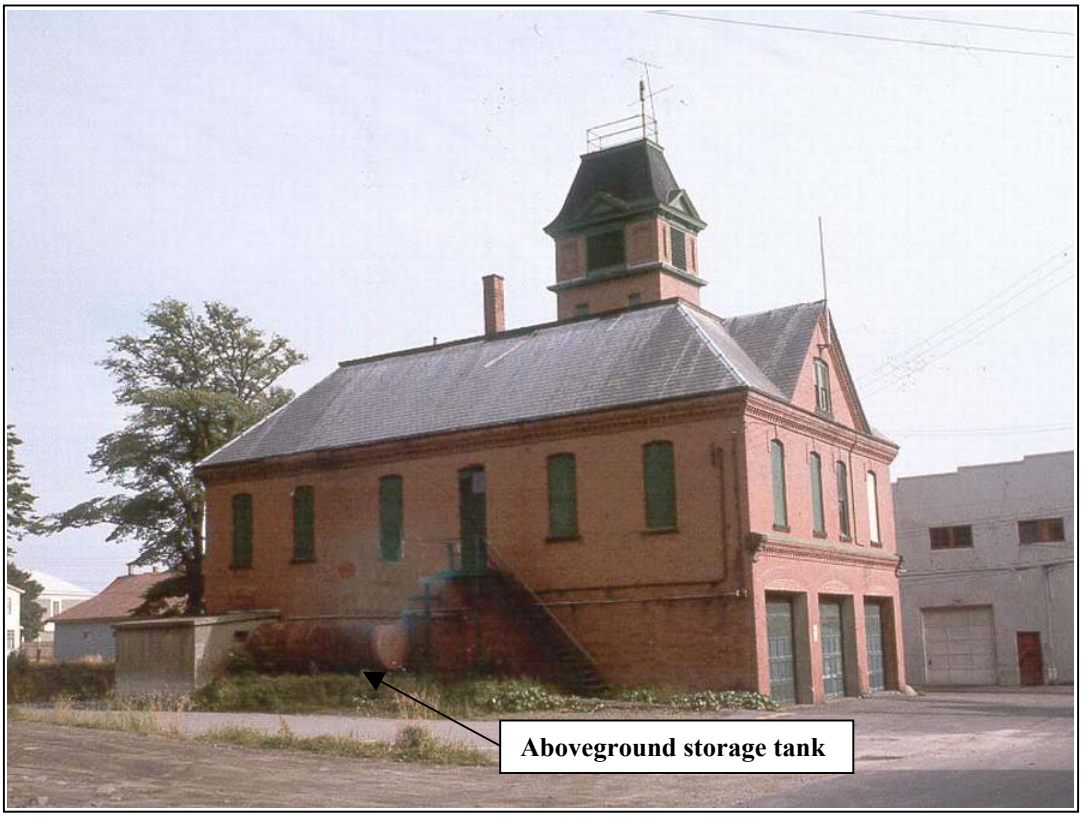


Photo 6: Taken 1978. Former engine house at the southwest corner of the subject property. Note the steel aboveground storage tank on the north side of the building. The engine house was demolished in 1978. Photo taken facing southeast.

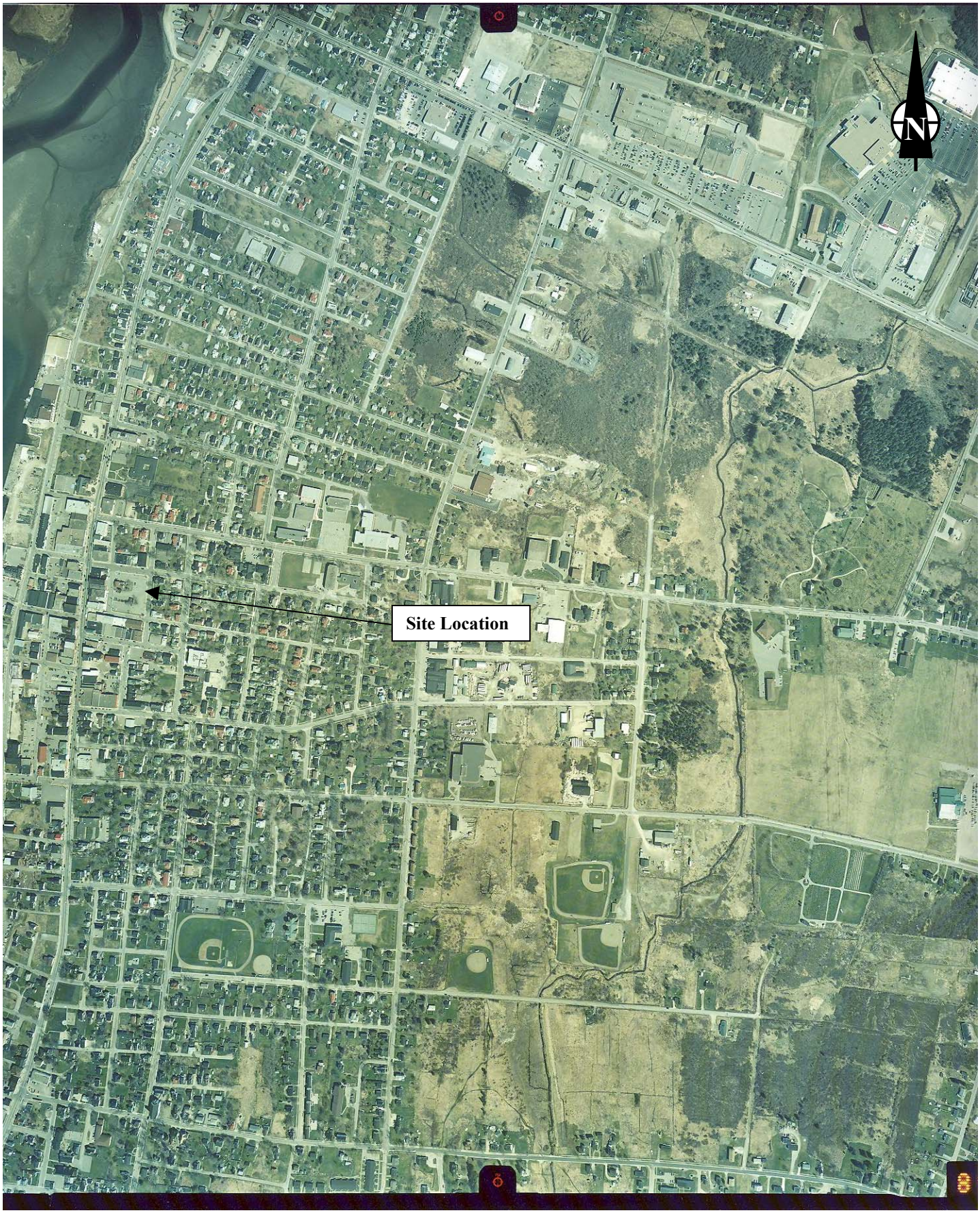
APPENDIX C

Aerial Photographs

MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: 1:16,000 approx.	1970 - Aerial Photograph Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate C-1

MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: 1:10,000 approx.	1978 - Aerial Photograph Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate C-2

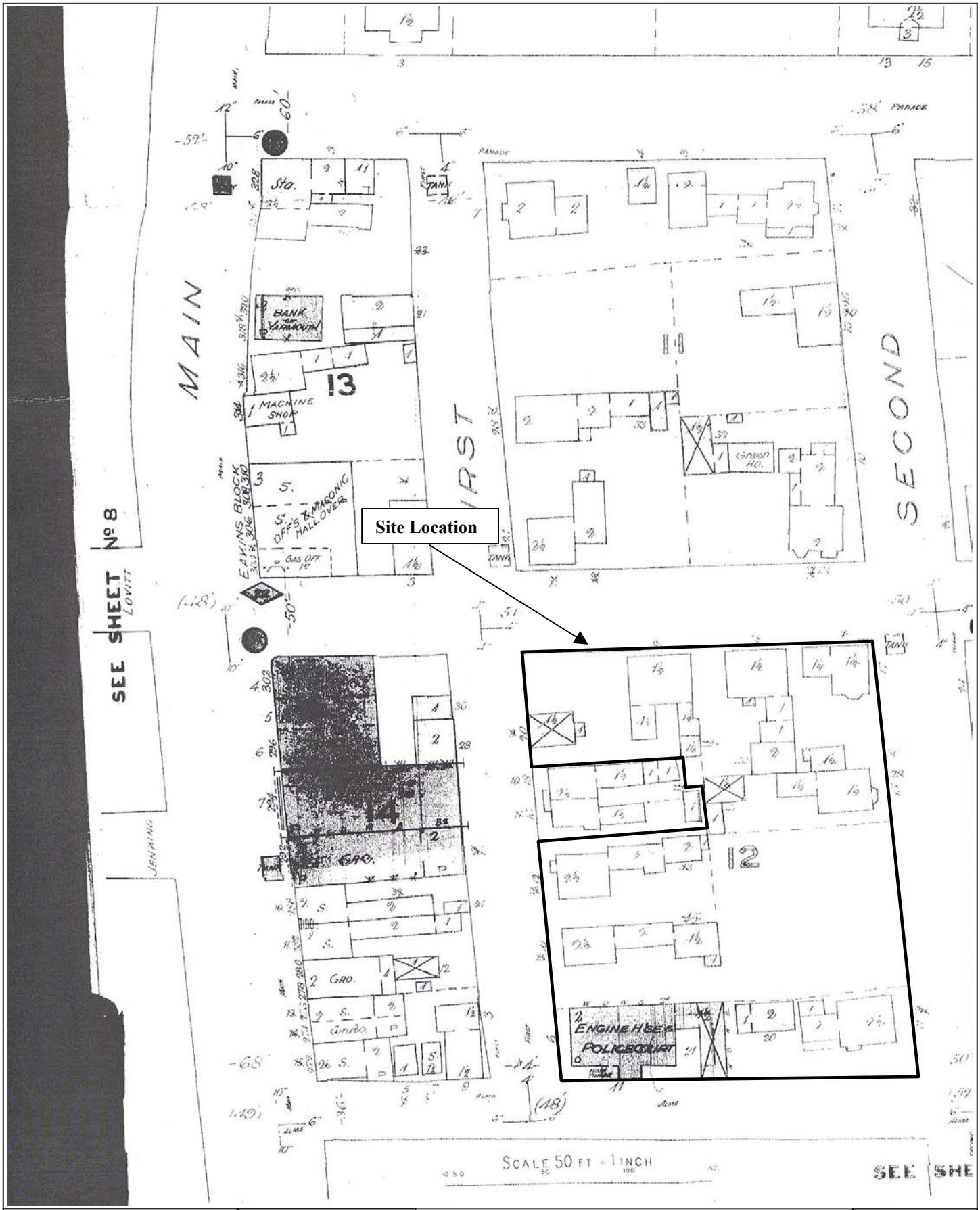
MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: 1:10,000 approx.	1989 - Aerial Photograph Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate C-3



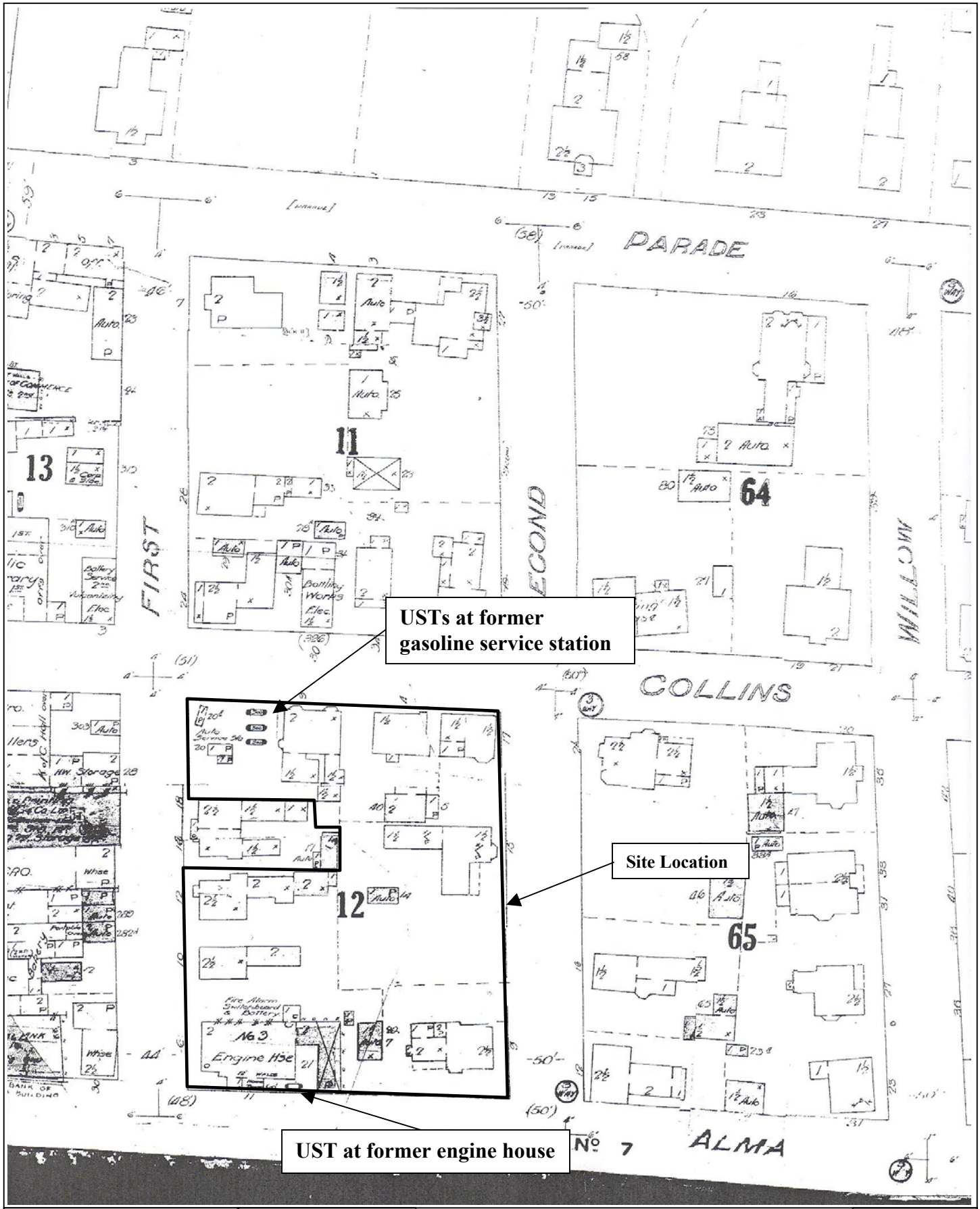
MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: 1:10,000 approx.	2006 - Aerial Photograph Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate C-4

APPENDIX D

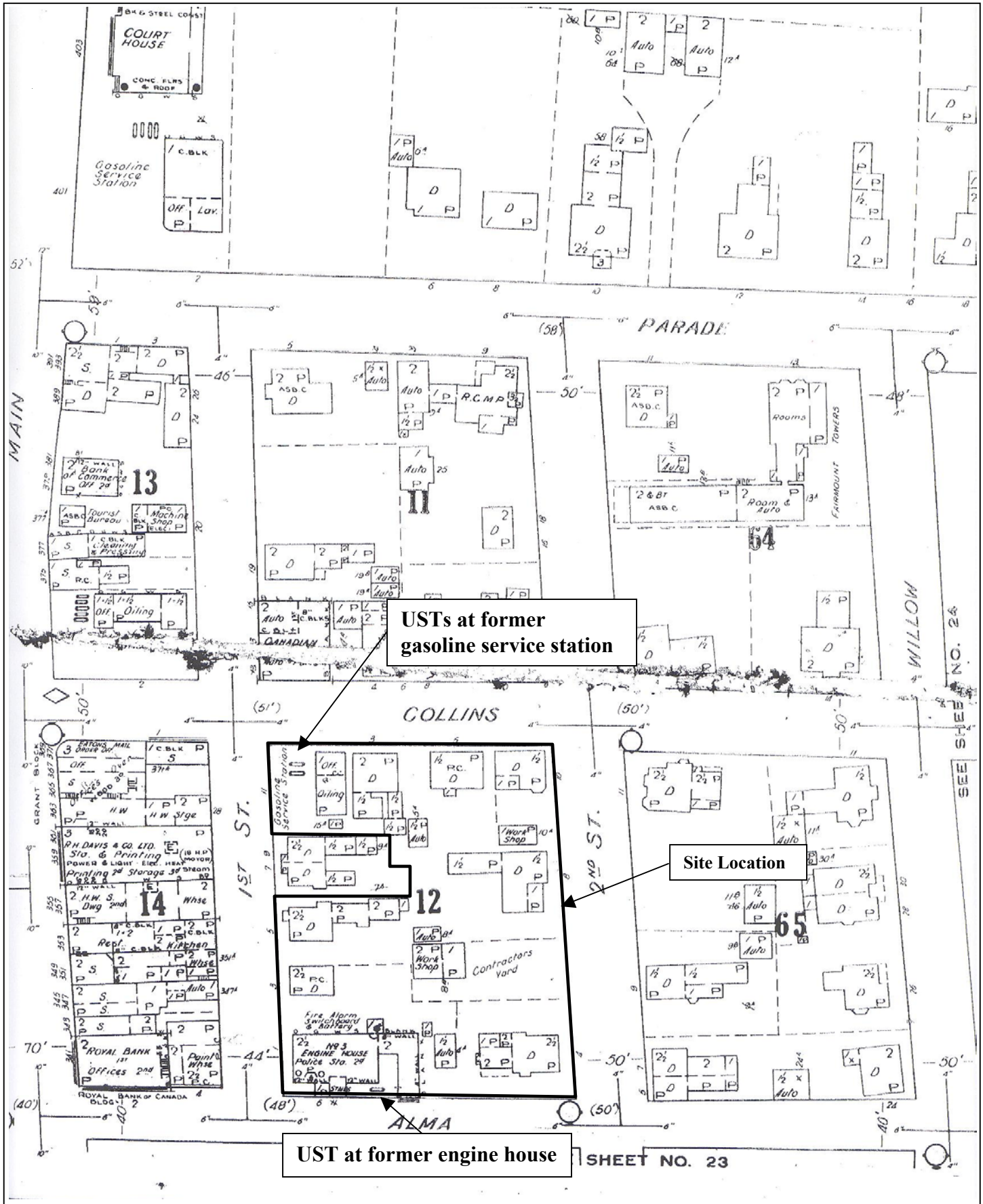
Fire Insurance Plans



MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: N.T.S.	1900 – Fire Insurance Plan Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate D-1



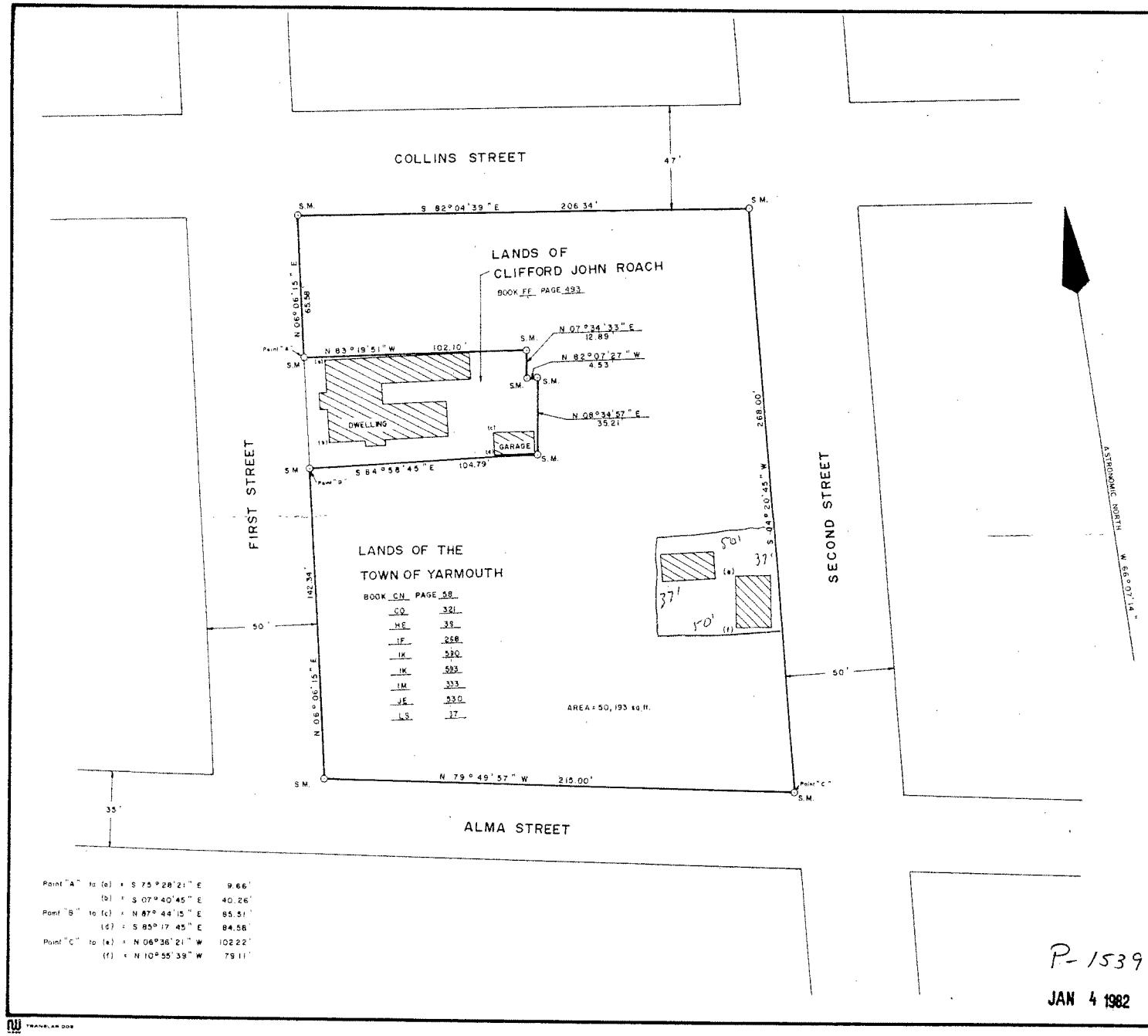
MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: N.T.S.	1927 – Fire Insurance Plan Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate D-2



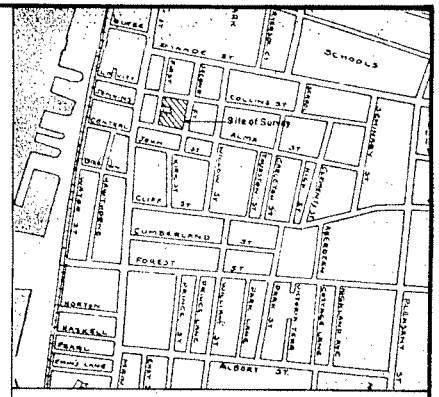
MARITIME TESTING	Job No.: 10516 Date: December 2009 Scale: N.T.S.	1955 – Fire Insurance Plan Phase I Environmental Site Assessment Civic No. 5 Collins Street, Yarmouth, NS	Plate D-3

APPENDIX E

Survey Plan (1981)



Point "A"	to (a)	= S 75°28'21" E	9.66'
	(b)	= S 07°40'45" E	40.26'
Point "B"	to (c)	= N 87°44'15" E	85.51'
	(d)	= S 85°17'45" E	84.56'
Point "C"	to (e)	= N 06°36'21" W	102.22'
	(f)	= N 10°55'39" W	79.11'



KEY PLAN SCALE - 1" = 500'

LEGEND:
- △N.S.C.M. — CO-ORDINATE MONUMENT
- ⊙S.M. — SURVEY MARKER
- O I.B. — IRON BAR
- — ALL BEARINGS AND DISTANCES ARE MEASURED
- — ALL BEARINGS ARE ASTRONOMIC REFERABLE TO A MERIDIAN OF W 66°07'14"

PLAN SHOWING LANDS OF THE
TOWN OF YARMOUTH AT YARMOUTH
IN THE COUNTY OF YARMOUTH PROVINCE OF
NOVA SCOTIA.

SCALE: 1" = 30'

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
R.C. DEARMAN
317
MEMBER

SURVEYOR'S CERTIFICATE

I (R.C DEARMAN) NOVA SCOTIA LAND SURVEYOR, HEREBY CERTIFY THAT THE SURVEY REPRESENTED BY THIS PLAN WAS CONDUCTED UNDER MY SUPERVISION, AND THAT THE SURVEY AND PLAN WERE MADE IN ACCORDANCE WITH THE NOVA SCOTIA LAND SURVEYORS ACT AND THE REGULATIONS MADE THEREUNDER.

DATED THIS 8 DAY OF DECEMBER A.D. 1981

R.C. Dearman N.S.L.S. NO. 317

THIS SURVEY WAS EXECUTED DURING THE PERIOD 3 DEC. 1981 TO 8 DEC. 1981

R.C. DEARMAN SURVEYS LIMITED
20(1Y81

P-1539

JAN 4 1982

APPENDIX F

NSE *Environmental Registry* Responses

NOVA SCOTIA
Environment
Information Access and Privacy

PO Box 442
5151 Terminal Rd., 5th floor
Halifax, Nova Scotia
B3J 2P8

ph: (902) 424-2577
fax: (902) 424-6925

November 19, 2009

Fax: 468-4919

Our file # RD-09-2604

Ryan Pellerin
Maritime Testing (1985) Limtied
97 Troop Avenue
Dartmouth, NS
B3B 2A7

Dear Mr. Pellering:

Re: 11 First Street, Yarmouth

I refer to your enquiry of the Environmental Registry received November 12, 2009. We acknowledge receipt of payment for one property.

No information was located through the Environmental Registry with regard to the above-referenced property.

Nova Scotia Environment makes no representations or warranties on the accuracy or completeness of the information provided.

Yours truly,

Aimee Standen-Burns
FOIPOP Administrator

NOVA SCOTIA
Environment
Information Access and Privacy

PO Box 442
5151 Terminal Rd., 5th floor
Halifax, Nova Scotia
B3J 2P8

ph: (902) 424-2577
fax: (902) 424-6925

November 19, 2009

Fax: 468-4919

Our file # RD-09-2605

Ryan Pellerin
Maritime Testing (1985) Limtied
97 Troop Avenue
Dartmouth, NS
B3B 2A7

Dear Mr. Pellering:

Re: 6 Alma Street, Yarmouth

I refer to your enquiry of the Environmental Registry received November 12, 2009. We acknowledge receipt of payment for one property.

No information was located through the Environmental Registry with regard to the above-referenced property.

Nova Scotia Environment makes no representations or warranties on the accuracy or completeness of the information provided.

Yours truly,

Aimee Standen-Burns
FOIPOP Administrator

NOVA SCOTIA
Environment
Information Access and Privacy

PO Box 442
5151 Terminal Rd., 5th floor
Halifax, Nova Scotia
B3J 2P8

ph: (902) 424-2577
fax: (902) 424-6925

November 23, 2009

Our file # RD-09-2582

NOV 2 3 2009

Fax: (902) 743-6244

Jeffrey Gushue
Town of Yarmouth
400 Main Street
Yarmouth, NS
B5A 1G2

Dear Mr. Gushue:

Re: 5 Collins Street, Yarmouth

I refer to your enquiry of the Environmental Registry received November 5, 2009. We acknowledge receipt of payment for one property.

No information was located through the Environmental Registry with regard to the above-referenced property.

Nova Scotia Environment makes no representations or warranties on the accuracy or completeness of the information provided.

Yours truly,

Crystal McLean

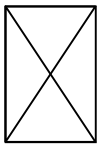
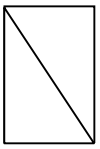
for Aimee Standen-Burns
FOIPOP Administrator

APPENDIX G

Explanation of Terms and Symbols

SOIL SAMPLES

CONDITION – This column graphically indicates the depth and condition of the sample:

 undisturbed  disturbed  not recovered

TYPE – The type of sample is indicated in this column as follows:

A auger sample
B block sample
C rock core, or frozen soil core
D drive sample
G grab sample
SS split spoon
P Pitcher tube sample
U tube sample (usually thin-walled)
W wash or air return sample
O other (see report text)

PENETRATION RESISTANCE – Unless otherwise noted this column refers to the number of blows (N) of a 140 pound (63.5 kg) hammer freely dropping 30 inches (0.76 m) required to drive a 2 inch (50.8 mm) O.D. open-end sampler 0.5 feet (0.15 m) to 1.5 feet (0.45 m) into the soil, or until 100 blows have been applied, in which case, the penetration is stated. This is the standard penetration test referred to in ASTM D 1586.

OTHER TESTS

In this column are tabulated results of other laboratory tests as indicated by the following symbols:

*C	Consolidation test
Fines	Percentage by weight smaller than #200 sieve
D_R	Relative density (formerly specific gravity)
k	Permeability coefficient
*MA	Mechanical grain size analysis and hydrometer test (if appropiate)
pp	Pocket pentrometer strength
*q	Triaxial compression test
q_U	Unconfined compressive strength
*SB	Shearbox test
SO_4	Concentration of water-soluble sulphate
*ST	Swelling test
TV	Torvane shear strength
VS	Vane Shear Strength (undistrubed-remolded)
ε_f	Unit strain at failure
γ	Unit weight of soil or rock
γ_d	Dry unit weight of soil or rock
ρ	Density of soil or rock
ρ_d	Dry density of soil or rock

* The results of these tests usually are reported separately

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured	- having cracks, and hence a blocky structure
Varved	-composed of regular alternating layers of silt and clay
Stratified	- composed of alternating layers or different soil types, e.g. silt and sand or silt and clay
Well Graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	- predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. silt and sand)	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

Relative Density	'N' Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value
	Kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 4$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 6$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$
FINE - GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO.200 SIEVE SIZE)	SILTS BELOW "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$
			MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$
			CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$
	ORGANIC SILTS & ORGANIC CLAYS BELOW "A" LINE ON PLASTICITY CHART		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
			OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$

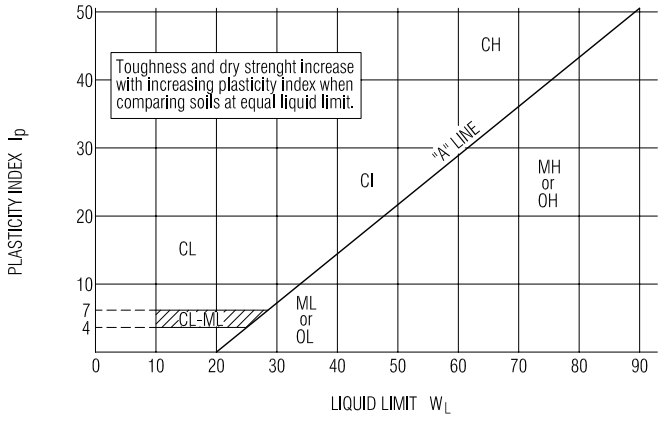
SEE CHART BELOW

FILL TILL BEDROCK

1. All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
2. Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture wtih clay binder between 5% and 12%.
3. Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
4. The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
gravelly, sandy, silty, clayey, ect.	35 - 21%
some	20 - 11%
trace	10 - 1%

PLASTICITY CHART



MARITIME TESTING
Consulting Engineering & Environmental Services

APPENDIX H

Borehole, Monitor Well Logs

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 1

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.27 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Soil Description	Sample TYPE
0	0	Asphalt Pavement	
0	0	FILL : silty sand, some gravel, loose to compact, moist, brown.	
4.5	1.4		G
5	1.5	TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.	
7	2.1		G
8	2.4	End of Borehole at 2.4 metres in Till.	
		Groundwater encountered at 2.1 metres below ground surface.	

PLATE 1

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 2

CASING RESISTANCE blows/300mm ⇩

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.12 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.
		Asphalt Pavement			
0–6	0–2	FILL : silty sand, some gravel, loose to compact, moist, brown. Petroleum Hydrocarbon odour detected.		G G	
6–9	2–3	TILL : silty sand, some gravel, occasional cobbles, compact, moist, greenish grey.		G	
9–10	3	End of Borehole at 2.8 metres in Till. Borehole dry upon completion.			

PLATE 2

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 3

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.48 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
		FILL : sandy gravel, trace silt, loose to compact, moist, grey brown.		
3	1	FILL : silty sand, some gravel, occasional cobble, compact, moist, brown.	SS	N=20
6	2		SS	N=35
8		TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.		
9			SS	N=31
10	3			
11			SS	N=36
13	4	End of Borehole at 4.0 metres in Till.		
		Groundwater encountered in Borehole at 3.0 metres below ground surface.		
16	5			

PLATE 3

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.AP 4

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION99.49 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	Description	TYPE
0		Asphalt Pavement	
0		FILL : silty sand, some gravel, loose to compact, moist, brown.	
4	1		G
6	2	TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey. Petroleum Hydrocarbon odour detected.	
8		▽	
9			G
10	3	End of Borehole at 3.0 metres in Till. Groundwater encounterd at 2.4 metres below ground surface.	
13	4		
16	5		

PLATE 4

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 5

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 99.67 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.
0		Asphalt Pavement			
		FILL : silty sand, some gravel, loose to compact, moist, brown.			
1					
2					
3	1				
4					
5					
6		TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.			
	2				
7					
8		▽			
9				G	
10	3	End of Borehole at 3.0 metres in Till.			
		Groundwater encounterd at 2.4 metres below ground surface.			
11					
12					
13	4				
14					
15					
16					
	5				

PLATE 5

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.BH 1

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION99.64 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	Soil Description	COND.	TYPE	PENE. RESIST.
0	0	Asphalt Pavement			
		FILL : silty sand, some gravel, loose to compact, moist, brown.			
3	1			SS	N=21
		TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.			
5				SS	N=47
7	2			SS	N=27
8		▽			
9				SS	N=28
10	3	Inferred Bedrock Level			
		End of Borehole at 3.2 metres - Bedrock Level			
		Groundwater encountered at 2.4 metres below ground surface.			
13	4				
16	5				

PLATE 6

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 2

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 101.10 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Asphalt Pavement

FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.

SS N=12

TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.

SS N=51

SS N=100

Inferred Bedrock Level

End of Borehole at 3.0 metres - Bedrock Level

Groundwater encountered at 2.8 metres below ground surface.

PLATE 7

BOREHOLE LOG

MARITIME TESTING
Consulting Engineering & Environmental Services

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 3

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 101.38 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
		FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.	SS	N=29
3	1			
4		TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.	SS	N=50
6	2		SS	N=28
7				
8			SS	63/275
9		Inferred Bedrock Level		
10	3	End of Borehole at 3.0 metres - Bedrock Level		
		Groundwater encountered at 2.8 metres below ground surface.		
13	4			
16	5			

PLATE 8

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.BH 4

CASING RESISTANCE blows/300mm ⇩

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.99 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	TYPE	PENE. RESIST.
		Asphalt Pavement		
1		FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.		
2				
3	1	TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist, greenish grey.	SS	N=18
4				
5			SS	N=43
6		Inferred Bedrock Level	SS	50/25
	2			
7		End of Borehole at 2.1 metres - Bedrock Level		
8		Borehole dry upon completion.		
9				
10	3			
11				
12				
13	4			
14				
15				
16				
	5			

PLATE 9

BOREHOLE LOG

MARITIME TESTING
Consulting Engineering & Environmental Services

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 5

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 99.97 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Soil Description	TYPE	PENE. RESIST.
		Asphalt Pavement		
0		FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.		
1		FILL : silty sand, some gravel, occasional cobble, compact, moist, greyish brown.		
2				
3	1		SS	N=37
4		TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.		
5			SS	N=29
6				
7	2		SS	N=35
8				
9			SS	N=22
10	3	Inferred Bedrock Level		
11		End of Borehole at 3.0 metres - Bedrock Level		
12		Groundwater encountered in Borehole at 2.75 metres below ground surface.		
13	4			
14				
15				
16	5			

PLATE 10

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.MW 1

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.13 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

ft	m	Description	COND.	TYPE	PENE. RESIST.
0	0	Asphalt Pavement			
1		FILL : sandy gravel, trace silt, loose to compact, moist, brown.			
2		FILL : silty sand, some gravel, loose to compact, moist, brown.			
3	1				
4				SS	N=25
5					
6				SS	N=24
7	2			SS	50/25
8		Inferred Bedrock Level			
9					
10	3	End of Borehole at 3.0 metres - Bedrock Level			
11		Groundwater level measurement taken on Nov. 19, 2009.			
12					
13	4				
14					
15					
16	5				

PLATE 11

BOREHOLE LOG

MARITIME TESTING
Consulting Engineering & Environmental Services

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. MW 2

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.38 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
0	0	FILL : silty sand, some gravel, loose to compact, moist, brown.		
4	1		SS	N=10
5		▽		
5	2	TILL : silty sand, some gravel, occasional cobble, compact, moist to wet, greenish grey.		
6			SS	N=30
8			SS	N=26
10	3		SS	N=45
13	4	Inferred Bedrock Level	SS	N=53
14		End of Borehole at 4.3 metres - Bedrock Level		
		Groundwater level measurement taken on Nov. 19, 2009.		
16	5			

PLATE 12

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.MW 3

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.90 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

ft	m	Description	COND.	TYPE	PENE. RESIST.
0	0	Asphalt Pavement			
1		FILL : silty sand, some gravel, loose to compact, moist, brown.			
2					
3	1				
4		TILL : silty sand, some gravel, occasional cobble, compact, moist to wet, greenish grey.		SS	N=23
5					
6		▽			
7	2				
8					
9				SS	N=49
10	3				
11					
12		End of Borehole at 3.6 metres in Till.			
13	4	Groundwater level measurement taken on Nov. 19, 2009.			
14					
15					
16	5				

PLATE 13

BOREHOLE LOG

MARITIME TESTING
Consulting Engineering & Environmental Services

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. MW 4

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.14 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	SOIL SAMPLE TYPE	SOIL SAMPLE PENE. RESIST.
0				Asphalt Pavement			
				FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.			
1				FILL : silty sand, some gravel, occasional cobble, compact, moist, greyish brown.			
2							
3	1						
4						G	
5				TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.			
6							
	2			Petroleum Hydrocarbon odour detected.			
7							
8 ▽						G	
9							
10	3						
11							
12							
13	4			End of Borehole at 4.0 metres in Till.			
14				Groundwater level measurement taken on Nov. 19, 2009.			
15							
16							
	5						

DRILL TYPE: Drill Rig

PLATE 14

APPENDIX I

Analytical Results

TABLE 1: TOTAL PETROLEUM HYDROCARBON (TPH) COMPOUNDS in Soil
Client: Town of Yarmouth
Site Location: Civic No. 5 Collins Street, Yarmouth, NS
Date Sampled: November 18 and 19, 2009
MTL Project No. 10516

Parameter		Atlantic PIRI Tier 1 Commercial RBSLs [1]	Sample ID (Depth)							
			AP2/2 (0.9 - 1.8 m)	AP2/2 Lab Dup	AP3/3 (2.4 - 3.0 m)	AP4/2 (2.4 - 3.0 m)	AP5/1 (2.4 - 3.0 m)	MW2/3 (2.1 - 2.7 m)	MW2/3 Lab Dup	MW4/2 (1.5 - 2.1 m)
BTEX (mg/kg)	Benzene	1.8	<0.03	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
	Toluene	160	<0.04	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
	Ethylbenzene	430	<0.09	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
	Xylenes	200	<0.2	-	<0.05	0.18	<0.05	<0.05	<0.05	<0.05
Modified TPH (mg/kg)	Gas Range	-	770	-	<3	24	<3	<3	<3	32
	Fuel Range	-	540	390	<15	380	<15	120	-	51
	Lube Range	-	450	330	<15	460	<15	330	-	61
Total Modified TPH - Tier 1 (mg/kg)		450 as gas 7,400 as fuel oil 10,000 as lube oil	1,800	-	<20	860	<20	450	-	140
Product Resemblance		-	One product in the gas/fuel oil range. Lube oil fraction.	-	-	One product in fuel/lube range.	-	Weathered fuel oil fraction. Lube oil fraction.	-	One product in fuel/lube range.

Notes: **value** - value exceeds commercial guideline

[1] 2003 Atlantic PIRI Tier I Risk-Based Screening Levels (RBSLs) for coarse-grained soil at a site with non-potable groundwater and commercial receptors.

TABLE 2: Total Petroleum Hydrocarbon (TPH) Compounds in Groundwater
Client: Town of Yarmouth
Site Location: Civic No. 5 Collins Street, Yarmouth, NS
Date Sampled: November 19, 2009
MTL Project No. 10516

Parameter		Atlantic PIRI Tier I Commercial RBSLs[1]	Sample ID			
			MW1	MW2	MW3	MW4
BTEX (mg/L)	Benzene	6.9	0.002	<0.001	<0.001	0.001
	Toluene	20	0.002	<0.001	<0.001	0.001
	Ethylbenzene	20	< 0.001	<0.001	<0.001	<0.001
	Xylenes	20	< 0.002	<0.002	<0.002	<0.002
Modified TPH (mg/L)	Gas Range	-	< 0.01	<0.01	<0.01	0.03
	Fuel Range	-	0.09	0.19	<0.05	0.50
	Lube Range	-	<0.1	<0.1	<0.1	<0.1
Total Modified TPH - Tier 1 (mg/L)		20 as gas 20 as fuel oil 20 as lube oil	<0.1	0.2	<0.1	0.5
Product Resemblance		-	One product in fuel oil range.	One product in fuel oil range.	-	One product in fuel oil range.

Notes: **value** - value exceeds commercial guideline

[1] 2003 Atlantic Tier I Risk-Based Screening Levels (RBSLs) for a site with coarse-grained soils, non-potable groundwater and commercial receptors

APPENDIX J

Laboratory Certificates of Analysis

Your Project #: 10516
Site:YARMOUTH
Your C.O.C. #: B 117034

Attention: Ryan Pellerin
Maritime Testing (1985) Limited
97 Troop Ave
Dartmouth, NS
B3B 2A7

Report Date: 2009/11/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A9F8030
Received: 2009/11/20, 15:40

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI)	1	2009/11/26	2009/11/26	ATL SOP 00111 R3	Based on Atl. PIRI
TEH in Soil (PIRI)	2	2009/11/26	2009/11/27	ATL SOP 00111 R3	Based on Atl. PIRI
TEH in Soil (PIRI)	2	2009/11/26	2009/11/28	ATL SOP 00111 R3	Based on Atl. PIRI
Moisture	5	N/A	2009/11/23	ATL SOP 00001 R3	MOE Handbook 1983
VPH in Soil (PIRI)	4	2009/11/23	2009/11/24	ATL SOP 00117 R4/00119 R6	Based on Atl. PIRI
VPH in Soil (PIRI)	1	2009/11/23	2009/11/25	ATL SOP 00117 R4/00119 R6	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	1	2009/11/23	2009/11/27		Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	3	2009/11/23	2009/11/28		Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	1	2009/11/23	2009/11/30		Based on Atl. PIRI

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Water (PIRI)	4	2009/11/26	2009/11/28	ATL SOP 00113 R3	Based on Atl. PIRI
VPH in Water (PIRI)	4	2009/11/25	2009/11/27	ATL SOP 00118 R4	Based on Atl. PIRI
ModTPH (T1) Calc. for Water	4	N/A	2009/11/28		Based on Atl. PIRI

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

../2

This document is in electronic format, hard copy is available on request.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Your Project #: 10516
Site:YARMOUTH
Your C.O.C. #: B 117034

Attention: Ryan Pellerin
Maritime Testing (1985) Limited
97 Troop Ave
Dartmouth, NS
B3B 2A7

Report Date: 2009/11/30

CERTIFICATE OF ANALYSIS

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

MARI KENNY,
Email: mari.kenny.reports@maxxamanalytics.com
Phone# (902) 420-0203

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 2

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Maxxam Job #: A9F8030
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		EK9339	EK9339		
Sampling Date		2009/11/18	2009/11/18		
COC Number		B 117034	B 117034		
	Units	**MW 2/3**	**MW 2/3 Lab-Dup**	**RDL**	**QC Batch**
Inorganics					
Moisture	%	17		1	2016443
Petroleum Hydrocarbons					
Benzene	mg/kg	ND	ND	0.03	2017630
Toluene	mg/kg	ND	ND	0.03	2017630
Ethylbenzene	mg/kg	ND	ND	0.03	2017630
Xylene (Total)	mg/kg	ND	ND	0.05	2017630
C6 - C10 (less BTEX)	mg/kg	ND	ND	3	2017630
>C10-C21 Hydrocarbons	mg/kg	120		15	2020174
>C21-<C32 Hydrocarbons	mg/kg	330		15	2020174
Modified TPH (Tier1)	mg/kg	450		20	2016178
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%	94			2020174
n-Dotriacontane - Extractable	%	90 (1)			2020174
Isobutylbenzene - Volatile	%	107	109		2017630

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Weathered fuel oil fraction. Lube oil fraction.

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Maxxam Job #: A9F8030
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		EK9340	EK9340		
Sampling Date		2009/11/18	2009/11/18		
COC Number		B 117034	B 117034		
	Units	**AP 2/2**	**AP 2/2 Lab-Dup**	**RDL**	**QC Batch**
Inorganics					
Moisture	%	13		1	2016443
Petroleum Hydrocarbons					
Benzene	mg/kg	ND		0.03	2017630
Toluene	mg/kg	ND (1)		0.04	2017630
Ethylbenzene	mg/kg	ND (1)		0.09	2017630
Xylene (Total)	mg/kg	ND (1)		0.2	2017630
C6 - C10 (less BTEX)	mg/kg	770		30	2017630
>C10-C21 Hydrocarbons	mg/kg	540	390	15	2020173
>C21-<C32 Hydrocarbons	mg/kg	450	300	15	2020173
Modified TPH (Tier1)	mg/kg	1800		30	2016178
Surrogate Recovery (%)					
Isobutylbenzene - Extractable	%	93	98		2020173
n-Dotriacontane - Extractable	%	82 (2)	89		2020173
Isobutylbenzene - Volatile	%	127			2017630

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated VPH RDL(s) due to matrix interference.
(2) One product in the gas/fuel oil range. Lube oil fraction.

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Maxxam Job #: A9F8030
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		EK9341	EK9342	EK9343		
Sampling Date		2009/11/19	2009/11/19	2009/11/19		
COC Number		B 117034	B 117034	B 117034		
	Units	**AP 3/3**	**AP 4/2**	**AP 5/1**	**RDL**	**QC Batch**
Inorganics						
Moisture	%	13	14	14	1	2016443
Petroleum Hydrocarbons						
Benzene	mg/kg	ND	ND	ND	0.03	2017630
Toluene	mg/kg	ND	ND	ND	0.03	2017630
Ethylbenzene	mg/kg	ND	ND	ND	0.03	2017630
Xylene (Total)	mg/kg	ND	0.18	ND	0.05	2017630
C6 - C10 (less BTEX)	mg/kg	ND	24	ND	3	2017630
>C10-C21 Hydrocarbons	mg/kg	ND	380	ND	15	2020174
>C21-<C32 Hydrocarbons	mg/kg	ND	460	ND	15	2020174
Modified TPH (Tier1)	mg/kg	ND	860	ND	20	2016178
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	98	95	94		2020174
n-Dotriacontane - Extractable	%	96	93 (1)	102		2020174
Isobutylbenzene - Volatile	%	105	104	101		2017630

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range; interference from possible PAHs.

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Maxxam Job #: A9F8030
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

ATLANTIC MUST IN WATER - PIRI TIER I (WATER)

Maxxam ID		EK9345	EK9346	EK9347	EK9348		
Sampling Date		2009/11/19	2009/11/19	2009/11/19	2009/11/19		
COC Number		B 117034	B 117034	B 117034	B 117034		
	Units	**MW1**	**MW2**	**MW3**	**MW4**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/L	0.002	ND	ND	0.001	0.001	2019191
Toluene	mg/L	0.002	ND	ND	0.001	0.001	2019191
Ethylbenzene	mg/L	ND	ND	ND	ND	0.001	2019191
Xylene (Total)	mg/L	ND	ND	ND	ND	0.002	2019191
C6 - C10 (less BTEX)	mg/L	ND	ND	ND	0.03	0.01	2019191
>C10-C21 Hydrocarbons	mg/L	0.09	0.19	ND	0.50	0.05	2019926
>C21-<C32 Hydrocarbons	mg/L	ND	ND	ND	ND	0.1	2019926
Modified TPH (Tier1)	mg/L	ND	0.2	ND	0.5	0.1	2016986
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	101	104	99	100		2019926
n-Dotriacontane - Extractable	%	100 (1)	103 (1)	99	97 (1)		2019926
Isobutylbenzene - Volatile	%	89	89	86	93		2019191

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel oil range.

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Maxxam Job #: A9F8030
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

GENERAL COMMENTS

Results relate only to the items tested.

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Maritime Testing (1985) Limited
Attention: Ryan Pellerin
Client Project #: 10516
P.O. #:
Project name: YARMOUTH

Quality Assurance Report

Maxxam Job Number: DA9F8030

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2017630	GTH	Matrix Spike						
		[EK9339-01]	Isobutylbenzene - Volatile	2009/11/24		93	%	60 - 140
			Benzene	2009/11/24		100	%	60 - 140
			Toluene	2009/11/24		116	%	60 - 140
			Ethylbenzene	2009/11/24		118	%	60 - 140
			Xylene (Total)	2009/11/24		124	%	60 - 140
		Spiked Blank	Isobutylbenzene - Volatile	2009/11/24		95	%	60 - 140
			Benzene	2009/11/24		96	%	60 - 140
			Toluene	2009/11/24		97	%	60 - 140
			Ethylbenzene	2009/11/24		98	%	60 - 140
			Xylene (Total)	2009/11/24		100	%	60 - 140
		Method Blank	Isobutylbenzene - Volatile	2009/11/24		103	%	60 - 140
			Benzene	2009/11/24	ND, RDL=0.03		mg/kg	
			Toluene	2009/11/24	ND, RDL=0.03		mg/kg	
			Ethylbenzene	2009/11/24	ND, RDL=0.03		mg/kg	
			Xylene (Total)	2009/11/24	ND, RDL=0.05		mg/kg	
			C6 - C10 (less BTEX)	2009/11/24	ND, RDL=3		mg/kg	
		RPD [EK9339-01]	Benzene	2009/11/24	NC		%	50
			Toluene	2009/11/24	NC		%	50
			Ethylbenzene	2009/11/24	NC		%	50
			Xylene (Total)	2009/11/24	NC		%	50
			C6 - C10 (less BTEX)	2009/11/24	NC		%	50
2019191	GTH	Matrix Spike	Isobutylbenzene - Volatile	2009/11/29		85	%	70 - 130
			Benzene	2009/11/29		91	%	70 - 130
			Toluene	2009/11/29		83	%	70 - 130
			Ethylbenzene	2009/11/29		83	%	70 - 130
			Xylene (Total)	2009/11/29		90	%	70 - 130
		Spiked Blank	Isobutylbenzene - Volatile	2009/11/27		90	%	70 - 130
			Benzene	2009/11/27		83	%	70 - 130
			Toluene	2009/11/27		85	%	70 - 130
			Ethylbenzene	2009/11/27		85	%	70 - 130
			Xylene (Total)	2009/11/27		91	%	70 - 130
		Method Blank	Isobutylbenzene - Volatile	2009/11/27		73	%	70 - 130
			Benzene	2009/11/27	ND, RDL=0.001		mg/L	
			Toluene	2009/11/27	ND, RDL=0.001		mg/L	
			Ethylbenzene	2009/11/27	ND, RDL=0.001		mg/L	
			Xylene (Total)	2009/11/27	ND, RDL=0.002		mg/L	
			C6 - C10 (less BTEX)	2009/11/27	ND, RDL=0.01		mg/L	
		RPD	Benzene	2009/11/28	NC		%	40
			Toluene	2009/11/28	NC		%	40
			Ethylbenzene	2009/11/28	NC		%	40
			Xylene (Total)	2009/11/28	NC		%	40
			C6 - C10 (less BTEX)	2009/11/28	NC		%	40
2019926	DMV	Matrix Spike	Isobutylbenzene - Extractable	2009/11/27		97	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		96	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27		101	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/27		80	%	30 - 130
		Spiked Blank	Isobutylbenzene - Extractable	2009/11/27		97	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		105	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27		103	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/27		81	%	30 - 130
		Method Blank	Isobutylbenzene - Extractable	2009/11/27		95	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		101	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27	ND, RDL=0.05		mg/L	
			>C21-<C32 Hydrocarbons	2009/11/27	ND, RDL=0.1		mg/L	

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Maritime Testing (1985) Limited
Attention: Ryan Pellerin
Client Project #: 10516
P.O. #:
Project name: YARMOUTH

Quality Assurance Report (Continued)

Maxxam Job Number: DA9F8030

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2019926	DMV	RPD	>C10-C21 Hydrocarbons	2009/11/27	NC		%	40
			>C21-<C32 Hydrocarbons	2009/11/27	NC		%	40
2020173	DMV	Matrix Spike						
		[EK9340-01]	Isobutylbenzene - Extractable	2009/11/27		96	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		84	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27		NC	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/27		NC	%	30 - 130
		Spiked Blank	Isobutylbenzene - Extractable	2009/11/26		92	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/26		88	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/26		89	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/26		96	%	30 - 130
		Method Blank	Isobutylbenzene - Extractable	2009/11/26		95	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/26		92	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/26	ND, RDL=15		mg/kg	
			>C21-<C32 Hydrocarbons	2009/11/26	ND, RDL=15		mg/kg	
		RPD [EK9340-01]	>C10-C21 Hydrocarbons	2009/11/27	31.7		%	50
			>C21-<C32 Hydrocarbons	2009/11/27	42.0		%	50
2020174	DMV	Matrix Spike	Isobutylbenzene - Extractable	2009/11/28		111	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/28		114	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/28		99	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/28		117	%	30 - 130
		Spiked Blank	Isobutylbenzene - Extractable	2009/11/27		100	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		98	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27		89	%	30 - 130
			>C21-<C32 Hydrocarbons	2009/11/27		99	%	30 - 130
		Method Blank	Isobutylbenzene - Extractable	2009/11/27		93	%	30 - 130
			n-Dotriacontane - Extractable	2009/11/27		93	%	30 - 130
			>C10-C21 Hydrocarbons	2009/11/27	ND, RDL=15		mg/kg	
			>C21-<C32 Hydrocarbons	2009/11/27	ND, RDL=15		mg/kg	
		RPD	>C10-C21 Hydrocarbons	2009/11/27	NC		%	50
			>C21-<C32 Hydrocarbons	2009/11/27	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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Your Project #: 10516
Site:YARMOUTH
Your C.O.C. #: B 117354

Attention: Ryan Pellerin
Maritime Testing (1985) Limited
97 Troop Ave
Dartmouth, NS
B3B 2A7

Report Date: 2009/11/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A9F8096
Received: 2009/11/23, 14:21

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
TEH in Soil (PIRI)	1	2009/11/26	2009/11/27	ATL SOP 00111 R3	Based on Atl. PIRI
Moisture	1	N/A	2009/11/23	ATL SOP 00001 R3	MOE Handbook 1983
VPH in Soil (PIRI)	1	2009/11/23	2009/11/24	ATL SOP 00117 R4/00119 R6	Based on Atl. PIRI
ModTPH (T1) Calc. for Soil	1	2009/11/23	2009/11/28		Based on Atl. PIRI

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

MARI KENNY,
Email: mari.kenny.reports@maxxamanalytics.com
Phone# (902) 420-0203

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 1

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Maxxam Job #: A9F8096
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

ATLANTIC MUST IN SOIL (SOIL)

Maxxam ID		EK9669		
Sampling Date		2009/11/19		
COC Number		B 117354		
	Units	**MW 4/2**	**RDL**	**QC Batch**
Inorganics				
Moisture	%	14	1	2016443
Petroleum Hydrocarbons				
Benzene	mg/kg	ND	0.03	2017630
Toluene	mg/kg	ND	0.03	2017630
Ethylbenzene	mg/kg	ND	0.03	2017630
Xylene (Total)	mg/kg	ND	0.05	2017630
C6 - C10 (less BTEX)	mg/kg	32	3	2017630
>C10-C21 Hydrocarbons	mg/kg	51	15	2020174
>C21-<C32 Hydrocarbons	mg/kg	61	15	2020174
Modified TPH (Tier1)	mg/kg	140	20	2016178
Surrogate Recovery (%)				
Isobutylbenzene - Extractable	%	86		2020174
n-Dotriacontane - Extractable	%	108 (1)		2020174
Isobutylbenzene - Volatile	%	109		2017630

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) One product in fuel / lube range.

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Maxxam Job #: A9F8096
Report Date: 2009/11/30

Maritime Testing (1985) Limited
Client Project #: 10516
Project name: YARMOUTH

GENERAL COMMENTS

Results relate only to the items tested.

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Maritime Testing (1985) Limited
Attention: Ryan Pellerin
Client Project #: 10516
P.O. #:
Project name: YARMOUTH

Quality Assurance Report

Maxxam Job Number: DA9F8096

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2017630 GTH	Matrix Spike	Isobutylbenzene - Volatile	2009/11/24		93	%	60 - 140
		Benzene	2009/11/24		100	%	60 - 140
		Toluene	2009/11/24		116	%	60 - 140
		Ethylbenzene	2009/11/24		118	%	60 - 140
		Xylene (Total)	2009/11/24		124	%	60 - 140
	Spiked Blank	Isobutylbenzene - Volatile	2009/11/24		95	%	60 - 140
		Benzene	2009/11/24		96	%	60 - 140
		Toluene	2009/11/24		97	%	60 - 140
		Ethylbenzene	2009/11/24		98	%	60 - 140
		Xylene (Total)	2009/11/24		100	%	60 - 140
	Method Blank	Isobutylbenzene - Volatile	2009/11/24		103	%	60 - 140
		Benzene	2009/11/24	ND, RDL=0.03		mg/kg	
		Toluene	2009/11/24	ND, RDL=0.03		mg/kg	
		Ethylbenzene	2009/11/24	ND, RDL=0.03		mg/kg	
		Xylene (Total)	2009/11/24	ND, RDL=0.05		mg/kg	
		C6 - C10 (less BTEX)	2009/11/24	ND, RDL=3		mg/kg	
	RPD	Benzene	2009/11/24	NC		%	50
		Toluene	2009/11/24	NC		%	50
		Ethylbenzene	2009/11/24	NC		%	50
		Xylene (Total)	2009/11/24	NC		%	50
		C6 - C10 (less BTEX)	2009/11/24	NC		%	50
2020174 DMV	Matrix Spike	Isobutylbenzene - Extractable	2009/11/28		111	%	30 - 130
		n-Dotriacontane - Extractable	2009/11/28		114	%	30 - 130
		>C10-C21 Hydrocarbons	2009/11/28		99	%	30 - 130
		>C21-<C32 Hydrocarbons	2009/11/28		117	%	30 - 130
	Spiked Blank	Isobutylbenzene - Extractable	2009/11/27		100	%	30 - 130
		n-Dotriacontane - Extractable	2009/11/27		98	%	30 - 130
		>C10-C21 Hydrocarbons	2009/11/27		89	%	30 - 130
		>C21-<C32 Hydrocarbons	2009/11/27		99	%	30 - 130
	Method Blank	Isobutylbenzene - Extractable	2009/11/27		93	%	30 - 130
		n-Dotriacontane - Extractable	2009/11/27		93	%	30 - 130
		>C10-C21 Hydrocarbons	2009/11/27	ND, RDL=15		mg/kg	
		>C21-<C32 Hydrocarbons	2009/11/27	ND, RDL=15		mg/kg	
	RPD	>C10-C21 Hydrocarbons	2009/11/27	NC		%	50
		>C21-<C32 Hydrocarbons	2009/11/27	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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MARITIME TESTING
Consulting Engineering & Environmental Services

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
5 COLLINS STREET
YARMOUTH, NOVA SCOTIA

Prepared for

Town of Yarmouth
400 Main Street
Yarmouth, NS
B5A 1G3

By

Maritime Testing (1985) Limited
97 Troop Avenue.
Dartmouth, Nova Scotia
B3B 2A7

MTL Project No. 10516

December 2009

MARITIME TESTING
Consulting Engineering & Environmental Services

December 16, 2009

Mr. Jeffrey Gushue
Town of Yarmouth
400 Main Street
Yarmouth, NS
B5A 1G3

MTL Project No. 10516

Dear Sir:

RE: Geotechnical Investigation Report – Proposed Commercial Development
5 Collins Street, Yarmouth, Nova Scotia.

Enclosed please fine one (1) copy of our geotechnical report prepared following a geotechnical investigation of the above-mentioned site.

We trust this meets with your present requirement. Should you have any questions, please contact the undersigned at your convenience.

Sincerely Yours,
Maritime Testing (1985) Limited

T. Kenneth Marvin, P.Eng.

Encl.

MARITIME TESTING (1985) LIMITED
97 Troop Avenue, Dartmouth NS B3B 2A7
Phone (902) 468-6486 - Fax (902) 468-4919
Website http://www.maritimetesting.ca

TABLE OF CONTENTS

1.0 INTRODUCTION

Maritime Testing (1985) Limited (MTL), at the request of the Town of Yarmouth, has carried out a geotechnical investigation at a site located at 5 Collins Street, Yarmouth, Nova Scotia. The purpose of the work was to assess the subsurface conditions at select areas of the site and to make recommendations for design and costing of earthworks and foundations. The geotechnical investigation was carried out in conjunction with an environmental assessment of the property.

This report presents the observations and engineering recommendations associated with the geotechnical investigation of the site. Included herein are the factual results of the field investigation including discussion of field procedures, subsurface conditions, and recommendations for site development.

2.0 DESCRIPTION OF SITE AND PROJECT

A new commercial development is being considered for construction on the property located at 5 Collins Street, in Yarmouth, Nova Scotia. Currently, detailed design is not available, but it is our understanding that the development will include a commercial building for a live-theatre, paved parking, and municipal services. The structure will be founded on conventional shallow foundations consisting of strip and spread footings.

At the time of the investigation, two abandoned buildings were located on the property while the remaining areas of the proposed development were being used as vehicle parking lots. A residential property is located within the site. The ground surface across the site is relatively flat with topographic relief of approximately 1.2 metres.

3.0 INVESTIGATION PROCEDURE

The fieldwork for the investigation was carried out on November 18 and 19, 2009, when fourteen (14) boreholes were drilled at the approximate locations shown on the enclosed Figure 1. In four (4) of the boreholes 50 mm diameter PVC monitoring wells were installed. The investigation was carried out using a track- mounted auger drill rig supplied by Lantech Drilling Services.

The investigation was carried out by qualified field engineering personnel who logged the subsurface conditions. The boreholes were advanced using continuous flyte augers with field sampling and testing performed in the open borehole. Standard Penetration Tests (SPT) were carried out at regular intervals in each borehole to obtain soil blow counts (i.e. N-values) using a

50-mm O.D. split spoon sampler. Disturbed soil samples were obtained from the boreholes using conventional techniques.

Following field sampling and visual description, overburden samples were placed in sample bags and transported to our Dartmouth laboratory for further examination and scheduling for geotechnical index testing.

4.0 SUBSURFACE CONDITIONS

An explanation of terms and symbols used in the report is provided in Appendix A. A summary of the encountered geologic conditions is provided on the Borehole Logs in Appendix B. Laboratory testing results are provided in Appendix C.

It should be noted that the stratigraphic boundaries on the Borehole Logs typically represent a transition of one soil type to another and do not necessarily indicate an exact plane of geologic change. Subsurface conditions may vary between and beyond the borehole locations.

In summary, the subsurface conditions encountered at the site were found to be relatively uniform with respect to material composition and consistency. Generally, asphalt pavement / fill materials have been encountered overlying glacial till and bedrock. Fill depth ranged from 0.9 metre at BH 4 to 2.4 metres at AP 3. Bedrock has been encountered at several of the boreholes at the site beneath the glacial till at depths ranging from 1.8 metres at BH 4 to 4.0 metres at MW 2. Groundwater measurements were obtained from the monitoring wells installed at the site. Depth to groundwater ranged from 1.5 metres to 3.0 metres below ground surface. The following paragraphs further describe the subsurface conditions encountered at the boreholes.

4.1 Asphalt Pavement

A thin layer of asphalt pavement was encountered at the surface of each borehole. The asphalt pavement was approximately 50 mm on average in thickness.

4.2 Fill

At all borehole locations, fill was encountered underlying the asphalt pavement and generally was re-worked site glacial soil consisting of a silty sand, trace to some gravel with occasional cobbles. Observations of the *in situ* deposits indicated that the material was brown to grey in

colour and its moisture content was described as moist. Standard penetration N-values recorded for the fill material ranged from 10 to 35 blows per 300 mm, indicating a compact to dense material. Note that high N-values recorded in the fill are do to gravel and cobble interference with the spoon sampler and may not necessarily be representative of the actual soil strength. The fill was proven to a total depth of between 0.9 and 2.4 metres below ground surface.

Moisture content testing of fill samples ranged from 15.2 to 16.7 percent.

4.3 Till (Site-Native Glacial Soil)

In all boreholes, a site-native glacial till deposit was encountered below the fill deposit. These soils are described on the Borehole Logs in Appendix B as silty sand, trace to some gravel, with occasional cobbles. Observations of the *in situ* deposits indicated that the material was greenish grey in colour and its moisture content was described as moist to wet. Representative standard penetration N-values for the till ranged from 23 to 47 at the boreholes indicating a compact to very dense relative density. The till was proven to a total depth of 2.4 metres at MW 2.

Laboratory gradation testing of a till sample indicated a material with 30 percent gravel, 41 percent sand and a fines content (i.e. silt and clay fraction) of 29 percent. Moisture content testing of till samples ranged from 7.0 to 8.1 percent.

4.4 Bedrock

Geologic mapping of the proposed development area indicates that the site is underlain by the New Cannan, White Rock and Kentville formations. The area is underlain with siltstone, slate and quartzite bedrock.

Bedrock was encountered at boreholes BH 1, BH 2, BH 3, BH 4, BH 5 and MW 2 at depths ranging from 1.8 metres to 4.0 metres. The bedrock has been inferred at the boreholes with the drill augers. Confirmation of the bedrock by coring was not conducted.

4.5 Groundwater

Groundwater observations were made during the field investigation through open-hole measurements at the borehole locations and groundwater measurements obtained from the monitoring wells installed at the site. A summary of the accumulated groundwater information is

provided on the Borehole Logs in Appendix B. Depth to groundwater ranged from 1.5 metres to 3.2 metres below ground surface (readings on November 19, 2009). Seasonal fluctuations in groundwater levels can be expected.

5.0 DISCUSSION AND RECOMMENDATIONS FOR DESIGN

5.1 Site Development - General

In the following paragraphs a discussion of the proposed development is presented in light of the observed subsurface conditions. Currently, detailed design information and final building location are not available for the project. However, it is assumed that the new structure(s) will be of conventional design and will incorporate shallow foundations and slab-on-grade floors. For reporting, it has been necessary to make some assumptions regarding the extent of development, particularly, the types of structures, site grades, construction methodology, etc. As a result, some of the recommendations outlined below are of a preliminary nature and can only be confirmed as specific designs are presented for the site. Once a final design concept is developed for the site, a review of our report should be conducted.

In conjunction with the current geotechnical assessment, an environmental site assessment has been carried out. The following geotechnical recommendations have been prepared on the basis that environmental impacts to the subsoils are within acceptable levels. The presence of contamination in the subsurface may have implication on site development particularly earthworks construction and the reuse (or disposal) of on-site soils.

The subsurface conditions encountered throughout the development area are uniform and consist of shallow fill deposits overlying "undisturbed" glacial soils and bedrock. The presence of competent bearing stratum at shallow depth will allow for the use of a conventional shallow foundation system for the proposed structure.

5.2 Site Preparation, Excavation and Earthworks

To prepare the building area to receive foundations/slabs, it will be necessary to remove all asphalt pavement, fill materials (including derelict foundations and slabs), and loose soils from beneath foundation and slab bearing areas. This material should be subexcavated to the level of competent soil (i.e. material noted on the Borehole Logs as "compact Till" and/or Bedrock). This excavation is expected to vary from 0.9 to 2.4 metres in the proposed building area on the south side of the site (i.e. BH 1, BH 2, BH 3, BH 4, BH 5, AP 3, AP 4, AP 5, MW 4). This material can

be stockpiled at the site for use in non-settlement areas of the site (i.e. site grading, landscaping) and common backfill material provided the environmental quality of the soil is acceptable for remaining on site.

Following this initial subexcavation, a general proof-rolling of the exposed subgrade (with vibratory compaction equipment) is recommended to identify any loose or soft areas. Any such areas identified should be subexcavated and replaced with approved fill.

Imported structural fill should consist of rockfill or well-graded sand and gravel with a maximum particle size of 150 mm diameter. The fill should be approved by geotechnical personnel prior to use. The material should be placed in lifts not exceeding 300 mm in thickness compacted to 100 percent of the material's standard Proctor maximum dry density (SPMDD). Water, loose/wet soils, frozen materials, etc. should be removed from excavations, and the bearing stratum approved prior to fill placement. **Quality control inspection and testing of engineered fill is recommended.**

Depending on final design grades for the proposed new development removal of bedrock to reach design grades maybe required. Depth and quantities will depend on final design grades. It is expected that blasting and/or breaking will be necessary. Select areas with significant fracturing (generally the top weathered material) may permit "ripping" of the rock to loosen fractured materials. Review of the applicable by-laws should be part of the detailed design process. A pre-blast survey is considered fundamental to any drilling and blasting at the site.

Excavations in the fill / till deposits are expected to remain temporarily stable at side slopes of 1:1 (horizontal to vertical), while long-term stability can be achieved at 3:1 for both types of soils. Excavations taken to levels within bedrock are expected to remain temporarily stable at-near vertical side slopes, depending on fracturing. Long-term stability of bedrock can be achieved at 1:5 slopes; however, this should be subject to confirmation of the quality of the rock mass.

5.3 Re-use of On-site Materials and Backfilling

The select portions of fill and site-native glacial deposits maybe considered suitable for reuse at the site as common material or, in some applications, as engineered fill. The reuse of on-site materials will be contingent to a large extent on the condition of the materials after excavation, handling and stockpiling and the environmental quality.

To qualify as engineered wall backfill, all boulders, debris and deleterious inclusions should be removed. Wall backfill should be placed in lifts not exceeding 250 mm thickness and compacted in-place to 95 percent standard Proctor maximum dry density. A higher level of compaction (i.e. 98 percent) is recommended for backfill beneath load bearing areas.

5.4 Foundations

A shallow foundation system consisting of strip and spread footings appear to be the most feasible foundation option for the proposed structure. Footings placed on approved undisturbed site-native soils may be designed for an allowable soil bearing pressure of 200 kPa. At the above bearing pressure, total and differential settlements are not expected to exceed 25 and 19 mm, respectively.

Foundations placed on sound, intact bedrock can be designed for an allowable bearing pressure of 500 kPa. For fractured bedrock we suggest a fractured/reworked rock bearing pressure of 400 kPa, with expected total and differential settlements not expected to exceed 25 mm and 19 mm, respectively.

Depending upon design grades, some footings may be considered for placement on a properly prepared engineered fill. Footings placed on engineered fill can be designed for an allowable soil bearing pressure of 150 kPa, with expected settlements to be as outlined above for till-supported foundations.

To prepare foundation areas to receive fill it will be necessary to excavate to the level of competent stratum, followed by the placement of an approved fill in compacted lifts. Preparation of foundations subgrade areas for footings placed on structural fill should be carried out in keeping with the recommendations for site preparation provided above. Quality control inspection of fill preparation beneath foundations and slabs is recommended.

Generally, foundations on site-native soils or engineered fill should be placed at a minimum depth of 1.2 metres below finished exterior grade to maintain adequate frost protection. Equivalent protection can be provided through design using insulation. Interior spread footings should be placed at a minimum depth of 600 mm below finished slab. For unheated areas, footings should be placed below expected frost penetration (i.e. 1.2 metres).

5.5 Floor Slabs

Slab-on-ground floors for the proposed structure should be cast on a free-draining granular material (NSTIR Type 1, or equivalent) with a minimum thickness of 200 mm. This material should be compacted to 100 percent of the material's standard Proctor maximum dry density. To reach the level of the underslab base course, excavation/filling should be carried out in accordance with previous recommendations for foundation and subgrade preparation.

5.6 Dewatering

During earthworks, water may be expected to enter excavations during precipitation events, as surface runoff or as seepage from within the soil strata. The rate of infiltration into shallow excavations is expected to be minor to moderate and can be controlled by conventional dewatering techniques consisting of 75 to 100 mm diameter portable pumps and grading of excavations to sump locations. The rate of infiltration into deeper excavations is expected to be moderate to high, subject to seasonal/weather conditions, and may require several larger pumps. Water pumped from excavations is expected to contain "fines" and will require care in disposal. Provision for proper site drainage in accordance with applicable municipal, provincial, and federal environmental requirements should be made at the construction stage.

5.7 Interpreted Soil and Bedrock Parameters

Soil and bedrock parameters recommended for use in design are outlined in Table 1, below. The parameters indicated have been summarized from field identification and from known empirical correlations. The values indicated are provided as a guide and their specific use in design should be confirmed with the geotechnical engineer.

Table 1: Summary of Recommended Soil and Bedrock Design Parameters

Parameter	Glacial Till	Bedrock
Bulk Unit Weight, kN/m^3	22	26
Moisture Content, %	12	-
Effective Unit Weight, kN/m^3	12	16
Soil Cohesion (C_u), kN/m^3	0	-
Effective Angle of Internal Friction	32°	44°
Active Earth Pressure Coeff. (K_a)	0.31	0.18
Passive Earth Pressure Coeff. (K_p)	3.3	5.6
Allowable Soil Bearing Press., kPa	200	500(intact)

6.0 COMMENTS ON CONSTRUCTION

The following comments on specific construction aspects of the project are provided for the guidance of designers. The contractor undertaking the work should make their own interpretation of the factual information provided in this report as it affects their construction procedures and scheduling.

The *in situ* soils are subject to loosening and softening in the presence of water. Construction methods and scheduling should reflect this. If construction takes place in the winter months care must be taken not to allow freezing of subsoil. Any fill or native soil that freezes must be sub excavated and replaced.

In periods of inclement weather or during extended work delays, foundation excavations within the site native soils should be protected by a working mat of lean concrete placed over the bearing soil immediately following excavation and preparation of the foundation contact area. It may be also necessary to insulate the founding strata during periods of subzero temperatures.

Geotechnical inspection and testing by qualified personnel is recommended during earthworks construction.

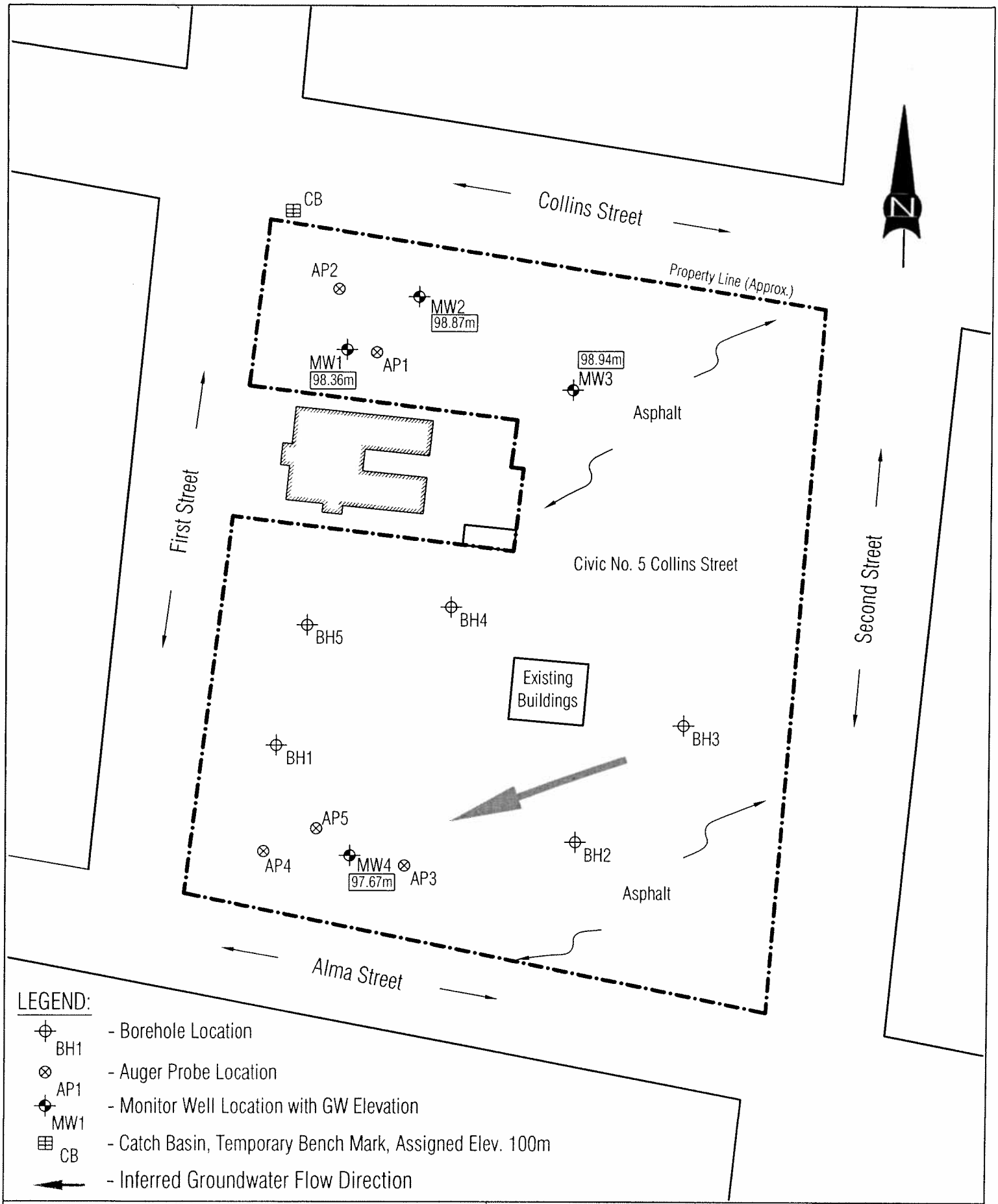
7.0 CLOSING

The geotechnical investigation undertaken has involved random sampling of site conditions. Should any conditions be encountered during constructions that are contrary to those reported herein, we request immediate notification so that reassessment can be undertaken.

We trust that this information meets with your present requirements. If any questions arise regarding the contents of this report, please contact the undersigned at your convenience.

Respectively Submitted,
Maritime Testing (1985) Limited

T. Kenneth Marvin, P.Eng.



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Site Sketch Showing Monitor Well and Borehole Locations
Phase I/II Environmental Site Assessment
Civic No. 5 Collins Street, Yarmouth, NS

DATE: Dec. 2009	SCALE: 1:600	DRAWN BY: JJ	CKD BY: BM	JOB No. 10516	FIGURE 1

APPENDIX A

Explanation of Terms and Symbols

MARITIME TESTING

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured	- having cracks, and hence a blocky structure
Varved	-composed of regular alternating layers of silt and clay
Stratified	- composed of alternating layers or different soil types, e.g. silt and sand or silt and clay
Well Graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	- predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. silt and sand)	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

Relative Density	'N' Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength Kips/sq.ft.	kPa	'N' Value
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

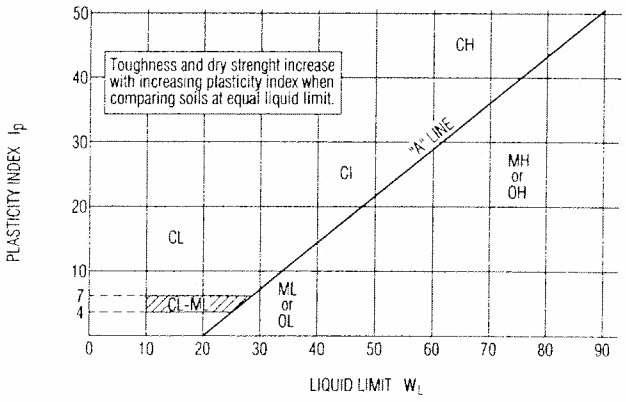
MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 4$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS	
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 6$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS	
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
FINE - GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO.200 SIEVE SIZE)	SILTS BELOW "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	SEE CHART BELOW
			MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
			CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$	
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS & ORGANIC CLAYS BELOW "A" LINE ON PLASTICITY CHART		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
			OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	

FILL TILL BEDROCK

1. All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
2. Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture wtih clay binder between 5% and 12%.
3. Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
4. The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
gravelly, sandy, silty, clayey, ect.	35 - 21%
some	20 - 11%
trace	10 - 1%

PLASTICITY CHART



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APPENDIX B

Borehole Logs

MARITIME TESTING
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BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 1

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.27 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.
0	0	Asphalt Pavement			
		FILL : silty sand, some gravel, loose to compact, moist, brown.			
4	1			G	
5		TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.			
7	2	▽		G	
8		End of Borehole at 2.4 metres in Till.			
		Groundwater encountered at 2.1 metres below ground surface.			
10	3				
13	4				
16	5				

PLATE 1

MARITIME TESTING
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BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 2

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.12 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.
		Asphalt Pavement			
0		FILL : silty sand, some gravel, loose to compact, moist, brown.		G	
		Petroleum Hydrocarbon odour detected.			
1					
2					
3	1				
4				G	
5					
6		TILL : silty sand, some gravel, occasional cobbles, compact, moist, greenish grey.			
7	2			G	
8					
9		End of Borehole at 2.8 metres in Till.			
10	3	Borehole dry upon completion.			
11					
12					
13	4				
14					
15					
16	5				

PLATE 2

MARITIME TESTING
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BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. AP 3

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.48 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Soil Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
0	0	FILL : sandy gravel, trace silt, loose to compact, moist, grey brown.		
3	1	FILL : silty sand, some gravel, occasional cobble, compact, moist, brown.	SS	N=20
6	2		SS	N=35
8	2	TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.		
9	3		SS	N=31
11	3		SS	N=36
13	4	End of Borehole at 4.0 metres in Till.		
		Groundwater encountered in Borehole at 3.0 metres below ground surface.		

PLATE 3

MARITIME TESTING
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BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.AP 4

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ 10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION99.49 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.
		Asphalt Pavement			
		FILL : silty sand, some gravel, loose to compact, moist, brown.			
1					
2					
3	1				
4				G	
5					
6		TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.			
	2				
7		Petroleum Hydrocarbon odour detected.			
8					
9				G	
10	3	End of Borehole at 3.0 metres in Till.			
		Groundwater encounterd at 2.4 metres below ground surface.			
11					
12					
13	4				
14					
15					
16					
	5				

PLATE 4

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.AP 5

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION99.67 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	Description	COND.	TYPE	PENE. RESIST.
0	0	Asphalt Pavement			
		FILL : silty sand, some gravel, loose to compact, moist, brown.			
6	2	TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.		G	
10	3	End of Borehole at 3.0 metres in Till.			
		Groundwater encounterd at 2.4 metres below ground surface.			

PLATE 5

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.BH 1

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION99.64 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

ft	m	SOIL DESCRIPTION	TYPE	PENE. RESIST.
		Asphalt Pavement		
0–3	0–1	FILL : silty sand, some gravel, loose to compact, moist, brown.	SS	N=21
4–7	1–2	TILL : silty sand, some gravel, occasional cobbles, compact, moist to wet, greenish grey.	SS	N=47
6–9	2–3		SS	N=27
8–10	2–3		SS	N=28
10	3	Inferred Bedrock Level		
10–16	3–5	End of Borehole at 3.2 metres - Bedrock Level Groundwater encountered at 2.4 metres below ground surface.		

PLATE 6

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 2

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft m

MODIFIED USCS SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 101.10 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
0	0	FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.		
3	1		SS	N=12
4	1	TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.		
5	1		SS	N=51
7	2		SS	N=100
10	3	Inferred Bedrock Level		
10	3	End of Borehole at 3.0 metres - Bedrock Level		
		Groundwater encountered at 2.8 metres below ground surface.		

PLATE 7

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT

Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 3

DRILL TYPE: Drill Rig

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 101.38 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	SOIL SAMPLE TYPE	SOIL SAMPLE PENE. RESIST.
0				Asphalt Pavement			
1				FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.			
2							
3	1					SS	N=29
4				TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.			
5						SS	N=50
6							
7	2					SS	N=28
8							
9						SS	63/275
10	3			Inferred Bedrock Level			
11				End of Borehole at 3.0 metres - Bedrock Level			
12				Groundwater encountered at 2.8 metres below ground surface.			
13	4						
14							
15							
16	5						

OTHER TESTS

PLATE 8

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 4

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DRILL TYPE: Drill Rig

OTHER TESTS

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.99 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	TYPE	PENE. RESIST.
0				Asphalt Pavement			
1				FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.			
2							
3	1			TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist, greenish grey.		SS	N=18
4							
5						SS	N=43
6	2			Inferred Bedrock Level		SS	50/25
7				End of Borehole at 2.1 metres - Bedrock Level			
8				Borehole dry upon completion.			
9							
10	3						
11							
12							
13	4						
14							
15							
16	5						

PLATE 9

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. BH 5

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DRILL TYPE: Drill Rig

OTHER TESTS

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 99.97 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	TYPE	PENE. RESIST.
				Asphalt Pavement			
				FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.			
1				FILL : silty sand, some gravel, occasional cobble, compact, moist, greyish brown.			
2							
3	1					SS	N=37
4				TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey.			
5						SS	N=29
6	2						
7						SS	N=35
8							
9						SS	N=22
10	3			Inferred Bedrock Level			
11				End of Borehole at 3.0 metres - Bedrock Level			
12				Groundwater encountered in Borehole at 2.75 metres below ground surface.			
13	4						
14							
15							
16	5						

PLATE 10

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. MW 1

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △
10 20 30 40 50

DEPTH ft m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.13 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

Well Details | Other Tests

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
		FILL : sandy gravel, trace silt, loose to compact, moist, brown.		
2		FILL : silty sand, some gravel, loose to compact, moist, brown.		
3	1			
4			SS	N=25
5				
6			SS	N=24
	2			
7		Inferred Bedrock Level	SS	50/25
8				
9				
10	3	End of Borehole at 3.0 metres - Bedrock Level		
11		Groundwater level measurement taken on Nov. 19, 2009.		
12				
13	4			
14				
15				
16	5			

PLATE 11

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST.19/11/09	JOB NO. 10516	HOLE NO.MW 2

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.38 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

Well Details | Other Tests

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
0	0	FILL : silty sand, some gravel, loose to compact, moist, brown.		
4	1		SS	N=10
5		TILL : silty sand, some gravel, occasional cobble, compact, moist to wet, greenish grey.		
6	2		SS	N=30
8			SS	N=26
10	3		SS	N=45
13	4	Inferred Bedrock Level	SS	N=53
14		End of Borehole at 4.3 metres - Bedrock Level		
		Groundwater level measurement taken on Nov. 19, 2009.		
16	5			

PLATE 12

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. MW 3

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.90 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

Well Details | Other Tests

Depth (ft)	Depth (m)	Description	TYPE	PENE. RESIST.
0	0	Asphalt Pavement		
0	0	FILL : silty sand, some gravel, loose to compact, moist, brown.		
4	1	TILL : silty sand, some gravel, occasional cobble, compact, moist to wet, greenish grey.	SS	N=23
9	3		SS	N=49
12	4	End of Borehole at 3.6 metres in Till.		
12	4	Groundwater level measurement taken on Nov. 19, 2009.		

PLATE 13

MARITIME TESTING
Consulting Engineering & Environmental Services

BOREHOLE LOG

PROJECT
Environmental / Geotechnical Investigation -
Civic No. 5 Collins Street, Yarmouth, NS

LOGGED/DWN. BAM	CKD. RP	DATE OF INVEST. 19/11/09	JOB NO. 10516	HOLE NO. MW 4

CASING RESISTANCE blows/300mm

WC % wp-□ w-● wl-△ (10 20 30 40 50)

DEPTH ft / m

MODIFIED USCS | SOIL SYMBOL

SOIL DESCRIPTION

DATUM TBM : Top of Catch Basin, Assumed Elevation 100.00 metres

SURFACE ELEVATION 100.14 meters

SOIL SAMPLE: COND. | TYPE | PENE. RESIST.

DRILL TYPE: Drill Rig

Well Details | Other Tests

Depth (ft)	Depth (m)	Description	Sample TYPE
0	0	Asphalt Pavement	
0	0	FILL : sandy gravel, trace to some silt, loose to compact, moist, brown.	
1		FILL : silty sand, some gravel, occasional cobble, compact, moist, greyish brown.	
2			
3	1		
4			G
5		TILL : silty sand, some gravel, occasional cobbles, compact to dense, moist to wet, greenish grey. Petroleum Hydrocarbon odour detected.	
6			
7	2		
8			G
9			
10	3		
11			
12			
13	4	End of Borehole at 4.0 metres in Till. Groundwater level measurement taken on Nov. 19, 2009.	
14			
15			
16	5		

PLATE 14

APPENDIX C

Laboratory Test Results

MARITIME TESTING

TABLE C-1: SUMMARY OF LABORATORY DATA
Geotechnical Investigation
Proposed Commerical Development
5 Collins Street, Yarmouth NS

Borehole No.	Sample No.	Depth (m)	Description	Moisture Content (%)	Particle Size Distribution		
					Gravel (%)	Sand (%)	Fines (silts and clays) (%)
BH 2	1	0.6 - 1.2		16.7			
	2	1.2 - 1.8	TILL : silty sand some gravel	7.0	30	41	29
BH 4	1	0.6 - 1.2		15.2			
	2	1.2 - 1.8		18.1			

MARITIME TESTING
Consulting Engineering & Environmental Services
97 TROOP AVE., DARTMOUTH, N.S. B3B 2A7 - TEL (902) 468-6486 FAX 468-4919

METRIC SIEVE ANALYSIS REPORT

Client:
Town of Yarmouth
400 Main Street
Yarmouth, NS
B5A 1G2

Our Project No: 10516
Client Contract No.:
Client PO.:
CC:

Attn: Mr. Jeffrey Gushue
PHONE **FAX:** (902) 742-6244

Project: Phase I, II and Geo Investigation - 5 Collins Street, Yarmouth
Source: BH # 2
Sample No: 2
Location: 1.2 - 1.8 m
Date Sampled: 20-Nov-09
Sampled by: BML
Date Received: 20-Nov-09
Date Tested: 20-Nov-09

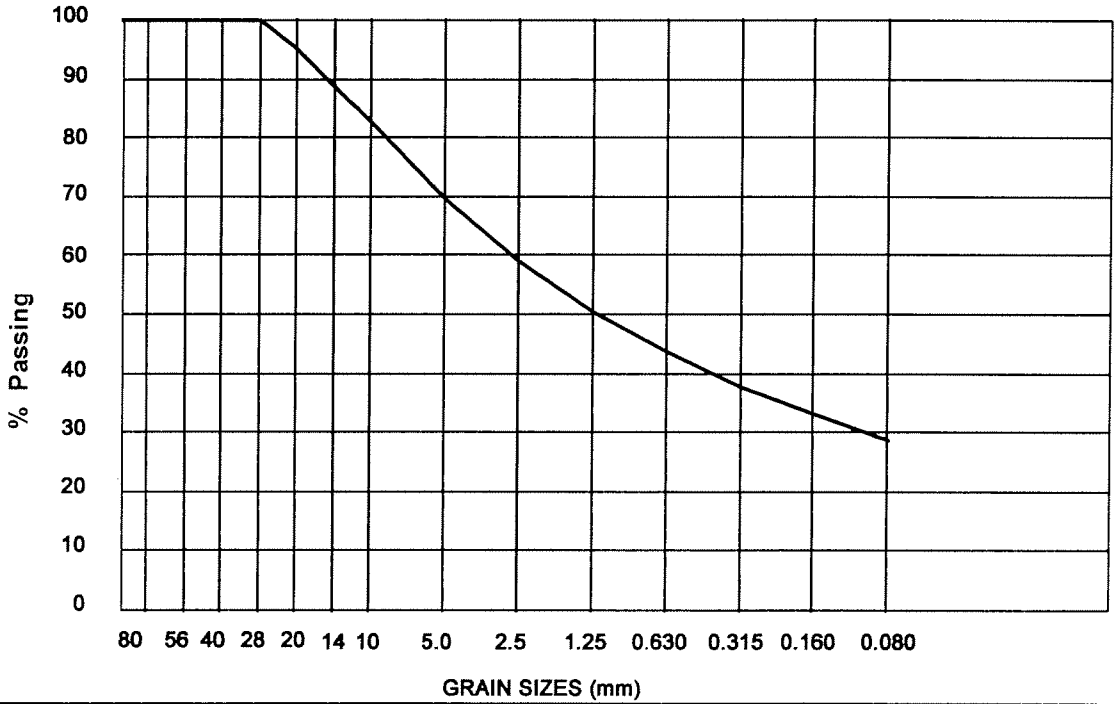
PHYSICAL PROPERTY TESTS

Soil Type	Till	Liquid Limit		Flat and Elongated Particles, %	
Gravel, %	30	Plastic Limit		Coarse Spec. Gravity	
Sand, %	41	Plasticity Index		Fractured Faces, %	
Silt and Clay, %	29	Coarse Absorption, %		Petrographic No.	
Moisture Cont., %	7	Fine Absorption, %		Max. Dry Density, (kg/m3)	
Abrasion Loss, %		Micro Deval Loss, %		Optimum Moisture, %	

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40		
28	100	
20	95	
14	88	
10	83	
5.0	70	
2.5	59	
1.25	50	
0.630	44	
0.315	38	
0.160	33	
0.080	28.8	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 5710 **MTL Tech:** BM **PER**

CERTIFIED LABORATORY FOR TESTING CONCRETE

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on request.

pm RP