FINAL

Mitigation of Leaking Abandoned Oil Well Casings
Shoal Point, NL

Submitted to:

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11 May 2017
Amec Foster Wheeler Project #: TF1612741

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1.0 INTRODUCTION

Amec Foster Wheeler Environment and Infrastructure, a division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), was retained by the Government of Newfoundland and Labrador Department of Municipal Affairs and Environment (MAE) to conduct a field investigation and to provide a report on observed oil seepage on the western shoreline of Shoal Point on the Port au Port Peninsula in Western Newfoundland (Figure 1) that has resulted in a visible sheen on the water in West Bay.

1.1 Scope of Work

The scope of work included three tasks: work scoping and consultation, an options analysis and completion of a report.

Work scoping and consultation included a background review, a health and safety plan for a site visit, and a field investigation. Each component of this task is described below:

- Review the existing information: This included reviewing all available information from the Department of Natural Resources (DNR), MAE, and the Canada-Newfoundland and Labrador Offshore Petroleum Board.
- Prepare a site-specific health and safety plan, including existing protocols for work in this area: During this phase Amec Foster Wheeler performed a hazard assessment of the site and develop a site-specific plan to safely perform work in the area.
- Conduct a field investigation: Amec Foster Wheeler conducted a visual inspection of the 2015 work and a visual investigation of seepage areas.

The results of the background review, field investigation, and regulatory review of the options with the DNR were used to inform the options analysis.

This report was produced as the final piece of the scope of work.

1.2 Study Area

The study area includes Shoal Point on the Port au Port Peninsula in western Newfoundland. Geological and background information related to the Port au Port Peninsula was assessed as part of this study. The field investigation included the seep area and visible well locations located on the western side of Shoal Point, located approximately 2.5 km south from the tip of the point (Figure 1).

2.0 BACKGROUND

Oil seepage is common on the Shoal Point Peninsula, such that drilling investigations have been undertaken for more than a century. At least 13 documented wells were drilled in the region between 1890 and 2012. Amec Foster Wheeler conducted a literature review in mid-2015 to try to determine the source of locally observed seepage. It was found that the location of the seepage did not correspond with any of the documented well locations, therefore indicating that the seepage originated from natural sources or from an undocumented well. Further investigation with a metal detector indicated that seepage was occurring through an undocumented well. Through the literature review and a site visit, two options for mitigation of seepage through an old, undocumented well casing were proposed (Amec Foster Wheeler, 2015a).

Later in 2015, Amec Foster Wheeler was retained by MAE to develop a methodology to excavate, expose and repair two abandoned leaking oil well casings at Shoal Point on the Port Au Port Peninsula. The casing of Well #1 was found under the beach sediment and Well #2 was approximately 0.2 m above ground surface. In both cases, the wells were exposed after a culvert was installed around each seep to separate the seep area from the water of West Bay. Oil seepage was observed within the Well #1 casing when it was exposed. Turbiditiy curtains and oil booms were also installed in West Bay to ensure that no silt or potential oil contamination escaped into West Bay. Well #1 was repaired using a Dresser coupler, encased in concrete, and schedule 40 steel extension pipe with all associated fittings, cap, pressure gauge and valve. Seepage was observed in the casing of Well #2 once Well #1 was repaired. It was then decided to repair Well #2 by welding an extension pipe and cap to the existing well. A representative of Amec Foster Wheeler was onsite to supervise the contractors conducting the work. Additional information available in Amec Foster Wheeler (2015b).

Upon completion of the repairs, no continued visual seepage was observed around either well casing and no pressure was shown on the gauges of either well. However, during spring of 2016, based on observations by Troy Duffy of MAE, sea ice damaged both sealed casings. Subsequently Well #1 was again demonstrating signs of oil seepage, likely a result of coupling seal disturbance by ice forces. Well #2 casing extension was observed to be sheared off at the weld location with the casing lying on the beach near the well, however there was no evidence of oil seepage.

A study was conducted by Memorial University of Newfoundland (Cook et al., 2017) to determine if the seepage area on Shoal Point was adversely affecting the scallop fishery. No evidence of hydrocarbon or metal contamination in the sediments, water, or mussels were detected, suggesting that the decline of the scallop fishery in Port au Port Bay cannot be explained by leaking hydrocarbons from the seepage area (Cook et al., 2017).

3.0 SITE VISIT

A site visit was conducted on November 9, 2016 by Clifford Smith and Titia Praamsma of Amec Foster Wheeler, Troy Duffy of MAE, and Stephen Wheeler, the constituency assistant to the local Member of the House of Assembly (MHA). The site visit consisted of visiting the reportedly leaking wellheads during low tide and a tour of the local geology. The weather was sunny and 8°C. A photo log of the site visit is included in Appendix A.

The wellheads were reached by driving to the northern tip of Shoal Point and walking approximately 2.5 km south on the beach. The wellheads were partially submerged, as the site visit was conducted after low tide. The two well casings that were repaired by Amec Foster Wheeler in 2015 were visited at this time. The welded extension casing of Well #2 was apparently sheared off and the extension casing was still in place on Well #1. Before and after photos are included in Appendix A.

The tour of the local geology consisted mainly of a visit to the Agauthuna Quarry and to view outcrops of the Green Point Shale at Piccadilly. At the Aguathuna Quarry, there is a pile of petroleum rich rocks of Carboniferous age that was transported to the quarry from Hooper's Brook, in Boswarlos, on the Port-au-Port Peninsula. The outcrops of the Green Point Shale on the northern shore of Piccadilly clearly show the faulted nature of the rock, as well as petroleum staining on some of the shale layers.

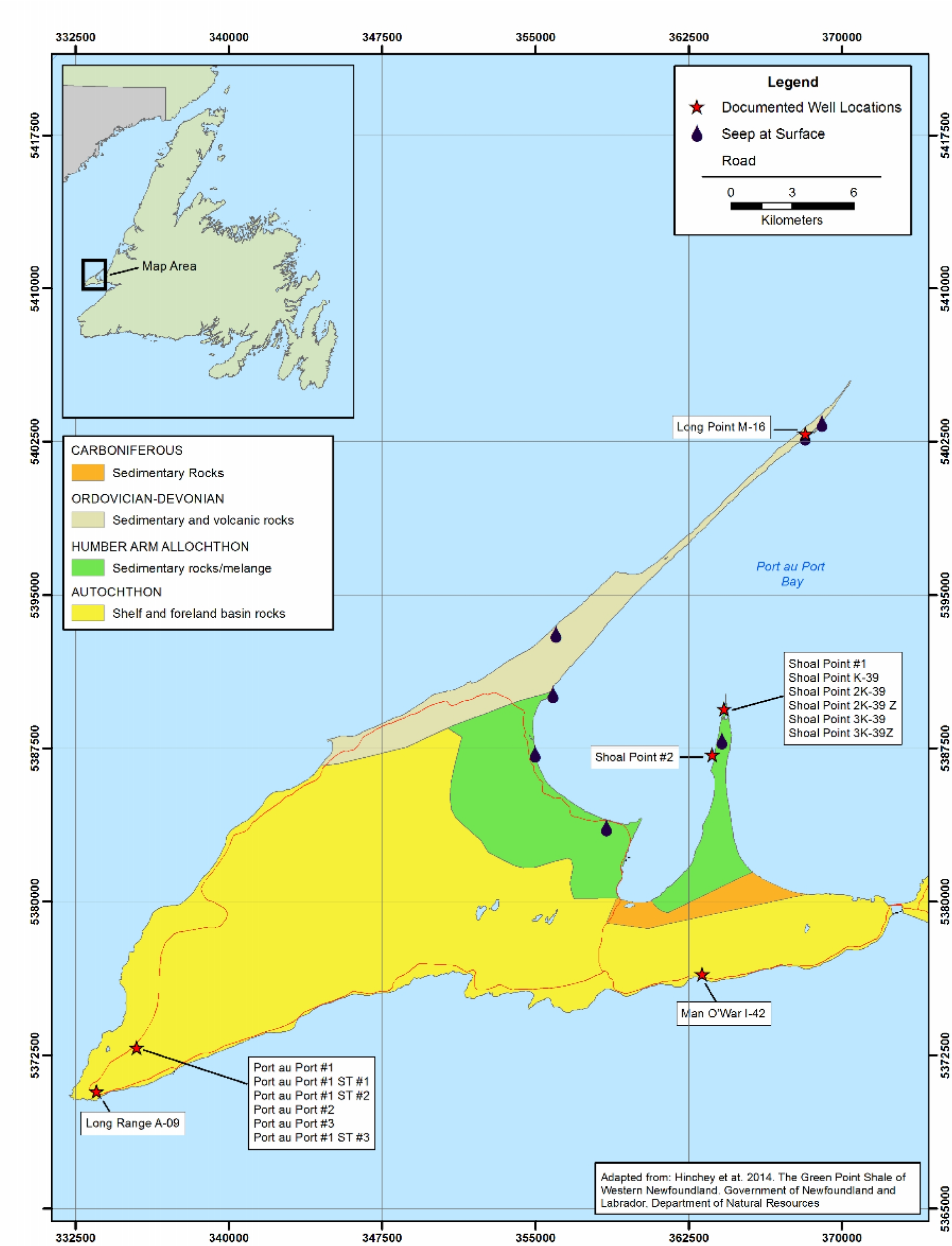

Figure 1 Port au Port Peninsula Showing Locations of Documented Wells and Seeps.

4.0 FINDINGS

The results of the study indicate that oil seepage has been observed at the study location for over 120 years in the leaky vertical beds of the Green Point Shale, resulting in ad hoc well drilling that may have created larger conduits for oil seepage if the wells were not properly cemented. The results of the geological interpretation, a description of the local well casings, optimal oil casing design, and shoreline erosion are presented in the following sections.

4.1 Geology

The bedrock geology in the vicinity of the observed seepage consists of vertically dipping, folded and faulted sedimentary sequences of the Humber Arm Allochthon (Williams and Cawood, 1989; Figure 2). A fault-bounded, large anticlinal structure beneath Shoal Point is considered an ideal location for oil exploration (Cooper et al., 2001; Hinchey et al., 2014). The sedimentary sequences were laid down prior to the Taconic Orogeny, which faulted and uplifted the carbonate and shale sedimentary sequences of the Humber Arm Allochthon (Hinchey et al., 2014).

The Taconic Orogeny occurred approximately 460 million years ago when North America and the Dashwood's micro-plate collided due to subduction of tectonic plates under North America. During this time period, rocks that were laid down up to 200 km east of Shoal Point were thrust on top of rocks of the same age, at the location of Shoal Point. The rock formation that was thrust over the rocks on Shoal Point form part of the Green Point Formation, within the Cow Head Group. These rocks that were thrust over are called allochthonous because they reside far from where they were deposited.

The Green Point Formation within the Humber Arm Allocthon, also known as the Green Point Shale, structurally overlies the St. George Group (see Figure 2). The St. George Group consists of a thick layer of limestones and dolomites (carbonate conglomerate) that were laid down during the same time period as the Green Point Formation. The St. George Group is autochthonous, meaning that the Group resides where it was deposited.

Exposed bedrock is limestone and shale in thin beds, steeply to vertically dipping, folded and faulted (Williams and Cawood, 1989). Core records for Shoal Point (Golden Eagle, 1965a; Golden Eagle, 1965b; Hinchey et al., 2014) indicate that the Green Point Formation of the Humber Arm Group reaches depths of approximately 2000 m below ground surface, below which the autochthonous (local) shelf succession and basement rocks lie.

The surficial geology is a beach and near shore environment. The stratigraphy at the high tide mark consists of bog as thick as three metres overlying a thin layer of bluish grey glaciomarine sediment (silt/clay/sands/gravel with the occasional boulder). Bedrock outcrops are abundant at the low tide mark and further out into the shallow water. Liverman and Taylor (1993) describe the surficial geology as accumulations of organic matter (bog).

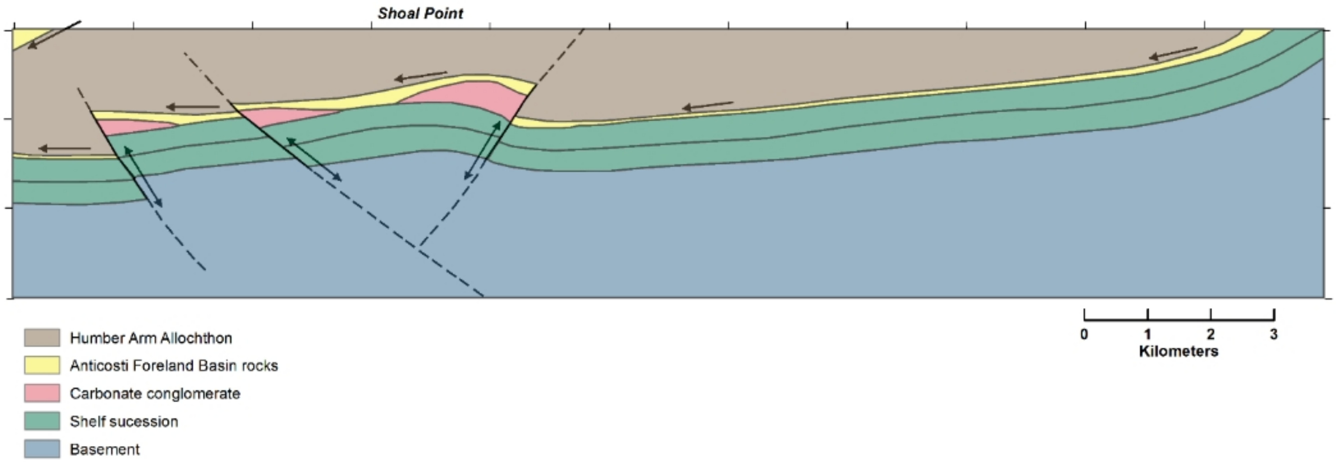

Figure 2 Cross section at the northern point of Shoal Point (adapted from Hinchey et al., 2014).

On the Port au Port Peninsula and in other parts of Western Newfoundland, the thrusting of the Green Point Shale onto the St. George Group of carbonates created a cap rock for oil and gas for accumulation within the St. George Group. At Shoal Point, the Green Point Shale lies in a vertical orientation (Corkin, 1965; Figure 3a). The vertical orientation of these finely bedded shale layers have allowed seepage of natural petroleum to occur and be visible at the ground surface. Figure 4 depicts historical hydrocarbon occurrences in Western Newfoundland, illustrating how common hydrocarbon seeps, shows and well drilling is in the area (DNR, 2017a).

In the early 1960s, Golden Eagle Refining Company of Canada Limited commissioned a study of the petroleum geology of the Port au Port Peninsula (Corkin, 1965). Corkin (1965) recommended drilling on Shoal Point to the basement rock to explore the potentially favourable reservoir rocks of the March Point / Petit Jardin Formations and the St. Georges Group. He noted that the carbonates were located under the tilted shales, allowing for natural oil seepage. Two wells were drilled by the Golden Eagle Refining Company (Golden Eagle, 1965a: Shoal Point #1 and Golden Eagle, 1965b: Shoal Point #2) as a result of Corkin's (1965) recommendations.

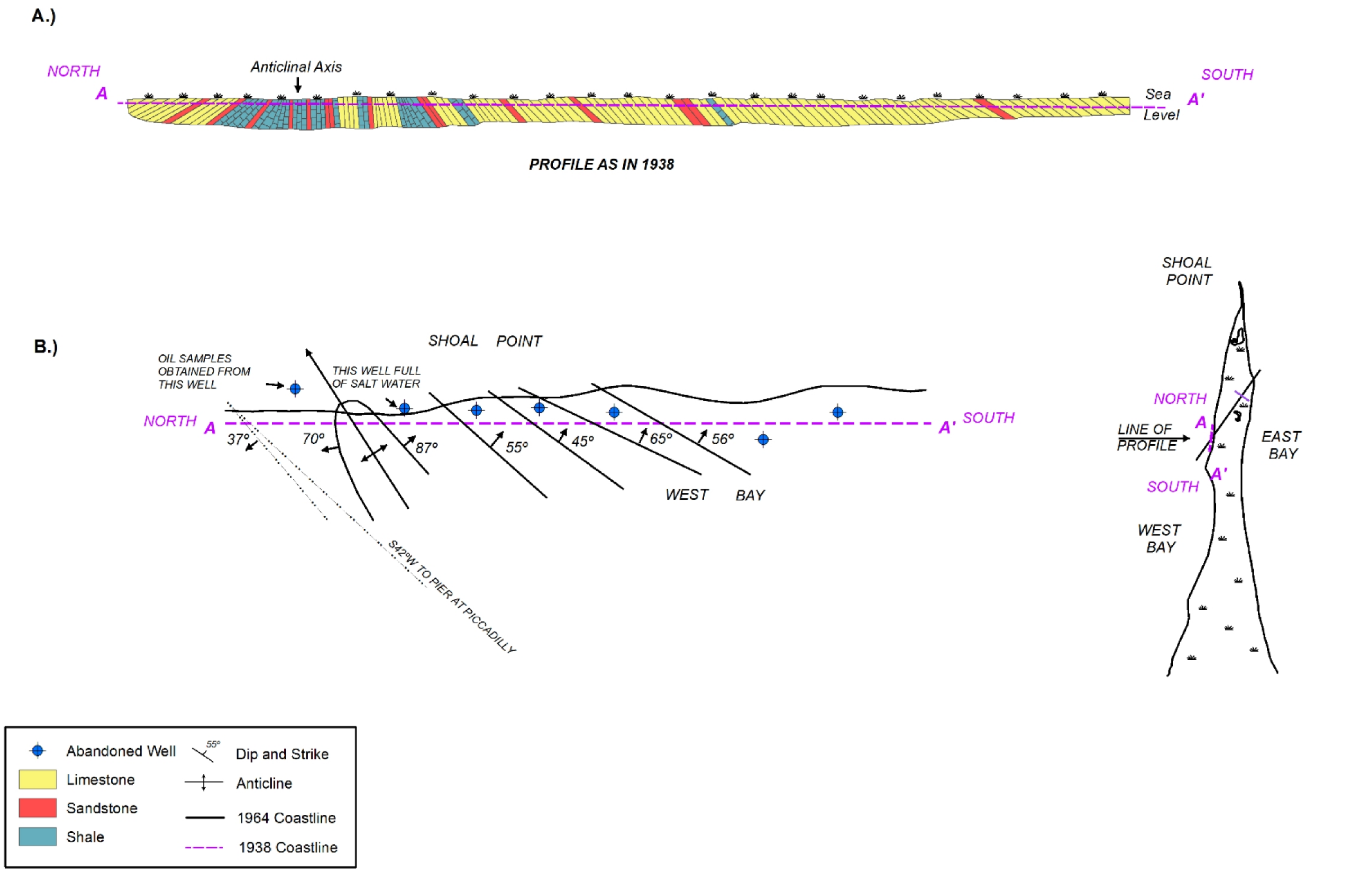

Figure 3 Depiction of steeply dipping beds (a) and (adapted from Corkin, 1965) and locations of seven wells described by Corkin (1965) at the current study location (b).

4.2 Shoal Point Wells

Hicks and Owens (2014) indicate the first known record of liquid hydrocarbon seepage at Shoal Point was documented by James Howley, a government geologist, in 1874 (Murray and Howley, 1881). The presence of oil seepage in this area sparked ad hoc well drilling activity around 1898, with the Western Oil Company of New Brunswick drilling four to six wells at Shoal Point (Hicks and Owens, 2014; Benoit First Nation, 2002). It is reported in Benoit First Nation (2002) that oil was found at 800 feet but the quantities were too low to justify a commercial operation. An unnamed English company is also reported to have drilled at least one well and maybe up to seven wells in the area in 1908 or 1911 (Benoit First Nation, 2002; Hicks and Owens, 2014). Drilling records are not available for these early wells.

Up to eleven wells were drilled at the study location prior to 1965 (Corkin, 1965; Fleming, 1970; Hicks and Owens, 2014). Corkin (1965) reports that seven wells were drilled at the turn of the 20th century, 2.5 km south of the tip of Shoal Point to total depths of 168 – 684 ft, producing 20 barrels per day. Figure 3B shows the observed well locations from Corkin (1965). Five years later, Fleming (1970) reports that four wells were drilled in 1898 at the same location by a Mr. Andrews of St. Stephen, New Brunswick and that three of the wells encountered oil at depths between 168 – 684 ft, producing 10 barrels per day. Another conflicting report of well drilling at the study area is that nine wells were drilled at the same location to a maximum depth of 1200 ft (Schuchert and Dunbar, 1934). One rough well log is documented in Fleming (1970) for a well drilled in 1899 to a total depth of 270 ft that yielded oil at 220 ft in a brown sandstone. Due to the conflicting reports, it is not known how many wells were drilled in the area of the observed seepage. However, it is plausible that two of the nine wells documented by Schuchert and Dunbar (1934) were underground, while the seven that were observed by Corkin (1965) were above ground. Our findings indicate that Well#1 and Well#2 were likely part of the drilling campaign at the turn of the 20th century.

The remaining two historical wells at Shoal point are the well documented Golden Eagle wells (Golden Eagle, 1965a; 1965b). One well was drilled at the tip of Shoal Point (No 1) to a total depth of 2475 ft and the other was drilled at the seep location to a total depth of 2355 ft. Five wells were drilled in the area of the northern tip of Shoal Point between 1999 and 2012 (Figure 1). In addition to the well drilling activity, Hicks and Owens (2014) indicate that live oil shows, where liquid or tacky oil is seen at the surface, remain common at Shoal Point.

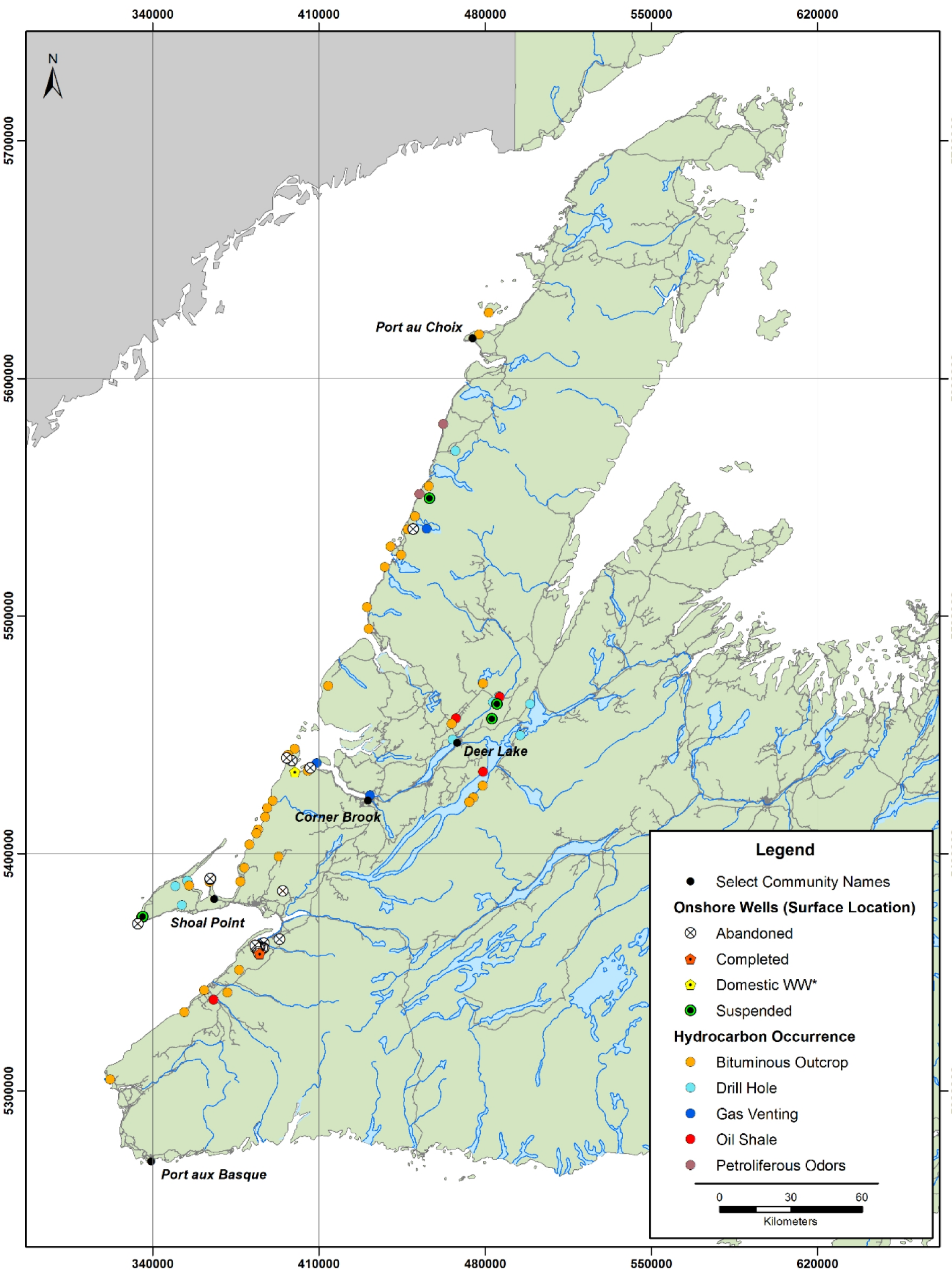

Figure 4 Hydrocarbon occurrence in Western Newfoundland (adapted from DNR, 2017a).

4.3 Oil Casings

Modern oil and gas wells are designed to inhibit migration of oil and gas to near surface aquifer systems and surface water bodies. The lifetime of an oil and gas well consists of well design, drilling, completion, production and abandonment.

Ideal well design and construction consists of a conductor pipe, surface casing, intermediate casing, production casing and production tubing, as shown in Figure 5. An important step, in terms of potential oil and gas migration to the surface, is effective cement sealing between the outside of the drill hole and the surface casing and between the other two casings. Cementing ensures a competent seal between the oil and gas producing layers and freshwater and marine ecosystems. Cementing between the surface and intermediate casings and intermediate and production casings are designed to provide extra protection and barriers to these systems that are vulnerable to contamination without an effective barrier.

Cementing is also the primary barrier for oil and gas leakage during well abandonment. Modern well decommissioning practices are approximately 60 years old (Dusseault, 2016) and consist of strategic placement of mechanical packers and cement seals at depth, corresponding with permeable rock formations that may contain oil and gas, as well as 10 m of cement plug at the top of the well bore.

There are issues that can occur with cementing that can affect the integrity of the well bore (Dusseault, 2016). Issues include:

- Unequal cement thickness and/or incomplete cementing, particularly if the borehole orientation changes from vertical to horizontal at depth;
- Cement can shrink during or after setting, causing micro-fractures in the cement;
- Water loss from cement in high permeability rock formation, diminishing the quality of the cement; and
- Pressure in the production casing, causing stress on the cement.

Potential cement shrinking is of particular concern as it can lead to leakage around the well casing through the micro-fractures. Slow gas seepage is common in western Canada though these micro-fractures. Oil seepage through micro-fractures in cement, however, does not generally occur (Dusseault, 2016).

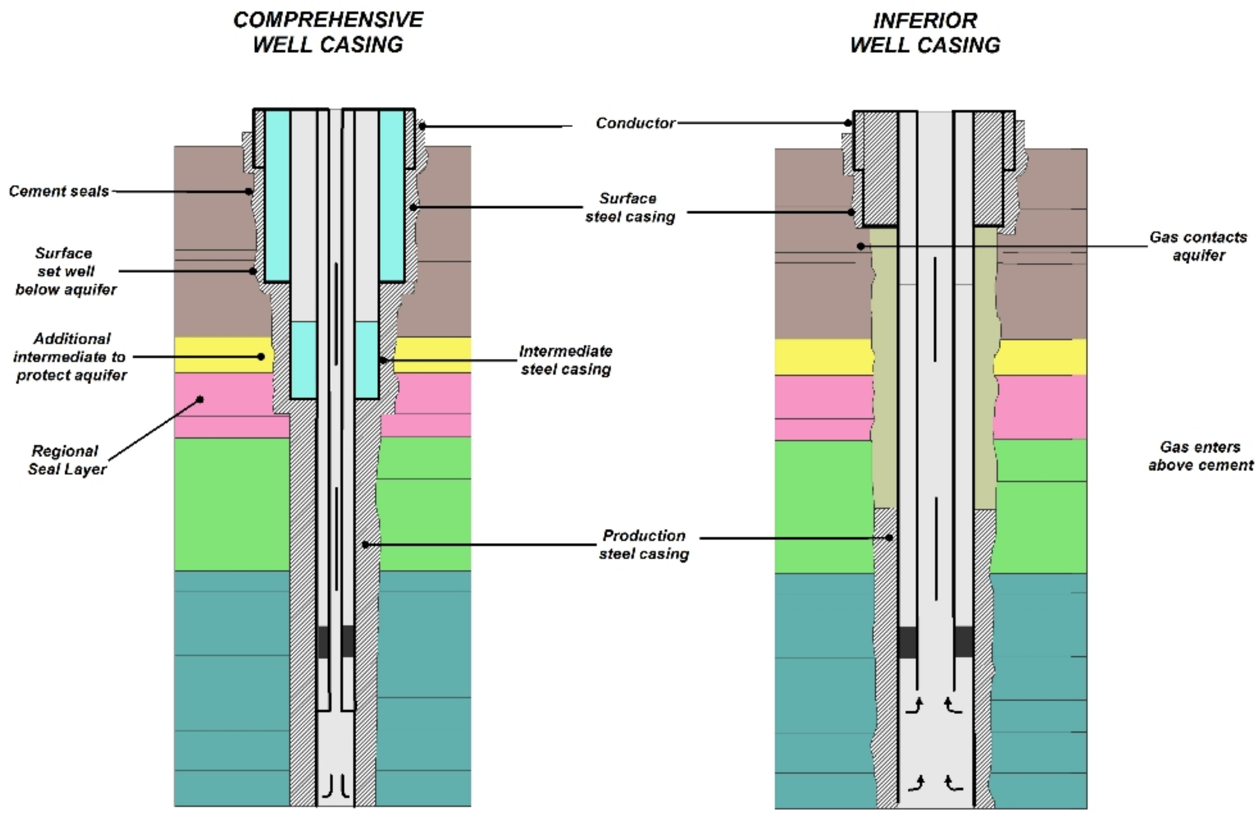

Figure 5 **Depictions of a comprehensive (ideal) well casing and an inferior well casing (adapted from Cuadrilla Resources).**

4.4 Shoreline erosion

The whole of Shoal Point is showing the effects of global sea level rise and local subsidence. The flat nature of the land makes these effects more dramatic as a small vertical rise of water level translates into a significant horizontal distance, creating a dramatic loss of shoreline. Catto (2001) and Irvine (2015) describe the beach as a steep sand and gravel beach that is prone to erosion. The erosion of the shoreline has resulted in the well casings being offshore, especially during high tide. Analyses of air photos taken in 1949, 1959, 1998, and 2008, indicate that shoreline erosion occurs at a rate of approximately 0.5 m/year (Figure 6).

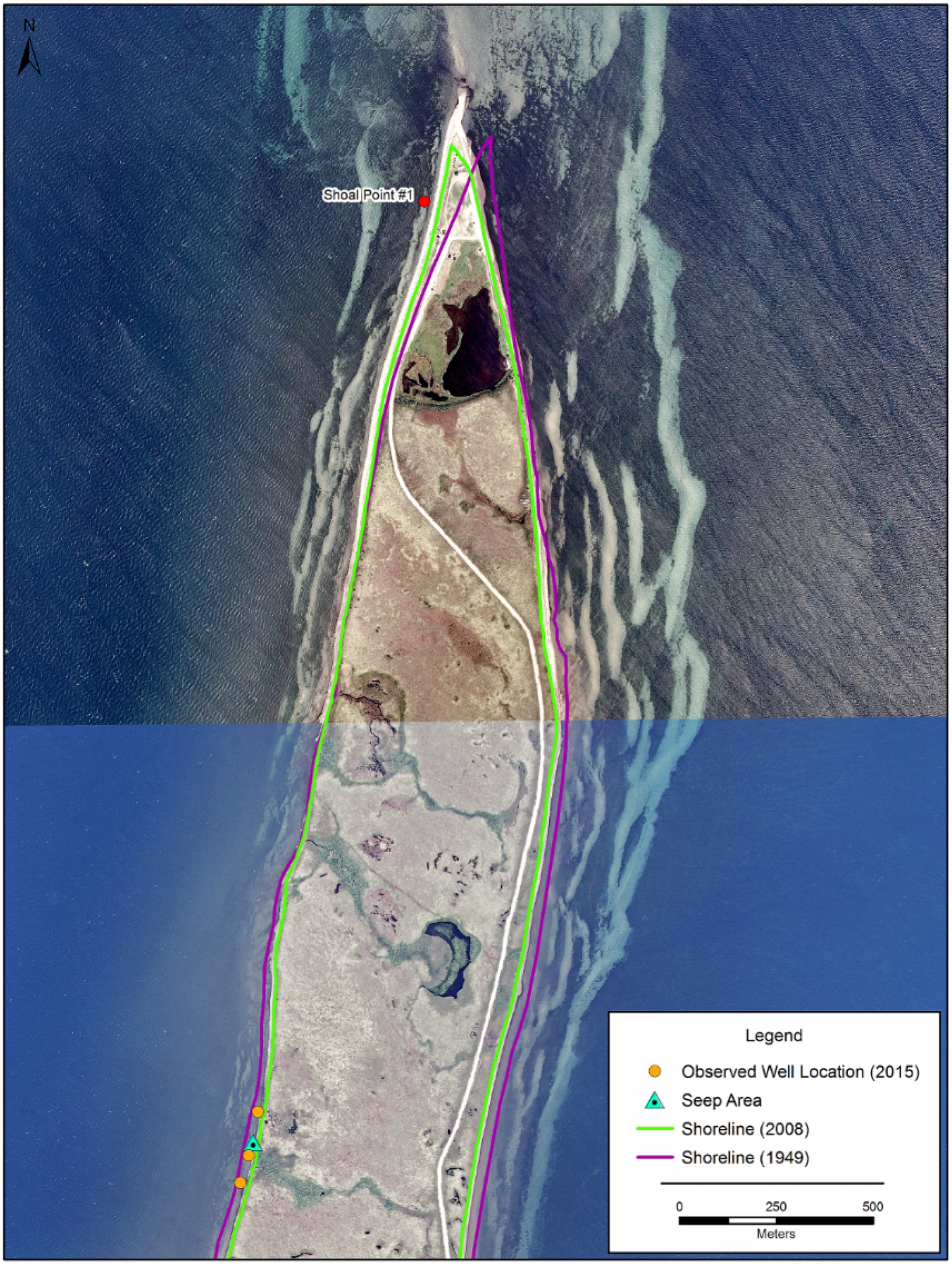

Figure 6 Effects of shoreline erosion between 1949 and 2008.

5.0 OPTIONS ANALYSIS

A full options analysis table is included in Appendix B, with a cost estimate for each in Appendix C. Each option is described below in detail.

5.1 Option 1 - Monitoring

Option 1 is to continue to monitor the seepage locations and record the observations. Monitoring of the seepage can be performed either internally within MAE or externally by a consultant.

The advantages of continuing to monitor the seepage locations include the following:

- Low short-term cost;
- May have the same net effect as other options;
- Passive, low-risk approach; and
- If seepage moves from casing area to another area, with seepage through existing vertical geology (not casing), this is best option.

The disadvantages of monitoring the seepage locations include:

- Requires inspections and potential monitoring;
- Potential long term costs (i.e. from monitoring program);
- Oil seepage continues from the inside of the casings and is visible;
- Oil seepage may occur outside the casing;
- Potential need for effects monitoring; and
- Delaying potentially inevitable action or remediation.

5.2 Option 2 – Cap

Option 2 is to repair the damaged wells that were originally repaired in 2015. The 2015 repairs extended the well casing approximately 1.5 m above mean sea level. The repairs proposed for this option would be to seal the pipes in a similar manner to the repairs in 2015 but to terminate the extension/seal below the beachline and seabed. This would minimize any potential damage from sea ice/pack ice.

Option 2 would utilize a large diameter, multi-plate culvert which would isolate the work zone (oil well casing) from the tidal currents. This system, in conjunction with sump pumps, will assist in providing a dry working area to conduct work. As with the previous repairs, all hydrocarbon contaminated materials that are excavated will be removed and placed into approved receptacles positioned above the high tide zone on the beach. The area surrounding the work zone will be protected with silt curtain oil absorbent booms. The oil well casing would be terminated below the seabed, backfilled with a low slump concrete and capped to prevent seepage from the casing opening. The well casing would then be covered with original seabed material to match original seabed grade.

The estimated cost for this work is approximately $200,000 plus access to the site. Site access will be required to be constructed from Shoal Cove Access Road on the east side of the point to the west shore of the point. The length of this road is approximately 450 m and will cross a bog. In an effort to minimize disturbance, high performance geogrid, filter fabric and rock fill will be placed. The access road would cost approximately $100,000 and can be removed at the completion of the project. Detailed design, tender specifications, project management and contract supervision are not included in this estimate.

The advantages of recapping the damaged wells that were temporarily repaired in 2015 include:

- Leakage from inside casing may be halted for some time;
- Casings are below beach surface and out of ice;
- May not require road on the bog or significant development or infill/structure onshore at location of casings; and
- Capability to perform scope can be completed by local contractors.

The disadvantages of capping the damaged wells are:

- Leakage outside casing is still possible;
- Seepage may occur;
- Casing cement plug may only be limited in depth or length relative to full casing or hole depth. This may result in leakage finding another path to surface or visibility;
- Work schedule affected by tides; and
- Capping may corrode.

5.3 Option 3 – Well Abandonment

Option 3 is to complete full well abandonments of the two wells that were repaired in 2015. This option will require extensive site work to enclose the work area, utilizing a built up access point and work platform with silt curtain oil absorbent booms. This will allow for work zone access and equipment setup at the well casing. Well abandonment will require the well casing to be drilled out to its full depth followed by the strategic placement of mechanical packers and cement seals at depth, as well as 10 m of cement plug at the top of the well bore, as per Regulation 1150/96 of the Petroleum Drilling Regulations under the Petroleum and Natural Gas Act (DNR, 2017b)

Due to the quantity of material required to construct the containment berm, an access road will be required to be constructed as described in Option 2. The estimated cost for Option 3 is approximately $1,000,000, which includes the cost of the road. Detailed design, tender specifications, project management and contract supervision are not included in this estimate.

The advantages of full well abandonment include:

- Well abandoned as per current guidelines; and
- Casing gone from ground and no longer a topic for visibility and ice damage.

The disadvantages of full well abandonment are:

- High cost;
- Will likely affect the bog with road;
- Seeps may recur and continue;
- May require drilling contractor from mainland Canada, increasing the mob/demob prices; and
- Work schedule affected by tides.

6.0 DISCUSSION AND CONCLUSIONS

This report summarizes the findings and work completed by MAE and Amec Foster Wheeler associated with recent (2015) seepage of Well #1 and Well #2 at Shoal Point, NL. Available documentation reviewed concerning the history of oil and gas exploration at Shoal Point suggests that Well #1 and Well #2 were drilled in the late 1800's, however no drilling logs or casing installation information has been found. A summary of the geology of Shoal Point has also been undertaken and documented with a basic background outline on industry standard practices associated with installation and abandonment of oil and gas well casings. At present, insufficient data are available to assess the volumes and frequency of seeps. Based on these findings it is apparent that the efforts made in late 2015 have been ineffective in completely halting oil seepage at Shoal Point, however oil seepage decreased before ice damaged the capped casings, early in 2016.

Given the vertical nature of the bedding within the Green Point Formation at Shoal Point, it is possible, even with mitigative measures in place, that such leakage may continue naturally through nearby bedrock or outside of casings in disturbed bedrock. A range of mitigative measures have been outlined, including monitoring, capping and well abandonment. Due to the uncertainty of the cause of seepage and the sporadic observations, it would be diligent to continue to monitor the seepage locations and record the observations for further assessment of Options 2 and 3.

7.0 CLOSURE

This report has been prepared for the exclusive use of the Government of Newfoundland and Labrador, Department of Municipal Affairs and Environment. The assessment was conducted using standard assessment practices and in accordance with written requests from the Client. No further warranty, expressed or implied, is made. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Amec Foster Wheeler accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. The limitations of this report are attached in Appendix D.

Yours sincerely,

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APPENDIX A: SITE PHOTOGRAPHS

Photo 1 Steeply dipping beds of the Green Point Formation

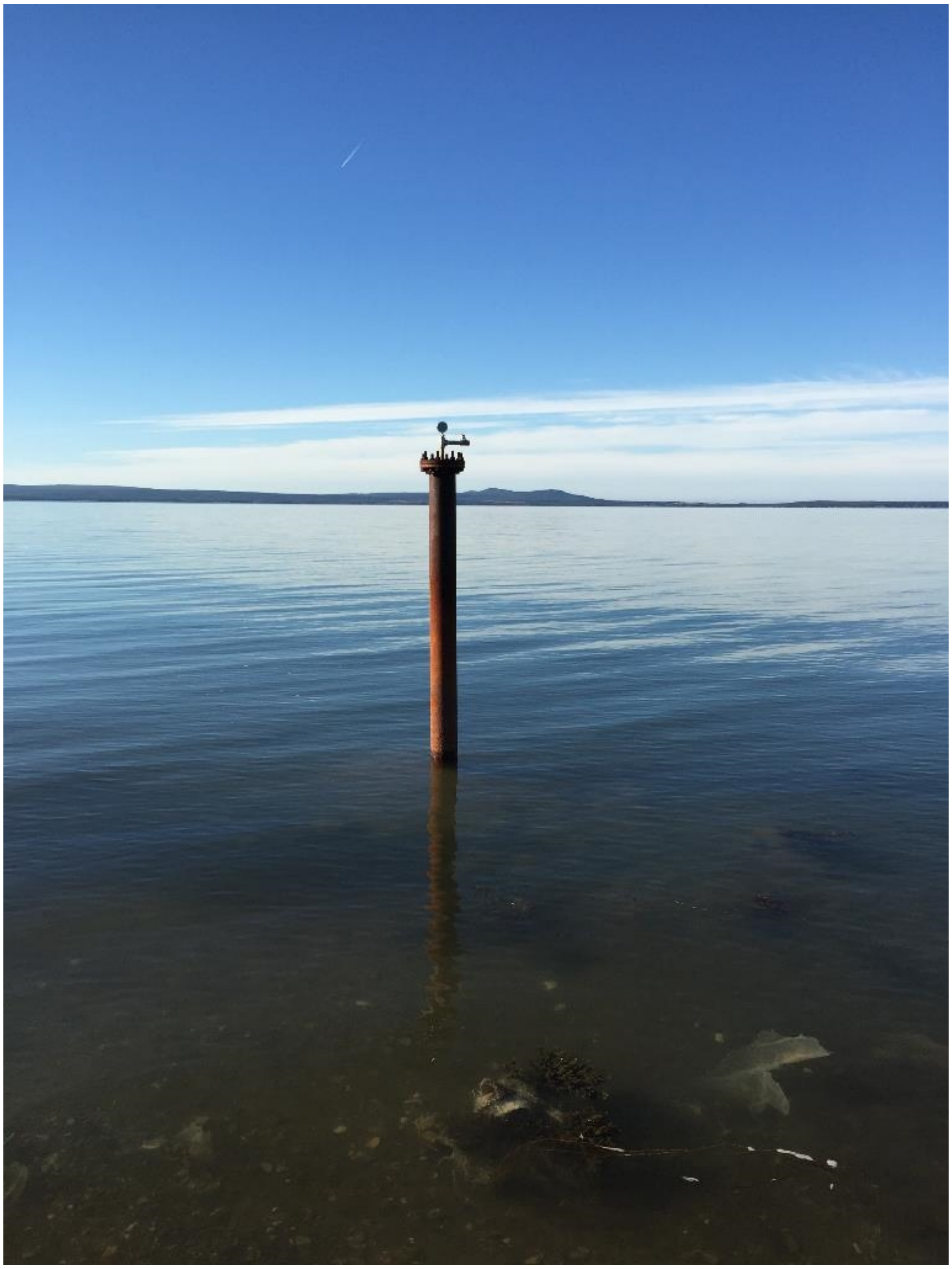

Photo 2 Well #1 that was extended in 2015.

Photo 3 Seepage from Well#1 in May, 2016.

Photo 4 Well#2 as completed in November, 2015.

Photo 5 Casing from Well #2 in May, 2016.

Photo 6 Shoal Point #2 casing from 1965.

Photo 7 Erosion and faulting of bog northest of the study location.

Photo 8 Sample of bituminous barite-celestite found at the quarry in Aguathuna.

Photo 9 Steeply dipping beds of the Green Point Shale found in Picadilly.

APPENDIX B: OPTIONS ANALYSIS

Table 1 Options Analysis

Remedial Technology / Approach	Approach or Methodology	Advantages	Disadvantages	Construction Duration	Estimated Longevity of Approach	Estimated Cost	Probability of Oil Seepage Reduction
Monitoring	Continue to monitor the seepage locations and record the observations.	• Low short-term cost. • May have the same net effect as other options. • Passive, low-risk approach. • If seepage moves from casing area to another area, with seepage through existing vertical geology (not casing), this is best option.	• Requires inspections and potential monitoring. • Potential long term costs (i.e. from monitoring program). • Oil seepage continues from the inside of the casings and is visible. • Oil seepage may occur outside the casing. • Potential need for effects monitoring (e.g. scallops etc.) • Delaying potentially inevitable action or remediation.	N/A	N/A	Depends on monitoring technique(s)	LOW
Cap	Repair the damaged well(s) and cap the well(s) below ground surface.	• Leakage from inside casing may be halted for some time. • Casings are below beach surface and out of ice. • May not require road on the bog or significant development or infill/structure onshore at location of casings. • Capability to perform scope can be completed by local contractors.	• Leakage outside casing is still possible. • Seepage may occur. • Casing cement plug may only be limited in depth or length relative to full casing or hole depth. This may result in leakage finding another path to surface or visibility. • Work schedule affected by tides. • Capping may corrode.	One week	Several years to infinite	$200,000[2] plus access to the site ($100,000) and cost for design, tender, project management and supervision	MEDIUM
Well Abandonment	Abandon both wells as per Regulation 1150/96 of the Petroleum Drilling Regulations under the Petroleum and Natural Gas Act.	• Well abandoned as per current guidelines. • Casing gone from ground and no longer a topic for visibility and ice damage.	• High cost • Will likely affect the bog with road. • Seeps may recur and continue. • May require drilling contractor from mainland Canada, increasing the mob/demob prices. • Work schedule affected by tides.	One month	Indefinitely	$1,000,000[2] plus access to site and platform ($150,000) and cost for design, tender, project management and supervision	HIGH

Notes:
1. Probability of success decreases for capping only if leakage is occurring around the casing, not only inside the casing as previously observed.
2. Price included per well. Additional wells may be completed, at the same time as the first well, at a lower incremental cost.
3. Natural seepage could occur elsewhere regardless of the chosen solution.

APPENDIX C: COSTING

Table 2 Costing of Options

Remediation or Risk Management Strategy	Major Work Component and Estimated Cost	Estimated Cost
Monitoring	**Estimated Total**	**$0**
Cap	Mobilization & Demobilization	$15,000
	Cash Allowance	$10,000
	Environmental Requirements	$70,000
	Projects Signs	$2,500
	Excavation, Trenching & Backfilling	$70,000
	Pipe Culverts	$15,000
	Water Mains (Casing Terminations)	$15,000
	Cast-in-Place Concrete	$5,000
	Estimated Total	**$202,500**
Access Road	Mobilization & Demobilization	$10,000
	High Performance Geo-grid	$25,000
	Rock Fill	$30,000
	Removal of Rock Fill and Geo-grid	$25,000
	Contingency	$10,000
	Estimated Total	**$100,000**

Well Abandonment	Mobilization & Demobilization	$150,000
	Site Preparation and Site Utilities	$100,000
	Environmental Requirements	$100,000
	Projects Signs	$5,000
	Rig up and Ready to Spud	$50,000
	Rig Operations	$250,000
	Drilling Fluids and Chemicals	$50,000
	Cement and Bridge Plugs	$50,000
	Site Supervision, HSE and Security	$50,000
	Surface Equipment and Rentals	$35,000
	Waste Management and Disposal	$50,000
	Access Road	$100,000
	Estimated Total	**$990,000**

APPENDIX D: LIMITATIONS

LIMITATIONS

1. This report was prepared specifically for the Client (MAE). Any other use which a third party makes of this report, or any reliance on or decisions to be made based on it are the responsibility of such third parties. Amec Foster Wheeler Environment & Infrastructure accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.
2. The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.
3. The services performed and outlined in this report were based, in part, upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the site which are unavailable for direct observation reasonably beyond the control of Amec Foster Wheeler Environment & Infrastructure.
4. The objective of this report was to assess the environmental conditions at the site, given the context of our contract, with respect to existing environmental regulations within the applicable jurisdiction. Compliance of past owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.
5. The site history research performed herein relies on information supplied by others, such as local, provincial and federal agencies as well as the homeowner. No attempt has been made to independently verify the accuracy of such information, unless specifically noted in our report.
6. Our visual observations relating to potential contaminant materials in the environment at the site are described in this report. Testing of soil samples included field screening and analytical testing for specific parameters referred to in the report. Testing of groundwater samples included analytical testing for specific parameters referred to in the report. It should be noted that other compounds or material may be present in the site environment.
7. The conclusions of this report are based in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the site in locations not specifically investigated. Should such an event occur, Amec Foster Wheeler Environment & Infrastructure must be notified in order that we may determine if modifications to our conclusions are necessary.
8. The work performed in this report was carried out in accordance with the Standard Terms of Conditions made as part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.