



# PROJECT REGISTRATION

(In accordance with the Requirements of the Newfoundland and Labrador Environmental Protection Act)

FOR THE

## GARDEN HILL SEISMIC EXPLORATION PROGRAM

ON THE PORT AU PORT PENINSULA, NL

**JUNE 8, 2007**

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## FOR THE GARDEN HILL SEISMIC EXPLORATION PROGRAM ON THE PORT AU PORT PENINSULA, NL

Prepared on Behalf of:

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in association with



Environmental  
Management

**JUNE 8, 2007**

# Table of Contents

Page

Table of Contents .....	ii
List of Figures .....	iii
List of Tables .....	iii
1. NAME OF UNDERTAKING .....	1
2. PROPONENT .....	1
2.1 Proponent Name and Contact Information .....	1
2.2 Proponent Profile .....	2
3. THE UNDERTAKING .....	4
3.1 Nature of the Undertaking .....	4
3.2 Rationale for the Undertaking .....	4
3.3 Public Consultations .....	6
4. DESCRIPTION OF THE UNDERTAKING .....	7
4.1 Existing Physical Environment .....	7
4.1.1 Geology .....	8
4.1.2 Surface Water Bodies and Groundwater .....	9
4.1.3 Weather Conditions and Climate .....	13
4.1.4 Land Use .....	15
4.2 Existing Biological Environment .....	23
4.2.1 Terrestrial Ecosystem .....	23
4.2.2 Notable Areas .....	40
4.3 Description of 2D Seismic Survey Activities .....	42
4.3.1 Program Overview .....	42
4.3.2 Equipment .....	42
4.3.3 Project Phases .....	42
4.4 Description of 3D Seismic Survey Activities .....	45
4.5 Potential Conflicts .....	46
4.5.1 Potential Land Use – Project Conflicts .....	46
4.5.2 Potential Environment – Project Interactions .....	46
4.5.3 Field Guide for Environmental Safeguarding for Onshore Seismic Activities .....	46
4.6 Occupations .....	49
4.6.1 Hiring Plans and Policies .....	49
5. APPROVAL OF THE UNDERTAKING .....	50
6. SCHEDULE .....	50
7. FUNDING .....	51
8. REFERENCES .....	51
Appendix A: PDIP’s Environmental Policy Statement .....	A-1
Appendix B: PDIP’s Human Resources Policy Statement .....	B-1

## List of Figures

	Page
Figure 2-1	PDIP’s Interests on the Port au Port Peninsula.....3
Figure 3-1	Port au Port Lease Area and Proposed Seismic Survey Areas. ....5
Figure 4-1	Shaded Relief Map of Port au Port Peninsula.....8
Figure 4-2	Watersheds of the Port au Port Peninsula. ....10
Figure 4-3	Drilled Groundwater Well Locations. ....12
Figure 4-4	Wind Rose Diagrams for January, April, August, October. ....15
Figure 4-5	Road System of the Port au Port Peninsula.....16
Figure 4-6	Town Boundaries, Road System, Waste Disposal Sites, and Infilling Limits. ....17
Figure 4-7	Locations of Regional Pastureland, Private Parks, Archaeological Sites, and Silviculture Sites on the Port au Port Peninsula. ....19
Figure 4-8	Mines, Quarries, Mineral Claims, and Fee Simple Mining Leases of the Port au Port Peninsula. ....21
Figure 4-9	TekOil’s Proposed 3D Seismic Survey and Location of Recent Oil Wells Drilled on the Port au Port Peninsula. ....22
Figure 4-10	Locations of Rare Plants and Associated Habitat Types on the Port au Port Peninsula.....25
Figure 4-11	Notable Biological Areas in Port au Port Peninsula Area.....41
Figure 4-12	Typical Cut Survey Line. ....43
Figure 4-13	Typical Seismic Drill Rig Crossing a Temporary Bridge.....44
Figure 4-14	Seismic Data Acquisition Process.....45
Figure 4-15	Potential Areas of Land Use – Project Interactions.....47
Figure 4-16	Potential Areas of Biological Environment – Project Interactions.....48

## List of Tables

	Page
Table 3-1	Summary of Comments, Questions, and Issues.....6
Table 4-1	Watershed Characteristics on the Port au Port Peninsula. ....11
Table 4-2	Percentage of Wind by Direction.....14
Table 4-3	Monthly Highest 10 Metre Wind Speed (rounded to the nearest m/s) from each Direction. ....14
Table 4-4	Definition of ‘S-Ranks’ Used by the Atlantic Canadian Conservation Data Centre. ....23
Table 4-5	Study Area Plants and Associated S-Ranks. ....30
Table 4-6	SARA-, COSEWIC- and <i>ESA</i> -listed Species with Reasonable Possibility of Occurrence on the Peninsula.....37
Table 4-7	Breakdown of Occupations Anticipated for the 2D Seismic Survey.....49
Table 5-1	Required Government Permits, Approvals, and Authorizations.....50

## 1. NAME OF UNDERTAKING

Garden Hill Seismic Exploration Program

## 2. PROPONENT

### 2.1 Proponent Name and Contact Information

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## 2.2 Proponent Profile

PDI Production Inc. (PDIP), headquartered in St. John's, Newfoundland and Labrador, is an independent oil and gas company committed to the identification, development and operation of value-creating hydrocarbon opportunities. PDIP is the operator of the “Garden Hill Project” in western Newfoundland on behalf of the interest holders, itself and Canadian Imperial Venture Corporation (CIVC).

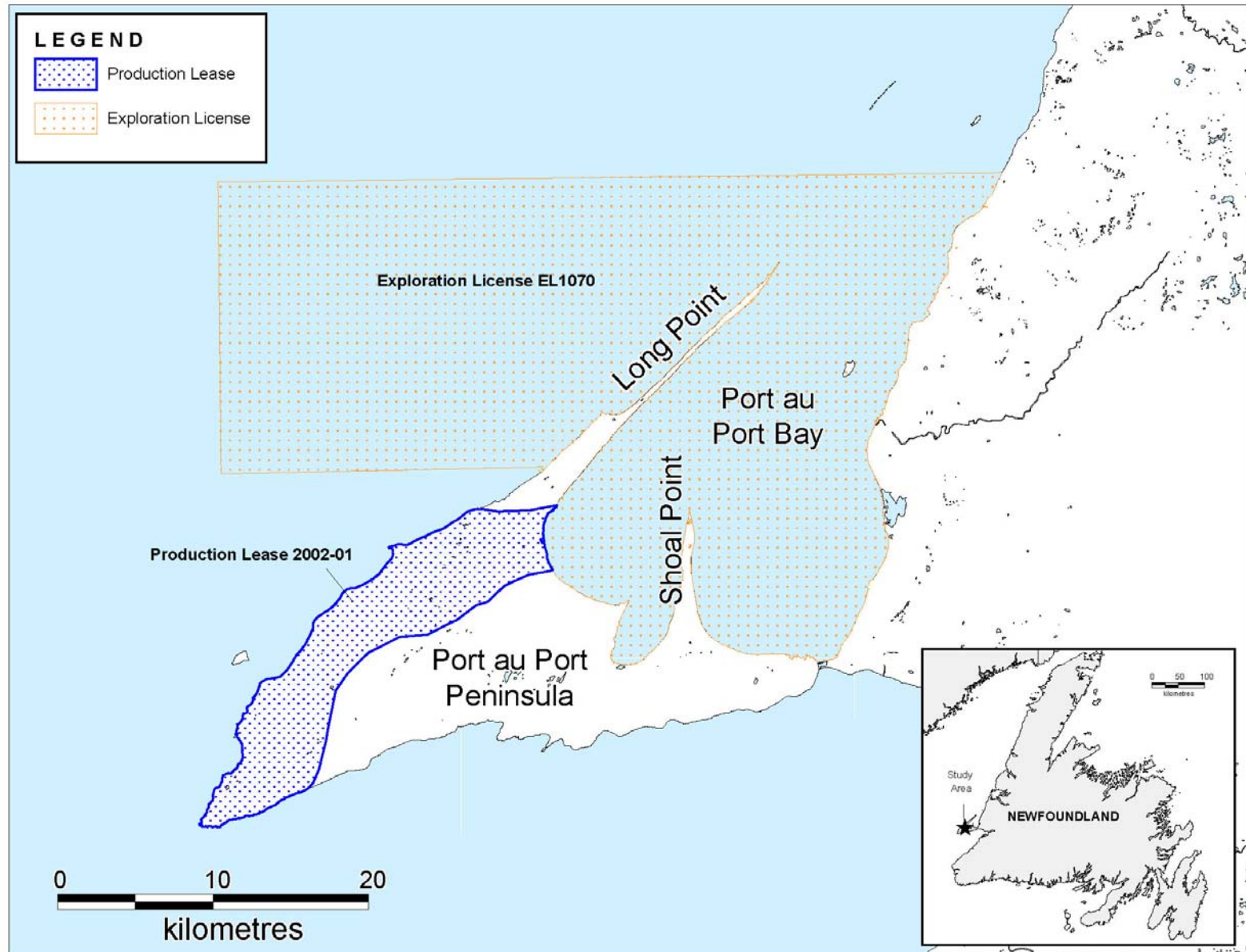
PDIP currently holds interests in the following assets on the Port au Port Peninsula (see Figure 2-1):

- Offshore exploration license EL-1070, which includes the “Shoal Point Prospect” and a portion of the “Lourdes Prospect”; and
- Onshore production lease 2002-01, which includes the Garden Hill South discovery where PDIP have already re-entered an existing well, and Garden Hill North where existing seismic surveys indicate the potential for commercial hydrocarbon bearing reservoirs.

The company manages detailed design, construction, operations and decommissioning, and provides these services throughout the asset life cycle of an oil and gas project.

PDIP's operations are guided by a number of objectives:

- Investment in local people and resources, wherever possible;
- Management of its operations to the highest safety, design and environmental standards (see Appendix A for PDIP's Environmental Policy Statement);
- Development of alliances with leading companies to continually improve efficiency, productivity and decision-making; and
- Continual identification and acquisition of opportunities with the potential to create significant value for shareholders.



**Figure 2-1 PDIP's Interests on the Port au Port Peninsula.**

### **3. THE UNDERTAKING**

#### **3.1 Nature of the Undertaking**

Newfoundland's petroleum potential was recognized almost 200 years ago along the province's west coast when in 1812 Mr Parsons skimmed oil from the surface of Parson's Pond to use as a treatment for his rheumatism. In 1867, Newfoundland's first oil well was drilled near this location. Numerous oil and gas seeps, bituminous residues, and oil shales were later found in other areas, including the Port au Port Peninsula where hydrocarbon occurrences have been found in all three of its major geological units. For over a century particular attention has been paid to the peninsula. Between the early 1900s and the mid 1960s nine oil wells were drilled at Shoal Point, a promontory extending into Port au Port Bay (NLDNR 2007a). Modern geophysical techniques and drilling methods, coupled with advances in geologic theory, have boosted exploration efforts on and around the peninsula since 1994, with promising results.

In order to develop a deeper understanding of oil resources in its Garden Hill Prospect, PDIP is proposing to carry out a land-based geophysical survey using 2D and possibly 3D seismic methods. It is believed the 2D survey will help to show closure of the structures and help to define suitable targets for exploratory drilling at Garden Hill North, and the 3D survey will enable detailed mapping of the reservoir at Garden Hill South to optimize development drilling, and to improve estimates of reservoir size and oil in place.

This Registration Document, which satisfies requirements of Newfoundland and Labrador's *Environmental Assessment Regulations, 2003* under the *Environmental Protection Act*, is submitted to the Department of Environment and Conservation (DOEC) to initiate the provincial environmental assessment process.

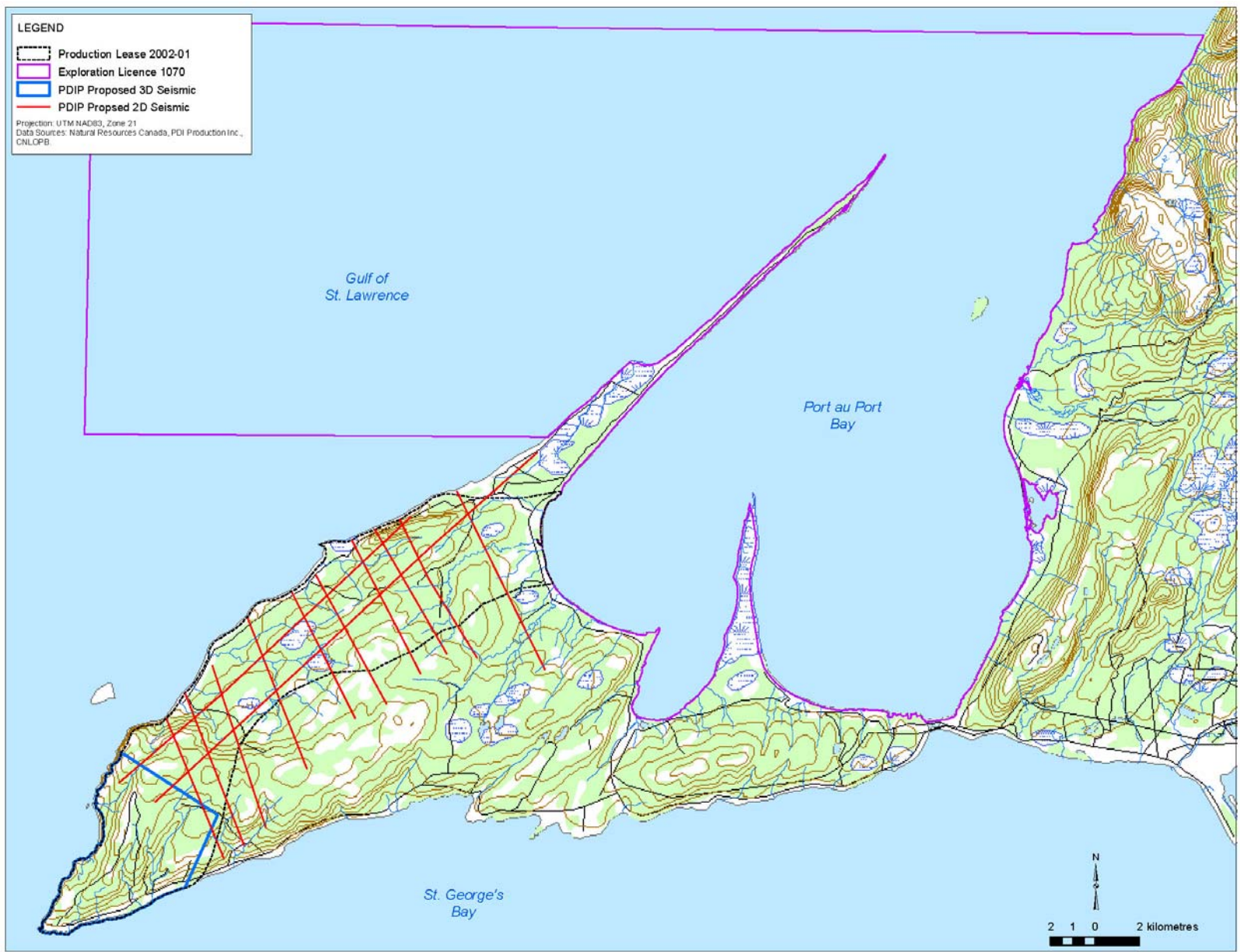
#### **3.2 Rationale for the Undertaking**

Recent studies of existing seismic data at Garden Hill South, combined with early flow production data from the Port au Port #1, Sidetrack #2 (PaP#1-ST#2) well, indicate that the Garden Hill South reservoir may be compartmentalized. In order to fully map the number and size of compartments, a detailed 3D seismic survey may be required. If required, PDIP will undertake this survey to assess the size of proven reserves, and to determine the best locations to drill new wells into these reserves.

PDIP is also investigating how best to develop the Garden Hill North Prospect. Existing seismic data show two different leads that indicate a potential for hydrocarbon resources in the area. However, the existing data are insufficient to show closure of the structures or to identify high quality drilling locations. Therefore, PDIP intends to carry out a land-based 2D seismic survey, which will augment existing 2D data acquired earlier, to confirm the closure and to identify appropriate drilling locations.

Figure 3-1 shows the location of PDIP's onshore interests and general areas in which the proposed seismic surveys are to be conducted. Once the data have been collected and analyzed, PDIP may decide to conduct additional seismic surveys in later years. These may be needed to help identify a drilling location with a high probability of success. If required, it is likely that additional surveys would be over the same area, with some further extensions to the northwest of Garden Hill and/or in parts of offshore exploration licence EL-1070.





**Figure 3-1 Port au Port Lease Area and Proposed Seismic Survey Areas.**

### 3.3 Public Consultations

In May 2007, public consultations, meetings, and open houses were held in Piccadilly, Stephenville, and Cape St George, on the Port au Port Peninsula, and in St John's with various community agencies, business firms, local/area interest groups, government agencies, and area residents. These sessions allowed PDIP to present information about the proposed Undertaking, and to identify issues and concerns of the participants. Furthermore, these sessions provided PDIP an occasion to gather additional information required for project planning.

In general, no major or significant issues or concerns were raised about the land seismic program. A summary of the comments, questions, and issues that were raised and the proponent's response is provided in Table 3-1:

**Table 3-1 Summary of Comments, Questions, and Issues.**

Organization or Group	Comments, Questions, and Issues	PDIP Response
Department of Fisheries and Oceans	<ul style="list-style-type: none"> <li>▪ Stream crossings vis-à-vis fish and fish habitat.</li> </ul>	PDIP and/or its geophysics consultant to discuss this with DFO's Area Habitat Coordinator in its Corner Brook office.
Environment Canada	<ul style="list-style-type: none"> <li>▪ Gannets near Cape St George.</li> <li>▪ Possible that proposed cutting time (commencing early August) coincides with the end of bird breeding season in area</li> </ul>	<p>Canadian Wildlife Service will be assessing this area in June 2007.</p> <p>PDIP will take this into consideration and will ensure that nesting birds are not disturbed.</p>
Natural History Society	<ul style="list-style-type: none"> <li>▪ No questions, comments, or issues.</li> </ul>	
Fisheries, Food, and Allied Workers Union	<ul style="list-style-type: none"> <li>▪ No questions, comments, or issues.</li> </ul>	
Long Range Economic Development Board, and Local Business Groups (Stephenville)	<ul style="list-style-type: none"> <li>▪ Most questions focused on economic and employment aspects of the proposed work.</li> <li>▪ Questions about landholder compensation for cut lines on their properties if applicable.</li> </ul>	<p>PDIP will endeavour to maximize local economic benefits and employment opportunities.</p> <p>If applicable, PDIP will look at each claim on a case-by-case basis.</p>
Open House Sessions	<ul style="list-style-type: none"> <li>▪ Numerous questions about employment opportunities and local economic spin-offs.</li> <li>▪ Questions about seismic lines on private lands.</li> <li>▪ Questions about availability of cut material for firewood.</li> </ul>	<p>PDIP will use local services and skilled workers whenever they are offered competitively in terms of quality, value, and delivery.</p> <p>PDIP will look at claims on a case-by-case basis.</p> <p>Wood will be made available to local residents if possible, subject to requirements of the Department of Natural Resources.</p>

**Table 3-1 Continued.**

<p>Ktaqamkuk Heritage Foundation</p>	<ul style="list-style-type: none"> <li>▪ This foundation indicates that 80% of community members are of Mi'kmaw decent, and that the Operator should include respect for the people, their culture, and "Mother Earth". This will allow the Operator and the Mi'kmaw people to develop the best relationship possible.</li> <li>▪ The Mi'kmaw people hope to see protection, employment, and spin-off opportunities, which are greatly needed, arising from this project.</li> </ul>	<p>PDIP will take these comments into consideration and will develop a Cultural Sensitivity Awareness Training Program for all field workers involved on this project.</p> <p>PDIP will seek to maximize use of local services and skills whenever they are offered competitively in terms of quality, value, and delivery.</p>
<p>Cape St George Town Council</p>	<ul style="list-style-type: none"> <li>▪ The town wants assurance that cut lines within its municipal boundaries will be left in a tidy condition.</li> <li>▪ Concern expressed about possible impacts on the designated water supply (Rouzes Brook), and the three unprotected water supplies (Terry's (or Marches) Brook, Red Brook, and Cornets Brook).</li> <li>▪ Council believes that a gannet colony exists to the southwest of Big Cove and is concerned that the proposed work could disturb these birds.</li> <li>▪ Hope was expressed that local services and skills will be used during the project.</li> </ul>	<p>Subject to requirements of the Department of Natural Resources, cut lines will be left in an appropriate condition.</p> <p>PDIP is working with various authorities to obtain stream crossing permits. Its geophysics consultant and sub-contractors will ensure that appropriate care is taken when working near rivers.</p> <p>No 2D seismic lines are near this site; however, a future 3D survey may come closer to this area. This concern has been raised with the Canadian Wildlife Service, who will conduct a survey in June 2007.</p> <p>Local services and skilled workers will be used whenever they are offered competitively in terms of quality, value, and delivery.</p>

## **4. DESCRIPTION OF THE UNDERTAKING**

### **4.1 Existing Physical Environment**

A map of the Project Area shows the tentative location of proposed 2D seismic lines, the area of the proposed 3D seismic survey, streams, and various roads (see Figure 3-1). Boundaries of the Garden Hill Prospect are also shown.

The following sections provide information about the existing physical and biological environments within or near to the proposed survey areas.

## 4.1.1 Geology

### 4.1.1.1 Bedrock and Surficial Geology

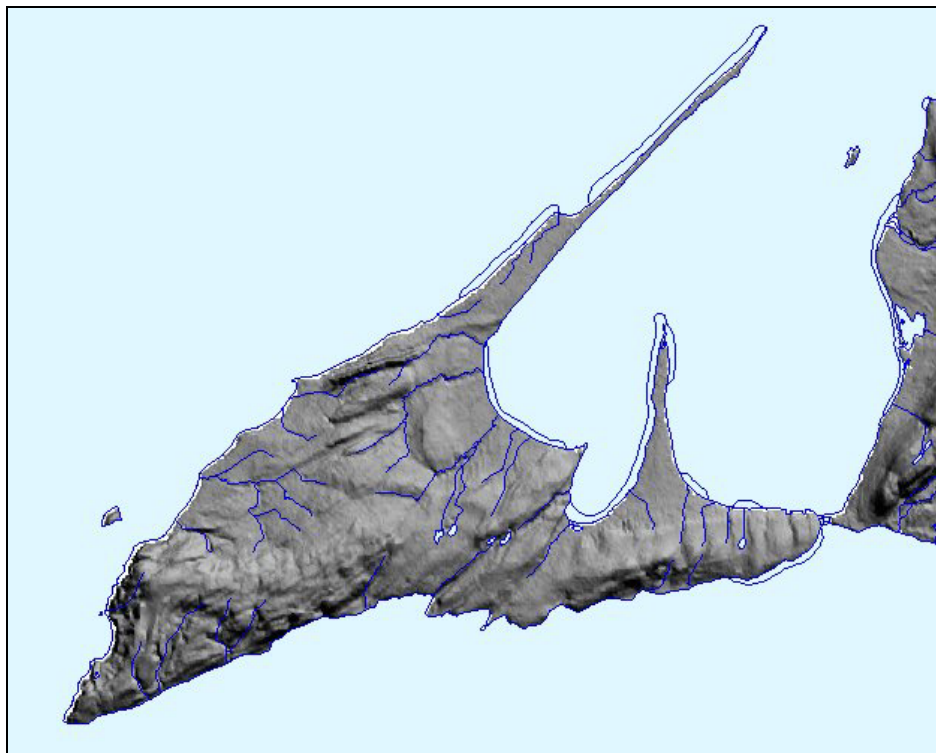
The bedrock geology of the Port au Port Peninsula primarily consists of Ordovician and Cambrian carbonate and clastic sedimentary rock units that are cut by several northeast trending fault zones, the most notable of which is the Round Head Thrust. The area has been affected by Acadian and Taconic deformation, with thrust slices being transported from the east during Paleozoic tectonism (Williams 1985; Williams and Cawood 1989; C-NLOPB, 2005).

Bedrock is exposed on ridges, concealed by vegetation, or overlain by a thin veneer of soil over most of the southern and central parts of the peninsula. The remaining half of the peninsula is overlain by either glacial till, which generally is to be found in the interior, or marine deposited clay, silt, gravel, and diamicton occurring as beach ridges, deltas, terraces, or bars, which typically can be found bordering the peninsula's shoreline. Minor, isolated areas of peat, colluvial, and fluvial deposits occur over less than about 10% of the peninsula. Shoal Point consists principally of organic peat overlying marine sediments (Batterson 2000a,b,c; Batterson et al. 2001).

### 4.1.1.2 Topography

The highest point on the peninsula (1,160 metres above sea level) is found in the White Hills located between the communities of Cape St George, Sheaves Cove, and Mainland. Other prominent topographic areas include Pierways Hill (786 masl) to the north of Campbell's Creek and Round Head (831 masl) east of Salmon Cove.

Gentler slopes grading to the shoreline are found on the west coast near the communities of Mainland and Three Rock Cove, and along most of the shoreline of Port au Port Bay. Figure 4-1 shows a shaded relief map of the peninsula.



Source: NL Department of Natural Resources.

**Figure 4-1 Shaded Relief Map of Port au Port Peninsula.**

## 4.1.2 Surface Water Bodies and Groundwater

### 4.1.2.1 Streams and Ponds

There are fifty-nine watersheds on the Port au Port Peninsula, as shown on Figure 4-2. These watershed divisions are based on information contained on 1:50,000 topographic maps for the area (NRCan 2000). These watersheds include a few, relatively short (i.e., on average about 1.9 km long) first order streams that typically have no tributaries or headwater ponds, and which derive their flows from hillsides and bogs. There are several higher order streams in the area that generally cover much larger watersheds (i.e. up to 4,113 Ha) and which characteristically reach further inland.

The flow of all streams is likely influenced locally to some extent by groundwater recharge and discharge, and tidal influences are noted in some water bodies near to the shoreline such as Victor's Brook, where a well developed salt marsh exists (Batterson et al. 2001), as well as Gravels Pond at the isthmus.

Only a few, relatively small freshwater ponds are found on the peninsula, as shown in Figure 4-2. In fact, the total area of all ponds accounts for less than 1% of the Port au Port Peninsula land mass. Table 4-1 provides information about the various watersheds, including the size of drainage areas, stream length, and total area of headwater ponds.

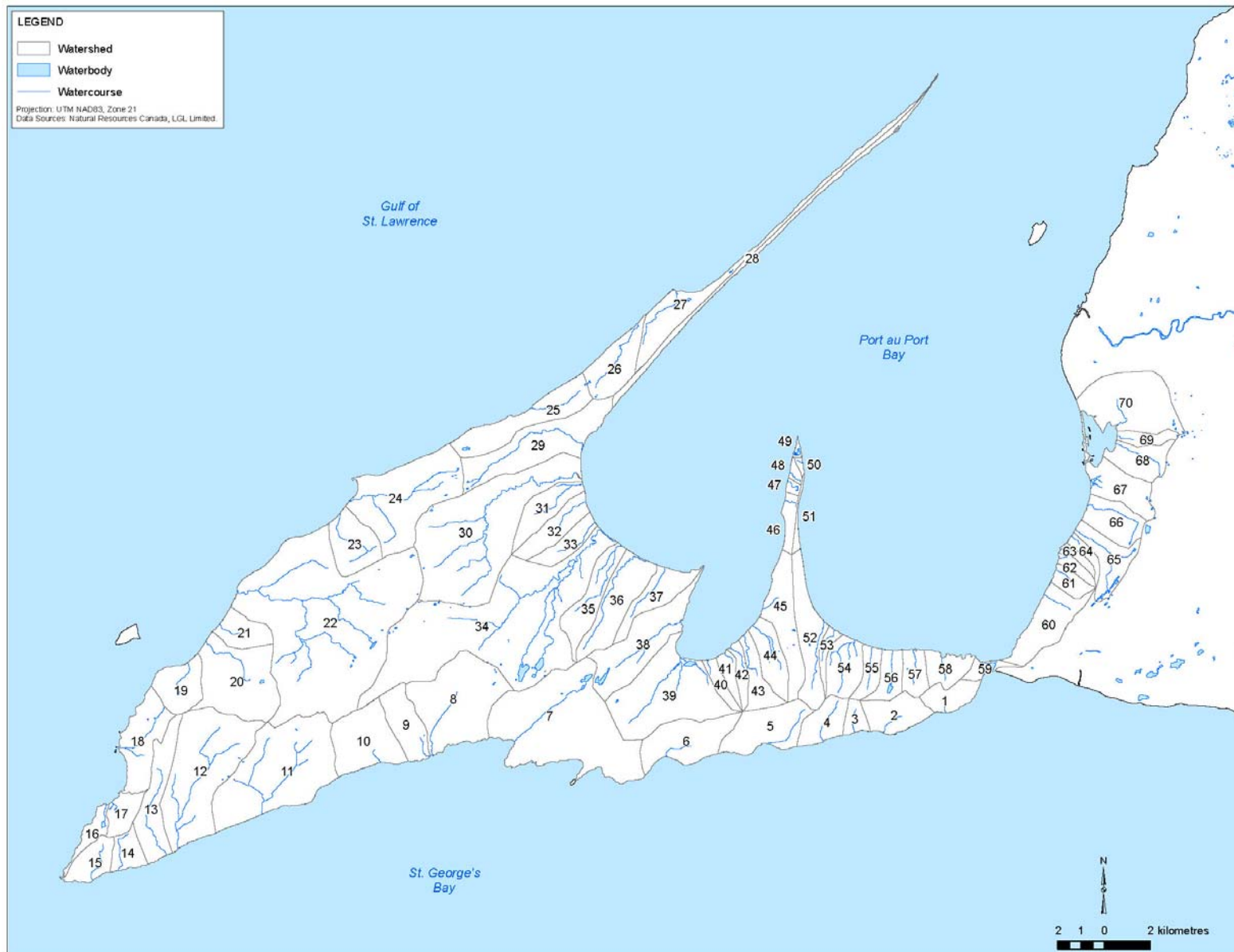
### 4.1.2.2 Groundwater

The DOEC maintains a database of drilled bedrock groundwater wells on the peninsula, most of which are used to supply domestic or community potable water (K. Guzzwell, pers. comm.). There are currently 173 listed wells, and Figure 4-3 shows the locations of those for which geographical coordinates are given in the database.

The listed wells range in depth from 6 to 154 metres, and only nine of these are "abandoned" due to insufficient supply or poor water quality.

The total area of the peninsula underlain by a shallow water table is relatively small. Such areas are typically associated with wetlands, bogs, ponds, and along streams. Both Shoal Point and Long Point have the largest continuous wetlands on the peninsula. Small bogs occur in other isolated areas of the peninsula, with more extensive bogs inland of Mainland and Three Rock Cove and to the north of Lower Cove.

Overburden deposits on the Port au Port Peninsula have been divided into two hydrostratigraphic units: a glacial till unit with low yield (mean of 9.5 lpm, or litres per minute), and a sand and gravel unit with moderate to high yield (mean of 50.4 lpm). Bedrock hydrostratigraphy on the peninsula has been divided into three units: carboniferous clastic sedimentary rocks with characteristically high yield (mean of 54.4 lpm); cambro-ordovician clastic sedimentary rocks with moderate yield (mean of 28.8 lpm); and cambro-ordovician carbonate rocks with moderate yield (mean of 36.7 lpm) (Golder Associates 1986).



Source: NRCan 2000.

**Figure 4-2 Watersheds of the Port au Port Peninsula.**

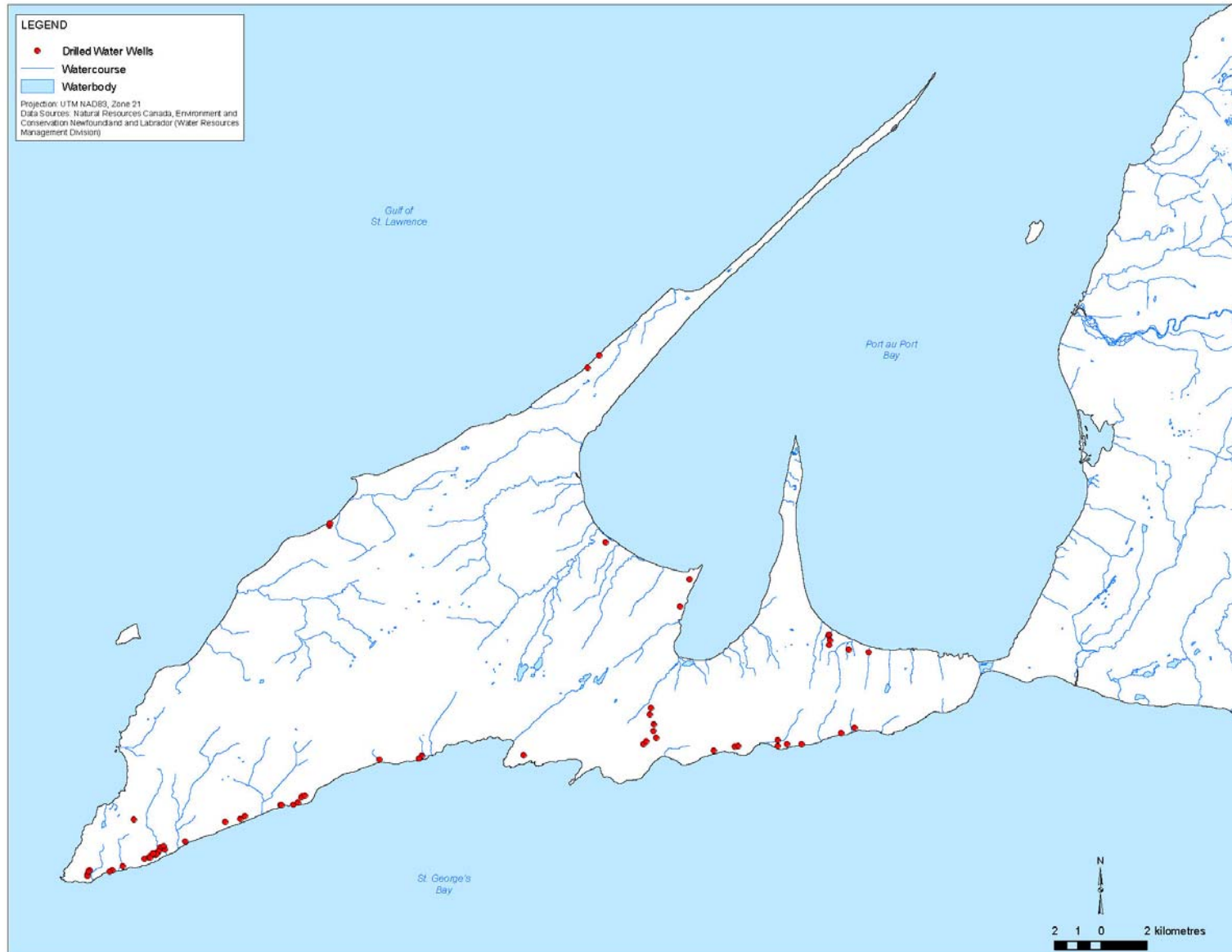
**Table 4-1 Watershed Characteristics on the Port au Port Peninsula.**

Watershed Number	Watershed Area (Ha)	Total Pond Area <sup>1</sup> (Ha)	Length of 1st Order Stream in Watershed <sup>1</sup> (km)	Name of 1st Order Stream in Watershed <sup>2</sup>	Total Length of all Streams in Watershed <sup>1</sup> (km)
1	247	0.00	0.6		0.6
2	372	0.00	1.2		1.2
3	123	0.00	1.1		1.1
4	307	0.00	2.1		2.1
5	583	0.00	2.5		2.5
6	624	0.00	1.4		1.4
7	2090	9.53	3.4	Falls Brook	4.1
8	1200	0.75	3.2		3.2
9	408	0.00	1.1	Big Cove Brook	1.1
10	689	0.00	0.7	Terry's (or Marches) Brook	0.7
11	1655	0.34	2.4	Red Brook	9.5
12	1519	0.34	2.2	Rouzes Brook	11.4
13	575	0.00	3.4	Cornects Brook	4.6
14	204	0.00	2.0		2.0
15	274	0.00	2.0		2.0
16	153	3.44	0.8		0.8
17	220	0.88	0.3		0.7
18	580	0.27	2.7		4.0
19	387	0.00	1.8		1.8
20	1010	1.94	3.1	Cointres Brook	3.1
21	284	0.05	1.5		1.5
22	4113	5.12	3.6	Mainland Brook	25.7
23	456	0.00	2.6		3.9
24	1293	1.54	2.6	Three Rock Cove Brook	9.5
25	675	2.95	2.4		2.5
26	467	0.56	3.9		3.9
27	653	1.90	3.3	Black Duck Brook	3.3
28	330	0.00	0.0		0.0
29	959	0.79	3.2	Lourdes Brook	7.3
30	2264	0.95	3.4	Victors Brook	18.3
31	358	0.00	2.4		3.6
32	335	0.00	1.7		1.7
33	242	0.00	2.3		2.3
34	3320	36.44	3.8	Harry Brook	26.6
35	444	0.00	3.6	Rioux Brook	5.9
36	623	0.00	6.0		6.0
37	374	0.00	2.7		2.7
38	840	11.04	2.2		4.5
39	1288	8.62	3.2	South Brook	7.2
40	124	0.00	0.7		0.7
41	122	0.00	0.6		0.6
42	128	0.06	1.7		1.7
43	270	0.00	2.2		2.2
44	340	0.06	1.6		3.7
45	562	0.82	0.9		0.9
46	124	0.00	0.7		0.7
47	33	0.94	0.5		0.5
48	39	0.00	0.7		0.7
49	19	3.69	0.0		0.0
50	20	0.00	0.3		0.3
51	46	0.00	0.0		0.0
52	555	0.20	3.2		3.2
53	100	0.33	0.9		1.6
54	367	0.00	1.9		5.1
55	181	0.00	1.9		1.9
56	224	5.42	1.5	Jack of Clubs Brook	1.5
57	206	0.34	1.1		1.5
58	245	0.00	1.0		1.0
59	103	15.89	0.0		0.0
<b>minimum</b>	<b>19</b>	<b>0.00</b>	<b>0.0</b>		<b>0.0</b>
<b>median</b>	<b>367</b>	<b>0.00</b>	<b>1.9</b>		<b>2.0</b>
<b>average</b>	<b>616</b>	<b>1.95</b>	<b>1.9</b>		<b>3.8</b>
<b>maximum</b>	<b>4113</b>	<b>36.44</b>	<b>6.0</b>		<b>26.6</b>

<sup>1</sup> Based on waterbodies that appear on 1:50,000 scale topographic maps produced by Natural Resources Canada's *Centre for Topographical Information*.

<sup>2</sup> Names obtained from 1:50,000 scale topographic maps. Where not indicated on these maps, names were provided by local area residents.





Source: NLDOEC (Water Resources Management Division).

**Figure 4-3 Drilled Groundwater Well Locations.**



### 4.1.3 Weather Conditions and Climate<sup>1</sup>

The area's climate is governed by the movement of low and high pressure regimes within the prevailing westerly flow of the upper atmosphere. This flow is induced by temperature gradients that span from tropical to polar regions, and westerlies are strongest during the winter when these gradients are most intense.

In winter, the peninsula is affected by cold arctic air flowing from the Quebec North Shore as it crosses the relatively warm waters of the Gulf of St. Lawrence (prior to the formation of ice). The cold air picks up heat and moisture from these waters resulting in streamers of snow showers that hit the west coast of Newfoundland.

Intense low-pressure systems frequently slow down or stall under an upper air low-pressure centre as they move through Newfoundland. Depending on the position, overall intensity and size of the system, this may result in an extended period of unchanging weather conditions that may range from relatively benign to heavy.

By summer, the main storm tracks have moved further north resulting in less frequent and weaker low-pressure systems. Increasing solar radiation throughout the spring causes the atmosphere to warm and the north-south temperature contrast to decrease. This lowers the kinetic energy of the westerly flow aloft and decreases the potential energy available for storm development.

With low pressure systems normally passing to the north of the region in combination with the northwest shoulder of the sub-tropical high to the south, the prevailing flow across the Gulf of St. Lawrence is from the south to southwest during the summer season. Wind speed is lower during the summer and gale or storm force winds are relatively infrequent. There is also a corresponding decrease in significant wave height.

The prevailing south to south-westerly flow during late spring and early summer tends to be moist and relatively warmer than the underlying waters of the Gulf. Cooling from below coupled with mixing of air in the near-surface layer often produces advection fog, which can persist for days at a time. The incidence of advection fog and the frequency of poor visibility are normally highest during July.

#### 4.1.3.1 Wind

C-NLOPB (2005) reviewed AES-40 meteorological data for a grid point located just to the west of the Port au Port Peninsula, and has used this information to base its discussion on winds that affect the area.

The percentage of observations of wind speed by direction is shown in Table 4-2. This table shows that winds occur most often from the west to northwest from November to March. In April, winds most often occur from the southwest to northwest. South to southwest winds dominate from May to August. Southwest to west winds are predominant in September and October.

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<sup>1</sup> Adapted and condensed from C-NLOPB (2005).

**Table 4-2 Percentage of Wind by Direction.**

Month	Direction								Total Reports
	NE	E	SE	S	SW	W	NW	N	
January	8.1	6.1	5.8	8.4	14.2	25.5	21.9	10.1	6076
February	8.8	6.4	6.2	8.4	14.0	23.3	20.7	12.2	5536
March	12.6	7.5	7.0	10.4	13.9	16.7	17.3	14.6	6076
April	12.4	9.8	10.5	11.4	13.9	13.4	14.0	14.6	5880
May	10.3	9.1	9.4	18.7	18.9	11.9	10.8	10.8	6076
June	6.5	6.4	8.8	22.5	26.6	12.7	8.9	7.5	5880
July	2.8	4.1	7.6	26.3	33.2	15.2	6.6	4.2	6076
August	4.6	4.7	6.0	19.1	32.9	18.2	8.5	5.9	6076
September	5.5	5.0	5.9	15.6	24.9	22.4	12.8	7.9	5880
October	5.7	4.6	7.1	13.0	20.4	21.6	17.1	10.5	6076
November	7.2	6.4	6.9	12.1	16.4	21.9	19.7	9.6	5880
December	6.7	5.7	6.5	9.3	13.5	23.6	22.0	12.6	6076
Years Mean	7.6	6.3	7.3	14.6	20.2	18.9	15.0	10.0	

Source: AES grid point 5817 in C-NLOPB (2005). Lat 48.75°N, Long 59.17 °W, 1954 to 2003.

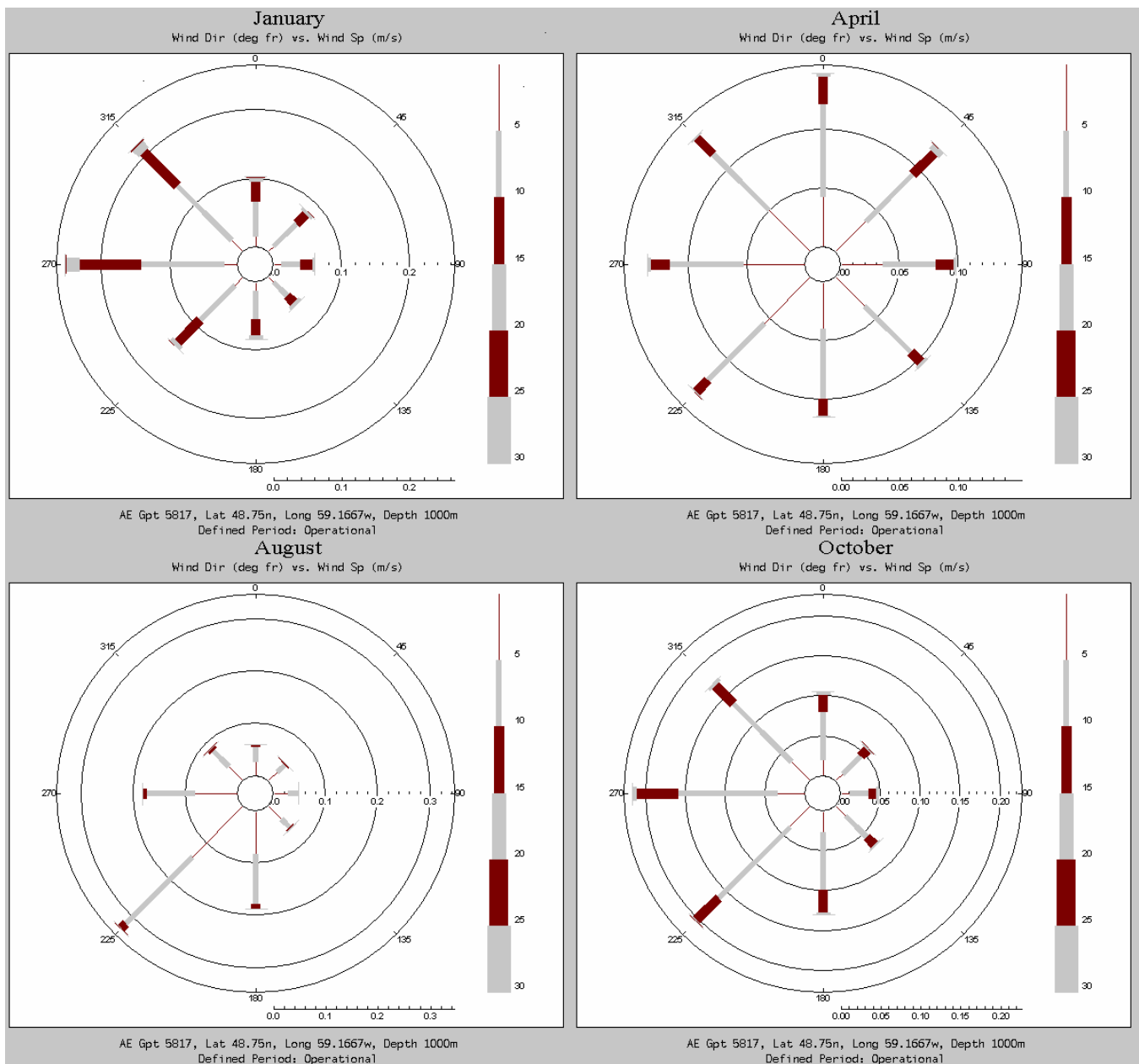
January, April, August, and October wind rose diagrams are given in Figure 4-4. Dominant wind directions are from the northwest, west, southwest and south. There is a strong annual cycle in the wind direction. In winter, the winds are from west to northwest, whereas in summer the winds are from south to southwest. In the transition month of April, winds are distributed throughout all directions.

Table 4-3 shows the highest winds (maximum 1-hour sustained winds) that occur by month in each of eight directions. The strongest winds with speeds of 25 m/sec occur in December and January. In January, the strongest are from the northwest to north whereas in December they are from the southwest. The lowest maximum wind speeds are in July.

**Table 4-3 Monthly Highest 10 Metre Wind Speed (rounded to the nearest m/s) from each Direction.**

Month	Direction								Monthly	
	NE	E	SE	S	SW	W	NW	N	Min	Max
January	23	24	21	23	21	21	25	25	21	25
February	24	20	21	20	20	21	22	20	20	24
March	20	23	19	18	18	24	23	21	18	24
April	19	19	17	16	17	18	18	21	16	21
May	16	19	14	19	19	19	16	15	14	19
June	17	13	13	14	14	14	14	15	13	17
July	14	10	15	15	14	13	13	15	10	15
August	14	14	17	15	14	16	13	16	13	17
September	15	21	15	18	19	18	19	18	15	21
October	21	20	19	20	17	21	19	19	17	21
November	18	20	22	22	20	22	21	21	18	22
December	20	18	22	22	25	22	22	24	18	25
Years Max	24	24	22	23	25	24	25	25		

Source: AES grid point 5817 in C-NLOPB (2005). Lat 48.75°N, Long 59.17°W, 1954 to 2003.



Source: C-NLOPB (2005).

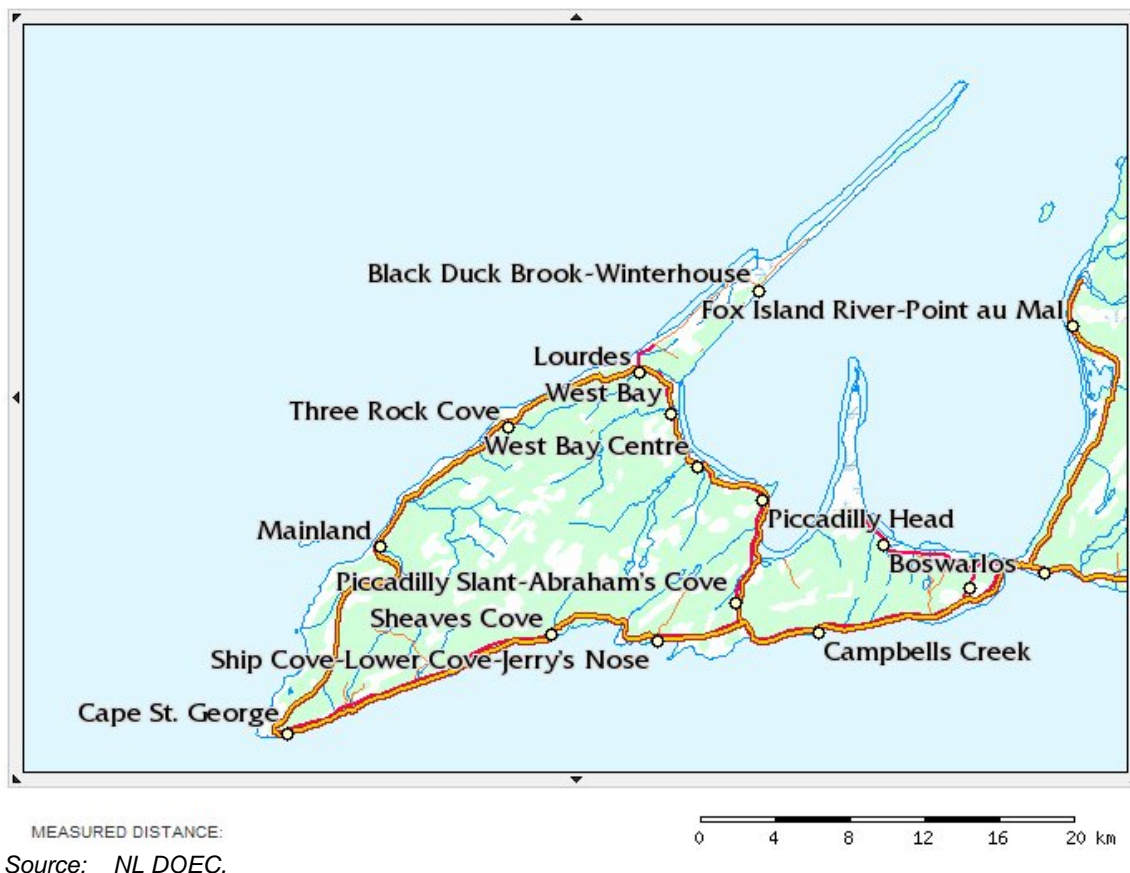
**Figure 4-4 Wind Rose Diagrams for January, April, August, October.**

#### 4.1.4 Land Use

Land on the Port au Port Peninsula is used for subsistence, recreation, industry, and commerce. In addition, there are several archaeological sites on the peninsula that are documented. Descriptions of various land uses and these resources are provided below.

##### 4.1.4.1 Roadways

Road access on the Port au Port Peninsula is provided via the provincial highway system linking various communities, as shown on Figure 4-5. A system of secondary roads, forestry roads, and paths also provide access to parts of the interior, as well as Shoal Point and Long Point.



**Figure 4-5 Road System of the Port au Port Peninsula.**

#### 4.1.4.2 Municipal and Residential Land Use

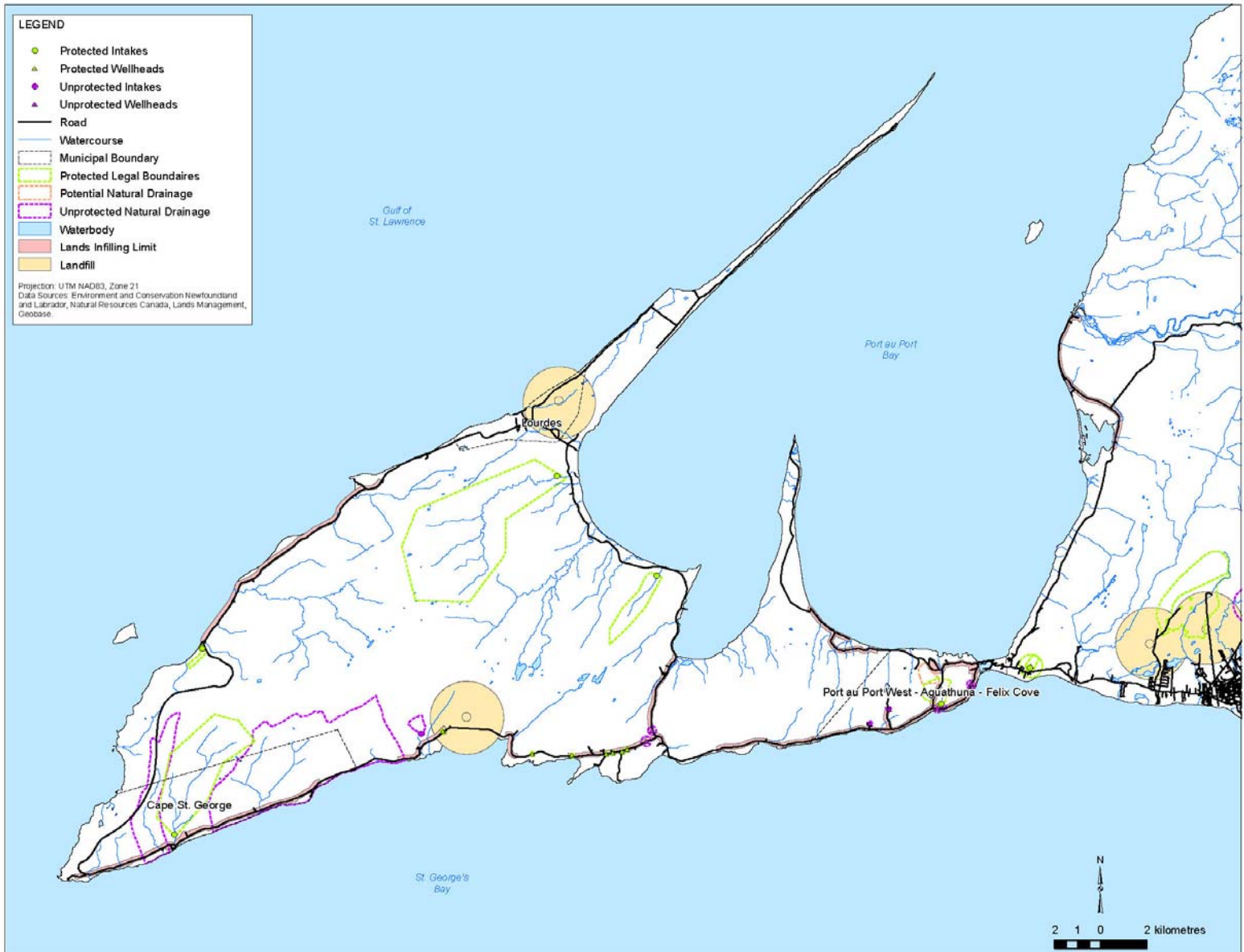
Residential areas on the Port au Port peninsula are found generally along the coastline. These communities are administered as unincorporated Local Service Districts or incorporated Towns (the Towns of Cape St George, Lourdes, and Port au Port West - Aguathuna - Felix Cove).

There is one municipal waste disposal site on the peninsula, located near Lourdes and West Bay, that is active. In addition, there are a few older sites: one near Ship Cove which has not been used for over twenty years and which was never officially closed. Another site exists at Lower Cove, which was closed about two years ago (B. Wright, pers. comm.). The location of the Lourdes and Ship Cove sites, municipal boundaries, road network, and infilling limits are shown on Figure 4-6.

There are several protected water supplies and wellheads on the peninsula in addition to unprotected potable water supplies. These are also shown on Figure 4-6.

#### 4.1.4.3 Agricultural Land Use

Most of the Port au Port Peninsula, with the exception of the interior portion, is designated as an Agricultural Development Area by the Department of Natural Resources; however, this designation is only for administrative purposes and none of the crown land is considered significant from an agricultural perspective (I. Bell, pers. comm.)



**Figure 4-6 Town Boundaries, Road System, Waste Disposal Sites, and Infilling Limits.**

Minor agricultural activity is found on the Port au Port Peninsula. There is an alpaca and llama farm in Felix Cove, and vegetable farm in Black Duck Brook. A regional pasture exists near the community of West Bay which is owned and operated by the *Port au Port Economic Development Association*. Another regional pasture exists on Long Point. Smaller pastures exist within various communities of the peninsula, as do some sheep and cattle farms (JW 2006). Figure 4-7 shows the location of regional pastures on the Port au Port Peninsula.

#### 4.1.4.4 Recreational Land Use

##### Hunting and Trapping

The peninsula represents Moose and Black Bear Management Areas # 43. The hunting season for moose is from September 10 through December 10 each year. There is no caribou management area on the Port au Port Peninsula.

##### Parks and Natural Areas

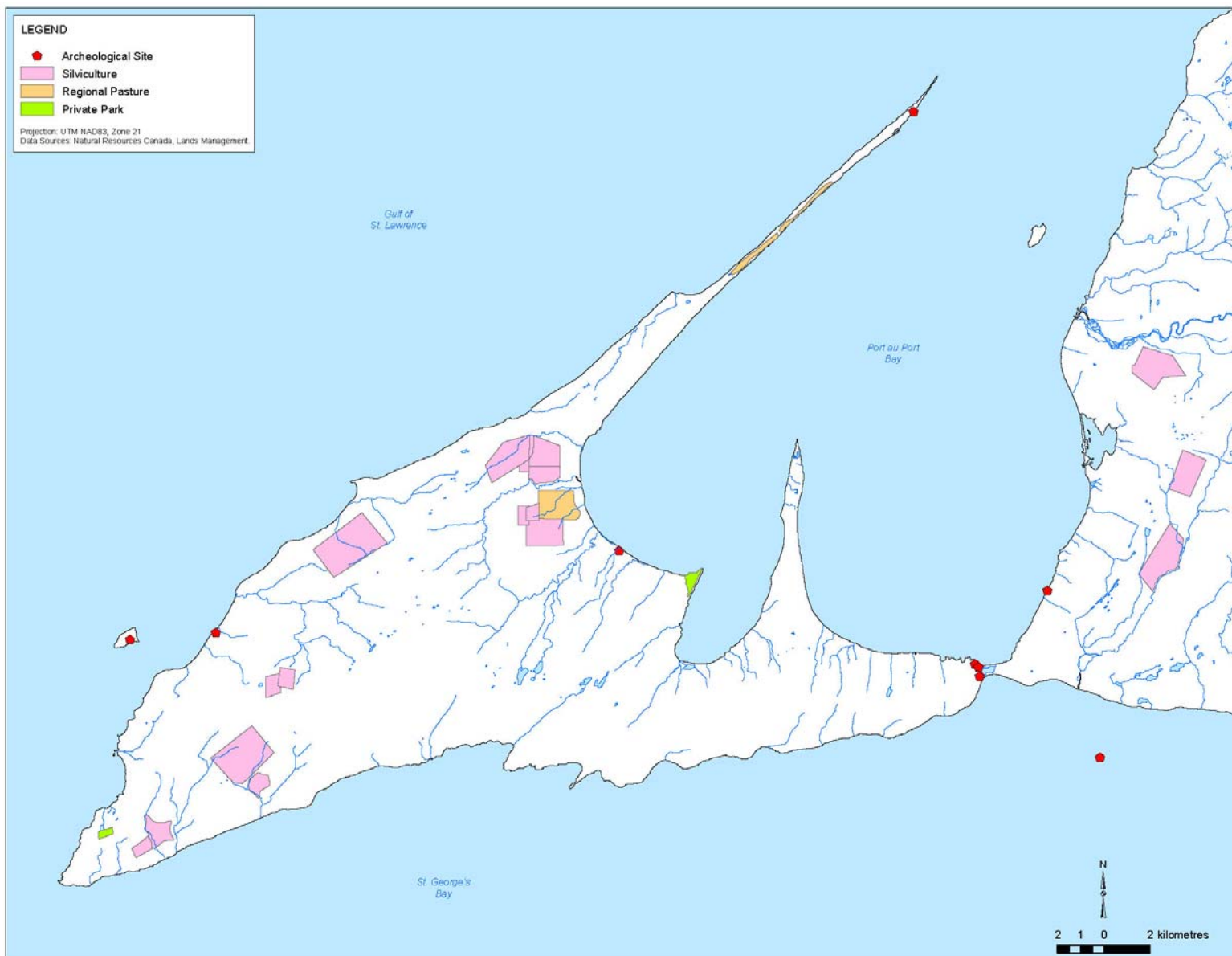
There are a number of parks and natural areas in Newfoundland and Labrador that are protected by federal or provincial legislation. Those under provincial jurisdiction include: wilderness, ecological, wildlife, and public reserves; and provincial and wildlife parks. Those under federal jurisdiction include: national parks, national historic sites, and migratory bird sanctuaries.

There are no special areas, as listed above, on the Port au Port Peninsula that are protected by either federal or provincial legislation (P. Taylor, pers. comm.); however, there are two private parks and lookouts in the area. Piccadilly Park, owned and operated by the *Port au Port Economic Development Association* is located at South Head on the western shore of Piccadilly Bay and is used for camping. At Cape St George there exists a small park, which is sometimes used for camping, and walking trails that follow the coastline. The locations of these parks are shown on Figure 4-7.

#### 4.1.4.5 Historic Resources

There are a number of archaeological sites on the Port au Port Peninsula that provide evidence of early European, Palaeoeskimo, and Recent Indian presence. These sites are shown on Figure 4-7 and include the following (K. Reynolds, pers. comm.):

- a 19<sup>th</sup> to 20<sup>th</sup> century former fishing community;
- a wooden shipwreck of unknown age and origin;
- Recent Indian flakes, dating 1,000 to 1,500 AD;
- aircraft wreckage originating from the former Ernest Harmon Air Force Base, dating 1953;
- hearths and refuse pits associated with late Palaeoeskimo and Recent Indian cultures, dating about 1,300-1,350 and 790 years before present;
- late Paleoeskimo or Recent Indian chert beds and boulders;
- 18<sup>th</sup> to 20<sup>th</sup> century European foundations and garden enclosures;
- Palaeoeskimo artifacts;
- several sites containing artifacts, or evidence of work/habitation areas of either Palaeoeskimo, Recent Indian, and/or European cultures.



**Figure 4-7** Locations of Regional Pastureland, Private Parks, Archaeological Sites, and Silviculture Sites on the Port au Port Peninsula.

#### 4.1.4.6 Industrial Land Use

##### Timber Harvesting

Most of the Port au Port Peninsula is characterized as being “Productive Forest Area”, land that is capable of producing at least 35 cubic meters per hectare (m<sup>3</sup>/ha) at rotation. The largest part of this area is owned by the crown, with minor areas of private ownership (NLDOEC 2007). Most timber harvesting activities took place on the Port au Port Peninsula during the 1990s, although limited harvesting in the area has taken place since (JW 2006).

The Port au Port Peninsula falls within Forestry District No. 14. Currently no pulp and paper firms have tenure on the Port au Port Peninsula. Kruger once owned a large “Reid Lot” to the south of Port au Port Bay, but this was sold to the crown in 1994.

The province manages a number of silviculture sites, as shown on Figure 4-7 (B. English, pers. comm.).

##### Mining, Quarrying, and Mineral Exploration

Located at Lower Cove on the Port au Port Peninsula, Atlantic Minerals Limited (AML) operates limestone and dolomite quarries, a modern two million tonne-per-year processing plant and deepwater shiploading facilities. The chemical-grade high-calcium limestone and chemical-grade dolomite are sold to the iron ore industry in Labrador West and Quebec, and are exported for various chemical/industrial uses (NLDNR 2007).

AML owns 2,900 acres of land and has an additional 13,000 acres of Licensed Claims on the Port au Port Peninsula. AML has over a billion metric tonnes of reserves, including proven reserves of over 50 million metric tonnes of chemical grade high calcium limestone and 70 million metric tonnes of chemical grade dolomite. The remaining reserves are suitable for construction aggregate (ALM 2007).

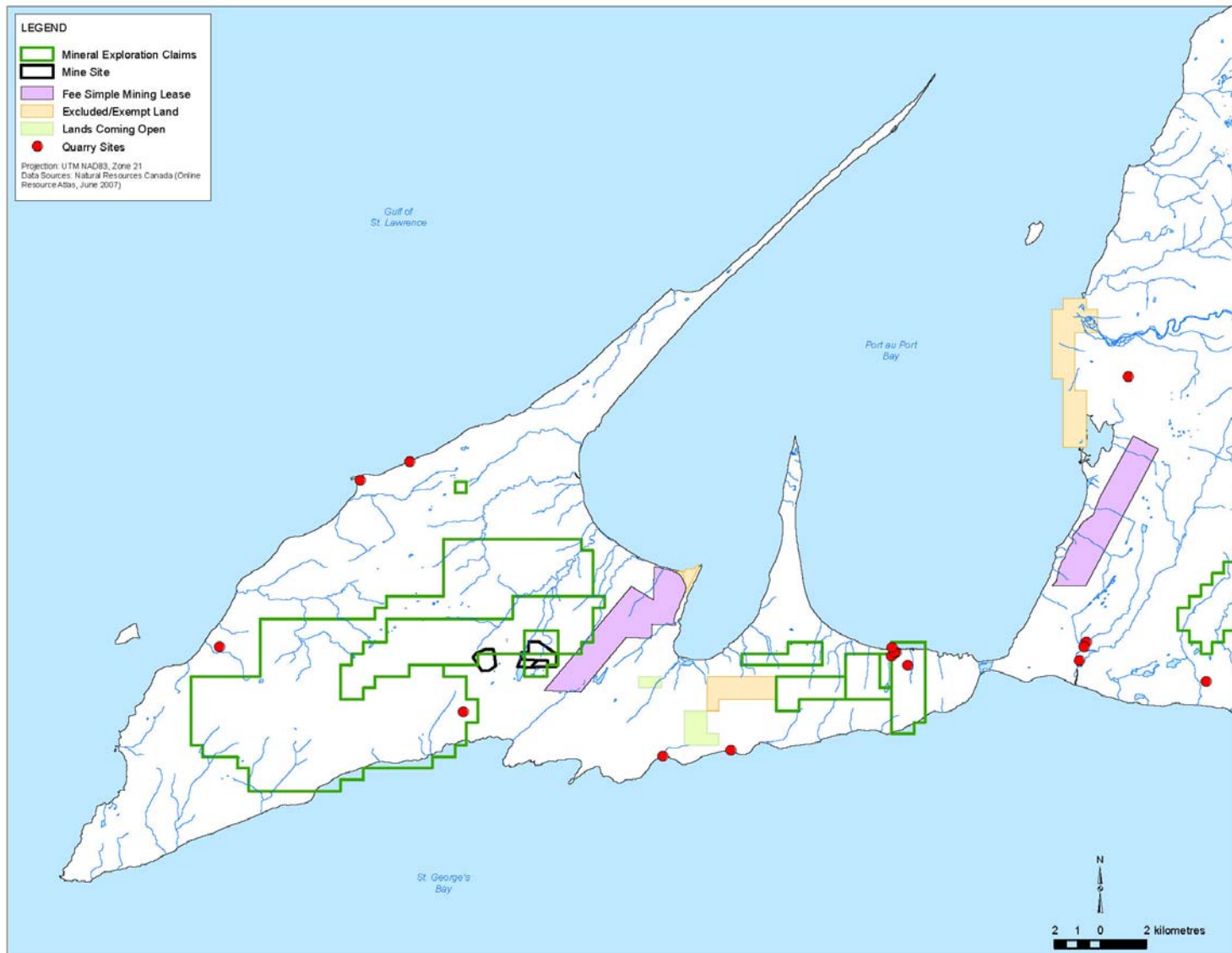
Total shipments of limestone and dolomite from Lower Cove were forecasted to increase from approximately 1.6 million tonnes in 2006 to 2.0 million tonnes in 2007. The company seasonally employs approximately 90 people.

AML’s activities in Lower Cove consist of drilling, blasting, and crushing followed by grading, stockpiling, and loading of finished product onto marine vessels by loading conveyors, with a capability of loading 3,000 tonnes/hr into Panamax class vessels (AML 2007).

In addition to AML’s operation, there are several other active quarries throughout the Port au Port Peninsula which produce mainly sand and gravel construction aggregate (F. Kirby, pers. comm.).

No other active mines exist on the peninsula; however, there are a number of mineral claims that cover a significant portion of the peninsula where exploration activities may occur. In addition, there is an area to the west of Piccadilly Bay that comprises a “Fee Simple Mining Lease”. The holder(s) of this lease retain mineral and oil & gas rights in perpetuity within the area, subject to certain conditions (K. Andrews, pers. comm.). Figure 4-8 shows various areas on the Port au Port Peninsula that are used as quarry and mine sites, staked as mineral claims, or are defined fee-simple mining lease areas.





Source: NL Land Use Atlas.

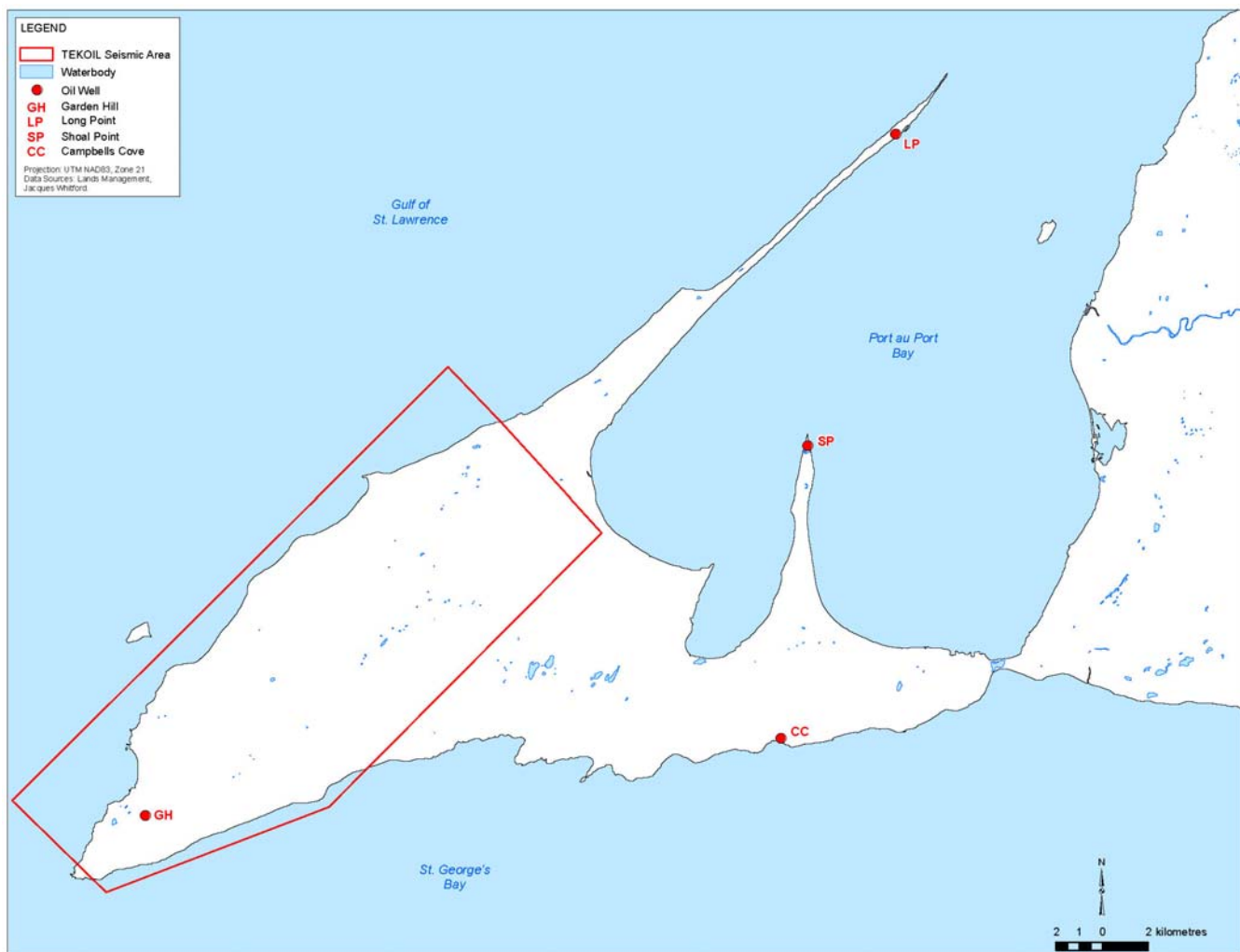
**Figure 4-8 Mines, Quarries, Mineral Claims, and Fee Simple Mining Leases of the Port au Port Peninsula.**

## Oil & Gas Exploration

Since the early 1900s the occurrence of oil seeps on the Port au Port Peninsula has provoked interest in its oil and gas resources. In 1995 Hunt Oil drilled PAP#1 at Garden Hill South. Since then, in 2001/02 Canadian Imperial Venture Corporation performed further work in the area, drilling a new well, and two sidetracks to the existing PAP#1 well. In addition, several organizations have explored for oil and gas in the area, both onshore and offshore.

Over the past several months PDIP has worked at Garden Hill South where, in its capacity as operator, the company has re-entered the PAP#1-ST#2 well and carried out well testing operations. In addition, there are three other oil wells that have been drilled in recent years at Long Point, Shoal Point, and Campbells Cove. Their locations are all shown on Figure 4-9.

Although it currently holds no lease in the area, TekOil and Gas Corporation, a Texas-based exploration and production company, is proposing to conduct a three-dimensional onshore to offshore seismic survey in the western part of the Port au Port Peninsula between Cape St George and Lourdes, as shown on Figure 4-9 (JW 2006).



**Figure 4-9 TekOil's Proposed 3D Seismic Survey and Location of Recent Oil Wells Drilled on the Port au Port Peninsula.**

## 4.2 Existing Biological Environment

### 4.2.1 Terrestrial Ecosystem

A description of the terrestrial biological environment within the Port au Port Peninsula is presented in three sections: (1) vegetation, (2) freshwater fish and fish habitat, and (3) wildlife (birds and mammals).

#### 4.2.1.1 Vegetation

This section provides background information on the terrestrial habitats and vegetation of the entire Port au Port Peninsula. It provides a general overview of the terrain and vegetation of the area and information on each of the habitats listed below. Each habitat type is described in terms of any rare species occurring within it, species that are of particular concern, and its ecological importance.

Information was collected through contact with experts of the terrestrial vegetation of the peninsula, by literature review, and by data acquisition from the Atlantic Canadian Conservation Data Centre (ACCDC). No field surveys or research were undertaken by LGL Ltd.

Information received from the Conservation Data Centre included a list of rare plant species recorded from the whole of the Port au Port Peninsula, their approximate survey location, and their “S-ranks”, which define the rarity of species or communities (ACCDC 2007). The S-ranks are defined in Table 4-4.

Much of the documented vegetation surveys that have been conducted have been in conjunction with the Rare Plant Project, 1999-2001. The purpose of this initiative was to learn more about the species listed in *The Rare Vascular Plants of Newfoundland* (Bouchard 1991), as well as any additional rare species that may be encountered. It involved a concerted effort of botanists who surveyed selected sites on the Port au Port Peninsula and other locations on the west coast of Newfoundland thought to have rare species or plant species potentially threatened by human activities. Other information has been garnered from opportunistic observations by botanists and naturalists, some dating back to observations recorded in the early part of the 20<sup>th</sup> century.

**Table 4-4 Definition of ‘S-Ranks’ Used by the Atlantic Canadian Conservation Data Centre.**

S1	<b>Extremely rare:</b> May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few remaining individuals).
S2	<b>Rare:</b> May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals).
S3	<b>Uncommon,</b> or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences).
S4	<b>Usually widespread, fairly common,</b> and apparently secure with many occurrences, but of longer-term concern (e.g., watch list) (100+ occurrences).
S5	Widespread, <b>abundant,</b> and secure, under present conditions.
S#S#	Numeric <b>range rank:</b> A range between two consecutive ranks for a species/community. Denotes uncertainty about the exact rarity (e.g., S1S2).
SH	<b>Historical:</b> Previously occurred in the province but may have been overlooked during the past 20-70 years. Presence is suspected and will likely be rediscovered; depending on species/community.
SU	<b>Unrankable:</b> Possibly in peril, but status is uncertain - need more information.

Source: ACCDC 2007.

Vegetation survey sites on the Port au Port Peninsula have been surveyed and will be briefly discussed. These include the following (Figure 4-10)

- Cape St. George
- Garden Hill
- Port au Port
- Area between Cape St. George and Mainland (western coast of Port au Port Peninsula)
- Lower Cove
- Southwestern Port au Port Peninsula
- White Hills
- Piccadilly Bay
- Piccadilly Head
- Piccadilly
- Round Head
- West Bay Centre
- Shoal Point
- The Gravels

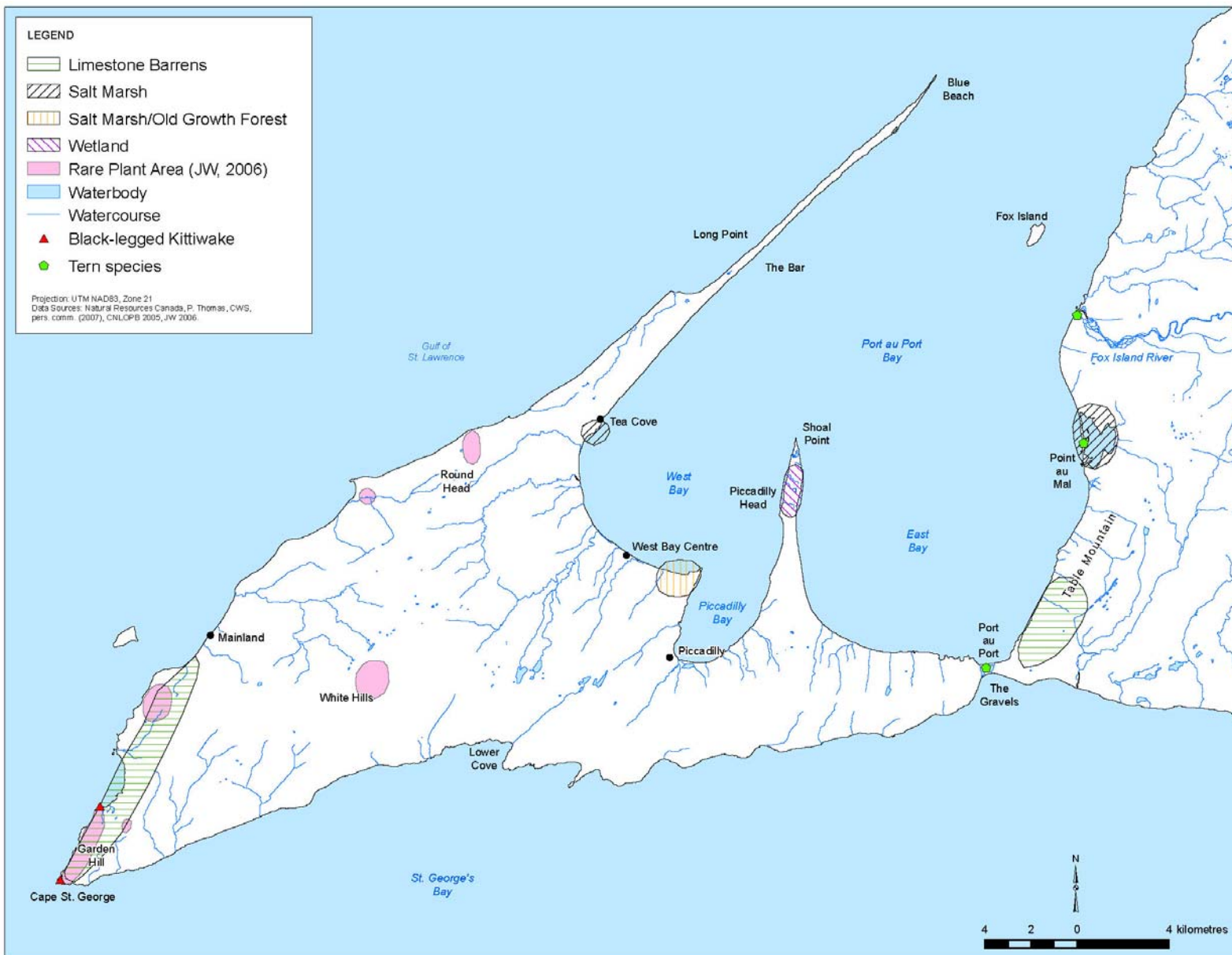
### Overview of Peninsula

The vegetation on the peninsula grows in the Port au Port sub-region of the Western Newfoundland Forest Ecoregion. This subregion contains balsam fir forest, wetland, salt marshes, and is characterized by wind-exposed barrens, bedrock, and shallow soils (Meades 1990). Many calciphilous species are to be found due to the limestone substrate and there are a number of rare plants, including arctic-alpine species, Gulf endemics, and Cordilleran disjuncts (Meades 1990). Common species are those adapted to exposed windy conditions, such as: mountain avens (*Dryas integrifolia*), swamp birch (*Betula pumila*), red bearberry (*Arctostaphylos uva ursi*), dwarf willow (*Salix herbacea*), purple saxifrage (*Saxifraga oppositifolia*), Greenland primrose (*Primula egaliksensis*), sedges (*Carex* spp.), alpine bearberry (*Arctostaphylos alpina*), and moss campion (*Silene acaulis*) (PAA 2000).

Some plants have ranges restricted to parts of the Western Newfoundland Forest Ecoregion. *Cypripedium reginae* is an example of a rare species dependant on calcareous or serpentine soils that cannot tolerate the harsh climate on the limestone barrens of the Great Northern Peninsula (Damman 1983).

Shoal Point is covered in peat and clay, and is characterized by stunted forest at the base, large extensions of peat bog, some patterned fens, several ponds close to the tip, and a small stretch of sand and gravel at the northern extremity. Much of the ground cover consists of sphagnum moss (*Sphagnum* spp.), Labrador tea (*Rhododendron groenlandicum*), sheep laurel (*Kalmia angustifolia*), sedge (*Carex* spp.), and blueberry (*Vaccinium angustifolium*) (Greenlea and Herringa 1984). There was a road leading up the 13 km spit that is now largely degraded but still used by ATVs (B. Winsor, pers. comm.).

Long Point extends 29 km from the northwest part of the Port au Port Peninsula, and is more developed with a highway, houses, and land developed for hay and pasture (Greenlea and Herringa 1984). Undisturbed areas consist up of peatlands and balsam fir forests that are more productive than those found on Shoal Point. Ground cover consists of juniper (*Juniperus* spp.), ferns, raspberries (*Rubus idaeus*) and grasses (Greenlea and Herringa 1984).



**Figure 4-10** Locations of Rare Plants and Associated Habitat Types on the Port au Port Peninsula.

The following sections provide more detail relating to the primary habitat types occurring within the Port au Port Peninsula. Habitat types include the following:

- Wetlands
- Limestone barrens
- Salt marshes
- Forest

## Wetlands

### *Habitat Description*

Wetlands are areas of land where the water table is at or above the level of the mineral soil, and include bogs, fens, marshes and swamps. Common species found in Newfoundland wetlands, like those on the Port au Port Peninsula, include bog rosemary (*Andromeda glaucophylla*), leatherleaf (*Chamaedaphne calyculata*), pitcher plant (*Sarracenia purpurea*), and round-leaved sundew (*Drosera rotundifolia*) (Meades 1990).

### *Wetlands on the Peninsula*

The Port au Port Peninsula is in the Boreal Atlantic Maritime wetland region. The western Newfoundland portion of this region consists of Atlantic plateau bogs, 2-4 m deep, and slope fens. Atlantic plateau bogs are plateau-like with the surface raised above surrounding terrain. There are often large and scattered pools. Slope fens are small meadow-like springs in the forest, developed on poorly drained slopes but receiving nutrient enriched seepage water from surrounding soils. These are common in forested areas of western and northern Newfoundland, particularly on limestone substrate (Wells and Pollett 1983). The wetland forms in this part of the province tend towards extensive plateau bogs on coastal lowlands, smaller rich slope fens on forest clearings, and alluvial shrub swamps of mountain maple (*Acer spicatum*) or speckled alder (*Alnus rugosa*) (Meades 1993).

Bogs found within the Port au Port subregion are classified within the characteristic *Kalmio-sphagnetum fuscum* association. Species groups characteristic for this association include *Kalmia angustifolia*, *Rubus chamaemorus*, *Vaccinium angustifolium*, *Sphagnum fuscum*, *S. Rubellum*, and *Myrica anomala* (Pollett 1972).

The characteristic fen association for much of the western part of the province, including Port au Port, is *Potentilla-Campylietum stellati*. This association is characterized by the species grouping of *Thalictrum polygamum*, *Selaginella selaginoides*, *Campylium stellatum* and *Potentilla fruticosa*. The indicators for rich fens within this same system are the association of the species *Tofieldia glutinosa*, *Triglochin maritime*, *Primula mistassinica*, and *Pinguicula vulgaris* (Pollett 1972). While minimal survey work has been done on wetlands of the Port au Port Peninsula, all of the rich fen indicator species have been recorded on the peninsula (ACCDC 2007).

Air photos of the Shoal Point and Long Point depict interesting wetland habitat, including meandering streams, fluvial fens, perched and kettle ponds and patterned systems such as ribbed and ladder fens. Such wetland structure is somewhat atypical of western Newfoundland. Peatland with ladder fens is more common in the central part of the province (Wells and Pollett 1983), and kettle formation is uncommon for the Island of Newfoundland. The streams and associated vegetation, and the high ratio of edge to open water of the ponds, along with the uniqueness of some of the wetland structures make these areas potentially interesting in terms of flora and habitat.

### *Extremely Rare, Rare and Uncommon Wetland Plants on the peninsula*

One plant survey was done near the tip of Shoal Point (Figure 4-10) in conjunction with the Newfoundland Rare Plant Project in 1999 (ACDC 2007). This turned up the following rare and uncommon species.

- Saltmarsh bulrush (*Bolboschoenus maritimus* subsp. *Paludosus*) (S2 rank)
- Beachgrass (*Ammophila breviligulata*) (S3 rank)
- Mackenzie's sedge (*Carex mackenziei*) (S3 rank)
- Hardstem bulrush (*Schoenoplectus acutus* var. *acutus*) (S3 rank)
- Freshwater cordgrass (*Spartina pectinata*) (S3 rank)

Extremely rare, rare and uncommon wetland species recorded elsewhere on the peninsula include the following species (ACDC 2007).

- Flat-stalked pondweed (*Potamogeton friesii*) (S1 rank)
- Western threadleaf pondweed (*Stuckenia filiformis* subsp. *occidentalis*) (S1 rank)
- Showy lady's slipper (*Cypripedium reginae*) (S2 rank)
- Slenderleaf sundew (*Drosera linearis*) (S2 rank)
- Knotted rush (*Juncus nodosus*) (S2 rank)
- Northern valerian (*Valeriana dioica* subsp. *sylvatica*) (S2 rank)
- White addersmouth (*Malaxis monophylla* var. *brachypoda*) (S2S3 rank) (also found in moist limestone barrens)

### *Importance of Wetlands*

Fens and marshes are very rich habitats for flora and fauna, including a diversity of orchids for plant enthusiasts and berries for consumption, and habitat for a wide variety of birds and waterfowl. Peatlands are essentially a non-renewable resource, considering they are formed over thousands of years of plant accumulation (National Wetlands Working Group 1988).

### Limestone Barrens

#### *Habitat Description*

Limestone barrens are found in exposed locations with Arctic-like climatic conditions of low temperatures and high winds. Ground is consistently disturbed by frost heave, frost shattering and cryoturbation (Tilley et al. 2005). This distinctive habitat gives rise to many unique and rare plants, including many endemics and species that are at their southern limit (Tilley et al. 2005). While the entire Port au Port Peninsula is often acclaimed for the interesting and unique limestone barren habitat, the northern parts of the peninsula are not significantly limestone influenced (J. Maunder, pers. comm.). Parts of the peninsula having significant amounts of limestone as parent material are centered in the southwest and centre of the peninsula (Greenlea and Herringa 1984).

The barrens structure includes a series of terraces extending inland from the shoreline. The lower terraces are dominated by shrubs such as dwarf willow and swamp birch. The upper terraces become more and more exposed until they are open bedrock with little soil cover. These upper exposed areas are often called Dryas Rock Gardens because of their abundance of mountain avens (*Dryas integrifolia*) (PAA 2000).



## *Limestone Barrens on the Peninsula*

There are two particularly noteworthy limestone barrens' locations on the peninsula. They are (1) Table Mountain, reaching the coast on the mainland side of the Port au Port isthmus, and (2) the barrens from Cape St. George on the southwest corner of the Port au Port Peninsula up to Mainland (Figure 4-10). Both areas are quite rich in rare plants. Table Mountain is the only provincial location where certain species are found, including *Neoturularia humilis*, *Carex petricosa* var. *misandroides*, and *Senecio cymbalaria*, while *Hedysarum boreale* subsp. *mackenzii* is recorded only between Cape St. George and Mainland. The latter location has been subject to increasing disturbance over the past 15 years with the development of a road and an increase in human recreation, leading to concerns over the habitat with respect to rare plant conservation (L. Hermanutz, pers. comm., N. Djan Chekar, pers. comm.).

## *Extremely Rare, Rare and Uncommon Limestone Barrens Plants on the peninsula*

Some of the extremely rare, rare and uncommon plants associated with limestone barrens on the Port au Port Peninsula include the following (ACCDC 2007).

- Rock dwelling sedge (*Carex petricosa* var. *misandroides*) (S1 rank)
- Dwarf arctic ragwort (*Senecio cymbalaria*) (S1 rank)
- Handsome pussytoes (*Antennaria pulcherrima*) (S2 rank)
- Low northern sedge (*Carex concinna*) (S2 rank)
- Northern rough fescue (*Festuca altaica*) (S2 rank)
- Alpine fescue (*Festuca brachyphylla* subsp. *brachyphylla*) (S2 rank)
- Dawson sandwort (*Minuartia dawsonensis*) (S2 rank)
- Low northern rockcress (*Neoturulia humilis*) (S2 rank)
- Hooker's orchid (*Platanthera hookeri*) (S2 rank)
- Crantz's cinquefoil (*Potentilla neumanniana*) (S2 rank)
- Dwarf tansy (*Tanacetum bipinnatum* subsp. *huronense*) (S2 rank)
- Selkirk's violet (*Viola selkirkii*) (S2 rank)
- Smooth cliffbrake (*Woodsia glabella*) (S2 rank)
- Bering chickweed (*Cerastium beeringianum* subsp. *beeringianum*) (S2S3 rank)
- Bulblet bladder fern (*Cystopteris bulbifera*) (S2S3 rank)
- White adder's-mouth orchid (*Malaxis monophylla* var. *brachypoda*) (S2S3 rank)
- Howell's pussytoes (*Antennaria howellii* subsp. *gaspensis*) (S3 rank)
- Glacier sedge (*Carex glacialis*) (S3 rank)
- Limestone oak fern (*Gymnocarpium robertianum*) (S3 rank)
- Arctic bladderpod (*Lesquerella arctica*) (S3 rank)

## *Importance of Limestone Barrens*

Limestone barrens are home to a unique suite of species and this habitat greatly increases the floral diversity and number of rare plants found in the region. The Port au Port Peninsula includes the southern extent of this habitat. Along with adjacent Table Mountain, this part of the limestone barrens is somewhat distinct from that found on the Great Northern Peninsula or in the Gros Morne Mountains (N. Djan Chekar, pers. comm.). Rare plants of the limestone barrens are sensitive to disturbance beyond the micro-site level, and some species have already been lost to the Cape St. George area of the Port au Port Peninsula due to human disturbance (L. Hermanutz, pers. comm.). On the province's northern peninsula, habitat loss of the limestone barrens due to quarrying, road construction, use of ATVs and uncontrolled development over the past 25 years has been responsible for endangering not only important plant species but the entire limestone barrens ecosystem (Limestone Barrens Habitat



Stewardship website). Thus far, survey work on the limestone barrens of the Port au Port Peninsula has been limited to the more accessible areas, and plant surveys have been targeted rather than systematic, leading many to believe that there is a high probability that more rare plants species are present in the limestone barrens habitat (J. Maunder, pers. comm.; C. Hanel, pers. comm.; N. Djan Chekar, pers. comm.)

#### *Limestone Barrens Plant Species of Particular Concern*

Low northern rockcress (*Neotorularia humilis*) has been recorded from only one location in the province, Table Mountain (Figure 4-11), and is listed as endangered under the Newfoundland and Labrador Endangered Species Act (Tilley et al. 2005). The plant is a perennial herb in the Brassicaceae family that depends on high elevation limestone habitats. Habitat degradation could threaten the population. Some other areas of the Port au Port Peninsula have been surveyed for the presence of this species but thus far it has not been observed on the peninsula, despite the presence of suitable habitat (Tilley et al. 2005).

Long's and Fernald's braya (*Braya longii* and *B. fernaldii*, respectively) are both small perennial flowers endemic to the limestone barrens habitat of Newfoundland. Although occurrence of neither species has yet been documented on the Port au Port Peninsula, apparent suitable habitat does exist in the area. Both species are briefly profiled in Section 4.2.1.4 on "Species at Risk".

#### Salt Marshes

##### *Habitat Description*

Salt marshes are grass-dominated coastal ecosystems subject to inundation of saline tidal waters (National Wetlands Working Group 1988). They contain salt tolerant terrestrial plants, and are characterized by a unique suite of characteristic vegetation. Common species in Newfoundland salt marshes include *Spartina alterniflora*, *Spartina pattens*, *Limonium carolinianum*, *Salicornia europaea*, *Suaeda linearis*, *Atriplex patula*, and *Plantago maritime*.

##### *Salt Marshes on the Peninsula*

There are a few salt marsh locations on the peninsula, including Piccadilly Provincial Park around Piccadilly Head and Tea Cove on Long Point (Figure 4-10).

##### *Rare Saltmarsh Plants*

The following are rare plants occurring in saltmarsh habitat on the peninsula (ACCDC 2007).

- Saltmarsh bulrush (*Bolboschoenus maritimus subsp. paludosus*) (S2 rank)
- Sea lavender (*Limonium carolinianum*) (S2 rank)
- Saltwater cordgrass (*Spartina alterniflora*) (S2 rank)

##### *Importance of Saltmarshes*

In Newfoundland, salt marsh habitats harbour a suite of rare species, mainly because of the rarity of these habitat types in the province (C. Hanel, pers. comm.). The characteristic high productivity of these systems can provide important food and habitat sources for fish and wildlife and their contribution to the fishery has often been indicated (National Wetlands Working Group 1998). To date, minimal surveying of salt marsh habitat has been conducted on Long Point, although salt marsh habitat at Tea Cove has been identified (Batterson and Sheppard 2000).

## Forests and Scrub Forests

### *Habitat Description*

As of 1984, the amount of productive forest in the Project Area was approximately 116.5 km<sup>2</sup> and was dominated by softwoods (Greenlea and Herringa 1984). Forest cover in the Port au Port subregion is reduced compared to other parts of the Western Newfoundland Forest Ecoregion, due to high wind and storm exposure. Where they do occur, forests are often stunted due to wind and are often unproductive (Meades and Moores 1989). Soil drainage is a large factor in species composition, with the better drained sites, such as Long Point (Figure 4-10) containing balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), white birch (*Betula papyrifera*), maple (*Acer* spp.), mountain ash (*Sorbus* sp.), and pin cherry (*Prunus pensylvanica*). Areas with poor drainage are typically characterized by black spruce (*Picea mariana*), larch (*Larix laricina*), and speckled alder (*Alnus rugosa*) (Greenlea and Herringa 1984). Black spruce is less common than in other parts of the province (Meades and Moore 1989). Some species, such as bilberry (*Vaccinium ovalifolium*) and yew (*Taxus canadensis*), are common in forests occurring over limestone bedrock (Meades 1993).

### *Extremely Rare, Rare and Uncommon Forest Plants*

The following are extremely rare, rare and uncommon plants occurring in forest habitat on the peninsula (ACCDC 2007).

- Hooked crowfoot (*Ranunculus recurvatus* var. *recurvatus*) (S1 rank)
- Selkirk's violet (*Viola selkirkii*) (S2 rank)
- Northern woodland violet (*Viola septentrionalis*) (S2 rank)
- Bulblet bladder fern (*Cystopteris bulbifera*) (S2S3 rank)

### *Importance of Forests and Scrub Forests*

The limestone substrate found in the barrens continues under much of the forest on the Port au Port Peninsula, making this an interesting system with unique characteristics (N. Djan Chekar, pers. comm.; Damman 1983). Few surveys have been conducted on the peninsula's forested areas.

### ACCDC Species Listings for Entire Port au Port Peninsula

Table 4-5 provides a complete listing of the 60+ extremely rare, rare and uncommon terrestrial vegetation species known to occur on the peninsula, as of May 2007.

**Table 4-5 Study Area Plants and Associated S-Ranks.**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Family</b>	<b>S-Rank</b>
Fairyslipper	<i>Calypso bulbosa</i> var. <i>americana</i>	Orchidaceae	S1
Rock dwelling sedge	<i>Carex petricosa</i> var. <i>misandroides</i>	Cyperaceae	S1
Teaberry	<i>Gaultheria procumbens</i>	Ericaceae	S1
Mackenzie's sweetvetch	<i>Hedysarum boreale</i> subsp. <i>mackenzii</i>	Fabaceae	S1
Low northern rockcress	<i>Neoturulia humilis</i>	Brassicaceae	S1
Flat stalked pondweed	<i>Potamogeton friesii</i>	Potamogetonaceae	S1
Hooked crowfoot	<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	Ranunculaceae	S1
Dwarf Arctic ragwort	<i>Senecio cymbalaria</i>	Asteraceae	S1
Slender wedgescale	<i>Sphenopholis intermedia</i>	Poaceae	S1
Western threadleaf pondweed	<i>Stuckenia filiformis</i> subsp. <i>occidentalis</i>	Potamogetonaceae	S1

**Table 4-5 Continued.**

Broadlobed dandelion	<i>Taraxacum latilobum</i>	Asteraceae	S1S2
Laurentian fragile fern	<i>Cystopteris laurentiana</i>	Dryopteridaceae	S1S3
Handsome pussytoes	<i>Antennaria pulcherrima</i>	Asteraceae	S2
Narrowleaf arnica	<i>Arnica angustifolia</i> subsp. <i>angustifolia</i>	Asteraceae	S2
Saltmarsh bulrush	<i>Bolboschoenus maritimus</i> subsp. <i>paludosus</i>	Cyperaceae	S2
Low northern sedge	<i>Carex concinna</i>	Cyperaceae	S2
Showy ladyslipper	<i>Cypripedium reginae</i>	Orchidaceae	S2
Slenderleaf sundew	<i>Drosera linearis</i>	Droseraceae	S2
Northern rough fescue	<i>Festuca altaica</i>	Poaceae	S2
Alpine fescue	<i>Festuca brachyphylla</i> subsp. <i>brachyphylla</i>	Poaceae	S2
Knotted rush	<i>Juncus nodosus</i>	Juncaceae	S2
Sea lavender	<i>Limonium carolinianum</i>	Plumbaginaceae	S2
Dawson sandwort	<i>Minuartia dawsonensis</i>	Caryophyllaceae	S2
Hooker's orchid	<i>Platanthera hookeri</i>	Orchidaceae	S2
Crantz's cinquefoil	<i>Potentilla neumanniana</i>	Rosaceae	S2
Macoun's buttercup	<i>Ranunculus macounii</i>	Ranunculaceae	S2
Seaside goldenrod	<i>Solidago sempervirens</i> var. <i>sempervirens</i>	Asteraceae	S2
Giant burreed	<i>Sparganium eurycarpum</i>	Sparganiaceae	S2
Saltwater cordgrass	<i>Spartina alterniflora</i>	Poaceae	S2
Dwarf tansy	<i>Tanacetum bipinnatum</i> subsp. <i>huronense</i>	Asteraceae	S2
Purple false oat	<i>Trisetum melicoides</i>	Poaceae	S2
Northern valerian	<i>Valeriana dioica</i> subsp. <i>sylvatica</i>	Valerianaceae	S2
Selkirk's violet	<i>Viola selkirkii</i>	Violaceae	S2
Northern woodland violet	<i>Viola septentrionalis</i>	Violaceae	S2
Smooth cliffbrake	<i>Woodsia glabella</i>	Dryopteridaceae	S2
Bering chickweed	<i>Cerastium beeringianum</i> subsp. <i>beeringianum</i>	Caryophyllaceae	S2S3
Bulblet bladder fern	<i>Cystopteris bulbifera</i>	Dryopteridaceae	S2S3
White addersmouth	<i>Malaxis monophylla</i> var. <i>brachypoda</i>	Orchidaceae	S2S3
Northern green orchid	<i>Platanthera aquilonis</i>	Orchidaceae	S2S3
Forest bluegrass	<i>Poa saltuensis</i>	Poaceae	S2S3
Beachgrass	<i>Ammophila breviligulata</i>	Poaceae	S3
Alpine pussytoes	<i>Antennaria alpina</i> subsp. <i>canescens</i>	Asteraceae	S3
Howell's pussytoes	<i>Antennaria howellii</i> subsp. <i>gaspensis</i>	Asteraceae	S3
Bristleleaf sedge	<i>Carex eburnea</i>	Cyperaceae	S3
Glacier sedge	<i>Carex glacialis</i>	Cyperaceae	S3
Mackenzie's sedge	<i>Carex mackenziei</i>	Cyperaceae	S3
Longstalked sedge	<i>Carex pedunculata</i>	Cyperaceae	S3
Rock sedge	<i>Carex rupestris</i>	Cyperaceae	S3
Sterile sedge	<i>Carex sterilis</i>	Cyperaceae	S3
Fewflowered spikerush	<i>Eleocharis quinqueflora</i>	Cyperaceae	S3
Bog willowherb	<i>Epilobium leptophyllum</i>	Onagraceae	S3
Limestone oak fern	<i>Gymnocarpium robertianum</i>	Dryopteridaceae	S3
Arctic bladderpod	<i>Lesquerella arctica</i>	Brassicaceae	S3
Green addersmouth	<i>Malaxis unifolia</i>	Orchidaceae	S3
Whitegrain mountainrice	<i>Oryzopsis asperifolia</i>	Poaceae	S3
Newfoundland oxytrope	<i>Oxytropis campestris</i> var. <i>minor</i>	Fabaceae	S3
Northern hollyfern	<i>Polystichum lonchitis</i>	Dryopteridaceae	S3
Snowy cinquefoil	<i>Potentilla nivea</i>	Rosaceae	S3
Plumboy	<i>Rubus arcticus</i> subsp. <i>acaulis</i>	Rosaceae	S3
Limestone willow	<i>Salix calcicola</i> var. <i>calcicola</i>	Salicaceae	S3
Hardstem bulrush	<i>Schoenoplectus acutus</i> var. <i>acutus</i>	Cyperaceae	S3
Freshwater cordgrass	<i>Spartina pectinata</i>	Poaceae	S3
Common moonwort	<i>Botrychium lunaria</i>	Ophioglossaceae	S3S4

Source: ACCDC (2007).

#### 4.2.1.2 Fish and Fish Habitat

Examination of topographic maps indicates the occurrence of fifty-nine watersheds on the peninsula (NRCan). Many of these watersheds are first order streams without tributaries and likely do not have much high quality fish habitat due to steep slopes and intermittent flows. Second and third order streams also occur in the area.

There is little available habitat and biological information on the freshwater systems that occur on the Port au Port Peninsula (B. Watkins, pers. comm.). Freshwater fish species that occur on the peninsula include brook trout (*Salvelinus fontinalis*) (both resident and sea run), American eels (*Anguilla rostrata*), and threespine stickleback (*Gasterosteus aculeatus*) (Porter et al. 1974; JW 2006). No banded killifish (*Fundulus diaphanous*) have been reported on the Port au Port Peninsula. No scheduled Atlantic salmon (*Salmo salar*) rivers occur on the peninsula.

#### 4.2.1.3 Terrestrial Wildlife

This section provides background information on the land birds and terrestrial mammals present on the Port au Port Peninsula. Those that are common to the region are listed, with land birds divided into those commonly found in forested habitats and those found in wetland or more open habitats. Bird and mammal species of interest or concern are discussed in more detail.

Systematic surveys of terrestrial wildlife have been few on the peninsula (S. Pardy, pers. comm.), and much of these data rely on anecdotal evidence and inferences based on known populations near the area and knowledge of animal biology and habitat requirements.

#### Birds

Because of geography and predominance in the surrounding marine system, the Port au Port Peninsula and, in particular, Shoal Point and Long Point are potentially important stop-over points for land and shore birds during migration (P. Thomas, pers. comm.).

Few systematic surveys have been conducted for land birds on the Port au Port Peninsula. The following species, typical of boreal forests, boreal wetlands and open areas, have been recorded (PAA 2000; B. Winsor, pers comm.; NF Bird List website).

#### *Forest Birds Recorded on the Port au Port Peninsula*

- Northern Flicker (*Colaptes auratus*)
- Alder Flycatcher (*Empidonax alnorum*)
- Northern Shrike (*Lanius excubitor*)
- Ruby-crowned Kinglet (*Regulus calendula*)
- Ruby-throated Hummingbird (*Archilochus colubris*)
- Swainson's Thrush (*Catharus ustulatus*)
- Hermit Thrush (*Catharus guttatus*)
- Black and White Warbler (*Mniotilta varia*)
- Tennessee Warbler (*Vermivora peregrina*)
- Yellow Warbler (*Dendroica aestiva*)
- Bay-breasted Warbler (*Dendroica castanea*)
- Northern Parula (*Parula americana*)

- Northern Waterthrush (*Seiurus noveboracensis*)
- Pine Siskin (*Carduelis pinus*)
- Common Grackle (*Quiscalus quiscula*)
- Purple Finch (*Carpodacus purpureus*)
- Savannah Sparrow (*Passerculus sandwichensis*)
- Lincoln's Sparrow (*Melospiza lincolni*)
- Fox Sparrow (*Passerella iliaca*)
- Swamp Sparrow (*Melospiza georgiana*)

#### *Wetland and Open Area Birds Recorded on the Port au Port Peninsula*

- Savannah Sparrow (*Passerculus sandwichensis*)
- Lincoln's Sparrow (*Melospiza lincolni*)
- Song Sparrow (*Melospiza melodia*)
- Snow Bunting (*Plectrophenax nivalis*)
- Bobolink (*Dolichonyx oryzivorus*)
- Mourning Warbler (*Oporornis philadelphia*)
- Merlin (*Falco columbarius*)
- American Kestrel (*Haliaeetus leucocephalus*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- Mallard (*Abas okatyrrhynchos*)
- Eurasian Wigeon (*Anas penelope*)
- Ruddy Duck (*Oxyura jamaicensis*)
- Snow Goose (*Anser caerulescens*)
- Canada Goose (*Branta canadensis*)
- Black Duck (*Anas rubripes*)
- Green-winged Teal (*Anas carolinensis*)
- Great Blue Heron (*Andrea herodias*)
- Mourning Dove (*Zenaida macroura*)
- American Pipit (*Anthus rubescens*)
- Horned Lark (*Eremophila alpestris*)
- Lapland Longspur (*Calcarius lapponicus*)
- Gadwall (*Anas strepera*)

#### *Trout River Bird Species*

The closest Breeding Bird Survey location is at Trout River, approximately 75 km north of the peninsula at the southern border of Gros Morne National Park. While differing in habitat due in part to its serpentine substrate, it is situated on the west coast of same ecoregion, the Western Newfoundland Forest. Species collected at Trout River between 1966 and 2004 (Sauer et al. 2005) include the following:

- Spotted Sandpiper (*Actitis macularia*)
- Wilson's Snipe (*Gallinago delicata*)
- Herring Gull (*Larus argentatus*)
- Great Black-backed Gull (*Larus marinus*)
- Belted Kingfisher (*Ceryle alcyon*)
- Downy Woodpecker (*Picoides pubescens*)
- Hairy Woodpecker (*Picoides villosus*)

- Blackpoll Warbler (*Dendroica striata*)
- Black-and-white Warbler (*Mniotilta varia*)
- American Redstart (*Setophaga ruticilla*)
- Ovenbird (*Seiurus aurocapillus*)
- Northern Waterthrush (*Seiurus noveboracensis*)
- Mourning Warbler (*Oporornis philadelphia*)
- Common Yellowthroat (*Geothlypis trichas*)
- Blue-headed Vireo (*Vireo solitarius*)
- American Crow (*Corvus brachyrhynchos*)
- Wilson's Warbler (*Wilsonia pusilla*)
- Savannah Sparrow (*Passerculus sandwichensis*)
- Common Raven (*Corvus corax*)
- Fox Sparrow (*Passerella iliaca*)
- Black-capped Chickadee (*Poecile atricapillus*)
- Song Sparrow (*Melospiza melodia*)
- Boreal Chickadee (*Poecile hudsonicus*)
- Lincoln's Sparrow (*Melospiza lincolni*)
- Winter Wren (*Troglodytes troglodytes*)
- Swamp Sparrow (*Melospiza georgiana*)
- Golden-crowned Kinglet (*Regulus satrapa*)
- White-throated Sparrow (*Zonotrichia albicollis*)
- Ruby-crowned Kinglet (*Regulus calendula*)
- Purple Finch (*Carpodacus purpureus*)
- American Robin (*Turdus migratorius*)
- Pine Siskin (*Carduelis pinus*)
- Nashville Warbler (*Vermivora ruficapilla*)
- Cape May Warbler (*Dendroica tigrina*)
- Yellow Warbler (*Dendroica petechia*)
- Yellow-rumped Warbler (*Dendroica coronata*)
- Magnolia Warbler (*Dendroica magnolia*)
- Black-throated Green Warbler (*Dendroica virens*)

#### *Terrestrial Bird Species of Concern on the Port au Port Peninsula*

##### Short-eared Owl (*Asio flammeus flammeus*)

The Short-eared Owl is listed as a species of *special concern* in Canada under COSEWIC (Schmelzer 2005) and as *vulnerable* by the Newfoundland and Labrador *ESA*. This species is found across the country, but has been suffering a long term population decline due to loss of habitat. This owl is a ground nester and its preferred habitat is open fields, tundra, bog, sand dune and coastal barrens (Schmelzer 2005). Although known to breed in June in the Canadian Arctic, its breeding time in Newfoundland is unknown. Incubation lasts three to four weeks and the young fledge two to three weeks after hatching. Rare observations have been made of the Short-eared Owl on Long Point during its breeding period (B. Mactavish, pers. comm.; B. Winsor, pers. comm.).

##### Gray-cheeked Thrush (*Catharus minimus*)

The Gray-cheeked Thrush was recently listed as *vulnerable* by the Newfoundland and Labrador *ESA*. Breeding by this thrush has been recorded on the Port au Port Peninsula near Mainland. The Gray-cheeked Thrush likely breeds on other parts of the peninsula as well (P. Thomas, pers. comm.). The

provincial population size is not known, though trends in Canadian populations and regional anecdotal evidence suggest a strong downward trend (GNLDEC website 2006). It nests on the ground or in low shrubs of its preferred low, dense, coniferous forest habitat, and is present in this province from May to August (Dalley et al. 2005). The few records of breeding by this bird have been in June and July. There is insufficient information to either assess any demographic parameters or identify the most important factors threatening the species.

Peregrine Falcon/Tundra Peregrine Falcon (*Falco peregrinus anatum/tundrius*)

See Section 4.2.1.4 (Species at Risk) for short profile of *Falco peregrinus anatum*.

Rusty Blackbird (*Euphagus carolinus*)

The Rusty Blackbird is listed as a species of special concern by COSEWIC due to the severe decline this population has experienced throughout the country (COSEWIC 2006). It has not been documented on the peninsula though it has been recorded elsewhere in western Newfoundland, including along the approaches to the Long Range Mountains (B. Winsor, pers. comm.). Suitable boreal forest wetland habitat is found on the Port au Port Peninsula (B. Mactavish, pers. comm.). It is not listed by the Newfoundland and Labrador *ESA*.

Olive-sided Flycatcher (*Contopus cooperi*)

The Olive-sided Flycatcher is on the candidate list for COSEWIC. It has a large range throughout North America but populations have been declining throughout most of its range in the past decades (Cornell Lab of Ornithology). Preferred habitat of this bird is coniferous forest, often associated with openings and along the edges of water bodies where standing dead trees are present. Olive-sided Flycatchers have been observed migrating along the Port au Port Peninsula (P. Thomas, pers. comm.). It is not listed by the Newfoundland and Labrador *ESA*.

## Mammals

Mammals typical of boreal habitats are found on the peninsula, including masked shrew (*Sorex cinereus*), snowshoe hare (*Lepus americanus*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), red squirrel (*Tamiasciurus hudsonicus*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*) meadow vole (*Microtus pennsylvanicus*), ermine (*Mustela erminea*), mink (*Mustela vison*), river otter (*Lontra canadensis*), black bear (*Ursus americanus*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), lynx (*Lynx lynx*), and moose (*Alces alces*) (Meades 1990).

### *Terrestrial Mammal Species of Interest on the Port au Port Peninsula*

Moose, woodland caribou and Newfoundland marten are the mammal species of most interest on the peninsula. A short profile of the moose is presented here and profiles of the other two mammal species are included in Section 4.2.1.4 on Species at Risk.

#### Moose

Moose are abundant throughout the peninsula in their favoured balsam fir forest habitat (B. Winsor, pers. comm.) and its populations have been increasing in recent years in western Newfoundland (W. Barney, pers. comm.). The Port au Port Peninsula makes up Moose Management Area 43 which will distribute 450 hunting licenses for the 2007/2008 season (NLDOEC 2007). This equals the number of licenses distributed in 2006/2007 and is an increase from the 400 distributed in 2005/2006 (JW 2006).

The moose breeding period takes place in September/October in Newfoundland, with young being born in the spring and staying with their mothers until the following spring. There have also been reported sightings of an albino moose on the Port au Port Peninsula (Denise Cole, pers. comm.).

#### 4.2.1.4 Species at Risk

A number of plant and animal species considered under legislation as “species at risk” potentially occur on the Port au Port Peninsula (Table 4-6). Some of these species are known to occur on the peninsula while others have some chance of occurrence based on existing habitat and historical records. All of the following species designations associated with the *Species at Risk Act (SARA)*, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the *Endangered Species Act (ESA)* of the Government of Newfoundland and Labrador are current as of 1 May 2007. Emphasis is given to those species listed as endangered, threatened or special concern on Schedule 1 of SARA. Only species listed on Schedule 1 have special legal protection under SARA in terms of recovery strategies, penalties to be incurred for harming or killing individuals of the species, or destroying critical habitat.

#### SARA

Once a species is listed, measures to protect it and help its recovery are implemented. Marine-associated and terrestrial species that are legally protected under SARA (i.e., Schedule 1 *threatened* or *endangered*) as well as those listed as special concern on Schedule 1, Schedule 2 and Schedule 3, and that potentially occur on the peninsula are indicated in Table 4-6.

Schedules 2 and 3 of SARA identify species that were designated ‘at risk’ by COSEWIC prior to October 1999 and must be reassessed using revised criteria before they can be considered for addition to Schedule 1.

Under SARA Schedule 1, a ‘recovery strategy’ and corresponding ‘action plan’ must be prepared for endangered, threatened and extirpated species, and a management plan must be prepared for species listed as special concern.

#### COSEWIC

COSEWIC has also designated some species as either *endangered* or *threatened* that do not occur on the SARA listing as either *endangered* or *threatened*. These COSEWIC-listed species that may occur on the peninsula are indicated in Table 4-6.

#### ESA (Government of Newfoundland and Labrador)

Species that are listed as “wildlife at risk” by the Government of Newfoundland and Labrador and that may occur on the peninsula are indicated in Table 4-6. Eight of the ESA species listed as either endangered or threatened are also listed as either endangered or threatened on Schedule 1 of the SARA.

Species listed under the ESA that also have ‘special concern’ status under the SARA include banded killifish, Harlequin Duck, Barrow’s Goldeneye, Fernald’s milk-vetch and the boreal felt lichen.

#### Profiles of Species Listed as Endangered, Threatened or Special Concern on Schedule 1 of SARA

Profiles of terrestrial species listed as either endangered or threatened on Schedule 1 of the SARA are provided in this section.



**Table 4-6 SARA-, COSEWIC- and ESA-listed Species with Reasonable Possibility of Occurrence on the Peninsula.**

Species	SARA <sup>a</sup>			COSEWIC <sup>b</sup>			ESA <sup>c</sup>		
	Endangered	Threatened	Special Concern	Endangered	Threatened	Special Concern	Endangered	Threatened	Vulnerable
<b>Terrestrial</b>									
American marten ( <i>Martes americana atrata</i> ) (Newfoundland population)	Schedule 1			X			X		
Red Crossbill ( <i>percna</i> subspecies) ( <i>Loxia curvirostra percna</i> )	Schedule 1			X			X		
Piping Plover ( <i>melodus</i> subspecies) ( <i>Charadrius melodus melodus</i> )	Schedule 1			X			X		
Long's braya ( <i>Braya longii</i> )	Schedule 1			X			X		
Barrens willow ( <i>Salix jejuna</i> )	Schedule 1			X			X		
Woodland caribou ( <i>Rangifer tarandus caribou</i> ) (Boreal population)		Schedule 1			X			X	
Peregrine Falcon ( <i>anatum</i> subspecies) ( <i>Falco peregrinus anatum</i> )		Schedule 1			X			X	
Fernald's braya ( <i>Braya fernaldii</i> )		Schedule 1			X			X	
Banded killifish ( <i>Fundulus diaphanus</i> ) (Newfoundland population)			Schedule 1			X			X
Fernald's milk-vetch ( <i>Astragalus robbinsii</i> <i>var. fernaldii</i> )			Schedule 1			X			X

**Table 4.6 Continued.**

Short-eared Owl ( <i>Asio flammeus</i> )			Schedule 3			X			X
Rusty Blackbird ( <i>Euphagus carolinus</i> )						X			
Low northern rockcross ( <i>Neotorulia humilis</i> )							X		
Gray-cheeked Thrush ( <i>Catharus minimus</i> )									X

Sources: <sup>a</sup> SARA website ([http://www.sararegistry.gc.ca/default\\_e.cfm](http://www.sararegistry.gc.ca/default_e.cfm)) (May 2007)

<sup>b</sup> COSEWIC website (<http://www.cosepac.gc.ca/index.htm>) (May 2007)

<sup>c</sup> ESA (Government of Newfoundland and Labrador) website ([http://www.env.gov.nl.ca/env/wildlife/wildlife\\_at\\_risk.htm](http://www.env.gov.nl.ca/env/wildlife/wildlife_at_risk.htm)) (May 2007)

### *Newfoundland Marten (Martes americana)*

The Newfoundland marten is listed as *endangered* on both Schedule 1 of SARA and by ESA, and as threatened by COSEWIC. No recovery strategy for this population is yet available. It has never been recorded on the Port au Port Peninsula. The limited habitat found there coupled with the long history of occupation would make it unlikely that a resident population of the Newfoundland marten occurs on the Port au Port Peninsula (J. Gosse, pers. comm.). This mammal's core population is located slightly east of the Port au Port Peninsula, so it is possible that some Newfoundland martens do disperse to peninsula.

### *Red Crossbill (Loxia curvirostra percna)*

The Red Crossbill is listed as *endangered* on Schedule 1 of the SARA, by COSEWIC, and by ESA. A recovery strategy for this bird was released in October 2006 (Environment Canada 2006). It is found in conifer forests of central and western Newfoundland and its specific range and breeding period depend on regional productivity of cone crops (SARA website). The Study Area offers potential habitat for this species (P. Thomas, pers. comm., B. Mactavish, pers. comm.), though the Red Crossbill's affinity for pine cones makes it unlikely that this habitat would be very significant to them (B. Winsor, pers. comm.). This species has not been documented on the Port au Port Peninsula. Dramatic declines have been observed through breeding bird counts over the past 50 years, possibly due to factors such as habitat degradation and loss, and competition for food from the introduced red squirrel (SARA website).

### *Piping Plover (Charadrius melodus melodus)*

This subspecies of the Piping Plover is listed as endangered on Schedule 1 of the SARA, by COSEWIC, and by ESA. A proposed recovery strategy for this shorebird is outlined in Goossen (2002 in C-NLOPB, Section 3.5.5). In Newfoundland, this small, thrush-sized shorebird is only found on beaches of the southwest coast, typically off the Port au Port Peninsula. There are fewer than 50 adult Piping Plovers nesting in Newfoundland. A recent sighting at Piccadilly Beach was reported in 2005 (C-NLOPB 2005, Section 3.5.5).

### *Long's Braya (Braya longii)*

*Long's braya* is listed as *endangered* on Schedule 1 of the SARA, by COSEWIC, and by ESA. A recovery strategy for this plant is not yet available. It is a small perennial flower endemic to the limestone barrens habitat of Newfoundland. This plant has a highly restricted population and is susceptible to habitat loss and degradation due to human disturbance. It is self-pollinating with wind dispersed seeds. Since seeds are carried only short distances, new populations cannot establish in an area once the original population is destroyed. Despite the presence of suitable habitat for this species on the Port au Port Peninsula, no occurrences have yet been documented.

### *Barrens Willow (Salix jejuna)*

Barrens Willow is listed as *endangered* on Schedule 1 of the SARA, by COSEWIC, and by ESA. A recovery strategy for this rare plant was released in October 2003 (Djan-Chekar 2003). Although this dwarf prostrate shrub has never been documented on the peninsula, being a restricted endemic of limestone barrens habitat implies a chance of its occurrence on the peninsula.

### *Woodland Caribou (Rangifer tarandus caribou) (Boreal population)*

Woodland caribou herds from the Island of Newfoundland are not listed by either COSEWIC or by ESA (Thomas and Gray 2002). However, recent evidence of herd decline on the Island of Newfoundland

has recently initiated a two-year study to examine the south coast and northern peninsula herds (GNLDEC 2006). The study will investigate current population status, spatial distribution of herds, calf mortality, and current range distribution patterns to protect critical range components. Caribou were introduced to the Port au Port Peninsula in the 1960s but the population never experienced a great increase from the original twenty animals on the peninsula (W. Barney, pers. comm.). A flight survey counted a total of 37 individuals in 1976 (Menchenton 1977) and sporadic observations of caribou on the peninsula suggest that there could still be a small population on the peninsula. Calving on the peninsula would occur in May. There is no hunting of caribou on the Port au Port Peninsula (NLDOEC 2007).

#### *Peregrine Falcon (Falco peregrinus anatum)*

This subspecies of the peregrine falcon is listed as *threatened* on Schedule 1 of SARA, by COSEWIC, and by *ESA* due to its relative rarity and uncertainty about its population stability. No recovery strategy for this bird is yet available. This subspecies of Peregrine Falcon breeds in Labrador and has been observed migrating through the peninsula in the 1990s (B. Winsor, pers. comm.), though there have been no recorded sightings of it in recent years.

#### *Fernald's Braya (Braya fernaldii)*

Fernald's braya is listed as *threatened* on Schedule 1 of SARA, by COSEWIC, and by *ESA*. It is a small perennial flower endemic to the limestone barrens habitat of Newfoundland. It has a highly restricted population and is susceptible to habitat loss and degradation due to human disturbance. Fernald's braya is self-pollinating with wind dispersed seeds. Since seeds are carried only short distances, new populations cannot establish in an area once the original population is destroyed. Despite the presence of suitable habitat for this species on the Port au Port Peninsula, no occurrences have yet been documented.

#### *Banded Killifish (Fundulus diaphanus)*

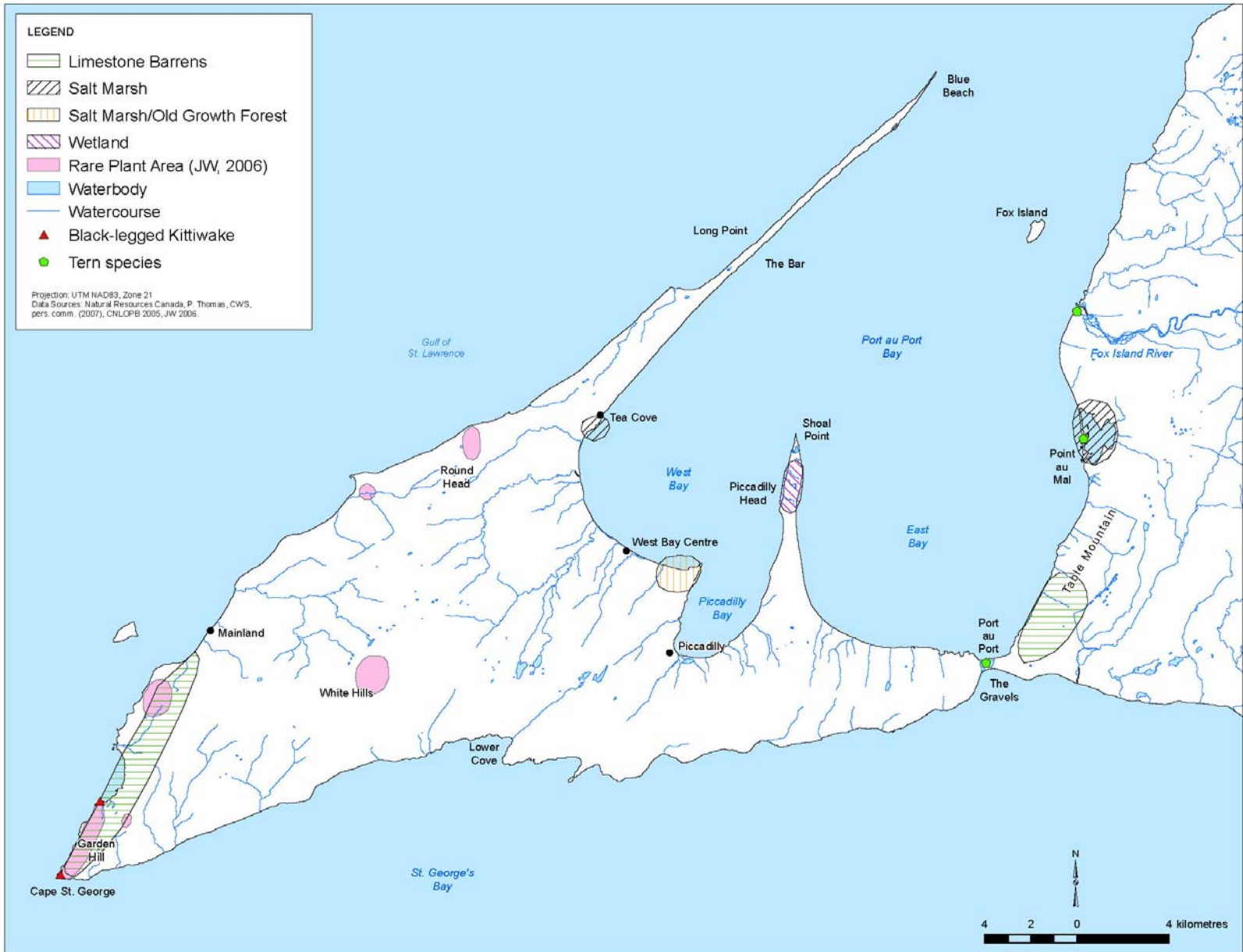
The banded killifish is listed as a species of *special concern* on Schedule 1 of SARA and by COSEWIC, and as *vulnerable* by *ESA*. It is primarily regarded as a freshwater species although it has been recorded in estuarine habitat. The banded killifish has not been documented on the peninsula but there are records of it nearby in the vicinity of Stephenville Crossing.

#### *Fernald's Milk-vetch (Astragalus robbinsii var. fernaldii)*

Fernald's milk-vetch is listed as a species of *special concern* on Schedule 1 of SARA and by COSEWIC, and as *vulnerable* by *ESA*. Although this perennial herbaceous plant has never been documented on the peninsula, its specificity for limestones barrens habitat implies a chance of its occurrence in this type of habitat on the peninsula.

### **4.2.2 Notable Areas**

Several areas on the Port au Port Peninsula are deemed notable due to a variety of reasons (e.g., breeding areas, locations of rare plants). The following sections describe these notable areas (Figure 4-11).



**Figure 4-11 Notable Biological Areas in Port au Port Peninsula Area.**

#### 4.2.2.1 Marine-associated Birds

##### Black-legged Kittiwake Nesting Area at Cape St. George

Two Black-legged Kittiwake colonies were identified in the vicinity of Cape St. George in June 2002 (C-NLOPB 2005; P. Thomas, pers. comm.). The southern most colony is described as very large (>1,000 birds) and the most northerly colony is described as large (501-1,000 birds).

#### 4.2.2.2 Terrestrial

Rare plant areas on the western side of Port au Port Bay were indicated in the TekOil and Gas Corporation Port au Port Seismic Program Screening and Registration (JW 2006) (Figure 4-11). Important areas characterized by the four types of terrestrial habitat described in Section 4.2.1.1 on vegetation are also indicated on (Figure 4-11).

### **4.3 Description of 2D Seismic Survey Activities**

#### **4.3.1 Program Overview**

The 2D onshore seismic survey will consist of 10 parallel lines, spaced 1 km apart and oriented NW-SE, and 2 parallel lines, spaced 1 km apart, and oriented NW-SW (Figure 3-1). The lines will total approximately 115 km. The locations of these lines were laid out by PDIP's technical consultants, and have been modified slightly to reduce the number of stream crossings, of which there will be 39. These lines are to be shot to confirm the validity of the trap of two leads mapped on existing seismic lines.

Dynamite charges will be used for the survey. The source points will be located at approximately 100 m intervals along the seismic lines. By recording the reflected energy at regular intervals along the line, followed by computerized data processing and analysis, a 2D image of the interpreted subsurface geology will be produced, which will help identify targets for exploratory drilling.

#### **4.3.2 Equipment**

It is expected that the proposed survey will have conventional characteristics. The 2D survey will use the following, conventional equipment (or similar):

- Energy source: 2 kg dynamite charges loaded in shot holes;
- Shot holes: To be drilled to a depth of about 8 m by a specialized track-mounted drill rig;
- Detector parameters: Conventional geophones with 10 to 240 Hz response range and less than 0.1% distortion. Total active line 6000m (split spread);
- Fold: Nominal 120 fold for 2D lines.

#### **4.3.3 Project Phases**

##### 4.3.3.1 Phase I: Land Surveying and Line Cutting

Before any physical work begins, permits and approvals will be obtained from federal, provincial, and municipal governments, private landowners, and all other relevant organizations and individuals that hold interest in, or title to, the land.

Around the first week of August, the desired survey lines will be laid out, and a cutting crew will clear the lines of vegetation with chain saws. This will result in a cut line that will be about 2.5 m wide, as shown in Figure 4-12, to ensure enough space for safe operations for working crew and to allow passage of a small drill rig. Lines will be cut to UTM coordinate headings using hand-held GPS units,

eliminating the need to flag the lines in advance. Cutting crews will require all terrain vehicles (ATV) for access, and to transport equipment and supplies. As per PDIP's Field Guide for Environmental Safeguarding (FGES) for Onshore Seismic Activities, crews will be advised to minimize ground surface impacts as much as possible, and to use existing ATV woods trails rather than cut lines when conditions warrant. In addition, crews will respect raptor nest sites and avoid cutting any tree with an identifiable raptor nest.

During this phase of the work, conditions at each stream crossing will be noted. Where required, as per PDIP's FGES, cut lines at stream crossings will be offset from the proposed survey lines shown on Figure 4-15 to allow optimal equipment passage with the view to minimizing impacts to the stream and its riparian zone, thus creating a "dog leg" in the cut line. (The seismic cable must, however, be laid in a straight line, with minimal cutting). Dog legs will also be cut at road crossings to obscure the view of cut lines from these publicly accessible vantage points.



**Figure 4-12 Typical Cut Survey Line.**

Wood of suitable size will be stacked vertically at regular intervals in accordance with regulations, so that it may be recovered by local users as part of their domestic cutting allotment. Smaller size scrub will be placed in windrows along alternating sides of the cut line. Recognising concerns raised during the public consultation process, PDIP will ensure that lines are left in an appropriate condition.

#### 4.3.3.2 Phase II: Line Chaining

In early winter one or two 2-person chaining crews will stake out the lines at 25 metre intervals with marking pickets. PDIP's seismic consultant will provide a chief for each crew; the other person will be locally hired. At this time, temporary bridges will be built at stream crossings, if required, so that stream beds will not be disturbed by machinery transit.



#### 4.3.3.3 Phase III: Shot Hole Drilling

During the winter, a specialized seismic drill rig will be secured to drill previously marked shot holes at 100 m intervals and to a depth of approximately 8 m.. These drill rigs are small units mounted on rubber tracked carriers, known as "enviro-drills", which leave a very light footprint. A typical unit is shown in Figure 4-13 below.

The charges will likely be of a particular type, called "cut to fit" in a plastic cartridge. This material begins to biodegrade after 6 months, so any misfires are eventually rendered harmless. A fuse line leads up the hole to the picket, where it is concealed. The holes are backfilled with gravel, to ensure that all energy is directed downward. There is no cap on the fuse line, so premature triggering of the shot is not possible.



**Figure 4-13 Typical Seismic Drill Rig Crossing a Temporary Bridge.**

Shot holes will not be placed less than 21 metres from a watercourse, or within 180 metres of any structure, waterwell, driveway, survey monument, or buried service line of any kind.

During drilling, Baroid's Quik-Foam gel, a proprietary blend of alcohol ethoxy sulfates that are biodegradable, will be added to the drilling unit's compressed air to help to stabilize overburden soils to prevent caving prior to placement of explosive charges in each shot hole.

The drill rigs will travel each line only twice: once on the way in, once on the way out. ATVs or snowmobiles will be used for access during the course of drilling. Because the ground surface will likely be frozen and covered with snow and ice during this phase of the work, it is anticipated that ground disturbance caused by the drill rig, ATVs, and snowmobiles will be limited.

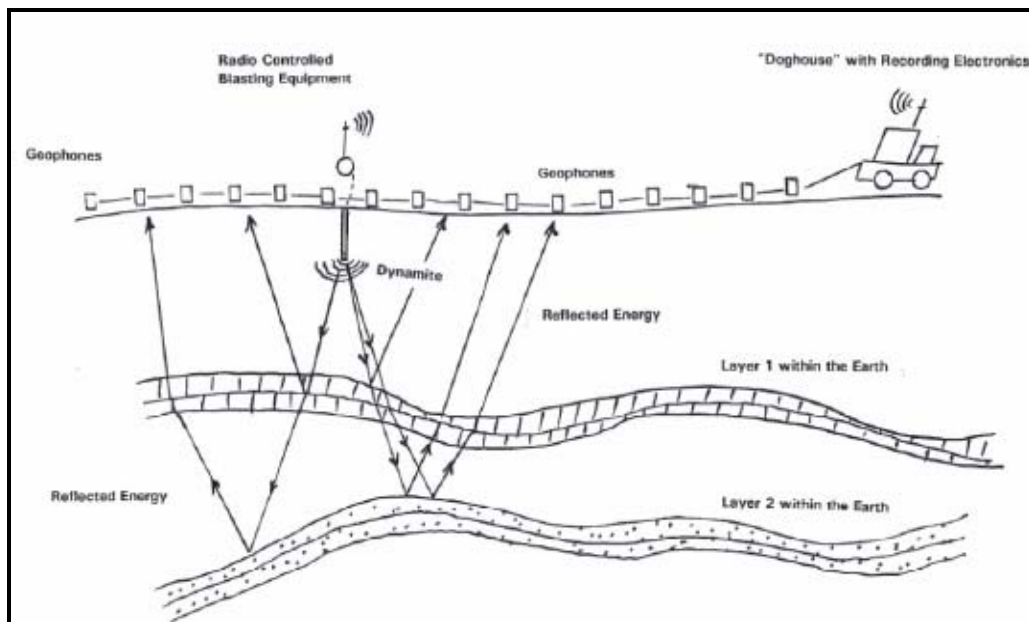


#### 4.3.3.4 Phase IV: Seismic Survey

During the summer after the line has been drilled, the line crew will begin the seismic survey. This will be a helicopter assisted program, which will also require minor use of ATVs along the cut lines. The first step will be to place microphones sensitive to ground motion, known as geophones, at each of the staked locations. All geophones will be connected by cable or radio to the "doghouse", which contains the recording electronics. Typically 500 sets of geophones will be laid before recording can commence.

When a sufficient number of geophones have been laid, the next step will be to begin the seismic recording. The "shooter", a licensed blaster using an ATV, will arm one shot at a time and inform the technician in the Doghouse, who will then set off that particular shot electronically. At the instant the shot is set off, the recording system records the returning echos for a short period of time, typically 3 to 6 seconds. Reflected pressure waves are sensed by the geophones, electronically digitized, and sent to the recorder. This process will then be repeated at each shotpoint along the line.

Once the line has been recorded, the survey crew will use a precise Global Positioning System (GPS) to determine the shotpoint locations to within approximately a few centimetres accuracy. This information is critical in processing the data and later in determining the position of underground geologic structures. A schematic of the seismic data acquisition process is shown in Figure 4-14 below.



Source: GeoScott Exploration Consultants

**Figure 4-14 Seismic Data Acquisition Process.**

### 4.4 Description of 3D Seismic Survey Activities

If required, the 3D onshore seismic survey will cover the Garden Hill South oil field. It will encompass an area of approximately 33 km<sup>2</sup> on the southern tip of the Port au Port Peninsula, as shown on Figure 3-1.

Although the detailed design of this survey has yet to be undertaken, it is probable that geophone cables will be laid across the area at intervals of approximately 200 m. It is planned to use dynamite charges spaced at approximately 100 m intervals loaded down shot holes. These will be used to

produce a 3D survey consisting of 25 m bins with a nominal 50 fold (or 60 fold). The depth of the shot holes and charge size will be finalized when the depth of the base of weathering and penetration efficiency is established.

In general, the activities described above in Section 4.3 for the 2D seismic work will likely be similar to those for the 3D survey.

## **4.5 Potential Conflicts**

In recognition of the various resources and land uses in the area of the proposed 2D and 3D seismic surveys, it is acknowledged that the potential exists for conflicts to arise. In addition, these proposed surveys overlap areas of environmental importance. These are described below.

### **4.5.1 Potential Land Use – Project Conflicts**

Figure 4-15 shows a number of areas where the proposed activities may interact with other land use activities and resources. These include:

- municipal boundaries and land-infilling areas (Cape St George, Lourdes, Mainland, Three Rock Cove);
- protected and unprotected drinking water supplies (Cape St George, Lourdes, Mainland);
- an archaeological site (Mainland);
- some provincial silviculture areas;
- waste disposal site (Lourdes);
- regional pasture (West Bay);
- mineral exploration claims; and
- a private park (Cape St George).

### **4.5.2 Potential Environment – Project Interactions**

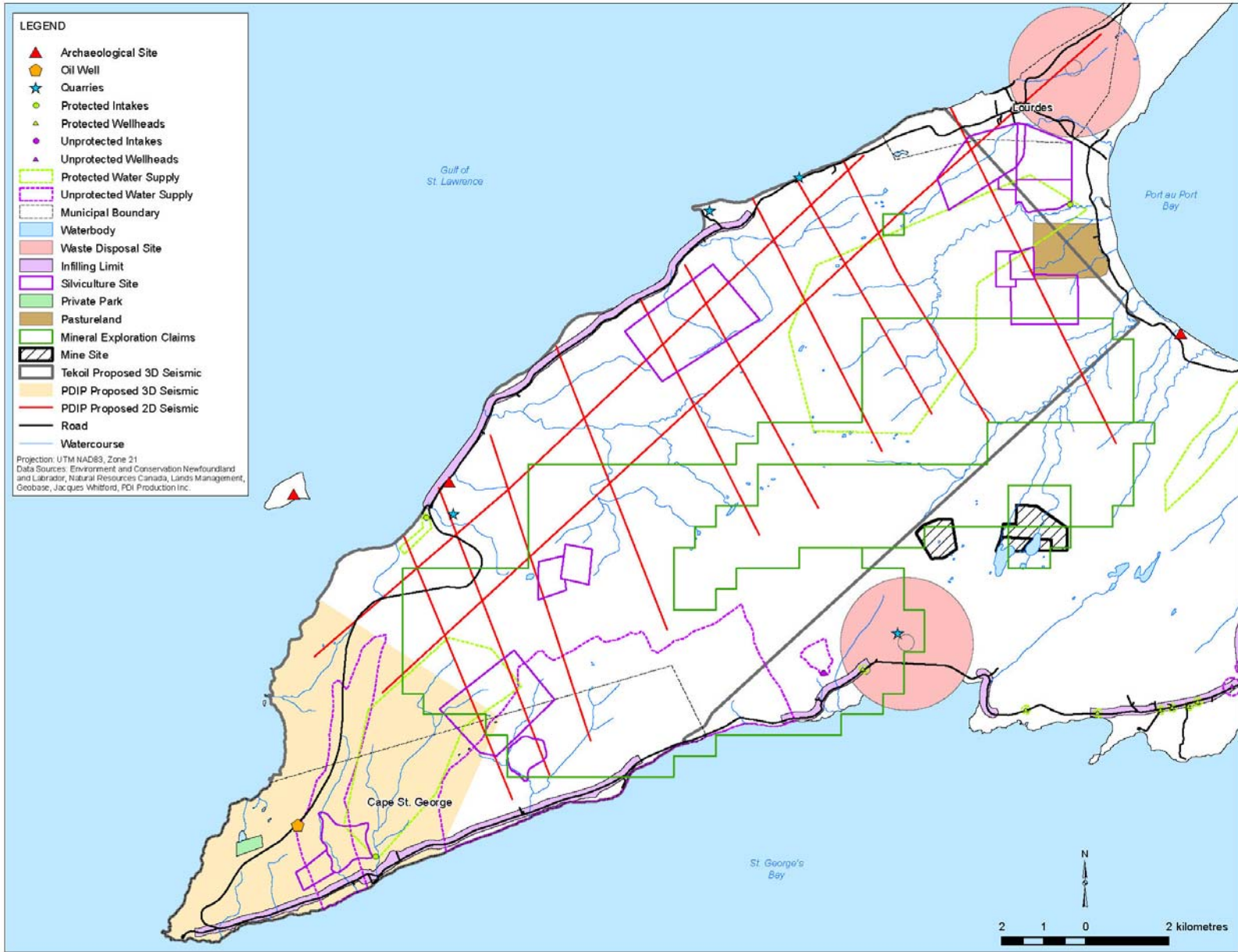
Figure 4-16 shows a number of areas where the proposed activities may interact with the biological and physical environment. These include:

- 39 stream fording locations (which appear on 1:50,000 topographic maps) which may interact with fish and fish habitat;
- limestone barrens and other potential rare plant areas; and
- nesting sites for Black-legged Kittiwakes (Cape St George, Big Cove).

### **4.5.3 Field Guide for Environmental Safeguarding for Onshore Seismic Activities**

PDIP's environmental policy shows that PDIP are environmentally responsible corporate citizens and hold personal safety, resource conservation, and protection of the environment in high regard. PDIP endeavour to undertake operations in a manner that minimizes interaction with the surrounding natural environment.

In order to ensure that negative impacts of proposed seismic surveys are mitigated as much as possible, PDIP are developing a Field Guide for Environmental Safeguarding for Onshore Seismic Activities. The document outlines potential environmental concerns associated with activities and identifies appropriate prevention and mitigation measures. This document will be provided to all workers, employees, and contractors involved with field work, and they will be required to adhere to all of its requirements.



**Figure 4-15 Potential Areas of Land Use – Project Interactions.**

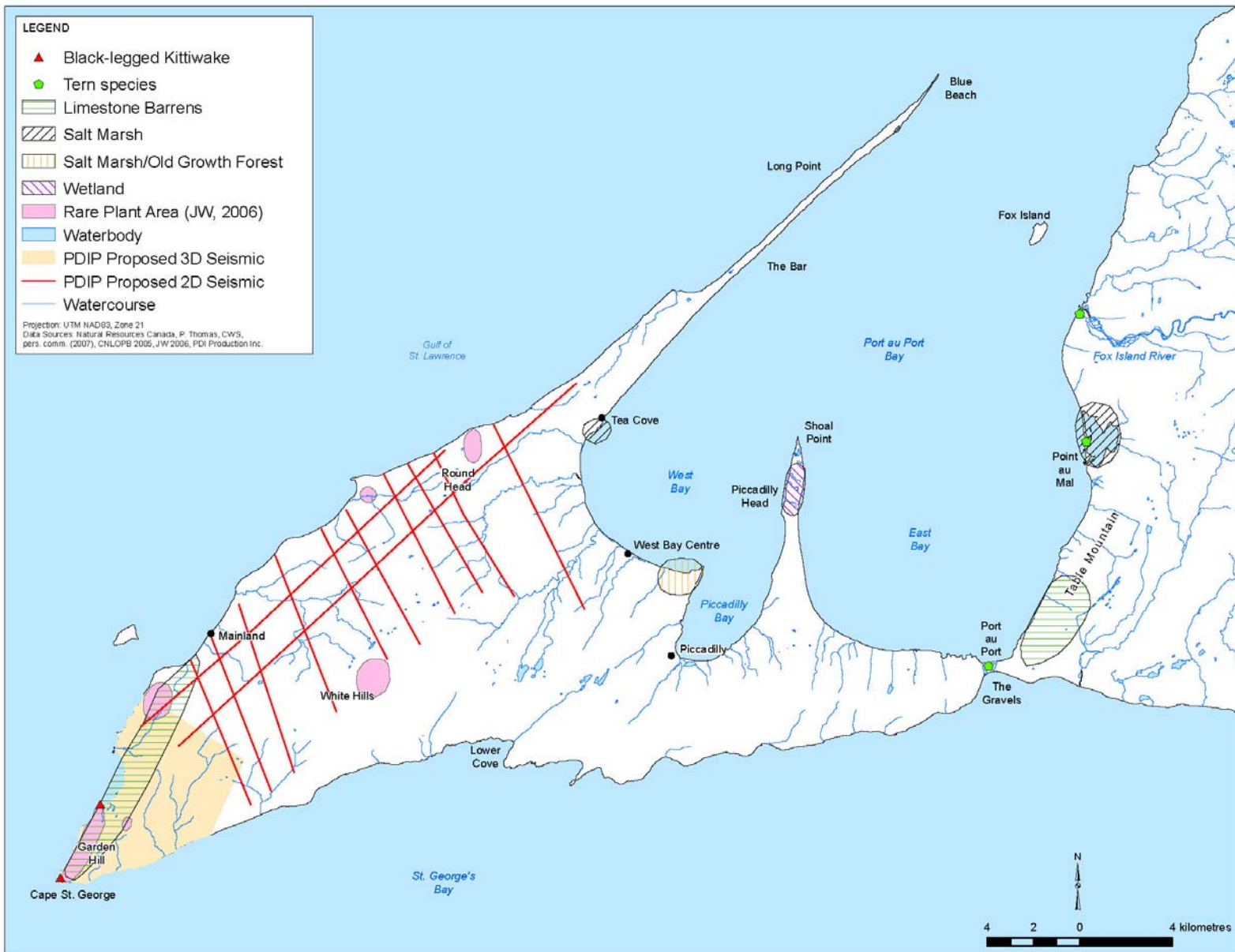


Figure 4-16 Potential Areas of Biological Environment – Project Interactions.

This document will require periodic monitoring of conditions during the various phases of the work, and all seismic lines will be flown over in a small aircraft at the end of each 2D and 3D survey in order to identify areas of excessive ground disturbance. These areas will be noted and rehabilitation work will begin soon after to minimize impacts and restore the lines to an appropriate condition.

A final closure summary, complete with numerous photographs of various locations, will be prepared and submitted to NLDOEC on completion of all field activities.

## 4.6 Occupations

### 4.6.1 Hiring Plans and Policies

The proponent will engage the services of local contractors and skilled workers to the greatest extent possible, and is committed to the principles of employment equity and maximum economic benefit to local communities. A statement of PDIP's Human Resources Policy is included in Appendix B.

The estimated numbers and types of occupations<sup>2</sup> created by the 2D seismic work during different phases of the work are provided in Table 4-7.

**Table 4-7 Breakdown of Occupations Anticipated for the 2D Seismic Survey.**

Activity	Occupation	NOC Code	Number of People
<b>Project Coordination (for all phases below)</b>	Environmental Engineer	2131	1
	Mechanical Engineer	2132	1
<b>Phase I: Line layout and mapping</b>	Geophysicist	2113	1
	GIS Specialist	2255	1
	Geophysicist	2113	1
	O&G Services Operator	8412	1
Line cutting	Chain Saw Operators	8421	36
	Geophysicist	2113	1
	Environmental Monitor	2121	1
<b>Phase II: Line chaining</b>	Geophysicist	2113	2
Temporary bridge construction	Forestry Labourers	8616	6
	Environmental Monitor	2121	1
<b>Phase III: Shothole drilling</b>	Driller	7372	3
	Driller's Helper	7612	3
	Driller's Foreman	7219	1
	Geophysicist	2113	1
	Environmental Monitor	2121	1
GPS survey	Geophysicist	2113	2
<b>Phase IV: Seismic shoot and bridge removal</b>	Helicopter pilot	2271	1
	Seismic Crew	2212	24 – 36
	Forestry Labourers	8616	6
	Environmental Monitor	2121	1
<b>Phase V: Environmental Monitoring and Remediation</b>	Helicopter pilot	2271	1
	Geophysicist	2113	1
	Environmental Monitor	2121	1
	Forestry Labourers	8616	?
Data interpretation	Geophysicist	2113	1

<sup>2</sup> As per the National Occupational Classification 2006

## 5. APPROVAL OF THE UNDERTAKING

Government permits, approvals, and authorizations required before starting any field activities are provided in Table 5-1.

**Table 5-1 Required Government Permits, Approvals, and Authorizations.**

Permit, Approval, Authorization Required	Applicable Legislation	Relevant Activity	Responsible Agency
<b>Federal government</b>			
"Request for Project Review" Application	<i>Fisheries Act</i>	Stream Fording	DFO
License for a Temporary Magazine	<i>Explosives Act and Explosives Regulations</i>	Blasting Materials Storage	DNR
Permit to Transport Explosives	<i>Explosives Act and Explosives Regulations</i>	Blasting Materials Transportation	DNR
<b>Provincial government</b>			
Authorization to Proceed to Permitting (environmental assessment release)	<i>Environmental Protection Act, Environmental Assessment Regulations</i>	Proceed to Permitting	DOEC
Exploration Licence		Onshore Seismic Exploration	DNR
Stream Fording Permit	<i>Water Resources Act</i>	Stream Fording	DOEC
Small Bridges	<i>Water Resources Act</i>	Stream Crossings	DOEC
Commercial Cutting Permit	<i>Forestry Act and Cutting of Timber Regulations</i>	Seismic line cutting	DNR
Blasters Safety Certificate		Blasting	
Development Activity In A Protected Public Water Supply Area	<i>Water Resources Act</i>	Activities within Protected Water Supply Areas	DOEC

## 6. SCHEDULE

It is anticipated that line cutting will commence during the first week of August, as fledglings leave their nests by about the 3<sup>rd</sup> week of July (B. Mactavish, pers. comm.), and any cutting before this time could have a negative impact on these birds.

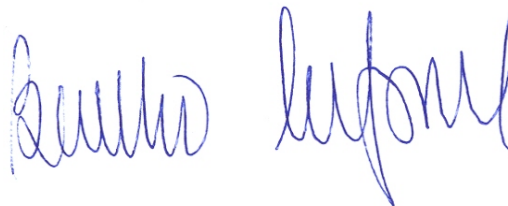
Because cutting will require 39 stream crossings, cutting must be planned to ensure there is no impact on fish, spawning habitat, and fish eggs. For this reason, it is planned that work will be completed before the end of September.



## 7. FUNDING

The Garden Hill Seismic Exploration Program will be wholly funded by PDIP and its partners. This project will not require funding in the form of a grant or loan from any government body, program, agency, or department.

The estimated capital cost for the Garden Hill Seismic Exploration Program is less than \$15 million and therefore will not be subject to applicable cost recovery fees.



8 June 2007

Date

Signature of Chief Executive Officer

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AML 2007

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## **Appendix A: PDIP's Environmental Policy Statement**

### **Mission Statement**

To provide operating services for the development of hydrocarbon assets, working to the highest design, safety and environmental standards and investing in local people to deliver returns.

### **Environmental Statement**

PDIP are environmentally responsible corporate citizens and hold personal safety, resource conservation, and protection of the environment in high regard. PDIP endeavour to undertake operations in a manner that minimizes interaction with the surrounding natural environment. Their facilities, equipment, and operating practices meet or exceed all applicable regulations and codes, and conform to good oilfield practice, and all contractors are required to adhere to the same principles.

PDIP make every effort to minimize waste produced and always ensure that any waste produced while carrying out activities is disposed of in accordance with relevant regulations. PDIP aim to reuse and recycle wherever possible and ensure that domestic waste generated during activities is stored and removed by an appropriate waste management contractor. Hazardous wastes are removed from project areas using appropriate waste management contractors and are treated and disposed of in accordance with relevant regulations.

It is PDIP's aim to achieve zero spills. In order to meet this objective, PDIP ensure that only qualified personnel operate equipment at site, by employing suitably qualified personnel and providing additional training whenever required. As well, to ensure the long life of equipment and infrastructure, regular maintenance and servicing are carried out to help reduce the risk of spills and leaks. PDIP also recognise, however, that in some cases, despite using the best available preventative measures, a spill may occur. For this reason, PDIP have also developed a spill contingency plan describing the response measures to undertake in the event of a release of oil or other pollutant to the environment.

## **Appendix B: PDIP's Human Resources Policy Statement**

PDIP is committed to bringing maximum benefits associated with the Port au Port operations to Newfoundland and Labrador, through incorporation of local resources for work associated with our oil and gas operations where commercially achievable. PDIP seek to strengthen the involvement of Newfoundlanders, particularly those in Western Newfoundland, and strive to provide these individuals and companies with full opportunity to participate in PDIP's activities on the Port au Port peninsula.

The recruitment and hiring process will be open and fair, with first consideration to qualified individuals resident in Western Newfoundland and then the remainder of the Province. When specialized knowledge or experience is required and when qualified Canadian workers are not available, foreign workers will be hired.

Goods and services will be procured through competitive tender on the basis of free, open and international competition, with:

- full and fair opportunity for all interested Newfoundland and Canadian companies.
- first consideration given to Newfoundland, and in particular Western Newfoundland, suppliers where they are competitive in terms of fair market price, quality, and delivery.
- encouragement of the development of long-term industrial support for the oil and gas industry in Western Newfoundland and Canada.

PDIP encourage and foster a non-discriminatory environment for the employment of all properly qualified persons. PDIP's goal is to achieve a level of diversity in employment that is at least proportional to the diversity found within the local labour market population.

Contractors and subcontractors working with PDIP must also subscribe to and apply these principles in their own operations.