POTTLE LAKE

Source Water Protection Plan

CBRM Water Utility
2013

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1.0 INTRODUCTION

The Nova Scotia Drinking Water Strategy (Nova Scotia Environment and Labour 2002) outlines a multi-barrier approach to achieve the delivery of safe, clean drinking water to all Nova Scotians. The barriers are:

- Keeping clean water clean: select the highest quality sources of water and protect these sources to prevent contamination.
- Making the water safe to drink: treat water to remove natural and manmade impurities.
- Proving the water is safe to drink: consistently monitor water quality and take swift, corrective action when deficiencies are identified.

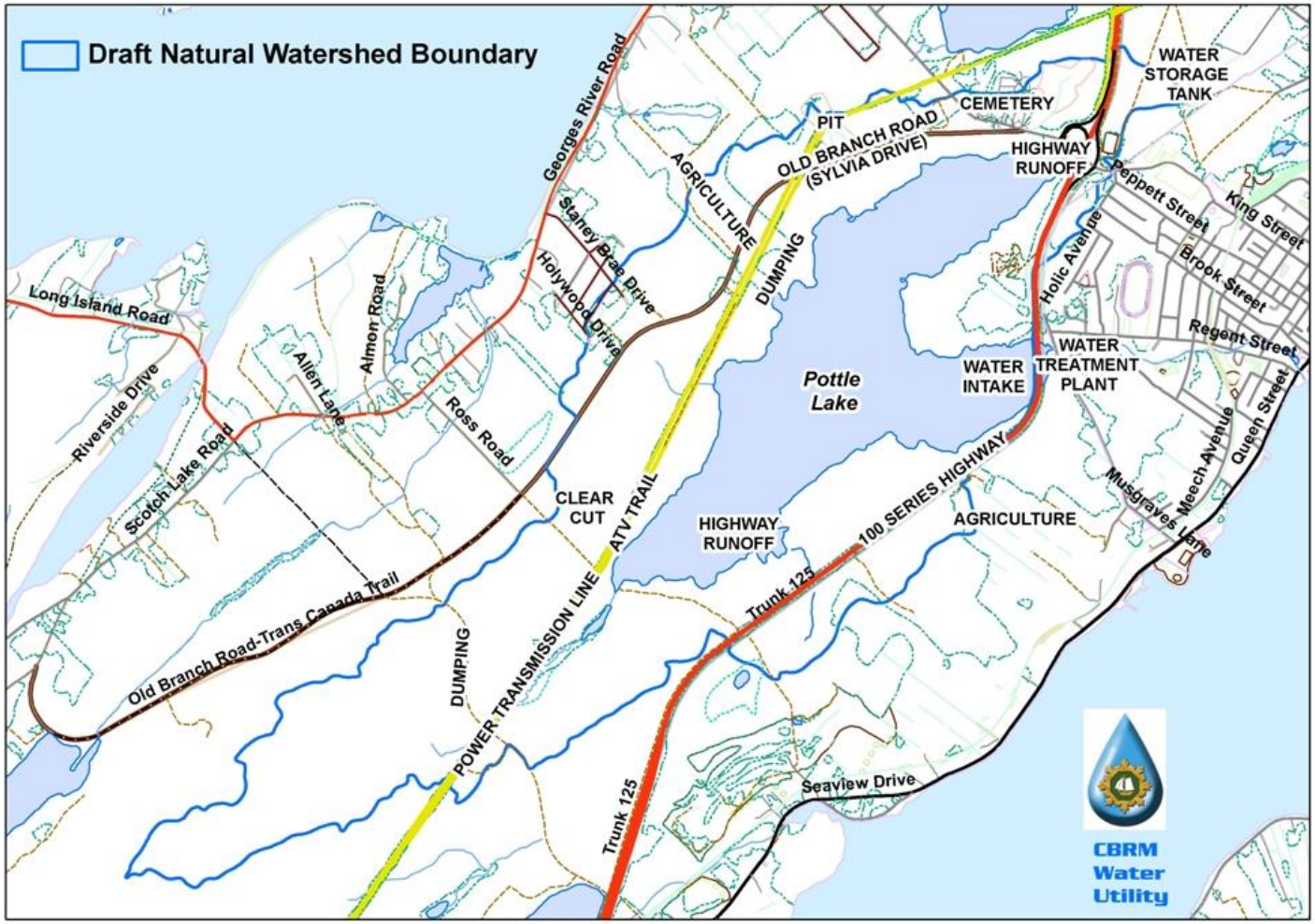
To address the first barrier, keep clean water clean, all municipal units must develop a source water protection (SWP) plan. A SWP plan is a document outlining the drinking water supply area. The plan identifies potential risks to the drinking water quality and quantity, and lastly, identifies strategies to reduce those risks.

This SWP plan is based on a background report by ADI Limited (2006) *North Sydney Water Supply Source Water Protection Planning for the Pottle Lake Watershed* and the knowledge and expertise of the SWP Planning (SWPP) Committee (Section 2.2).

1.1 Overview of the Drinking Water Supply Area

Pottle Lake, the drinking water source for the urban areas of the Northside, is located west of North Sydney (see Figure 1). The Northside, so named because of its location on the north shore of Sydney Harbour, includes Bras d'Or, Florence, Sydney Mines, and North Sydney. The Pottle Lake watershed covers 1126 hectares and includes all the lands and streams which drain into the large 285 hectare Pottle Lake (see Map 1).

Figure 1. Northern Pottle Lake watershed. G. Langille photograph July 2008.



Map 1. Pottle Lake watershed area showing some land uses

Pottle Lake is in the Lowland Hydrological Region, Sedimentary Plain Hydrologic District; an area of thin glacial till overlying massive sandstone bedrock (Baechler et al., in progress). Water flow is controlled by four Hydrostratigraphic Units (HUs):

- sandstone (bedrock) HU, base layer,
- sandy till HU, overlies bedrock,
- soil HU, surface layer of altered till, and
- organic HU, in localized depressions, forming wetlands (only 39 hectares).

Surface runoff from rainfall or snow melt mainly interflows within the soil HU. Some of the precipitation penetrates to the upper sandy till, moving down gradient in the direction of contact with the bedrock. A portion, about 380 millimetres (25 % of annual precipitation), recharges the bedrock HU.

Cape Breton generally has two wet seasons, the spring and fall, when groundwater can be recharged. A dry season normally occurs from May to September and a minor recession in groundwater levels and stream flow can occur in February. Annually, based on a thirty year average, precipitation exceeds evaporation and transpiration and there is an excess of 1003 millimetres available to infiltrate into the groundwater. Groundwater flows mostly within the till, but fracturing from glacial unloading has created higher than normal permeability in the shallow bedrock. In the Pottle Lake area the fractured bedrock may drain water from the till HU and reduce water flowing to streams and the lake.

ADI Limited (2006) believes there may be some groundwater flow under the till HU which does not discharge into the lake. Groundwater recharge of Pottle Lake could be influenced by the presence of low permeability till HU and fine grained lake sediments under the bed of the lake. Information about the lake bed is not available, but limnology researchers at Acadia University may be contracted to investigate these factors.

1.2 Drinking Water System

Horner Associates Limited – ADI Limited (2004) report drinking water was drawn from Pottle Lake for the Town of North Sydney as early as 1896. Steam power pumped the water to an earthen berm reservoir on Ferris Hill. Water pipes were extended to Sydney Mines beginning in 1902. Chlorination equipment was added around 1940. Electric pumps were installed in 1948 and a back-up diesel pump in 1950. Florence was added to the Northside water system in 1950. A 600 millimetre concrete gravity pipe intake and wet well were built during initial construction of the Highway 125 By-pass in the 1960s. The water storage tank labelled in Map 1, a 9,546,600 litre concrete treated-water reservoir at the same location as the original earthen berm, was built in 1980. In 1989-90 new primary pumping, screening, and chlorination equipment was installed in the water treatment plant on the west side of Musgrave Lane. By 1990 the plant was equipped to add fluoride as well as lime for pH adjustment.

The Town of North Sydney was amalgamated with the City of Sydney, the County of Cape Breton, and five other towns in 1995 to form the Cape Breton Regional Municipality (CBRM). Since then, the CBRM Water Utility has operated the North

Sydney water treatment plant. Under approval number 2008-060693-R04, the plant pumps 2.8 million gallons (12.6 million liters) a day of potable water to 18,800 residents.

Water is withdrawn from Pottle Lake under permit number 2012-080984, authorization number 2537, which expires on April 1, 2022. According to the terms and conditions of approval, the average rate of withdrawal should be 19,000 m^3 (19 million litres) per day with no maximum rate of withdrawal. As shown in Map 1, the intake for the North Sydney Water Treatment Plant is located on the west side of highway 125 about 125 metres from shore (see Figure 2). The intake is a 900 millimetre (36 inch) diameter pipe with screen about two metres (6.5 feet) below normal water surface.

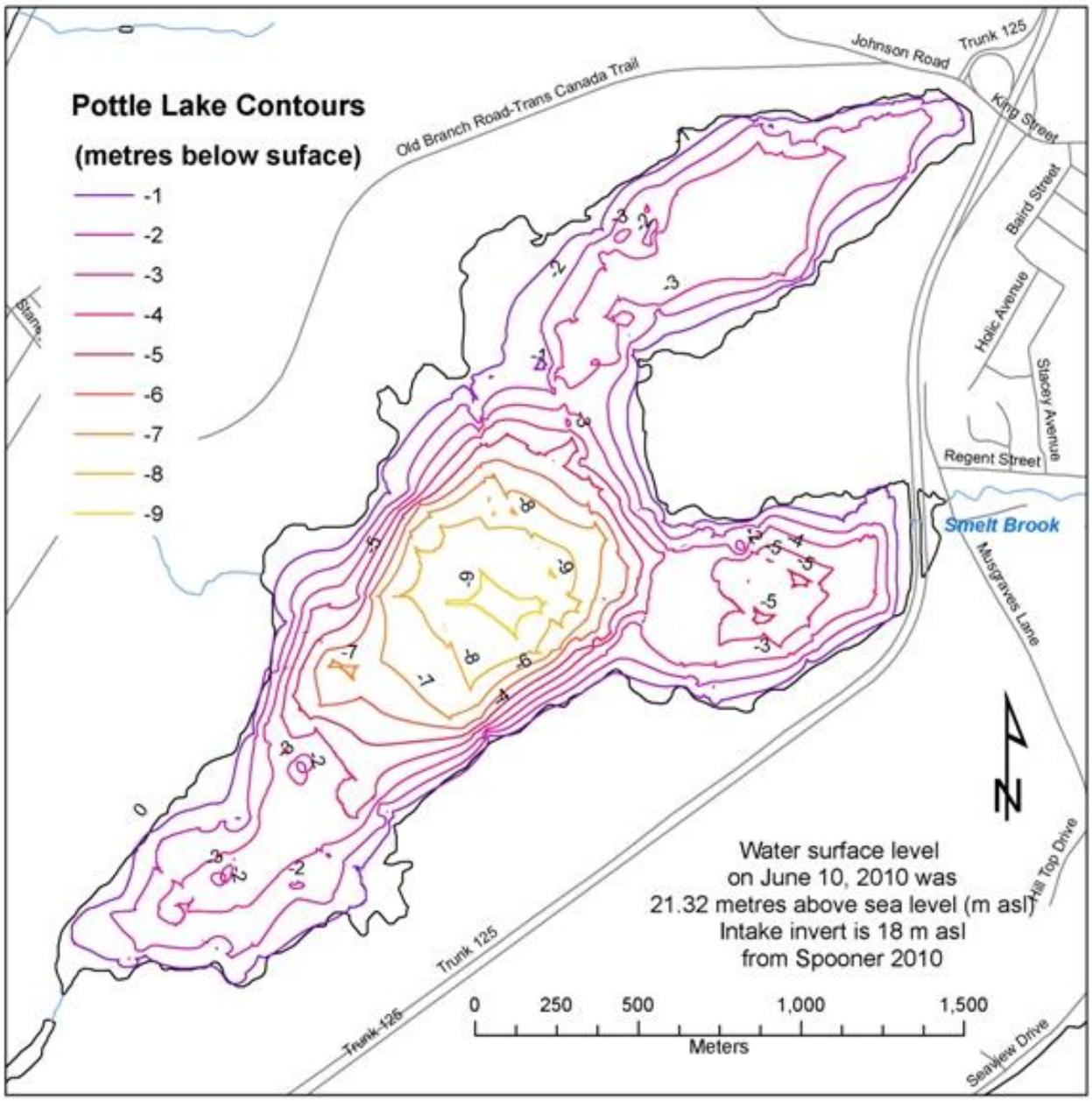
The $15.8 million dollar Pottle Lake treatment plant, built on the east side of Musgraves Lane (across the street from the original treatment plant) became operational in 2010 (see Figure 2), and was designed to meet the approved withdrawal rate. Water from the wet well in the original building is pumped to the new plant where all treatment is done, based on an ultra-filtration (UF) membrane system. The treated water then flows back under Musgrave Lane to the pump house to be distributed.

Figure 2. Intake left of Highway 125; pump house and treatment plant on the right.

There are 6700 water meters and 660 hydrants in the distribution system. Of the 6,524 m^3 per day of billed water consumption, residential customers account for 61 per cent, medium-sized businesses 8 per cent, while industrial or institutional users take 31 percent. Large water consumers are Marine Atlantic, Northside General Hospital, and the fish plant at the mouth of Smelt Brook.

CBRM's utility manager and a directly reporting water operations manager are responsible for safety of the various water supplies throughout the municipality. A treatment supervisor works with a team of ten certified treatment and distribution system specialists in day-to-day operations of the various physical plants and distribution systems. They are supported by a water quality analyst, a water quality tester, a water

systems engineer, meter reading and repair staff, two operations supervisors, and a watershed coordinator. North Sydney water treatment plant is one of five main plants that are staffed seven days a week.



Map 2. Bathymetry of Pottle Lake from Spooner (2010)

1.3 Water Quality and Quantity

Although Pottle Lake is a surface water supply, it is known to be a spring fed lake. There is a limited amount of data available for Pottle Lake, but Baechler (2008) has estimated that, of the 60 inches (1500 mm) of rainfall per year falling in the watershed:

- 20 inches(500 mm)/yr is lost through evaporation and transpiration,
- 25 inches (625 mm)/yr flows into Pottle Lake via surface water runoff, and
- 15 inches (375 mm)/yr flows into Pottle Lake via ground water.

ADI Limited (2006) described Pottle Lake as being elongated northeast-southwest parallel to the main glacial flow direction that deposited the underlying till sheet (see Map 2 above). A bathymetric study by Spooner (2010) recorded a maximum depth of 9.79 metres within a circular depression in the centre of the lake. Water level on the day of Spooner's survey, June 10, 2010 was 21.32 metres above sea level (ASL). Two elongated shallower depressions form the north and south arms of the lake, which are generally about three metres deep (see Map 2).

Smelt Brook, the only outlet from Pottle Lake, is indicated on the right in Map 2. Flow to the brook is controlled by a stop log structure shown in Figure 3. Logs are removed as the lake level drops to retain a positive hydraulic pressure from the lake to Smelt Brook. This ensures that any contaminants from Highway 125 do not flow towards the intake. The drawing of the Smelt Brook Stop Log Elevations dated March 1, 2000, by NS Department of Transportation & Public Works (NSTPW) included in Appendix I, indicates the level of Pottle Lake ranges from a low of 20.25 metres ASL to a high of 21.90 metres ASL. W.N. Horner & Associates (1990), who designed the intake structure, estimated low water levels to be 18 metres ASL. The 1990 intake was designed with an invert elevation of 18 metres, about three metres below normal lake levels.

ADI Limited (2006), reviewing chemical analytical results on raw water from Pottle Lake from June 2002 to February 2005, found that the lake water met drinking water health guidelines. The CBRM Water Utility (2011) report on baseline chemical quality for raw water in 2011 show total dissolved solids (TDS) of 45 mg/L, colour of 12 true colour units (TCU), and turbidity maximums from 0.495 to 3.620 Nephelometric Turbidity Units (NTU). Maximum pH in raw water was 9.96 and minimum was 4.01. Maximum bicarbonate alkalinity was 7 mg/L. Nitrates and nitrites were low at less than 0.06 mg/L and maximum total organic carbon was 2.9 mg/L. Metals were present in low concentrations. The above values meet even aesthetic guidelines for treated water.

ADI Limited and Hydro-Com Technologies (2007), in *Safe Yields - Pottle Lake, MacAskills and Kelly Lake Water Supplies* defined safe yield as the amount of water that can be taken from a source of supply over a period of years without depleting that source beyond its ability to be naturally refilled. Horner Associates (1980) noted a safe yield for the Pottle Lake watershed in 1980 of 28.6 million litres per day (Lpd) or 28,600 m^3/day. Withdrawal at the time was 22.7 million Lpd (22,700 m^3/day) serving 21,000 customers. As a result of reduced demand and leak repairs, withdrawal for potable water from Pottle Lake now averages 12.6 million Lpd.

Figure 3. Stop logs and eel weir adjacent to Pottle Lake pump house

Safe yield calculations now consider environmental flows needed to maintain fish habitat and other aquatic resources within watershed ecosystems. Recommended environmental flows for Pottle Lake are 4665 m^3 per day making the combined required flow 23665 m^3 (23.665 million litres) per day. The probability of the combined required flow at the water intake being exceeded during the summer is 19 per cent. This means that the required flow cannot be supplied by the natural flow of the basin approximately 81 per cent of the time. Although the natural stream flow cannot meet the combined water demand from the water supply basins, Pottle Lake has sufficient storage to satisfy all but the most extreme situations. The consultants indicated that Pottle Lake, with a surface area of 2.90 square kilometers could supply 19 million litres (19000 m^3) per day for 15 days and drop only 0.1 metre. Spooner (2010) determined that Pottle Lake has a volume of 9.8 million cubic metres when the water level is 21.32 m ASL, enough to meet daily demand for about a year and a half.

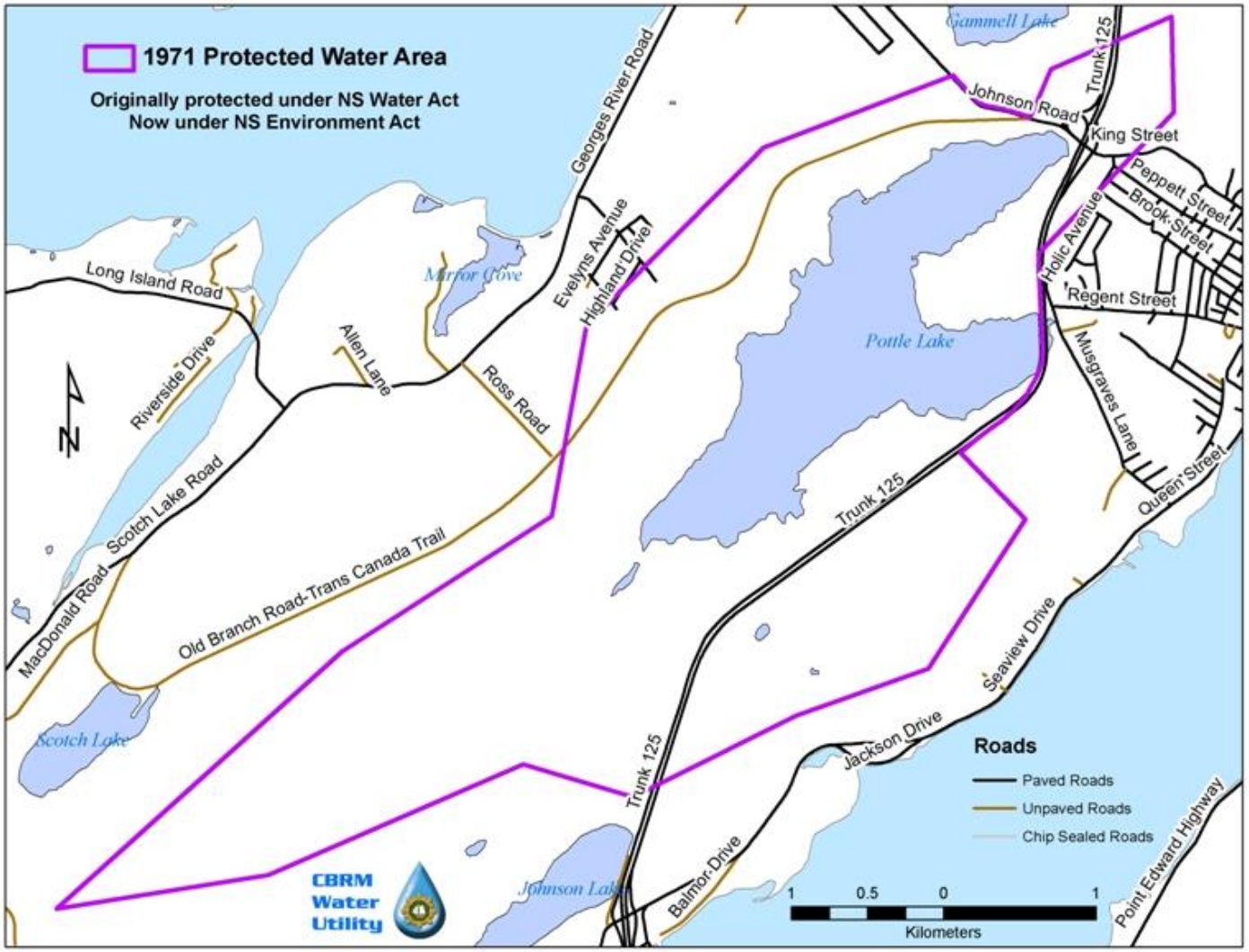
Several sources of uncertainty in the safe yield analysis were identified, encouraging the utility to use the report as a basis for, but not a substitute for, ongoing sound water-supply management practices.

1.4 Protected Water Area Designation

Prior to working with the County of Cape Breton to institute zoning restrictions, the Town of North Sydney used the Protected Water Area designation provisions under the *Water Act* to regulate activities that might impair the quality of water in Pottle Lake and its watershed. The area designated in December 1971 is shown in Map 3. Land-use controls through municipal planning strategies and land-use by-laws are designed to restrict activities related to developments. Activities such as fishing, boating, waste disposal, or application of herbicides and pesticides cannot normally be restricted by municipal land-use by-laws.

The designation under the *Water Act,* now under the *Environment Act,* and the regulations created in 1971 are still in effect..

a. Fishing, bathing, and boating are prohibited.
b. Hunting is prohibited.
c. The disposal of wastes of any kind is prohibited except in accordance with the provisions of the *Water Act*, and the *Public Health Act*.
d. The use of biocides is prohibited.
e. Open burning is prohibited.
f. Camping and picnicking are prohibited



Map 3. Pottle Lake Protected Water Area Designation under the *Water Act* 1971

2.0 SOURCE WATER PROTECTION PROCESS

Nova Scotia Environment and Labour Water and Wastewater Branch (2004) prepared a handbook for municipalities, *Developing a Municipal Source Water Protection Plan: A Guide for Water Utilities and Municipalities.* ADI Limited used this document as a template for their background report on the Pottle Lake watershed. CBRM Water Utility has also used the five-step process to guide the structure of this report.

2.1 A Five-Step Process

STEP ONE **Advisory Committee**	• Form a committee reflecting the jurisdictional make-up of the water supply area. It is important to include municipal councillors, water utility engineers, planners, landowners, and residents from the area. • Include stakeholders from sectors such as agriculture, forestry, and other commercial operations, as well as special interest groups with an interest in the water supply area.
STEP TWO **Delineate Boundary**	• Use maps and land-use information to delineate the boundary of the watershed area or groundwater capture zone. • Mark the water supply boundary on a 1:50,000 scale (or less) map. • Solicit public input during this step if necessary to provide information about the watershed.
STEP THREE **Assess Risks**	• Conduct a comprehensive assessment of all land-use activities within the water supply area. • Determine what activities impact or impair water quality. • Identify potential future sources of contamination. • Assess the risk that each activity or source of contamination will have on the source water. • Solicit public input at this step if needed.
STEP FOUR **Management Plan**	• Compile all information and set goals and objectives. • Evaluate options. • Develop management strategies to reduce negative impacts to water quality. • Management options may include the following: (A)cquisition of land (B)ylaws - municipal planning for land-use (B)est Management Practices (C)ontingency planning for emergency situations (D)esignation (E)ducation • Consult the public.
STEP FIVE **Monitor & Evaluate**	• Develop a monitoring program and schedule. • Continue to evaluate the effectiveness of the management plan. • Develop a mechanism for the committee to respond to impairment or changes in water quality. • Modify the plan if necessary.

Table 1. Developing a Source Water Protection Plan summary chart.

Table 1 from *Developing a Municipal Source Water Protection Plan: A Guide for Water Utilities and Municipalities* Nova Scotia Environment and Labour Water and Wastewater Branch (2004, pages 8 and 9)

2.2 Source Water Protection Planning (SWPP) Committee

The CBRM Water Utility knows that the most important members of an advisory committee are the residents and landowners within the watershed. Using a geographic information system (GIS), the watershed coordinator generated a map of landowners within the existing area zoned by the CBRM Planning Department in 2004 as a water supply zone. This zone, called the Public Water Supply Zone (PWS) (see Map 4), when originally created was intended to correspond with the natural watershed boundary. It was based on the best mapping available at the time. (See section 3 for more detail.)

In late January 2008, letters were sent out to 119 private landowners within the Pottle Lake PWS Zone. The letter explained the requirement by NS Environment to develop a source water protection plan for the Pottle Lake watershed. Addressees were invited to attend an afternoon or evening meeting on February 19, 2008, or to contact the watershed coordinator.

Eventually, seven people from the watershed area agreed to sit on the source water protection committee and an initial Pottle Lake SWPP committee meeting was held on April 2. By the fourth meeting in October 2008, the committee had developed and accepted a Terms of Reference document, which is included in Appendix B. Membership was divided between voting and non-voting member as follows:

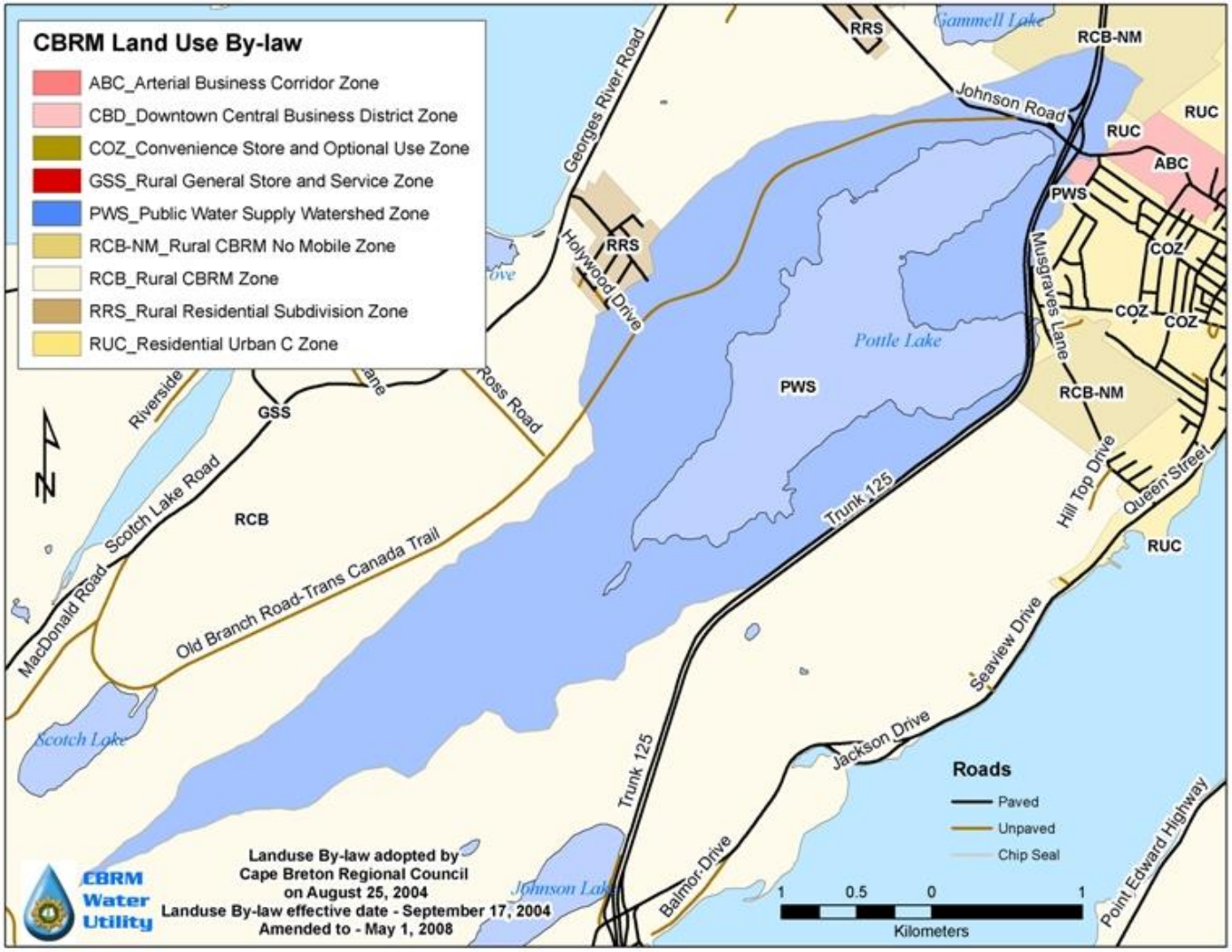
VOTING MEMBERS

Landowner representatives – 3 members
Commercial representative – 1 member
Agriculture representative – 1 member
Recreation representative – 1 member
CBRM Council – 1 member
CBRM Water Utility – 1 member
NS Transportation and Infrastructure Renewal (TIR) – 1 member

NON-VOTING MEMBERS

NS Department of Natural Resources (DNR), Forester – 1 member
NS Environment, Watershed planner – 1 member
NS Environment, Inspector Specialist – 1 member

The committee provides advice to the CBRM Water Utility on the management of the Pottle Lake watershed, provides a forum for landowners, residents and users to discuss issues related to the management of the watershed, and assists in the preparation of a management plan for the watershed. The committee met every month to two months during the development of the plan, and will continue meeting approximately at least once a year into the future, as the plan is implemented and new issues arise.



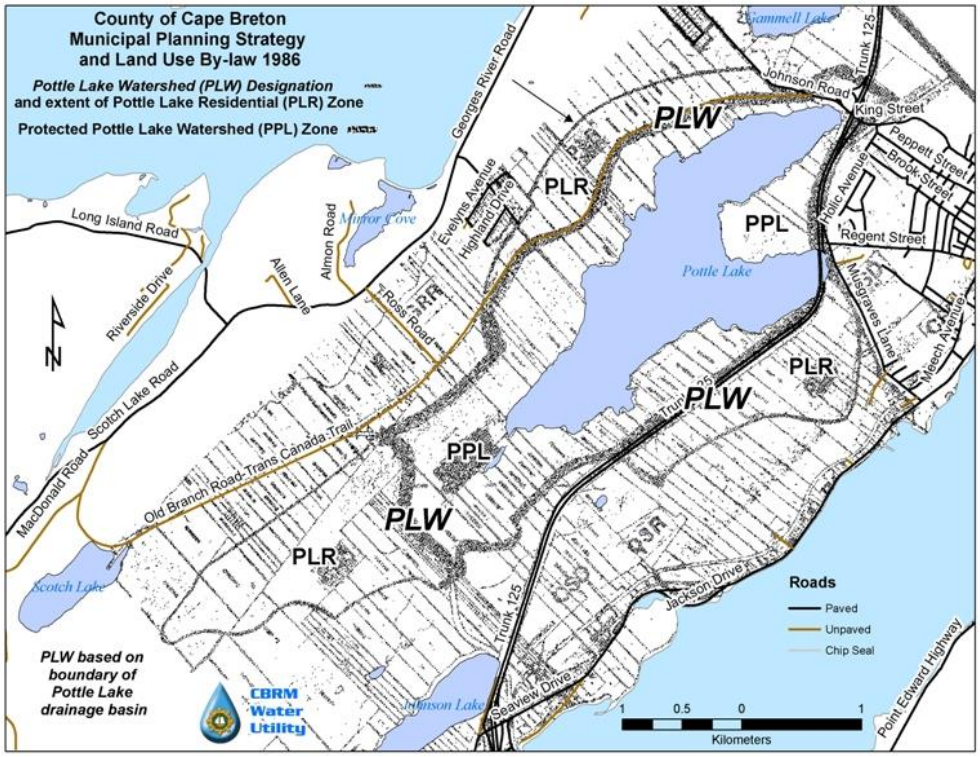
Map 4. Current CBRM land-use zoning in Pottle Lake watershed area

3.0 DELINEATION OF SOURCE AREAS

A source water area is the watershed or wellhead that contributes all the water used to supply drinking water from the source. The source water area for the Northside communities is the watershed draining into Pottle Lake. ADI Limited (2006) assumes the shallow groundwater and surface watersheds are similar. However, the divides for the deeper groundwater flow within the bedrock may not coincide. ADI Limited concluded there is presently insufficient technical data to subdivide the watershed into higher priority zones such as riparian zones or groundwater recharge zones. Therefore, to be conservative, ADI Limited recommended the entire surface water watershed be considered for source water protection.

Several possible boundaries were discussed:

- The area designated in 1971 under the Water Act as a Protected Water Area (Map 3).
- The "Protected Pottle Lake Watershed" (PPL) Zone (Map 5) from the 1986 Cape Breton County municipal planning strategy and land-use bylaw. The natural watershed boundary (as identified at the time) was the extent of the planning boundary known as "Pottle Lake Watershed Designation". Within the Pottle Lake Watershed Designation, two "zones" were created, the "Pottle Lake Residential" (PLR) Zone and the "Protected Pottle Lake Watershed" (PPL) Zone.
- The current CBRM land use zoning for the Public Water Supply Zone (Map 4 and Section 5.5).
- The natural watershed (as delineated in 2009 using 2006 orthophotography) (Map 6).



Map 5. 1986 Cape Breton County Pottle Lake designation and zoning

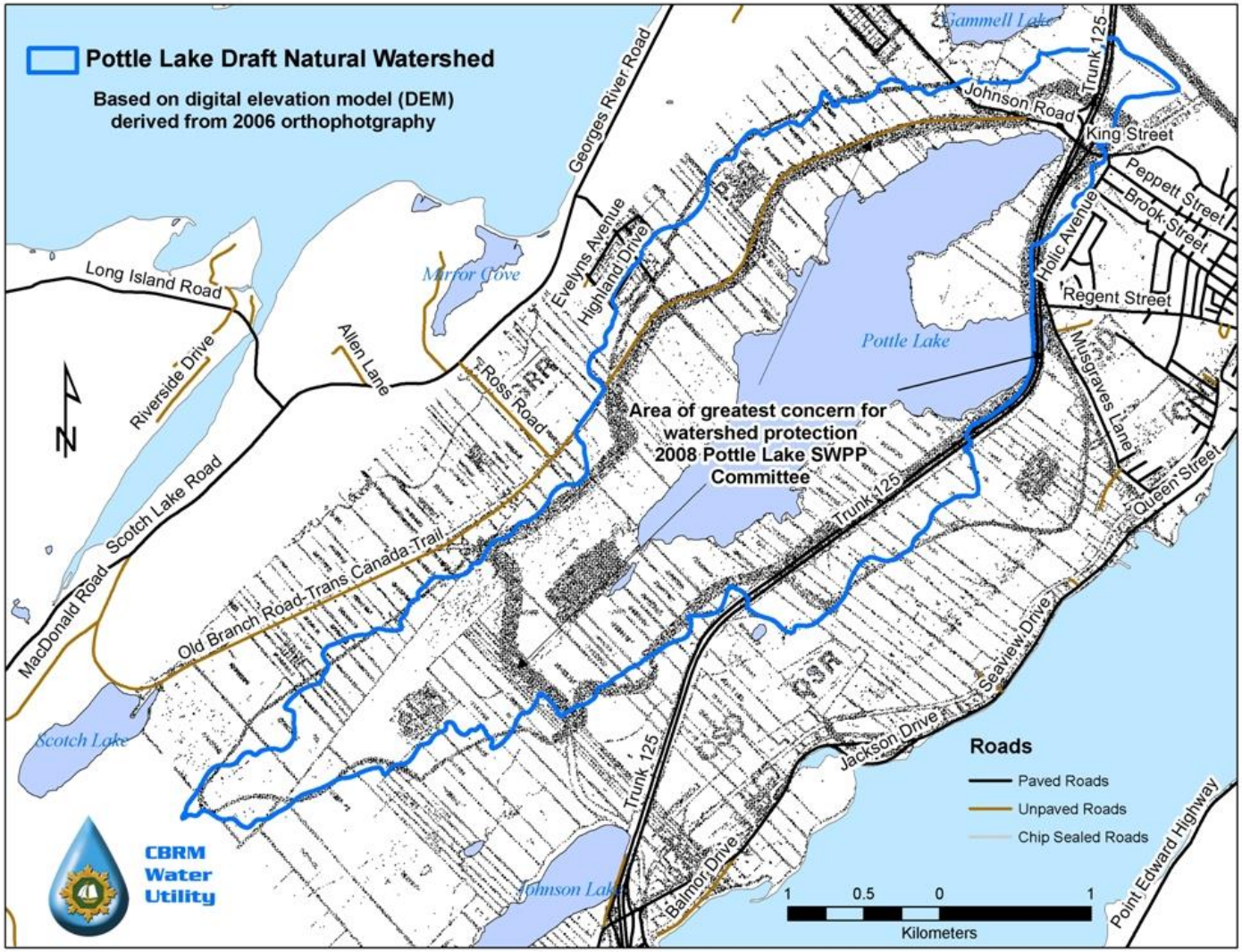
3.1 Natural Watershed Boundaries

A watershed is *the area drained by, or contributing to a stream, lake or other body of water. It is the area that topographically appears to contribute all the water that passes through a given cross-section of a stream* (Nova Scotia Environment and Labour, Environmental and Natural Areas Management, no date a, page 7).

Maps 1 and 6 show a draft version of a watershed boundary for Pottle Lake prepared by the watershed coordinator and vetted by a hydrogeologist. The watershed boundaries outlined in blue define a natural surface water watershed formed by topography. Groundwater and surface water run from areas of high to low water level. Generally, the two watershed boundaries should be similar, but differences may exist. The natural watershed that contributes flow to Pottle Lake was delineated by joining all the hills and ridges surrounding the lake. As stated above, some members of the Pottle Lake SWPP committee do not recognize these natural watershed boundaries. The committee as a whole agree that the area most deserving of protection is bounded by Highway 125 and the former rail bed known as Old Branch Road or Sylvia Drive. This area coincides with the 1986 Protected Pottle Lake Watershed (PPL) zone as shown in Map 5.

Delineation of the Pottle Lake watershed area is complicated by the fact that forty per cent of the recharge of the lake may be contributed by groundwater. The photography obtained from the province in 2006 was as accurate as LIDAR data obtained for other areas in 2008. Topography was estimated using two metre contours developed from the digital elevation model (DEM) provided by the provincial mapping agency. However, the watershed boundary generated from the 2010 LIDAR survey by CBRM was very similar to the 2008 boundary.

ADI Limited (2006) suggested Gammell Lake, shown on the left in Figure 1 and in Map 6, may be part of the Pottle Lake watershed. A study of the mass points produced from the 2006 photography indicates there is a continuous ridge behind the stables on Johnston Road separating the two surface watersheds. Of course, groundwater connectivity, which may exist, can only be derived from data obtained using monitoring wells.



Map 6. Draft of Pottle Lake natural watershed boundary showing area of concern

4.0 RISK IDENTIFICATION

Step Three of the source water protection planning process should produce:

- *a complete listing of all identified existing and potential issues that pose a risk to drinking water quality*
- *a list of existing and potential issues prioritized in the order in which they are to be addressed in the management plan*

NSEL (no date b, page 3) provides a flowchart to guide risk assessment.

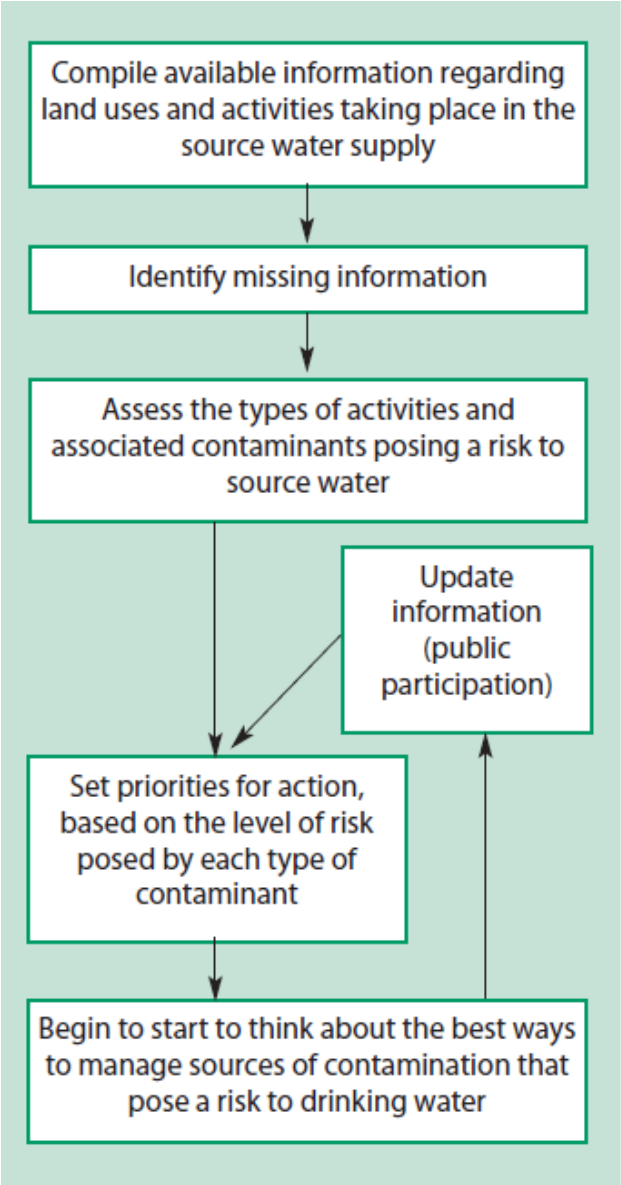
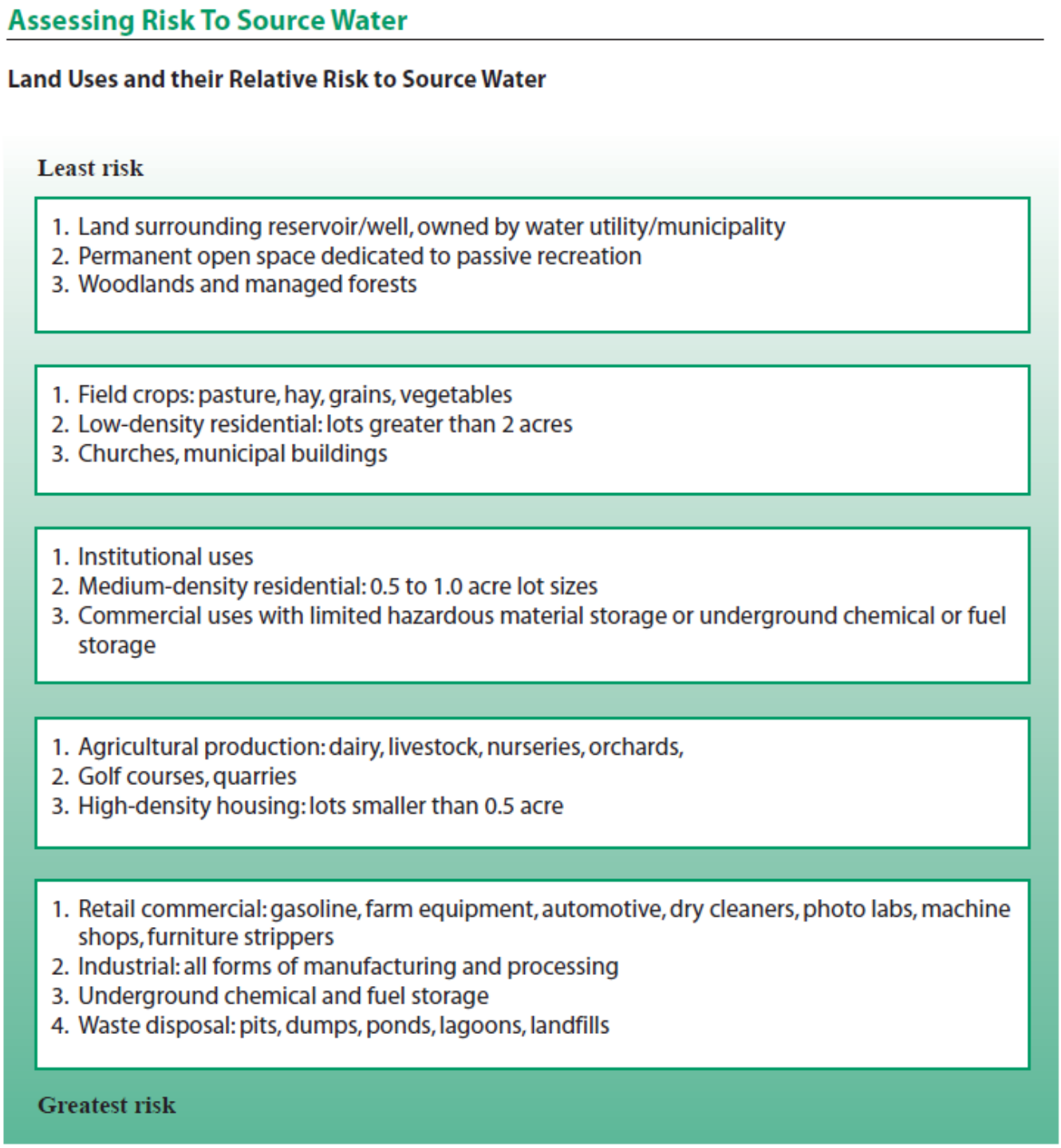


Figure 4. Risk assessment flowchart for source water protection from NS Environment.

NSEL (no date b, page 5) offers a list of land uses and their relative risk to source water.



Assessing Risk To Source Water

Land Uses and their Relative Risk to Source Water

Least risk

1. Land surrounding reservoir/well, owned by water utility/municipality
2. Permanent open space dedicated to passive recreation
3. Woodlands and managed forests

1. Field crops: pasture, hay, grains, vegetables
2. Low-density residential: lots greater than 2 acres
3. Churches, municipal buildings

1. Institutional uses
2. Medium-density residential: 0.5 to 1.0 acre lot sizes
3. Commercial uses with limited hazardous material storage or underground chemical or fuel storage

1. Agricultural production: dairy, livestock, nurseries, orchards,
2. Golf courses, quarries
3. High-density housing: lots smaller than 0.5 acre

1. Retail commercial: gasoline, farm equipment, automotive, dry cleaners, photo labs, machine shops, furniture strippers
2. Industrial: all forms of manufacturing and processing
3. Underground chemical and fuel storage
4. Waste disposal: pits, dumps, ponds, lagoons, landfills

Greatest risk

Table 2. List of land uses with relative risk to source water from NS Environment.

4.1 Natural Sources

There are natural sources of contamination in the environment which may impact surface water systems such as:

- pathogens (e.g. bacteria from decaying vegetation, animal carcasses, faeces), and
- organic acids, low pH, elevated metals (iron and manganese), and colour from wetland drainage.

4.1.1 Stream/Lake Sediments

Various metals can be adsorbed onto the surface of fine grained sediments in the beds of streams and lakes. These metals can then be refluxed up into the water column in dissolved form.

ADI Limited (2006) reviewed the Geochemical Atlas of Nova Scotia (Lombard, 1990), finding elevated metal concentrations in stream sediments in the general area of the Pottle Lake watershed for manganese, cobalt, copper, lead, zinc, silver, arsenic, molybdenum, and nickel. Lake sediments, compared to the rest of the Atlantic Coastal Hydrological Region, were elevated in manganese, cadmium, nickel, and zinc. Although there may be elevated metals on stream and lake sediments, concentrations are not necessarily above environmental quality standards. They also may not be available in dissolved form for intake by organisms.

4.1.2 Wildlife

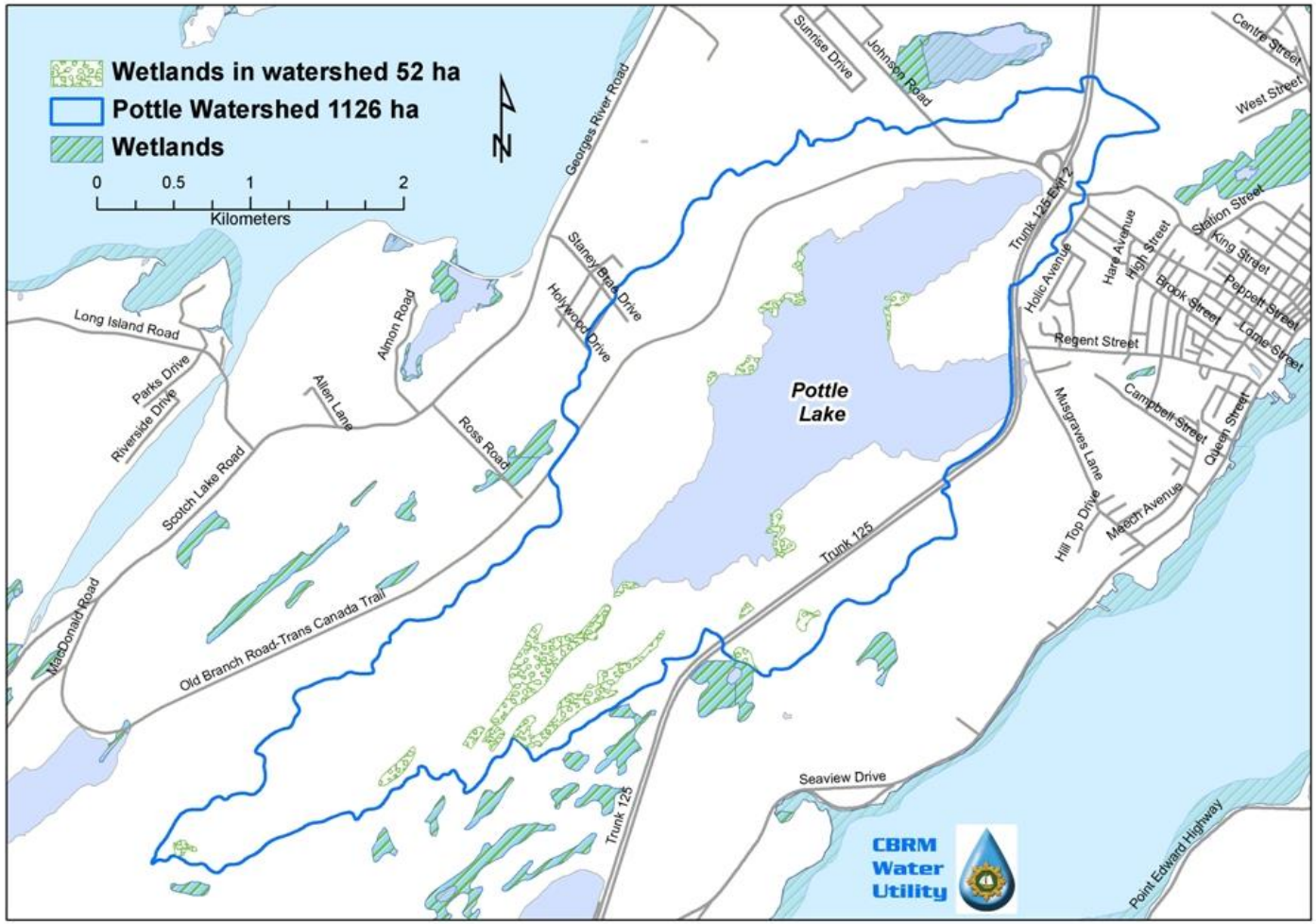
Beaver, a source of the protozoa Giardia, concern water treatment operators. A trapper, who visits all CBRM water supply watersheds twice a year, took two beaver and two muskrat from Pottle Lake in 2008 and no beaver, but seven muskrats and one otter, in 2009. The trapper took one beaver in 2010, two beaver and an otter in 2011, but no beaver in 2012

4.1.3 Wetlands

Map 7 displays wetlands in the Pottle Lake watershed area. Water from wetlands contains organic acids that can lower stream pH and buffering capacity, create coloured water systems, and elevate iron and manganese levels. Wetlands constitute less than five percent of the Pottle Lake watershed but pH does occasionally exceed the aesthetic standards of the Canadian Drinking Water Quality Guidelines for treated water. Colour, iron, and manganese levels for Pottle Lake raw water are acceptable, even for treated water.

4.2 Human Activities

Using maps, the landowners and other committee members pointed out activities in the watershed area and provided some management suggestions. The watershed coordinator was directed to prepare a draft source water protection plan based on their comments



Map 7. Provincially mapped wetlands in Pottle Lake watershed area.

The Pottle Lake watershed is one of the CBRM potable water supplies most impacted by human activity. A GIS query, using the draft 2008 natural watershed boundary, indicates there are twenty-three structures in the natural watershed. Map 8 shows the distribution of property ownership within the watershed. Table 3 provides the number of hectares and the percentage of the watershed owned by each sector. The NSDNR land at the southwestern end of the lake is in the lengthy process of being transferred to CBRM.

Pottle Lake watershed ownership		
	Hectares	**%**
Private	376	33%
Water	285	25%
NS Transportation & IR	145	13%
CBRM	117	10%
NSDNR	110	10%
Road Parcels	47	4%
Cemetery\Churches	21	2%
Corporate	18	2%
Golf Course	7	1%
	1126	100%

Table 3. Percentages of land ownership within the Pottle Lake watershed (see Map 8).

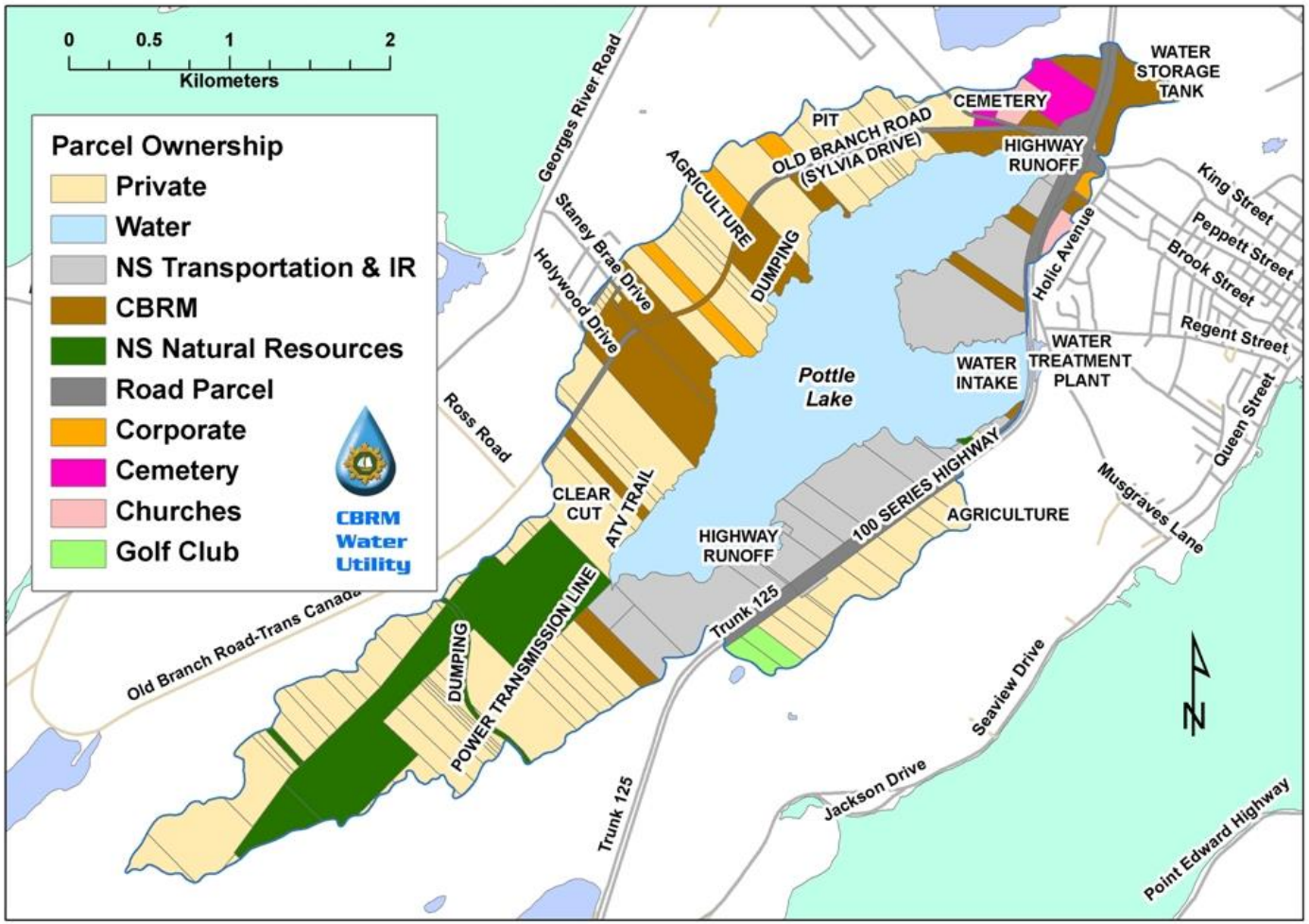
4.2.1 Disposal Sites and Illegal Dumping

Illegal dumping can pose several risks to drinking water supplies, including release of hydrocarbons, heavy metals, semi-volatile organic compounds, and polycyclic aromatic hydrocarbons (PAHs). The Atlantic Coastal Action Program Cape Breton (ACAP CB) prepared a report on illegal dumpsites for CBRM in December 2003 (ACAP CB 2003). The report noted that much of the illegal dumping of waste materials was happening near Pottle Lake. As a pilot for the project, ten sites along the Old Branch Road were cleaned up; however, in spite of the use of cameras and patrols, the areas were soon recontaminated. ACAP CB stated that barriers would be required to limit access to the Old Branch Road, something recreational groups have also recommended.

ACAP CB coordinated the formation of an inter-agency committee, which tried to deal with the illegal dumping issue through a combination of communication, cleanup, enforcement, and monitoring. This committee eventually dissolved. Further efforts were made by the Pottle Lake SWPP Committee, who focused one meeting on illegal dumping issues. Representatives from CBRM Solid Waste, NSDNR Enforcement Division, NS Environment, CBR Police Services, CBRM By-laws, the local ATV club, CBRM Crime Stoppers, local landowners, and councillors brainstormed on solutions.

The Pottle Lake SWPP Committee moved to request that Municipal Council consider:

- restricted access to the Old Branch Road,
- increased frequency of dump days in North Sydney,
- more solid waste education on the Northside, and
- increased enforcement for illegal dumping infractions.



Map 8. Property ownership in the Pottle Lake watershed area.

To notify Municipal Council, the Manager of Utilities sent a letter to the watershed coordinator on January 25, 2010, which was copied to the Public Services Committee of CBRM Council. At that time, within CBRM, the Public Services Committee was the most appropriate body to address the Pottle Lake SWPP Committee's concerns about illegal dumping. Since 2010, CBRM has used the Committee of the Whole structure to hear all submissions.

4.2.2 Transportation

Road wash runoff can include petroleum hydrocarbon products, PAHs, asbestos particles, metals, and bacteria. Highway 125 and its ramps include almost eight kilometres of paved surface which run off to the lake. The Johnson Road extends through one kilometre of the watershed while only 115 metres of King Street is in the watershed. Other roads in the watershed include 270 metres of Highland Drive, 150 metres of Staney Brae Drive and 3.7 kilometres of the unmaintained Old Branch Road.

Bailey (1984) sampled water from Pottle Lake to monitor the impact of the twinning of Highway 125 on lake water quality. Analysis indicated the majority of parameters were within the Guidelines for Canadian Drinking Water Quality (GCDWQ). During winter months, sodium, chloride, and turbidity concentrations went up following construction, especially near Small Brook flowing under the 125 into the south arm of the lake.

The sections of Highway 125 adjacent to Pottle Lake have mechanisms engineered into their construction to protect the drinking water supply. An impermeable berm was constructed between the highway and Pottle Lake. Run-off is directed to isolated rip-rap drains with geotextile filters located between the road and the lake. In the event of a spill, responders are meant to use excavation equipment to block the drains with clay material from the berm until the contaminant has been cleaned. At the Johnson Road exit, a settling pond is located between the highway and the berm to collect road wash. A system of finger dykes slows the flow of run off, encouraging contaminants to settle out in the pond. Run off eventually enters the lake through a culvert under the berm. Figure 5 shows the settling pond designed to reduce turbidity adjacent to Highway 125 and the top of the culvert draining run off into the north arm of Pottle Lake.

Figure 5. Settling pond at 125 interchange: finger dykes at left, outlet on the right.

Some Pottle Lake SWPP Committee meetings have focussed on an emergency response plan for Pottle Lake. A presentation by the committee member from TIR explained the berms and drains for the 125 highway. Committee members learned that runoff from vehicles does drain into the lake, especially at Small Brook and the Johnston Road interchange.

One SWPP meeting included first responders: Cape Breton Regional Police Services (CBRPS), CBRM Fire and Emergency Service, CB Hazmat Team, and the North Sydney Volunteer Fire services. The Emergency Measures Organization (EMO) coordinator was contacted later about ensuring 911 operators were made aware of watershed contamination concerns. CBRM Water Utility operations staff needs to work with the watershed coordinator and other agencies and contractors to develop an emergency response plan to deal with vehicle accidents and other spill incidents in the Pottle Lake watershed.

4.2.3 Pits or Quarries

An active pit, indicated in Map 8 off the Old Branch Road is shown in aerial view in Figure 6 below. As well as being used as a source of flat stones for culvert placement, the pit has been used extensively as a dump site for everything from ditching debris to old asphalt and concrete or soil. The dumping of soil from former industrial areas is especially worrisome as the bedrock has been exposed and broken up as the result of extracting flat stone for culvert placement. The fractured bedrock around Pottle Lake allows contaminants to flow into the groundwater and eventually reach the water supply.

Other pits along the Old Branch Road, such as the former MacKenzie gravel pit, are used mainly as sites for illegal garbage dumping. ADI Limited (2006) noted borrow pits along Highway 125 near the water supply intake. Iron and manganese staining in adjacent ditches was presumed to be leaching from organics in material grubbed from ditches.

Figure 6. Rock extraction and dump site off Old Branch Road.

4.2.4 Forestry Activities

Forestry activity occurs on private land within the watershed, although clear cutting as seen in the foreground of Figure 9 is not common. There is no large scale commercial forestry operation within the watershed. Some landowners cut saw logs or firewood using selection harvesting methods. However, a few landowners may get stumpage payments from contractors who harvest using more intensive methods. Poor forestry management can add to sediment flow to the lake and increase nutrient and metal loadings due to decaying wood and slash. Most importantly, as outlined in the May 2004 edition of Opflow (Ernst and others, 2004), increased forest cover in a watershed reduces the cost of treating drinking water. Researchers agree that forests, riparian areas, and wetlands act as natural filters, reducing the flow of pollutants to water bodies.

4.2.5 Recreational Land Use

Most recreational activities occur on the bed of the former North Sydney branch rail line. Known as the Old Branch Road or Sylvia Drive, the unmaintained road extends from Johnston Road to Scotch Lake (see Figure 7 and Map 8). Extending almost four kilometers through the watershed, the road is less than 100 metres from Pottle Lake near Johnston Road but about 800 metres from the shore near Ross Road. Recreational activities involving motorized vehicles can cause erosion and contribute sediment to the lake, spill oils or fuels, or contribute to illegal dumping.

Figure 7. Multi-use on Old Branch Road 2009.

There have been several initiatives over the years to manage recreational activity along this route. The Sylvia Drive Development Strategy (Finney 1996), prepared by the Pottle's Lake Preservation Committee, recognized that Sylvia Drive was used for hiking, cycling, cross-country skiing, snowmobiling, and horseback riding. That committee felt that horses and ATVs would have to be excluded from the groomed surface to make maintenance realistic and proposed placing barriers at Johnston Road and Ross Road. They also hoped to restrict illegal dumping of garbage.

The Pottle's Lake Preservation Committee seems to have disbanded but in August 1999 a group called the Cape Breton County Trails Association (CBCTA) received permission from CBRM to use the right of the way of the former North Sydney branch rail line for a

portion of the Trans Canada Trail. CBCTA proposed that ATVs and dirt bikes could use the trail but non-motorized users would have the right of way. The CBCTA held various meetings in Georges River to discuss possible gating of the Old Branch Road. Through a public vote at one meeting, in spite of mailed ballots favouring gates, the majority of those at the meeting resolved that no gates should be erected. Landowners formed a committee to work with the CBCTA; however, the CBCTA found it impossible to maintain the Trans Canada Trail without gates and ceased maintenance of the trail. Although the group had really ceased to function by 2005, it was officially disbanded in March 2009.

A representative of the Northside ATV club attended the December 2009 meeting of the Pottle Lake SWPP Committee and expressed interest in pursuing the use of Sylvia Drive as a multi-use trail under the Trans Canada Trail umbrella. A representative from Cape Breton Island Pathways Association made a presentation at the February 2010 meeting of the watershed committee. The Pathways organization has developed several portions of the Trans Canada Trail in Cape Breton and have prepared trail inspection audit reports to support funding proposals by ATV clubs and other groups. The SWPP Committee members present agreed to support the Northside ATV club in their attempts to convert the Old Branch Road to a managed, multi-use trail.

Although fishing and hunting are prohibited by the regulations under the designation of Pottle Lake as a Protected Water Area (see Map 3 and Section 1.4) these activities do occur. Those fishing do not use boats and hopefully will not introduce exotic species. Hunters, however, use ATVs and other off-road vehicles which could cause erosion or spills of gasoline.

East of Highway 125 and north of Johnston Road is a walking track on a small portion of the watershed below the water tank. Little impact is probable from walkers but there has been pressure to intensify the use by permitting a ball field. The area drains under the highway into a settling pond before discharging into the lake.

4.2.6 Cemetery

Lakeside Cemetery operated in the Pottle Lake watershed prior to its designation as a Protected Water Area and the regulators excluded the cemetery property from designation. The cemetery is currently expanding to the north outside the Pottle Lake watershed, but within the Gammell Lake drainage basin. ADI Limited (2006) cautioned that, being less than 100 metres from the lake, pathogens, nutrients, and embalming fluids from the cemetery could impact the lake through groundwater transport. There is a small chapel on the cemetery property and four storage buildings, some presumably containing lawn mowers and fuel, are located throughout the cemetery.

4.2.7 Residential and Commercial Development

Dwellings can be a source of contamination from leaking on-site septic systems, lawn chemicals and fertilizers, poor waste disposal, and improperly constructed or maintained water wells. There are eleven single unit dwellings in the watershed; ten south of

Highland Drive in the Staney Brae Subdivision and one along Johnston Road near the cemetery. The dwellings are serviced by on-site septic systems and wells. These homes are not close to Pottle Lake, varying from 300 metres to 800 metres from the lake shore. As for commercial land use, the home on Johnston Road includes a storage building and repair garage associated with a general contracting business. As well, culverts under the 125 highway direct runoff from the Clansman Motel and Restaurant buildings and parking lot to the settling pond before it reaches Pottle Lake.

4.2.8 Agricultural Land Use

Agricultural lands are a common source of sediment, nutrients, pathogens, and pesticides. Map 8 shows two areas of agriculture north and south of the lake. Sunrise Stables and Eagle Rest Farms (the area north of the lake, shown in the foreground of Figure 1) work about 12 hectares of hay. Sunrise Stables also has about 0.7 hectare of horse pasture at the extreme northern watershed boundary. The stables are located outside the watershed boundary. Figure 8 shows a portion of a former hay field (5.5 hectares) acquired by CBRM from Sunrise Stables on Johnston Road. This property is now used as an illegal dump site and a place for off-highway vehicles (OHVs) to create mud. South of the lake, there is a dairy farm (see Figure 8) but most of the run off from their fields now flows directly to Smelt Brook instead of under the 125 to the lake.

Figure 8. Former hay field now owned by CBRM on left, dairy farm on right

4.2.9 Utilities

A Nova Scotia Power Incorporated (NSPI) transmission corridor runs through the watershed (refer to Map 8 and Figure 9). Risks associated with a transmission corridor include use of chemicals in the maintenance of poles and vegetation control, spills or accidents with fuels in vehicles performing inspections, or recreational use of the corridor (an ATV trail is visible in Figure 9).

In 2013, CBRM learned that the Maritime Link transmission line is planned to run along the west side, parallel to the existing line, further away from Pottle Lake. The Right-of-Way in this area is currently 67 metres, 40metres of which is cleared to

accommodate the existing transmission line. Although the 67 metres Right-of-Way will not change, the cleared portion will increase from the current 40 metres to the full 67 metres to accommodate the new transmission line. This clear-cutting operation will increase overland flow to Pottle Lake in the short term, but regrowth should eventually provide dense young growth to reduce erosion.

4.2.10 Mining

The NS Mineral Rights database, as of January 2010, listed no mineral claims within the Pottle Lake watershed. ADI Limited (2006) cautions that the former rail beds, such as the Old Branch Road, were often built with mine waste rock which can generate acid mine drainage, lowering pH and elevating metal concentrations. The 2008 baseline chemical quality report for Pottle Lake (see Appendix E) found no exceedances of federal guidelines for metals.

Figure 9. Aerial oblique of Pottle Lake and power line from the west

4.2.11 Summary

Considering the continuum of risks presented in Table 2, the human risks in the Pottle Lake watershed cover the range from least to greatest. There is little commercial or residential activity in the watershed, but illegal dumping along the Old Branch Road is a concern. There are 10,000 vehicles per day on Highway 125, including heavy trucks loaded with chemicals and fuel, so accidents and resulting spills are inevitable. The committee prepared a risk assessment matrix which is indicated in Table 4.

Current Contamination Issue	Activity\Cause	Scale of Problem*	Priority Rank**
hydrocarbons, other contaminants	**illegal dumping**	**3**	**1**
road salts, hydrocarbons, other contaminants	**Highway 125 traffic**	**3**	**2**
hydrocarbons, siltation, and other contaminants	**trucking, road maintenance**	**4**	**3**
hydrocarbons and siltation	**ATV and 4x4 use**	**4**	**3**
hydrocarbons and siltation	**pit and quarry activity**	**4**	**4**
chemical and biological contamination	**cemetery**	**4**	**4**
hydrocarbons, siltation, and water storage	**forestry**	**4**	**4**
biological contamination	**residential wells and septic**	**5**	**5**
hydrocarbons, other contaminants	**motel runoff**	**5**	**5**
sediment, nutrients, pathogens, and pesticides	**agriculture**	**5**	**5**
pathogens from wildlife	**beaver activity**	**5**	**5**
hydrocarbons	**utility poles**	**5**	**5**
hydrocarbons, siltation, pathogens, and water storage	**PROPERTY DEVELOPMENT**	**5**	**5**

* Scale 1 = Severe 3 = Moderate 5 = Minimal ** Rank 1 = High 3 = Moderate 5 = Low

Future concerns in bold, all caps: example **PROPERTY DEVELOPMENT**

Table 4. List of activities and relative risk developed by SWPP committee.

5.0 SOURCE WATER PROTECTION STRATEGIES

ADI Limited (2006) identified fifteen strategies to manage risks associated with source water supplies. These are an expansion of a list of ABCs provided by NS Environment: Acquisition, By-laws, Best Management Practices, Contingency Planning, Designation, and Education (see Table 1). This section examines eight strategies most applicable to managing activities in the Pottle Lake watershed.

5.1 Inspection and Enforcement

The majority of problems in the Pottle Lake watershed occur along the Old Branch Road. The CBRM Water Utility encourages inclusive rather than restrictive use of water supply watersheds; promoting recreational use of the watershed by hikers, cross country skiers, and other self-propelled users. These users provide a certain level of inspection and security without the impacts of motorized vehicles. Landowners on the Pottle Lake SWPP Committee concur that vehicle traffic and illegal dumping along the Old Branch Road need to be restricted and eliminated respectively. The creation of a managed trail is welcomed by some as a means to increase inspection and enforcement by DNR staff.

5.1.1 CBRM By-laws

In 2009, the watershed coordinator photographed illegal dumpsites and forwarded the images, with a map, to the CBRM by-law enforcement staff who recorded the information. It was hoped that CBRM staff from By-laws and Solid Waste would inspect the site with an NS Environment inspector and a CBR police constable, who would begin an investigation. There were challenges with this process and a concern among staff and councillors that it was the landowner who received a notice to clean up the site, as offenders, who dumped the material, were rarely apprehended. Since 2011, CBRM Solid Waste has used provincial funds to employ a police constable to investigate cases of illegal dumping and charge offenders or, at least, get the offenders to clean up the site. This program has considerably reduced illegal dumping in the water supply areas.

5.1.2 Protected Water Area Designation

As described in section 1.4, the regulations under the Protected Water Area (PWA) designation for Pottle Lake prohibit fishing, hunting, boating, bathing, camping, picnicking, waste disposal, open burning, and use of biocides. Restrictions on fishing from the shore have not been enforced as offenders are rare and it is not considered a threat to water quality. Hunters gain vehicle access to the watershed on the Old Branch Road. Travel by motorized vehicle, not hunting, is the concern and restricted access would be a solution. Boats are easily visible and local residents comply with the no-boating regulation. Although NS DNR staff enforce fishing and hunting restrictions, CBRM staff is responsible for enforcing regulation under the PWA designation. The illegal disposal and burning of household wastes in the watershed is of greatest concern to the members of the Pottle Lake SWPP Committee. Possibly PWA regulations could be used to reduce illegal dumping. The SWPP Committee needs to discuss possible changes to the boundaries, regulations, and enforcement for the Pottle Lake PWA designation.

5.1.3 Activities Designation Regulations

Pottle Lake SWPP Committee members are concerned about the materials being trucked in to the four-hectare pit on the Old Branch Road. Section 13 (e) of the provincial Activities Designation Regulations states that a pit larger than two hectares where a ground disturbance or excavation is made for the purpose of removing aggregate is designated as an activity. Such a pit then requires an approval from the Minister or an Administrator. There are several ways to be exempt from approval and the watershed coordinator asked the regional office of NS Environment to determine if the pit near Pottle Lake has a permit or requires one. NS Environment staff determined the pit was exempt from requirements under Section 29 (1)(b):
Any other activity or class of activity which the Minister believes on reasonable and probable grounds causes or will cause a significant adverse effect because the sensitivity of the site where the proposed activity is to be located.

In spite of being within the natural watershed of Pottle Lake, Lakeside cemetery was excluded from the designation boundary and has been excluded from CBRM's Public Water Supply Zone. Section 28 of the NS Environment Act regulations state that the construction or operation of a cemetery is designated as an activity. The local Department of Environment office determined Lakeside Cemetery is exempt from obtaining a permit under the Activities Designation Regulations as it is a historic facility. NS Environment staff investigated the expansion of the cemetery and determined that the cemetery has three large lots and as long as the burial plots are within these tracts the activity can continue.

5.2 Public Education

The *Municipal Planning Strategy of the Cape Breton Regional Municipality* (CBRM 2007a, page 9.7) discusses public education:

The majority of people will respect the need to protect the watershed of a source of public drinking water. However, people need to know if and when they are within a watershed. The responsibility of the Regional Municipality is to notify and educate. Notification in the form of signage will be placed directly within the watersheds. Property owners could regularly receive literature (e.g. along with their tax bill) that they own land within a public water supply watershed and what conservation methods are recommended.

The CBRM Water Utility encourages inclusive rather than restrictive use of water supply watersheds. The Utility stresses education of the community to encourage cooperative use of the watersheds in a respectful manner. These themes will be the foundation of public education and outreach work encouraged by the Pottle Lake SWPP Committee.

CBRM staff feels use of the media is key in creating awareness among watershed users and residents of the importance of clean source water. CBRM and ACAP Cape Breton have developed media messages and inserted them in for water bills. Efforts are made to continuously improve messages related to source water protection, including where Northside residents get their water and what watershed signs look like.

Goals and objectives of the 2012-2013 education program, listed below, will be met through school programs and attendance at community festivals and fairs such as the Cape Breton County Exhibition. A curriculum consultant was hired to ensure that the source water protection messages fit with the school curriculum.

Goals:

- Increase general awareness of the CBRM water sources.
- Encourage stewardship by residents to protect these valuable water sources.
- Highlight potential watershed concerns and provide residents with a reasonable option to recognize, report, or change such issues.

Objectives:

- The Water Education Tool Kit will be promoted to grade 5 and 6 teachers within the CBRM.
- The Water Education Tool Kit will be expanded to include grades 1 and 2 with appropriately designed and themed lessons.
- The Water Cycle school presentation will be given as appropriate and as requested within CBRM school and community programs.
- The French "cycle d'eau" presentation will also be given to expand the reach of the water conservation messages.

Similar goals will be reached through the ACAP newsletter and website and inserts in local media, including the Cape Breton Post and Eastlink. ACAP CB also organizes many high profile fundraisers, programs, and events each year, which present an opportunity to benefit from media coverage and an increased awareness of source water protection.

Source water protection now has its own section on the CBRM web site:

http://www.cbrm.ns.ca/source-water-protection.html

The watershed coordinator maintains the web site. The Northside page links to mapping and minutes of the source water protection committee meetings and the finalized source water protection plan.

5.2.1 Signs

Signs have been distributed throughout the watershed areas to inform the public where the water supplies are located. The so-called "Violation" sign (see Figure 10, Appendix H) has been placed near most water supplies on CBRM land including one at the head of Pottle Lake. Other "Keep it Clean" signs (see Figure 11, Appendix H) are placed in the watershed on private lands where the landowner has requested it or on crown land with the permission of provincial DNR staff. These have also been placed along the Old Branch Road where ATVs are permitted to travel. Signs have also been placed along less travelled routes where ATVs might enter the watershed.

5.3 Emergency Response Plan

As stated in Section 4.2.2, the Pottle Lake SWPP Committee held two meetings which focussed on an emergency response plan for Pottle Lake. The TIR representative on the committee shared his knowledge of the berms and drains for the 125 highway with staff of CBRM Public Works North and CBRM Water Utility. In May 2009 regular members of the Pottle Lake SWPP Committee were joined by representatives of CBR Police Services, CBRM Fire and Emergency Service, CB Hazmat Team, and the North Sydney Volunteer Fire services. The EMO coordinator was contacted later about 911 scripts.

CBRM Water Utility operations staff needs to work with the watershed coordinator and other agencies and contractors to develop an emergency response. Work on the plan has been slow, but the North Sydney Fire Chief is now a member of the Source Water Protection Committee, which helps with communication. An Emergency Response Plan prepared by ADI Limited (1999) with recently updated contact numbers is included in Appendix C of this report. As there is no back-up water supply for the Northside, contingency planning is crucial. EXP (2013) recommended CBRM undertake scenario planning with Emergency Measures Organization (EMO) and operations to enhance response time and approach to various critical issues, which would impact yield and quality (e.g. forest fires, tanker spills).

5.4 Road Maintenance

The most heavily travelled roads in the watershed are Highway 125 and Johnson Road, which are maintained by the provincial government, as are Highland Drive and Staney Brae Drive. A small section of King Street is maintained by the municipality. Both the province and CBRM use salt in the winter for de-icing.

The berms and settling ponds for Highway 125 were described in section 4.2.7 of this report. These devices might slow movement of fuel oil, gasoline, or other spilled materials, but with the high volume of commercial traffic, coordinated contingency planning is crucial to deal with spills near Pottle Lake.

Having NSTIR representation on the Pottle Lake SWPP committee will help communication between CBRM and TIR to ensure regular maintenance work is carried out in a manner which minimizes impact on the water supply.

Inverness County (MCI 2010) has policies that might be emulated by CBRM:

- *The staff of the Municipality will initiate discussion with staff of Nova Scotia Department of Transportation and Infrastructure Renewal (TIR) on methods and materials currently used for road deicing in an attempt to eliminate or reduce rates of road salt application in the immediate area of the Zone A at each well head.*
- *Alternatively, the Municipality will evaluate options to mitigate the impact of road salt application on the production wells, e.g. a road gutter system to divert road runoff from the wellheads.*

- *The Municipality will initiate discussion with TIR on ensuring road works undertaken by staff or contractors employ the necessary containment devices for temporary fuel storage and erosion controls to reduce the potential for migration of sediments from disturbed sites. This can be achieved through the inclusion of wording in all contracts and purchase orders.*

5.5 Land Use and Planning

The Cape Breton Regional Municipality, through their planning department, developed a regional municipal planning strategy and land-use by-law in August, 2004. This regional plan created a Public Water Supply (PWS) Zone which was applied to the various water supply watersheds throughout the municipality, including Pottle Lake. Zone restrictions listed below prevent commercial or industrial development, call for very specific requirements for residential development, and no intensive agriculture is allowed. The CBRM planning department and the Pottle Lake SWPP committee should discuss PWS boundary changes and possible changes in restrictions.

Section 1 PWS Uses Permitted

Development Permits shall only be issued in the PWS Zone for one or more of the following uses in compliance with any relevant section of the General Provisions Part, and any specific section of this Part devoted to the use.

- ***agricultural – only the following***
- *crop farming*
- *animal grazing*
- *existing agricultural buildings housing or impounding animals highlighted on the Land Use By-law Map*

- ***conservation and water utility related uses – (all)***

- ***forestry uses – only the following***
- *harvesting*
- *silviculture*

- ***residential – only the following***
- *existing residential dwellings*
- *mobile/mini/rectangular dwellings in compliance with Section 2*
- *single detached dwellings in compliance with Section 2*

Section 2 Lot Development Requirements for dwellings

- *Minimum lot size = 5 acres*
- *Minimum public street/road frontage = 300 feet*
- *The lot on which the dwelling is to be constructed shall only front along a public street/road that existed on the date this Land Use By-law came into effect.*

CBRM (2007b, page 98)

5.6 Best Management Practices (BMPs)

The Nova Scotia Department of Natural Resources and Nova Scotia Environment and Labour (2005) collaborated on a manual of best practice, *Best Management Practices/Forest Planning in Municipal Drinking Water Supply Areas Nova*. NS Environment and Labour, Water and Wastewater Branch (2005), working separately, prepared *General Provisions for Pesticide Use in Nova Scotia.* Nova Scotia Department of Agriculture and Fisheries and Nova Scotia Department of Environment and Labour (2005) released *A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia.*

These reports were reviewed by the watershed coordinator and by committee members with knowledge in the particular sector. Pertinent practices are listed in the following subsections.

5.6.1. Forest Management Best Management Practices

The Best Management Practices approach is included in Appendix A of the Nova Scotia Department of Natural Resources and Nova Scotia Environment and Labour (2005) document. Appendix A, "Summary of Existing Regulations and Practices that Contribute to Maintaining Water Quality," encourages due diligence and includes reasonable practices to mitigate or protect against foreseeable potentially damaging actions or activities. Appendix B is entitled "Potential Analysis, Planning, Implementation, Inspection, Monitoring and Continual Improvement Process."

Appendix C of *Best Management Practices/Forest Planning in Municipal Drinking Water Supply Areas Nova Scotia* outlines examples of enhanced practices that might be adopted following an analysis and planning exercise (see appendix F of this report). The CBRM Water Utility could provide assistance with trail planning and locating vegetable-based oil and spill kits. Contractors on municipal land and landowners working on their own properties will be provided with information on forest management best management practices. Forest harvesters will also be directed to staff from NS Environment and NSDNR for advice on stream crossings and wetlands delineation.

5.6.2. Residential Septic Systems and Wells Best Management Practices

In 2004, CBRM adopted a regional planning strategy. Part 8 of this document, "Public Works Infrastructure Services," looked at alternatives to conventional wastewater disposal systems where on-site disposal systems were experiencing problems. For example, as a result of problems with existing on-site systems, an expensive urban sewer system was built in Birch Grove and a community well serviced by CBRM was constructed in Floral Heights in Sydney River. Inspection of existing wells and on-site septic systems near Pottle Lake should be done before problems arise; ensuring that expensive expansion of piped services is not required.

Part 9 of the 2004 CBRM Municipal Planning Strategy, entitled "Environmental Issues", began with a section on public water supply watersheds. Policy 1.e of part 9 encouraged Council to adopt a by-law that would create wastewater management districts (WMDs) to service residential septic systems in water supply watersheds. A monitoring and maintenance program might include inspections of all on-site sewage disposal systems, cost sharing replacement programs for malfunctioning or antiquated systems, and regular septic tank clean outs. The program would be carried out by the municipality and paid for by the owner as an additional taxed service.

No waste water management districts have been implemented in CBRM. Work ceased on a regional waste water strategy that was to be completed in 2012. This strategy would have identified WMDs. Monitoring and maintenance programs for septic systems would have been mandatory within these areas.

5.6.3. Environmental Farm Plans and Beneficial Management Practices

A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia, referred to in the introduction, recommends Beneficial Management Practices. Most farmers in the Pottle Lake watershed have been provided these plans. CBRM Water Utility, working with the local provincial agricultural resource coordinator (ARC), has offered to provide GIS support to farmers participating in the Environmental Farm Plan (EFP) program. The ARC encourages farmers in the Pottle Lake watershed to develop a Nutrient Management Program (NMP) by offering 100 per cent assistance (up to $1500) for new plans and 75 per cent assistance for renewal plans. Farmers with NMPs are also eligible for a limestone transportation subsidy.

The Nutrient Management Plan must include:

- Producer identification and operation description;
- At least three cropping years; Three year manure plan (timing & amount of application) Three year fertilizer plan (timing & amount of application) Three year lime program template;
- Manure and/or commercial fertilizer recommendations based on previous two year's history of manure and crops to be grown;
- Recommendations to be based on current soil analysis and manure analysis (not older than one year);
- Farm land base: farm maps (aerial and line); field names, sizes and soil types;
- Nutrient balance sheets;
- Phosphorous level description and spreadsheet;
- Environmental concerns (including information on surface water bodies and wells);
- Manure Animal Unit Equivalent (AUE)/ha and alternative manure plan (if needed).

The agricultural practices guide also provides information on management of livestock manures, chemical fertilizers, and pest control products, pasturing livestock, location of buffer strips, and practices for soil conservation and management. Water quality in Pottle Lake indicates that farm practices within the watershed are not a problem and the committee currently has no concerns about agriculture impairing water quality.

5.6.4. Utility Easement Maintenance

ADI Limited (2006) reported that NSPI considered Pottle Lake watershed a "No Herbicide Zone" in which brush clearing is done by mechanical means only. In 2009 NSPI had crews checking poles in the transmission corridor for deterioration. The contractors contacted CBRM's watershed coordinator who informed them that Pottle Lake was a designated protected water area and no biocides are permitted in the watershed. No creosote or other preservative was applied in the watershed area.

The CBRM watershed coordinator has asked NSPI to provide plans for expanded clearing of the easement to accommodate the proposed Maritime Link transmission line. This clear-cutting operation will increase overland flow to Pottle Lake in the short term, but regrowth will hopefully eventually provide dense young growth to reduce erosion.

5.7 Land Acquisition

ADI Limited (2006) refers to a 1987 Pottle Lake Watershed Committee Summary Report which considered properties along the Old Branch Road to be priorities to purchase. The CBRM Water Utility has a policy of acquiring lands in drinking water supply areas when they become available. The Pottle Lake SWPP Committee recommends strongly that land purchased by CBRM for watershed protection not be sold at a later date. Of course, acquired land has to be properly managed. Former hay land between the Old Branch Road and the lake, purchased by CBRM, is now used as an illegal dump site and a place for off-highway vehicles (OHVs) to create mud. Adjacent hay land, which is still being used, is not subject to trespass in the same manner.

5.8 Adaptation for Climate Change

Consultants have predicted that Cape Breton will be warmer in the future with more extreme rainfall events. Precipitation will most likely not increase so we will experience longer dry periods with increased frequencies of low flows. Warmer temperatures may also exacerbate the problem by increasing the rate of evaporation in lakes, reducing the water levels.

To monitor effects of climate change, consultants have recommended that the water level of Pottle Lake be measured on a regular basis. CBCL Limited, who designed the new water treatment plant, had trouble implementing a system to record water levels in Pottle Lake but the SCADA system does record water level in the wet well. The equates to lake levels and, although impacted by the pumps, is reliable when the pumps are not running.

CBRM Water Utility also suggested that stream flow gauges be installed in Smelt Brook as part of the construction of the new water treatment plant, but this was not done. According to ADI Limited and Hydro-Com Technologies (2007), stream flow gauges could be supplemented with environmental sensors to monitor parameters such as air and water temperature. They also suggested CBRM consider installing appropriate field equipment to estimate evaporation rates. There are no plans to install this equipment.

6.0 MONITORING AND IMPLEMENTATION PLANS

Source water protection monitoring is a formalized review process that reviews the performance of the source water protection plan. This typically involves monitoring the quality of source waters to evaluate changes in the state or health of the water supply area. The plan may not be meeting its objectives if water quality is deteriorating in the water supply or the identified management options (such as BMPs) are not being followed. A municipality or utility should be able to link deterioration in water quality to one or more of the risks identified in the source water protection plan.

Source water protection monitoring complements, but is different from, regulatory compliance monitoring completed by a utility or municipality on its raw water to meet regulatory requirements. Raw water quality monitoring may be on a much more frequent basis depending on the source of supply, risk of contamination, type of treatment, and similar factors.

As well, SWP plans need to be regularly reviewed to ensure new land uses or activities, or, conversely, the cessation of land uses or activities are included. Also, any changes to the water supply infrastructure, such as construction of a new well or the introduction of new legislation, should be noted. The monitoring and evaluation program for the SWP Plan will help assure the Pottle Lake SWPP Committee that the plan remains current with changing conditions and priorities in the water supply area.

6.1 Regulatory Compliance Monitoring

Under the requirements of the *Environment Act*, the Activities Designation Regulations, and the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations, CBRM samples raw water before it enters the treatment process. The raw water is tested daily for turbidity and pH and twice yearly (spring and fall) for chemical quality.

Although the health based Guidelines for Canadian Drinking Water Quality (GCDWQ) do not apply to raw water, in 2012, Pottle Lake raw water met even the aesthetic objectives for treated water (see Section 1.3). See appendix E for the 2012 baseline chemical quality reports for Pottle Lake. Raw water is tested for bacteria, protozoa, or viruses when NS Environment requests it.

Treated water is tested twice daily in the plant for pH, turbidity, and chlorine. Twice a week, treated water is collected at sixteen sample points throughout the distribution system. All sample points are tested for turbidity, pH, and residual chlorine. Thirteen points are tested for total coliform bacteria and E.coli. Since the new treatment plant came on line in 2010, samples have been collected once a week.

Treated water, like raw water, is also tested twice a year for the levels of chemicals and metals. There were no exceedances of the health based Guidelines or aesthetic objectives for Canadian Drinking Water Quality (GCDWQ) for chemical quality in 2012.

Quarterly tests are done for levels of trihalomethanes (THMs), bromodichloromethane, and haloacetic acids (HAAs). The water utility prepares annual reports for each treatment plant summarizing sampling results. The reports for Pottle Lake are provided to the source water protection committee members so they are aware of raw water quality in the lake.

6.2 Water Supply Area Monitoring

The CBRM Water Utility does no additional monitoring of raw water from Pottle Lake, instead relying on the compliance monitoring from the clear well to reveal any quality issues. John K. Underwood (1983) reviewed the same water samples as Bailey (1984) and concluded that no sampling other than at the intake pipe appeared to be warranted. Currently, there are concerns about possible groundwater contamination from dumping and the cemetery. This would be best addressed by monitoring some wells in the area.

EXP (2013) made the following recommendations with respect to SWPP monitoring:

- Consideration should be given to undertaking a limnological investigation to determine changes in water and biological quality with depth, space and time.
- The CBRM should consider incorporating analysis of caffeine as an indicator of septic influences.
- All raw water chemistries including those collected during testing, design and commissioning should be added to the CBRM's Excel spreadsheet of raw water quality data to aid in providing a longer time baseline of conditions.

In addition to monitoring the water supply area through water quality and quantity sampling, municipalities should also undertake visual monitoring of their water supply area. For example, regularly driving by or walking through the watershed area can identify potential water quality problems, such as all-terrain vehicles in watercourses. Surveys and discussions with local landowners can reveal if they are following best management practices. This may help determine if additional education efforts are required, identify problems that are not being adequately addressed, or may identify activities that are in violation of the bylaws or regulations that have been put in place to protect water quality. As the source water protection plans are completed, the watershed coordinator has more time to conduct tours and interviews in the watersheds.

6.2.1 Data Management

CBRM water supply system data is managed using programmable logic controls (PLC) and automatic communication to servers linked to a supervisory control and data acquisition (SCADA) system. Four meters in the Northside distribution system report to the SCADA system and facilitate leak detection. The new treatment plant brings full SCADA capability to this water supply system. Information for the North Sydney system can be accessed from anywhere in the CBRM network. CBRM had hoped for a regional communications upgrade with all information reporting to a central server, but this may not be possible. Security has been improved by requiring a VPN (virtual private network) sign in before reaching the SCADA computer, meaning users must authenticate twice to access SCADA remotely. Although the digital database is continually upgraded as

change occurs, the current efforts of the CBRM are focussed on systems to document and track drinking water quality. Expansion of the system will be required to accommodate suggested monitoring programs.

The CBRM planning department has significant GIS capability. Geographic information systems (GIS) provide a valuable planning tool for watershed protection. The current watershed coordinator was a former GIS technologist with the CBRM planning department and has been able to build GIS files for all the watershed areas. Future monitoring data must be supplied in digital formats that can be related to the georeferenced GIS files. It is also important that the water utility retain an employee with GIS skills, as the CBRM engineering and public works department relies totally on CAD software which does not provide the analytical tools required for watershed management.

6.3 Source Water Protection Plan Review and Update

The Pottle Lake SWPP Committee will regularly review and update the source water protection plan. NS Environment watershed planners recommend annual reviews of the plans and full revisions every five years or after significant changes to the water supply system or its source. Suggested questions for review include:

- How many source water committee meetings have been held in the past year?
- Have there been any changes to committee membership?
- Have there been any changes made to the committee terms of reference?
- Have changes to the system infrastructure been made (e.g. wells constructed or decommissioned)?
- Have there been changes to property ownership within the watershed or aquifer area?
- Have new land uses begun (or existing uses changed or ceased) within the watershed or aquifer area?
- Have activities continued, declined or increased with the past year within the watershed or aquifer area?
- Have any new risks to the watershed or aquifer area been identified? What risk reduction strategies will be employed?
- Have any accidents/emergencies occurred within the watershed or aquifer area within the past year?
- Has source water monitoring (differs from regulatory compliance monitoring) been undertaken? Please describe the results.
- Has your contingency plan been reviewed and contact information updated?

NS Environment also recommends providing an updated implementation plan, including items completed, ongoing, or yet to be completed. Based on consideration of all the above questions, SWPP committee members can identify if any items need to be added to the implementation plan. The implementation plan will be updated on a regular basis based, in part, on input from the SWPP committee.

6.4 Further Research

There is a lack of detailed hydrological and hydrogeological studies for the Pottle Lake watershed area and thus ADI Limited (2006) recommended long-term monitoring programs. The best approach would be to undertake affordable, practical programs each year to obtain information pertinent to answering specific operation or protection issues as they arise.

ADI Limited (2006) suggested some priority questions:

- How much water resides in storage within the lake? How does it fluctuate seasonally/annually? How much is accessible at the extraction point?
- What are the seasonal, storm and snowmelt fluctuations in the water chemistry? What chemicals are present on the lake bottom sediments?
- Does Smelt Brook provide fish habitat? If so, how should flows be managed to maintain and improve it?

ADI Limited and Hydro-Com Technologies (2007) recommended:

- stream flow monitoring for both inflow and outflow,
- collection of air and water temperatures at stream flow gauges,
- stage monitoring,
- lake bathymetry surveys,
- field inspection or survey of possible hydraulic connectivity with Gammell Lake,
- the development of stage-storage and inflow-outflow relationships, and
- installation of equipment for estimating evaporation.

A hydrogeologist, making a presentation to the Pottle Lake SWPP Committee, stressed that further data is needed to manage the watershed. Committee discussion brought forth the following suggestions for monitoring or research:

- Collect and analyze water samples for bacterial and chemical levels.
- Collect and analyse lake bottom sediments.
- Identify amounts of water going into the lake via surface and ground water runoff and amounts of water extracted for human use and being lost through evaporation.
- Install monitoring equipment to collect baseline data for future reference and assess climate change impacts to the lake.
- Expand or decrease the natural surface water watershed boundaries as identified in the presentation to adequately isolate and protect the Pottle Lake watershed.
- If necessary, in certain areas, delineate the groundwater watershed boundary.
- Develop a contingency plan for the lake.

CBRM Water Utility staff have discussed possible research projects in the Pottle Lake watershed with limnology researchers at Acadia University and the Applied Geomatics Research Group (AGRG) at the Centre of Geographic Sciences (COGS). ADI Limited (2006) suggested monitoring of fresh water aquatic life would be useful in understanding the ecology of the lake. A Cape Breton University (CBU) professor is currently (2013) investigating the Yellow Lampmussel in Pottle Lake and the watershed coordinator is

building relationships with other researchers at CBU, so they will think of the water supply watersheds as locations for student projects.

EXP (2013) recommended:

- Consideration should be given to undertaking a limnological investigation to determine changes in water and biological quality with depth, space and time.
- The CBRM should undertake scenario planning with EMO and operations to enhance response time and approach to various critical issues, which would impact yield and quality (e.g. forest fires, tanker spills).
- The CBRM should consider incorporating analysis of caffeine as an indicator of septic influences.
- All raw water chemistries including those collected during testing, design and commissioning should be added to the CBRM's Excel spreadsheet of raw water quality data to aid in providing a longer time baseline of conditions

6.5 Implementation

Following discussion of the draft source water protection plan and guided by the list of land uses with relative risk to source water (see Table 2), the Pottle Lake SWPP Committee prioritized concerns for the watershed. These were presented in Table 4. An implementation schedule has been developed and is presented below in Table 5.

EXP (2013) formulated the following recommendations regarding the SWPP process.

- Update changes in land use on GIS mapping on an annual basis.
- Work on scenario based emergency planning with EMO and Operations. Include fire departments in terms of motor vehicle accidents with fluids leaking, structure fires with oil tanks, suppressant foams used in fires.
- Develop forest management plans that accommodate water resources management, as well as minimizing risk of fires and bug infestations.
- Enhance the frequency of monitoring for select parameters to aid in identifying impacts due to a changing climate.
- Continue with public awareness programs regarding water conservation and water protection via newsletters, if deemed useful.
- Maintain a special Constable for solid waste to deal with illegal dumping in watershed.

	2013				2014	
Management Strategy	**Jan - Mar**	**Apr - Jun**	**Jul - Sep**	**Oct - Dec**	**Jan -Mar**	**Apr - Jun**
Outreach and Education						
Develop and distribute SWP Plan Newsletter (done 2012)						
Work with ACAP CB to create community awareness						
Establish watershed protection signage at access roads						
Put source water protection materials on the CBRM web site						
Approach private landowners to determine willingness to sell						
Support better management of the Old Branch Road						
Encourage household well, septic system and oil tank maintenance						
CBRM Policy and Procedure						
Update contingency/ EMO plans for spills\accidents						
Develop CBRM policy on mineral exploration in watershed						
Review water samples for bacteria, chemicals, caffeine?, and salt?						
Work with CBRM Planning Department on zoning requirements						
Work with NSE to revise designation regulations?						
Research, Mapping and Monitoring						
Survey location and condition of all stream inlets						
Research lake bottom sediment and aquatic life (Spooner?)						
Improve mapping of surface and ground watershed boundaries						
Research groundwater\surface water interaction (monitoring wells?)						
Operate and maintain eel weir						
Obtain bathymetry and develop stage-storage curves (done 2010)						
Install water level gauge near Smelt Brook (done 2011)						
Support Provincial\Federal Initiatives						
Sustainable forestry methods education (NSDNR)						
Environmental Farm Plans (NS Agriculture)						
Expansion of monitoring well network (NSE and Groundswell)						
NSEN Water Caucus						
Operate and maintain eel weir on Smelt Brook (NSTIR and DFO)						
Review and update SWP Plan						

Table 5. Source water protection plan implementation schedule.

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APPENDIX A SWP PLANNING COMMITTEE

2008-2013 Pottle Lake Source Water Protection Planning Committee

Pottle Lake Watershed
Source Water Protection Plan

2008-2010 Pottle Lake Source Water Protection Planning Committee

Chairperson - Alan Jackson
Vice Chairperson - Kyle Beaton
CBRM Councillor - Mae Rowe
Agriculture Representative - Arnie Verschuren
Forestry Representative - Charlotte MacKenzie (retired from committee)
Recreation Representative – Charlene Clark
Commercial Representative - Clansman Motel, Howie Allen
Landowner - Percy MacKenzie
NSTIR - Bill Swain
NSDNR Forester - Brian MacSween
NSDNR Geologist - Brendan MacKenzie (retired)
NS Environment Watershed Planner - Cheryl Benjamin (formerly Dawn MacNeil)
NS Environment Inspector Specialist - Rodney Lahey
CBRM Watershed Coordinator - Britt Roscoe
Recording Secretary – Wendy Neil (formerly Kelly MacLeod)
Northside ATV Club – formerly Dan Hardy (club currently disbanded)

Other contacts

Louis Ferguson, Manager, Public Works North Division, CBRM
John Ivey, Supervisor Public Works North Division, CBRM
Nadine Keller Wadden, CBRM Water Analyst
Derrick Jessome, Operator, Pottle Lake water treatment plant
Monique Cashin, Emera Centre

APPENDIX B COMMITTEE TERMS OF REFERENCE

Terms of Reference
Pottle Lake Source Water Protection Planning Committee

TERMS OF REFERENCE
POTTLE LAKE SOURCE WATER PROTECTION (SWP) PLANNING COMMITTEE

MANDATE

The purpose of the Pottle Lake SWP Planning Committee is to:

1. Advise the CBRM Water Utility on the management of Pottle Lake watershed in order to ensure an adequate supply of safe drinking water from the lake;
2. Provide a forum for landowners, residents, and users of the watershed to discuss and to present their views on all matters related to the management of the watershed;
3. To prepare a water supply watershed management strategy for Pottle Lake.

GENERAL

The committee will:

1. Review and make recommendations on all activities affecting the SWP area as requested by the Utility, CBRM, and communities in the area.
2. From time to time request individuals or groups to inform the committee on matters affecting the SWP area.
3. Review and comment on water quality and quantity monitoring programs and other studies related to the SWP area. All water quality information available from member agencies shall be made available to the committee.
4. Develop information and education programs about source water protection for local residents, land owners, and other users of the SWP area lands.
5. Elect a chair and vice-chair.
6. Advise CBRM Council and the Director of Public Works on issues pertaining to the Pottle Lake watershed.
7. Welcome all landowners to attend SWP Committee meetings as observers.
8. Assist in the development and implementation of a Source Water Protection Plan which will be reviewed periodically.
9. Assist with revisions of the regulations for the protected water area as required.
10. Review these Terms of Reference annually. Amend these Terms of Reference for the Pottle Lake SWP Planning Committee from time to time.
11. Address problems and solutions on matters of concern as they arise.
12. Advise on forest matters and other land use issues.
13. Develop best management practices for activities in the watershed. These best management practices will also be used to guide any approval processes for activities in the watershed.
14. Review and make recommendations on activities affecting the watershed area as requested by the municipality.
15. Provide information on committee activities to landowners in the watershed area.

MEMBERSHIP

VOTING MEMBERS

Landowner representatives – 3 members
Commercial representative – 1 member
Councillor, CBRM – 1 member
CBRM Water Utility - 1 member
Recreation representative – 1 member
Agriculture representative – 1 member
Forestry representative – 1 member
NS TIR – 1 member

NON-VOTING MEMBERS

NSDNR, Geologist – 1 member (retired, not replaced)
NSDNR, Forester – 1 member
NS Environment, Watershed planner – 1 member
NS Environment, Inspector Specialist – 1 member

OPERATION OF COMMITTEE

1. The chair and vice chair of the committee shall be appointed annually by the membership at the meeting closest to April 1. Members will serve on the committee for a minimum three-year term
2. CBRM will provide secretarial services.
3. The committee will endeavour to conduct business by consensus, but should the committee be unable to attain consensual agreement on an issue, voting may be necessary. All motions require support from at least a two-thirds majority of the members present. Six committee members including a minimum of two non-government landowners and one government landowner constitute a quorum.
4. The committee must prepare an annual report of its activities to be distributed to all bodies represented on the committee and to other interested parties.
5. The chair will act as the committee spokesperson.
6. The committee may call for the input of other landowners in the source water supply area from time to time.
7. If a vacancy occurs before the yearly term is complete, then the committee will appoint a replacement for the vacancy for the interim until the year ends.
8. If a vacancy occurs on the committee before the end of a member's term, the Water Utility representative will forward a notification to the residents within the Pottle Lake source water protection area before the annual general meeting and bring back to the committee the received expressions of interest. At that time, the committee will review the expressions of interest and appoint a new member to fill the vacant position on the Pottle Lake SWP Planning Committee.
9. The committee, at the discretion of the Chairperson, shall hold two meetings per year and additional meetings as required.
10. Full minutes of all discussions and recommendations of the committee shall be kept at the CBRM Clerk's office.
11. Expenditures by the Source Water Protection Committee require prior approval from the CBRM Water Utility.

MEMBERS' ROLES

Landowners

The landowners on the SWP Planning Committee are in a unique position of knowing the watershed and their land in addition to their own and their neighbours' land use practices. The landowners are encouraged to express their concerns and interests; advise and provide information to the committee on land use management and source water protection; communicate with other landowners on committee activities; and report to the committee any problems that they may encounter within the watershed.

CBRM Councillor

The councillor is responsible for representing the interests of the citizens served by the Water Utility and the watershed landowners. The Councillor will also represent the municipality's interests as a landowner in the watershed.

Sector Representatives

Representatives for the forestry, agriculture, commercial, and recreation sectors are responsible for representing the interests of other operators within the watershed area. These individuals will review and comment on best management practices and contingency planning related to their industry or activity.

Department of Natural Resources (DNR) Representatives

The DNR representative will work with the committee providing information and advising on topics related to forestry, wildlife, geology, wetlands, and source water protection. He or she will also represent the department's interests as a landowner in the watershed.

Department of Transportation and Infrastructure Renewal (TIR) Representative

The TIR representative will work with the committee providing information and advising on topics related to Highway 125 and general transportation issues. The representative will also represent the department's interests as a landowner in the watershed.

Water Utility Representative

The Water Utility representative will report to the committee on activities undertaken by the municipality and any approvals in the watershed area. The representative will work with the committee providing information and advising on topics relating to source water protection, watershed management, land use, and the operation of the Water Utility. The representative will also bring concerns to the committee relating to water quality and watershed management.

Department of Environment Representatives

The NS Environment representative will work with the committee providing information and advising on topics related to source water protection, watershed management, the Environment Act, and Protected Water Area Regulations.

APPENDIX C CONTINGENCY PLAN

APPENDIX A

EMERGENCY RESPONSE PLAN

from

REPORT ON

Potential Migration of Contaminants into Pottle Lake

Prepared For

Nova Scotia Department of
Transportation and Public Works
P O Box 1180
Sydney NS BIP 6J9

Prepared By

ADI Limited
P O Box 1688
Sydney NS BIP 6R7
Tel 902 562 2394
Fax 902 564 5660

FILE 24 0962 027 1
DATE February 1999

1 0 INTRODUCTION

Pottle Lake is the potable water supplier for the communities of North Sydney, Sydney Mines, and Florence. The lake is bordered on the East by the 125 Trans Canada Highway. In recent years the Department of Transportation and Public Works has gone to great effort to provide protection to the water supply from potential hazardous material spills as a result of traffic accidents.

These protection measures have included a low permeable containment berm, water diversion structures, and an oil containment boom structure. As part of the overall protection package this emergency response plan (ERP) has been prepared.

With any spill event the timely notification of appropriate agencies is one of the most important factors in minimizing the amount harm to the environment. Generally a number of agencies will be involved when such a hazardous spill occurs near Pottle Lake. At a minimum it is anticipated that the following agencies
will be contacted:

1 Royal Canadian Mounted Police RCMP
2 Cape Breton Regional Police CBRP
3 North Sydney Fire Department
4 Cape Breton Regional Municipality Public Works Northside Division
5 The Provincial Department of Environment
6 Canadian Coast Guard

The preparation of this plan has involved interviews and recommendations from the following agencies:

- CBRM - Communications Centre
- CBRM - Emergency Measures Office
- Province of Nova Scotia - Emergency Measures Office

2 0 DESCRIPTION OF PROTECTION MEASURES

Figure 98-1 (not available) depicts the configuration of the current protection structures at Pottle Lake. Understanding how each of these systems functions is important to an efficient and effective clean up of hazardous materials There are three components to this system:

1. Containment Berm: This berm separates vehicle traffic from Pottle Lake and prevents any release of contaminants to Pottle Lake by directing runoff away from the lake to a system of catch basins The containment berm was built in the lake in 1999.

2. Containment Berm Drainage System This system is composed of catch basins and pipes that drains surface water and any potential hazardous materials at the berm on the north side of the highway to a pond located on the south side of the west bound lane

3. Floating boom containment structure: This structure is located at the discharge to Smelt Brook exit of the pond The function of this boom is to prevent any floating hydrocarbon product from being discharged to Smelt Brook until emergency crews can clean up the product.

It should be noted that the floating boom structure will only contain non solvable liquids that have a specific gravity less than water Other contaminants will flow under the boom and down Smelt Brook. The positive hydraulic gradient from the Pottle Lake to the downstream pond will prevent migration from the pond to Pottle Lake through the permeable road bed. **The hydraulic head could be reversed if there is a blockage at Musgrave Lane This condition must be avoided to protect the water supply**

It is therefore essential that the appropriate individuals with the CBRM Public Works Northside division are contacted to assess the situation and make adjustment at the water treatment plant if necessary. Where possible all contamination should be contained as close to the spill as possible In some instances it may be possible to contain a spill prior to it reaching the catch basins and the pond

3 0 CONTACT PROTOCOL

The emergency response plan for hazardous material response has been prepared with reference to the Cape Breton Regional Emergency Plan and therefore the contact protocol site management follows the criteria outlined in that document. Either the RCMP or the CBRM 911 centre will be the first agencies contacted when an accident occurs. Therefore central dispatch for each of these agencies should have a copy of this document as well the local CBRM Fire Department and Public Works Division.

The flow chart shown on Figure 1 provides an outline of the chain of contacts that should occur in the event of an accident and or spill of hazardous material at or near Pottle Lake.

The observer or other 911 receiver will contact the CBRM 911 centre. The 911 centre will contact the Fire Department in North Sydney. The Fire Department will become the lead municipal agency in the hazardous spill response and the fire chief or their designate will become the “site management coordinator”. This is in accordance with the draft Cape Breton Regional Emergency Plan and the Fire Prevention Act, Nova Scotia Statute, 1989.

The 911 centre will also contact the following agencies:

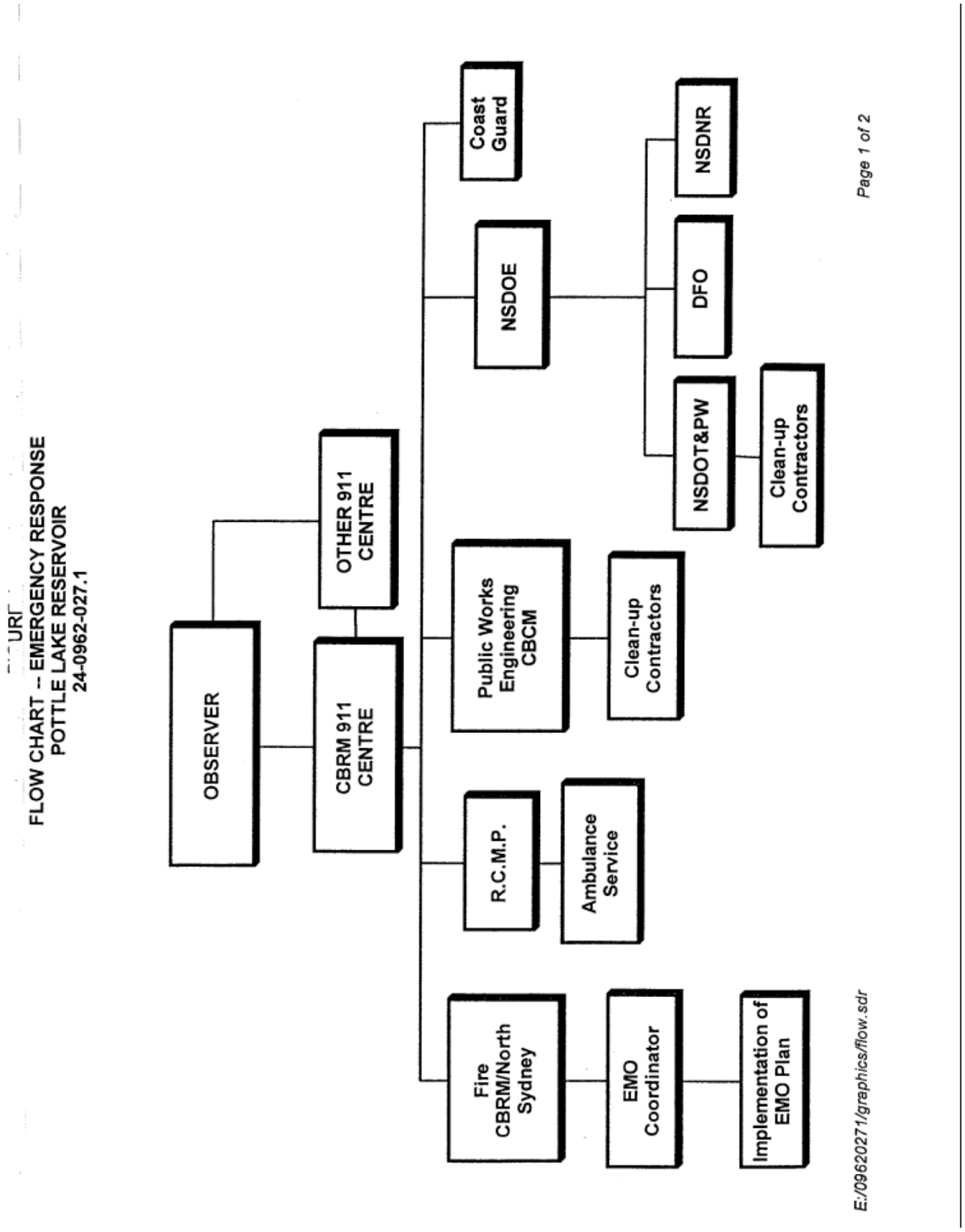
- RCMP - responsible for highway traffic control
- CBRM - Police responsible for CBRM jurisdiction
- Ambulance Service - responsible for human injury assistance
- NSDOE -responsible for assessment of potential environmental hazards
- Public Works Division - responsible for the boom structure operation and water supply
- Canadian Coast Guard - responsible for assisting in clean up of spilled material
- NSDOT PW - responsible for containment facility and extended traffic control

In accordance with the CBRM Emergency Plan each agency will appoint a coordinator who reports for that entity to the Site Manager Fire Department. Depending on the seriousness of the hazardous material spill these agencies will involve other parties in the response.

The site manager will be responsible for the communication with the Municipal Emergency Measures Office (EMO). The EMO will establish procedures for evacuation of residential and commercial properties if necessary.

Clean up of hazardous materials will involve a combination of equipment and skills from the Fire Department Coast Guard and specialized contractors. Deployment of specialized contractors will be at the direction of the Public Works Department, NSDOE and the Coast Guard with consultation with other agencies.

The NSDOE will be responsible for notification of the Nova Scotia Department of Natural Resources and the Federal Department of Fisheries and Oceans (DFO). These agencies will be primarily concerned with the affects on Smelt Brook.


FLOW CHART -- EMERGENCY RESPONSE
POTTLE LAKE RESERVOIR
24-0962-027.1
OBSERVER
CBRM 911 CENTRE
OTHER 911 CENTRE
Fire CBRM/North Sydney
R.C.M.P.
Ambulance Service
Public Works Engineering CBCM
Clean-up Contractors
Coast Guard
NSDOE
NSDOT&PW
Clean-up Contractors
DFO
NSDNR
EMO Coordinator
Implementation of EMO Plan
Page 1 of 2
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EMERGENCY RESPONSE
POTTLE LAKE RESERVOIR
LIST OF TELEPHONE CONTACTS
(updated May 2013)

RCMP Emergency	911
CBRM Emergency	911
North Sydney Fire Department	794-4700
CBRM Police Northern Division	794-5698
CBRM Public Works Dispatch	562-5255
NSDOE Spill Response	563-2100 or 800-565-1633
NSTIR Emergency Dispatch	563-2245 or 888-432-3223?
Pottle Lake Water Treatment Plant Business Hours	794-8800
After Hours	562-5255
DFO Business Hours	564-2400
After Hours	800-565-1633
Coast Guard Spill Response	800-565-1633
CBRM EMO Coordinator John Dilney	563-2352
NS Environment EMO Coordinator	800-565-1633

APPENDIX D RISK ASSESSMENT MATRIX

Contamination Issue	Activity/Cause	Scale of Problem*	Priority Rank**
Nutrients	• Agriculture	3	2
Fuel Leaks	• Domestic oil tanks	4	1
Sedimentation	• Construction • Agriculture • Forestry	1 2 4	1 2 3
Pesticides	• Agriculture	4	2
Bacteria	• Domestic septic systems • Manure • Municipal effluent	2 3 3	1 2 3
Salt	• Road de-icing	3	4

** 1 = Severe, 3 = Moderate, 5 = Minimal ** 1 = High, 3 = Moderate, 5 = Low*

List of activities with relative risk to source water from NS Environment

APPENDIX E POTTLE LAKE WATER CHEMISTRY

Annual Report North Sydney Water Treatment Plant

April 1st, 2012

Table 9: BASELINE CHEMICAL QUALITY

Parameter	Health-based Guideline (mg/L)	AO [or OG] (mg/L)	RAW WATER - North Sydney Water Treatment Plant 302 Musgraves Lane		TREATED WATER- North Sydney Water Treatment Plant 302 Musgraves Lane	
			March 7th (mg/L)	September 12th (mg/L)	March 7th (mg/L)	September 12th (mg/L)
Alkalinity (Total as $CaCO_3$)	--	--	8.2	9.6	<5	5.3
Total Aluminum	--	[0.1/0.2]	0.02	0.02	0.022	0.0093
Nitrogen (Ammonia Nitrogen)	--	--	<0.05	<0.05	<0.05	<0.05
Total Antimony	0.006	--	<0.0004	<0.001	<0.0004	<0.001
Total Arsenic	0.010	--	<0.0006	<0.0006	<0.0006	<0.0006
Total Barium	1	--	0.02	0.018	0.02	0.018
Total Boron	5	--	<0.1	<0.1	<0.1	<0.1
Total Cadmium	0.005	--	<0.000017	<0.000017	<0.000017	<0.000017
Total Calcium	--	--	3.3	3.6	3.3	3.9
Dissolved Chloride	--	≤250	19	20	26	23
Total Chromium	0.05	--	<0.001	0.0014	<0.001	<0.001
Colour (TCU)	--	≤15 TCU	12	5.7	<5	<5
Conductivity (µS/cm)	--	--	88	96	110	110
Total Copper	--	≤1.0	<0.002	0.0024	0.016	0.0079
Dissolved Fluoride	1.5	--	<0.1	<0.1	1.1	0.81
Hardness as $CaCO_3$	--	--	13	14	13	14
Total Iron	--	≤0.3	<0.1	<0.1	<0.1	<0.1
Total Lead	0.01	--	<0.001	<0.001	<0.001	<0.001
Total Magnesium	--	--	1.1	1.2	1.1	1.2
Total Manganese	--	≤0.05	0.015	0.022	0.011	0.0044
Nitrate	10	--	<0.05	<0.05	<0.05	<0.05
pH	--	6.5 - 8.5	6.9	7.1	6.5	7
Total Potassium	--	--	<0.6	0.63	<0.6	<0.6
Total Selenium	0.01	--	<0.001	<0.001	<0.001	<0.001
Total Sodium	--	≤200	11	14	14	15
Dissolved Sulphate	--	≤500	2.8	3.6	2.7	3.4
Calculated Total Dissolved Solids	--	≤500	44	50	51	51
Total Organic Carbon	--	--	2.2	2	2.2	1.6
Turbidity (NTU)	1.0	--	0.43	0.3	0.1	<0.1
Total Uranium	0.02	--	<0.00015	<0.00015	<0.00015	<0.00015
Total Zinc	--	≤5	0.0065	0.12	0.014	0.014
Other Parameters Sampled						
Total Beryllium	--	--	<0.0005	<0.0005	<0.0005	<0.0005
Total Bismuth	--	--	<0.002	<0.002	<0.002	<0.002
Total Cobalt	--	--	<0.001	<0.001	<0.001	<0.001
Total Lithium	--	--	<0.001	<0.001	<0.001	<0.001
Total Molybdenum	--	--	<0.004	<0.004	<0.004	<0.004
Total Nickel	--	--	<0.003	0.0039	<0.003	<0.003
Nitrite (N)	--	--	<0.01	<0.01	<0.01	<0.01
Nitrite + Nitrate	--	--	<0.05	<0.05	<0.05	<0.05
Orthophosphate	--	--	<0.01	<0.01	<0.01	<0.01
Total Phosphorus	--	--	<0.1	<0.1	<0.1	<0.1

Table 9: BASELINE CHEMICAL QUALITY (CONTINUED)

Parameter	Health-based Guideline (mg/L)	AO [or OG] (mg/L)	RAW WATER - North Sydney Water Treatment Plant 302 Musgraves Lane		TREATED WATER- North Sydney Water Treatment Plant 302 Musgraves Lane	
			March 7th (mg/L)	September 12th (mg/L)	March 7th (mg/L)	September 12th (mg/L)
Total Silver	--	--	<0.0001	<0.0001	<0.0001	<0.0001
Total Strontium	--	--	0.016	0.016	0.016	0.018
Total Thallium	--	--	<0.0008	<0.0008	<0.0008	<0.0008
Total Tin	--	--	<0.02	<0.02	<0.02	<0.02
Total Titanium	--	--	<0.003	<0.003	<0.003	<0.003
Silica	--	--	2.2	1.5	2.6	0.86
Total Vanadium	--	--	<0.002	<0.002	<0.002	<0.002
Calculated Parameters						
Anion Sum (me/L)	--	--	0.76	0.83	0.85	0.87
Bicarbonate Alkalinity as $CaCO_3$	--	--	8.2	9.6	<1	5.3
Carbonate Alkalinity as $CaCO_3$	--	--	<1	<1	<1	<1
Cation Sum (me/L)	--	--	0.74	0.88	0.84	0.94
Ion Balance (% Difference)	--	--	1.33	2.92	0.59	3.87
Langelier Index (@ 20C)	--	--	-2.98	-2.67	NC	-3
Langelier Index (@ 4C)	--	--	-3.23	-2.92	NC	-3.25
Saturation pH (@ 20C)	--	--	9.88	9.77	NC	10
Saturation pH (@ 4C)	--	--	10.1	10	NC	10.3
Dissolved Organic Carbon			2.1	1.9	1.8	1.5

Has any of the parameter exceeded Guidelines: No

If Yes provide date of occurrence and date when Department was notified:

Action taken:

Certified Lab:

Maxxam Analytics
90 Esplanade
Sydney, Nova Scotia
B1P 1A1
Tel: (902) 567-1255
Fax: (902) 539-6504

APPENDIX F ENHANCED FORESTRY PRACTICES

Appendix "C" Enhanced Practices that May Be Adopted from *Best Management Practices/Forest Planning in Municipal Drinking Water Supply Areas Nova Scotia* Nova Scotia Department of Natural Resources and Nova Scotia Environment and Labour, 2005.

The following are examples of further enhanced practices frequently recommended within municipal water supply areas.

Roads

- Follow the long term and short term road plans approved by the Watershed or Wellfield Advisory Committee. Note: Reduce the overall road network, minimize stream crossings and the length and number of skid trails.
- Roads should be located wherever possible on grades less than 10%.
- There should be minimal road width and curve radius to reduce road erosion.
- Establish grass cover on slopes and ditches adjacent to roadways.

Stream Crossings/Bridges/Culverts

- Water turnouts should be used on all roads where they approach streams to divert storm runoff from roads onto the forest floor.
- Roads should be gravelled where they approach streams with clean gravel.
- Road crossings should be placed at the narrowest section of the stream where stable approaches are available. The approaches and structure should be at right angles to the stream. This reduces sedimentation occurrence.
- Streams should be assessed for bridge or culvert installation and properly sized for peak flows. Failure to do so may result in frequent washouts and sedimentation.
- Open bottom culverts should be used when possible and properly set for fish passage. There is less washout with open bottom culverts. Open bottom culverts can usually be installed with less disturbance to the stream bottom.
- Bridge and culvert placement should create as little disturbance as possible.

Harvest Operations

- Pre-treatment conditions should be recorded.
- Follow operating plan prescriptions.
- Ribbon off stream buffers, special management zones, environmentally sensitive areas and any culturally significant areas.
- Meet or exceed regulations.
- Consider options to save or secure natural regeneration in harvesting applications.
- Operate machines in a manner to minimize impacts to soil, regeneration and understory.
- Time operations in sensitive areas to summer when ground is dry or in winter when ground is frozen or protected by snow cover.
- Keep machinery out of watercourses. Temporary bridges must be removed when the operation is completed.
- Keep debris out of waterways, recreational trails, roads, neighbouring immature stands, boundary lines and ribboned non cut areas.
- All garbage must be removed from the site and all hazardous substances properly disposed of outside the watershed.
- Forest debris should be left on the forest floor after harvesting.
- Portable toilet facilities should be used.

Equipment Maintenance/Oil Spills

- Power saws should be used according to the following practices:
    - Use vegetable-based oil to lubricate chains.
    - Store fuel in approved containers and labelled clearly.
    - Remove fuel containers from the site when work shift is over.
    - Fuel power saws over a spill pad and keep all fuels on the spill pad.
    - Use fire retardant pouches with each saw.
- Use of machinery should follow these precautions:
    - Vegetable-based oil should be used to lubricate chains.
    - Machines should be kept clean and leak-free.
    - Machines should be equipped with industry approved fire extinguishers.
    - Machines should carry a spill kit.
- Fuel tanks for machinery should be clean, leak-free, have a locking device, a no-drip nozzle, used with a spill kit, and should be stored on mineral soil as far away as possible from watercourses (at least 100 metres or 330 feet).
- No fuel or oil should be stored within the boundaries of the watershed or stored in approved areas.
- Refuelling should take place on spill pads outside of all buffer zones.
- All fuel leaks over five litres should be reported to the Water Utility and Nova Scotia Environment and Labour within one hour.
- Fire extinguishers should be available during all harvesting operations and should also meet required specifications.
- All trucks with loaders should have remote engine shut down.
- All trucks with loaders should have a hydraulic tank float switch.

Special Management Zones

- Zones may be enhanced beyond the regulations at specified locations, in cooperation with landowners, particularly the main water supply bodies and those close to the point of intake. Examples include enhanced machine exclusion zones, greater amounts of living trees to be retained in harvesting operations, no cut zones and limits on size of openings within a special management zone that can be created.

Harvesting

- Limits on clearcut size, distribution of cuts and amount of harvest area within specified time frames are sometimes negotiated with landowners.

Fire Fighting Equipment

- Persons in charge of an operation or activity conducted in the woods or within 305 metres (1,000 feet)

APPENDIX G AGRICULTURAL BMPS

A Guide to

Recommended Agricultural Practices Within Municipal Drinking Water Supply Areas in Nova Scotia

Prepared by
Nova Scotia Department of Agriculture and Fisheries
Nova Scotia Department of Environment and Labour

2005

INTRODUCTION

Some types of agricultural practices can impair water quality. If not carefully managed common pollutants of water originating from farming activities may include: sediment, nutrients (especially nitrogen and phosphorous), bacteria, and pesticides. The challenge to farmers is to balance agricultural production with the protection and conservation of water quality.

This document is designed as a guide to farmers and to operators of municipal drinking water supplies, providing recommended management practices that can be incorporated into daily farming activities to help protect water quality in areas which drain into public drinking water supply areas. It was developed in conjunction with the Nova Scotia Department of Agriculture and Fisheries and the Nova Scotia Department of Environment and Labour. It is aimed at minimizing the risk of an impact on water supply areas, while recognizing that there is no practical method of ensuring an absolute zero risk approach, particularly regarding surface water supplies (rivers and lakes).

Farmers operating within drainage areas contributing to municipal drinking water supplies are expected to demonstrate due diligence. Due diligence means taking every reasonable precaution to prevent or minimize impacts from activities that can impair water quality. The best approach to ensuring due diligence is achieved is through the use of Beneficial Management Practices, or BMPs. The BMPs outlined in this guidance document have a proven record of success in reducing impacts to water from farming activities. Some of the management practices in this document may be superseded by regulations in some water supply areas. For certainty, contact the water utility operator responsible for the water supply in question, or the Nova Scotia Department of the Environment and Labour.

BENEFICIAL MANAGEMENT PRACTICES

ENVIRONMENTAL FARM PLANS AND NUTRIENT MANAGEMENT

The Nova Scotia Federation of Agriculture and Department of Agriculture and Fisheries have developed programs to assist farmers in reducing impact to the environment from farming activities.

The **Environmental Farm Plan (EFP)** is a voluntary program that helps farmers identify and assess environmental risks on their property. Farmers work with an EFP coordinator and engineer to develop a confidential environmental farm plan for their operation.

The objective of the EFP Initiative is to help farm families develop a practical plan for operating the farm in an environmentally responsible manner. The Environmental Farm Plan acts as a guide which enables farm families to incorporate sound environmental practices into their operations. The EFP Initiative is industry-led and industry-driven.

The **Nutrient Management Program (NMP)** is a farm-specific tool that determines the amount, timing and application of nutrients from manures and fertilizer. Livestock and poultry producers operating in areas which drain into municipal drinking water supplies are strongly encouraged to develop a nutrient management plan for their farming operations. The major elements of such a plan should include:

- Periodic analysis of the manure produced in the animal operation
- Routine soil testing program
- Realistic yield goals for rate calculation
- Accurate records of fields manured and the application rates used
- Sufficient storage capacity
- Field maps where wetland and other freshwater ecosystems are identified
- Proper timing of manure application
- Calibration of manure spreaders so application rates can be determined

For more information about these programs please contact:

Environmental Farm Plan Coordinator
NSFA office - (902) 839-2293.
Email: nsfa@tru.eastlink.ca
Website: www.nsfa-fane.ca

Programs and Risk Management Division

Farm Investment Fund
Nova Scotia Department of Agriculture and Fisheries
176 College Road, PO Box 550, Truro, NS B2N 5E3
Tel: (902) 893-6510 Toll-free: 1-866-844-4276, Fax: (902) 893-7579

MANAGEMENT OF LIVESTOCK MANURES

The land application of livestock manure is recognized as an acceptable farming practice. When properly managed, the risk of an impact on a water supply area is minimized to a level that can be managed by other components of a water supply protection plan.

Between the time manure is excreted and the time it is incorporated into the soil, the loss of nutrients and the resulting potential for pollution can be quite high depending on how manure is handled. The following methods should be employed when managing manure in drinking water supply areas:

- Ensure that all manure hauling and spreading equipment is suited to the type and consistency of the manure produced on the farm.
- Ensure storage structures have the capacity to hold the total volume of manure, wastewater, and bedding produced between periods of land application.
- Time the loading and field application of manure to reduce the potential for environmental contamination and to provide the greatest benefit for soils and crops.
- Make storage facilities manure tight to contain and protect manure from the weather thereby providing the greatest conservation of nutrients and the best protection against water contamination.

- Keep manure handling to a minimum, agitating manure, particularly in liquid form, causes the gaseous loss of nitrogen, which causes odours. Manage manure in order to minimize the number of times that manure is mixed and spread.
- Plan the location of animal production and manure storage facilities so that they are adequately separated from water sources.
- Always apply manure following minimum separation distances for water resources.
- Avoid applying manure on wet soils to minimize compaction, runoff and leaching.
- Unless immediately incorporated into the soil, surface apply manure at reasonable distances from residences and public buildings to reduce odour problems.
- Rotate fields receiving manure to avoid nutrient buildup and maximize nutrient utilization, as dictated in the nutrient management plan.
- Only spread manure on slopes greater than 5% between the months of June and August.
- Supplement commercial fertilizers only when manure nutrients do not meet crop yield goals.
- Apply manures as close as possible to the time crop utilization of the nutrients in the manure. Utilize fall cover crops to minimize soil erosion and runoff and to maximize nutrient utilization from manure application.
- Avoid surface application of manure on steep slopes, frozen soil or near surface waters.

SEPARATION DISTANCES FROM WATERCOURSES AND WELLS

The Department of Agriculture and Fisheries has developed Manure Management Guidelines that recommend minimum setback distances for spreading manure on agricultural land. The following tables summarize minimum setback distances recommended for use within the manure management guidelines.

TABLE 1: Minimum Separation Distances for Manure Application

Water Source	Separation Distance (meters)	
	clay loam & loam soils	sand & gravel soils
Dug or Drilled Wells	30	60
Primary Watercourse	10	10
Tributaries to Primary	5	5
Ditches	3	3

TABLE 2: Recommended Separation Distances for Spreading Manure on Sloped Land

Slope gradient to watercourse (located within2 km of water treatment plant intake)	Separation Distance(meters)
< 2 %	20
2 - 5 %	50
5 - 10 %	100
> 10 %	Not Recommended

Farmers operating within a water supply area that has been designated as a Protected Water Area (PWA) under the Environment Act, may have to comply to other specified setback distances outlined within the PWA designation regulations.

Farmers should also be familiar with the Department of Agriculture and Fisheries Guidelines for the Siting and Management of Hog Farms in Nova Scotia, as well as any guidelines or regulations associated with separation distances required for the storage of animal manures.

For more information:
http://www.gov.ns.ca/nsaf/rs/envman/pub.shtml

Nova Scotia Department of Agriculture and Fisheries, *Guidelines for the Management and Use of Animal Manure in Nova Scotia, Publication No. R-91-2000, 1991.*

Nova Scotia Department of Agriculture and Fisheries, *Environmental Regulations Handbook for Nova Scotia Agriculture, January, 1997.*

Nova Scotia Department of Agriculture and Fisheries, *The Development of an On-Farm Manure Management Program, March, 1996*.

Nova Scotia Department of Agriculture and Fisheries, *Factsheets on Manure Nutrients, Manure Spreader Calibration, Earthen Manure Storages, and Integrated Fly Management for Livestock Farms.*

PASTURING LIVESTOCK

As a measure of due diligence, pasture land must be fenced to prohibit the entry of livestock into adjacent watercourses.

The minimum recommended setback for fencing pastured cattle from a well or watercourse is 5 meters. If livestock are pastured on both sides of the water supply, an approved crossing must be constructed so the livestock can cross without entering and disturbing the watercourse.

MANAGEMENT OF CHEMICAL FERTILIZERS

Farmers operating in areas which drain into municipal drinking water supplies that use surface water, should use the following setback distances when applying fertilizer to crops:

- 10 meters from the primary watercourse
- 5 meters (minimum) from a natural watercourse other than the primary watercourse
- 3 meters from a ditch

BUFFER STRIPS

Buffers are strips of land in permanent vegetation, designed to intercept pollutants and manage other environmental concerns. Buffers include: filter strips, grassed waterways, shelterbelts, windbreaks, living snow fences, contour grass strips, cross-wind trap strips, shallow water areas for wildlife, field borders, alley cropping, herbaceous wind barriers, and vegetative barriers. Riparian buffers refer to a buffer strip along a stream.

Strategically placed buffer strips in the agricultural landscape can effectively mitigate the movement of sediment, nutrients, and pesticides within farm fields and from farm fields. When combined with appropriate beneficial management practices, buffer strips should allow farmers to achieve a measure of economic and environmental sustainability in their operations. Buffer strips can also enhance wildlife habitat and protect biodiversity. Buffers

slow water runoff, trap sediment, and enhance infiltration within the buffer. Buffers also trap fertilizers, pesticides, pathogens, and heavy metals, and they help trap snow and cut down on blowing soil in areas with strong winds. Buffers help stabilize a stream, create shade and reduce its water temperature. Buffer strips also offer a setback distance for agricultural activities from water sources. If properly installed and maintained, they have the capacity to:

- remove up to 50 percent or more of nutrients and pesticides.
- remove up to 60 percent or more of certain pathogens.
- remove up to 75 percent or more of sediment.
- reduce noise and odour.

MANAGEMENT AND USE OF PEST CONTROL PRODUCTS

All users of pest control products within a municipal drinking water supply area shall hold a valid certificate of qualification as defined in the Pesticide Regulations of the Nova Scotia Environment Act (1995). Farms operating within a Designated Protected Water Area must comply with Section 21 of the Pesticide Regulations of the Nova Scotia Environment Act (1995), which states.

"No person shall apply a pesticide within a protected water area designated under Section 106 of the Act unless the person complies with any regulations regarding the use of pesticides within the protected water area."

In other words, farmers are responsible for finding out if they are conducting their agricultural activities within a Protected Water Area, in addition to, complying with any associated regulations which may apply to their farm activities.

SOIL CONSERVATION AND MANAGEMENT

The following recommended practices for soil conservation and management apply only within those Municipal Drinking Water Supply Areas in which the water supply is derived from surface waters (lake, river, stream, etc.). Farmers are encouraged to use erosion control methods if the following circumstances apply to their operation:

- In any year that annual crops (i.e. corn, small grains, vegetables, etc.) are grown on slopes exceeding 3%.
- Tillage operations or harvesting are conducted that will expose bare soil during mid-October through mid-April.
- Perennial crops which are subject to erosion (i.e. small fruits and tree fruits) are grown
- Reduce soil compaction by tilling or harvesting when soil is not wet. Studies have shown fields with soil compacted by farm equipment results in greater runoff of nutrients and pesticides.
- Avoid exposing large areas of bare soil during the winter period
- In Nova Scotia it is recommended that fields with bare soil or less than 50% cover, be mulched with hay or straw if it is too late to provide adequate field cover with cover crops.

APPENDIX H WATERSHED SIGNS

Figure 10. Violations Sign

Figure 11. Keep it Clean Sign

APPENDIX I SMELT BROOK STOP LOG SYSTEM

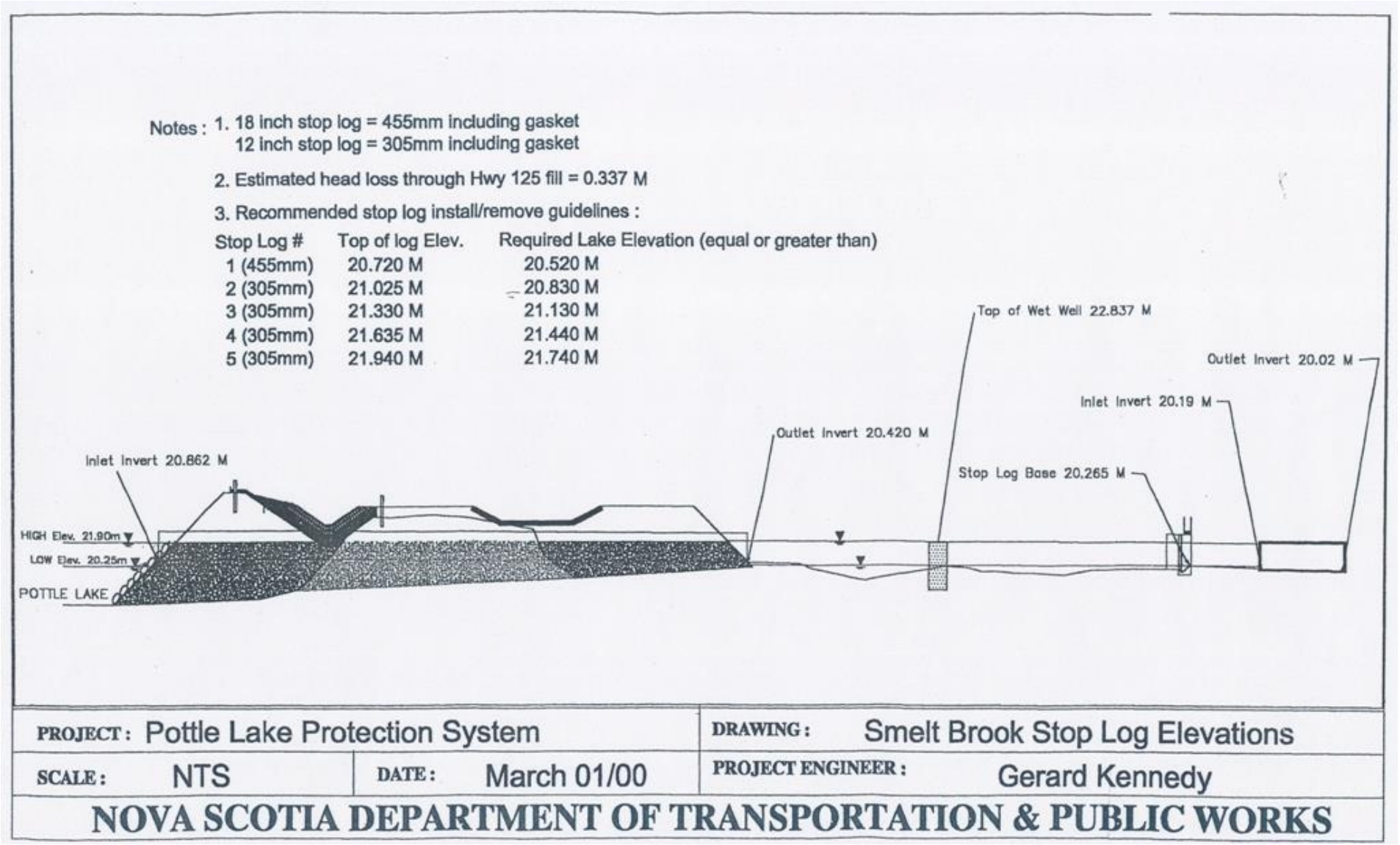

Figure 12. Plan of Smelt Brook Stop Log Elevations