SYNOPSIS

SEPTIC SYSTEM CLASSIFICATION STUDY

LAC BERNARD

1986

Summary of report prepared by GREBE Inc. on the septic system study conducted at Lac Bernard during the summer of 1986 under the lakes program of Environment Quebec.

May 1987

1. Introduction

A septic system classification study was carried out at Lac Bernard during the summer of 1986 under Environment Quebec's lakes program. It evaluated the efficiency of wastewater treatment systems that serve the shoreline residences and determined the likely profile of the lake's groundwater table and bedrock.

It is recognized that in tourist/rural areas, because buildings are widely dispersed, the purification of water is generally made through individual septic systems. To preserve the water quality of the lake, systems must be constructed according to established sta- a - and in soil favourable to this method of purification.

This synopsis presents the summary results of the study. It notes construction, location and operation faults and identifies those systems which constitute a direct source of pollution. It also describes the geography of the milieu and the classification methodology.

2. Summary

During the survey 410 residences were visited and 371 septic systems were classified as follows:

CLASS	DESCRIPTION	NUMBER	%
AA	Prescribed system - No pollution	1	0.3
A	System with faults in construction or location - No pollution	155	41.7
B	System with faults in construction or location - Source of indirect or occasional pollution	76	20.5
C	System with faults in construction or operation - Source of direct pollution	139	37.5

The table shows that a total of 58% of the classified systems are sources of occasional, indirect or direct pollution (classes B&C).

The 139 systems in class C are **direct** sources of pollution. In more than 90% of these systems the major fault is the direct disposal of greywater onto the soil through either a pipe (70%) or by small-scale disposal (30%) (i.e. water collected in a bucket under a sink).It must be stressed that the septic systems classified as **direct** sources of pollution (class C) **must** be corrected, to conform to the Quebec regulation concerning the -spos l -nd treatment of wastewaters from remote residences.

The 76 class B systems are **indirect** sources of pollution due to poorly located drainage fields. Soil drillings and observations of the terrain showed that:

- around 35% are located over a high groundwater table
- almost 25% are located too close to bedrock
- more than 40% are located too close (less than 15 m) to Lac Bernard.

Residents with class B systems are encouraged to assess their particular situation and discuss any possible corrective action with their municipal inspector.

3. Description of milieu

Lac Bernard is situated in the municipalities of LaPêche and Low, in the electoral district of Gatineau. Its geographic coordinates are $45^{0}45'$ latitude and $75^{0}59'$ longitude.

Lac Bernard is part of the hydrographic system of the Gatineau River. The outlet, situated in the north of the lake joins with Blackwater Creek which flows into the Gatineau River above the municipality of Low.

The lake is fed mainly by Motherwell Creek situated in the south the lake, as well as underground springs and groundwater.

With a maximum length of 5.20km and an average width of .91km Lac Bernard is irregularly shaped with a surface area of $4.72km^2$. and a perimeter of 26.42km. A circular lake with the same area would have a perimeter of 7.69km. The ratio of 26.4/7.69 is 3.43 and is known as the shoreline development index. This means that 3.43 times the number of residences are likely to be constructed around the fringe of Lac Bernard than around a circular lake with the attendant pressures on the aquatic environment.

The area of the lake's drainage basin (watershed) is $46.78km^2$ (lake excluded). The source, situated to the west of the lake, has an altitude of more than 350m while the lake is around 180m. The principal characteristics of the lake and its drainage basin are:

Maximum length	5.20 km
Average width	0.91 km
Area of lake	4.72 km^2
Length of shoreline	26.40 km
Shoreline development index	3.43
Area of watershed (excluding lake)	46.78 km^2
Ratio of area of basin to area of lake	9.91

A bathymetric map (contours of lake bottom) detailed the particulars of the lake's bed consisting of several deep depressions (75m+). In general the slope of the bed is steep near the shallows and smooths off near the centre of the depressions.

4. Septic systems classification

The study researched the available information on the physical and human nature of the lake's environs to prepare a large scale map. This map indicates the waterways, access routes, residences and public establishments constructed around the perimeter of the lake with each residence identified by a reference number. It was revised and completed by on-site verifications.

All the lake's residences were visited during the course of the survey and wherever sufficient information could be gathered, a sketch was drawn showing the placement of the septic system in r-lation to the lake and the residence, as well as the source of the drinking water supply. The sketch also contains the name of the owner, the reference number corresponding to that of the map, the class of septic system and the classification code.

The classification is based on an evaluation of the pollution caused by faults in construction, operation or location of septic systems observed during the survey. Each residence was assigned a classification according to the most serious fault of any of their systems (when more than one system is in place). These faults relate to operation of the system, its' distance from surface water and its position in relation to bedrock or the groundwater table.

Each system which is class B or C is assigned a three digit code that provides information on the reasons for the classification.

The first number in the code describes the fault:

CODE	FAULT	CLASS
1	Dry well which overflows onto the surface	C
2	Overflowing of wastewater onto the surface from a drainage field	C
3	Blocked drain pipes or septic tank	C
4	Emptying of wastewater onto the surface	C
5	Emptying of wastewater by artesian disposal (small-scale)	C
6	Inadequate distance between drainage field (or dry well) and a lake, waterway, marsh or pond	B
7	Presence of bedrock or groundwater table at an insufficient depth beneath the drainage field	B

The second number gives the thickness (cm) of the soil between the groundwater table and the drainage field.

The third number gives the thickness (cm) of the soil between the bedrock and the drainage field.

The following indicates the number of residences and septic systems classified, those which were not and the reasons for non-classification.

	NUMBER	%
Systems classified	371	90.5
Systems non-classified		
Absent owner	30	7.3
No system	3	.7
Under construction	2	.5
Lack of cooperation	2	.5
Incomplete information	2	.5
Total residences visited	410	100.0

In general, when the owner was absent, the system(s) of the residence was not classified. When it was possible, on occasion, to locate and identify the system with certainty, it was done.

The classification of septic systems was based on observations, diggings and data gathered from each owner. It is possible that following some drillings or more in-depth research, a reclassification might be justified. The classification will be used as a guide by the municipal inspector who may, depending on the circumstances, conduct more detailed investigations.

5. Comments on the septic systems

Nearly 60% of the systems classified at Lac Bernard constitute sources of indirect, occasional or direct pollution. The analysis of these systems provides the following facts. :

- .around 10% of the systems have only a cesspool to receive wastewater and serve as a drainage field.
- .nearly 40% of the systems have septic tanks. Often these tanks have an insufficient capacity and/or improper shape to assure the disposal of clarified water to the drainage field. In addition, in the majority of cases the drainage field is not the required size.
- .added to the generally under-sized components of septic systems is the sometimes poor location of the drainage field (too close to the lake or waterway, groundwater table or bedrock).

6. Hydrogeological survey of the terrain

The primary objective of this study was to evaluate the efficiency of the wastewater treatment systems which serve the residences of Lac Bernard. To meet this objective it was necessary to define, the nature of the terrain as well as the average profile of the groundwater table around the lake at the time of the survey. This was aided by 80 drillings and soil samples carried out at different places to verify the level of the groundwater table and bedrock.

In addition, information derived from the geological survey will facilitate the task of the municipal inspector, by helping him define concrete solutions to the problems of defective or poorly located systems.

Lac Bernard is situated in the Canadian Shield. The highest point of the watershed is to the west of the lake. The shoreline has average slopes, often less than 10%. The banks of Lac Bernard generally consist of sandy loam deposits on a rock base of the precambrium age with many rock outcroppings.

The majority of the residents obtain their supply of drinking water from the city. Artesian wells, and in some cases surface wells supply the rest.

It should be stressed that the nature of the soil deposits and their permeability as well as the depth of groundwater table and t e b^drock must be verified when selecting the appropriate septic system.

7.Water quality survey

A water quality survey was carried out in July, 1986, taking 346 samples. The survey results presents a summary of the bacteriological quality of the shallows at the time of the survey.

It is important to remember that the total number of coliform bacteria is an indicator, nothing else. The coliform bacteria revealed by the analysis, can be affected by laboratory handling methods, sampling techniques, atmospheric conditions, occupancy rate of the residences and the presence of swimmers in the immediate vicinity of the sampling. The only accurate way of identifying the sources of pollution, on the perimeter of the lake, is through the study done to classify septic systems.

The classification of water quality is for recreational use and is not an indicator of drinking water quality. Water is divided in four classes:

- .Class A, for **excellent** quality, when the number of coliform bacteria varies between 0 and 100.
- .Class B, for **good** quality, when the number of coliform bacteria varies between 101 and 500
- .Class C, for **mediocre** quality, when the number of coliform bacteria varies between 501 and 1000
- .Class D, for **poor** quality, when the number of coliform bacteria is higher than 1000

When interpreting the results, it is necessary to look at the class, and not the absolute value of the results. For instance, if the water samples taken from two different places give a reading 15 and 86 respectively, in both cases, the water is the same quality. In this case, water is of excellent quality.

The global quality of a lake's water is determined by a very simple calculation:

- . The lake is class A, of excellent quality, when 80% or more of the individual samples are A;
- . The lake class B of good quality, when the number of B samples, must be added to those of A to make up 80% or more of the total;
- . The lake is C, of mediocre quality, when the B and C samples must be added to A results to make up 80% or more of the total;
- . The lake is D, of poor quality, when B, C, and D samples must be added to the A results to make up 80% or more of the total.

The following table provides the information for calculating the global water quality of Lac Bernard. According to the table, the number of samples of class C reached 80% of the sampling. Thus the waters of Lac Bernard are rated class C, that is to say, mediocre quality.

CATEGORY	NUMBER OF SAMPLES	%
A	77	22
B	150	43
C	60	18
D	59	17

Global classification of Lake Bernard - C

SEPTIC SYSTEM CLASSIFICATION

LEGEND


Road


Stream


Drain


Drainage Field


Artesian Well


Surface Well


Drilled Well

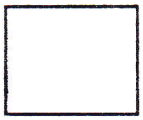

Spring


Drilling with mechanical auger


Pipe which is full or discharges onto surface


Dry well


Cesspool or absorption well


Residence


Shoreline


Overflow

Pumping Station


Septic tank

Holding tank (periodic storage)

Holding tank

1 Toilet waste

2 Greywater

1 + 2 Toilet waste and Greywater

SI Metric

> Larger than

< Smaller than

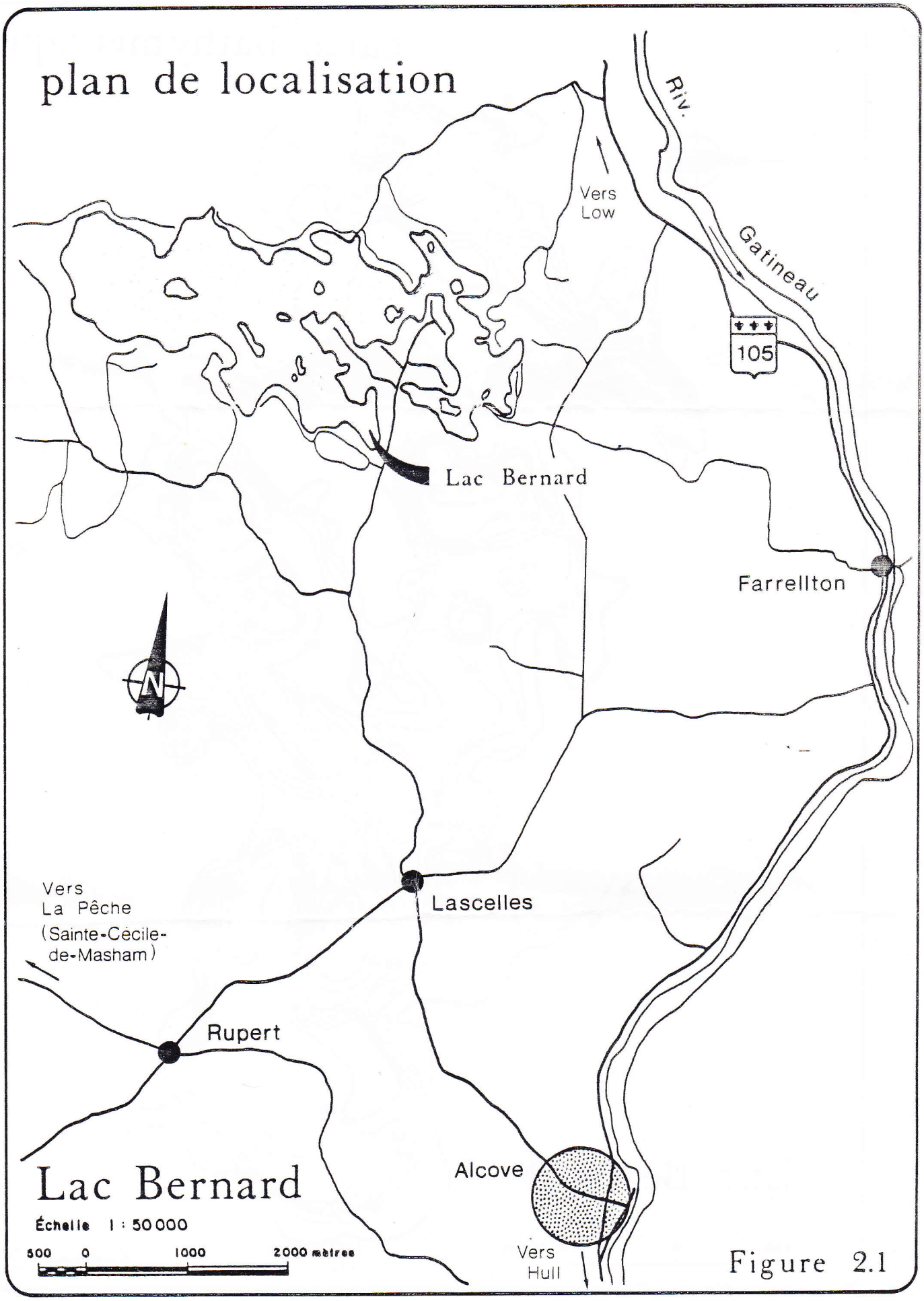

plan de localisation
Riv.
Vers
Low
Gatineau
105
Lac Bernard
Farrellton
N
Vers
La Pêche
(Sainte-Cécile-
de-Masham)
Lascelles
Rupert
Alcove
Vers
Hull
Lac Bernard
Échelle 1 : 50 000
500 0 1000 2000 mètres

Figure 2.1

carte bathymétrique

figure 2.3