Schedule to
Bylaw 535
Subdivision
Maberly Pines.

MABERLY PINES DEVELOPMENT

Terrain: Hydrogeological and Ecological Analysis

Concession V Parts of Lots 12, 13, 14, 15,

Concession VI Part of Lot 13

South Sherbrooke Township

WATER AND EARTH SCIENCE ASSOCIATES LTD.

124 O'CONNOR ST., SUITE 303, OTTAWA, ONTARIO K1P 5M9

MABERLY PINES DEVELOPMENT

Terrain, Hydrogeological and Ecological Analysis

Concession V Parts of Lots 12, 13, 14, 15

Concession VI Part of Lot 13

South Sherbrooke Township

Derek P. Smith M.Sc. FGAC

Water and Earth Science Associates Ltd.

Harold J. Parsons, Director

Al Macdonald B.Sc.

Bufo Inc.

1.0 Introduction

Water and Earth Science Associates were commissioned by Mr. Jacques Noel, President of Lakeside Living Limited to conduct an analysis of the hydrogeological, terrain and ecological conditions of a proposed seasonal residental subdivision located on Concession V (parts of Lots 12, 13, 14, 15) and Concession VI (part of Lot 13), Township of South Sherbrooke. (Figure 1)

In order to establish the suitability of the property for development on wells and septic tank systems and provide planning and environmental guidelines as dictated by terrain conditions, the following site factors were studied:

1. the distribution and lithology of bedrock and surficial materials
2. topography and drainage
3. the hydrogeological characteristics of the bedrock aquifer
4. the characteristics of terrain units and their potential to disperse and attenuate septic tank effluent, and
5. the most suitable design of well and septic tank systems.

The results of our investigations are presented in the following report.

1.1 Study Methods

First, a site reconnaissance of the property was made and pertinent published literature about the physiography, geology, ecology and hydrogeology of the Little Silver Lake area was reviewed.

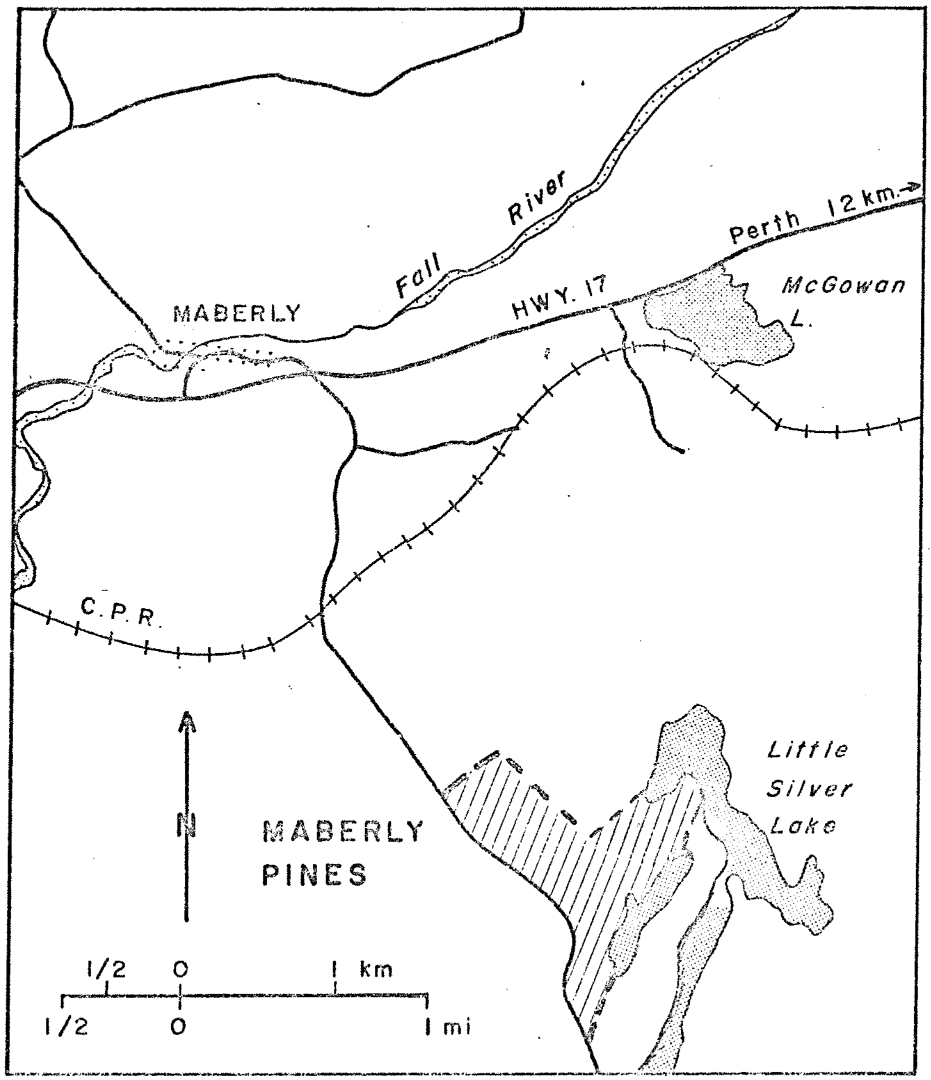


FIGURE I
MABERLY PINES
LOCATION MAP

Then five days of field work were conducted at the site during which time the geology and ecology of the land parcel was mapped at a scale of 1:2400. Large and small scale air photographs were used during this investigation. Field mapping was conducted by geological traversing and hand digging shallow test pits into the surficial sediments.

All published well logs from Concessions 3 - 9 and Lots 11 - 16 of South Sherbrooke Township were collected and analyzed to establish the potential of aquifers within the property. The grain size distribution and hydraulic conductivity of a typical soil sample were measured in the laboratory to determine the suitability of surficial materials for the in-ground disposal of domestic sewage.

Finally, planning documents and government regulations were reviewed as a basis for the recommendations included in this report.

1.2 Physiography

Physiographically, the Maberly Pines area is made up of a series of bedrock knobs and ridges interspersed with lowland areas. The terrain has a northwest-southeast orientation which is particularly pronounced immediately south of Little Silver Lake (Figure 2). Site topography reflects the peneplanation of this region which was caused by four major glacial advances and retreats. A maximum elevation of 212 metres above sea level occurs near Little Silver Lake, although most bedrock ridges lie at 202 - 210 metres above sea level. Lowland areas occur at elevations which range from 192 to 200 metres above sea level. Some variation in the elevation of swamps occurs across the site.

For example, the large pond in the northwest corner of the site has a 192 metre water level while a small waterbody near the highway to the south of the property lies at a 200 metre elevation.

2.0 Site Geology

The Little Silver Lake area is a good example of the Precambrian Terrain which characterizes much of the Canadian Shield of Ontario and Quebec. Ancient Precambrian rocks, last deformed by the Grenville Mountain Building episode which occurred about 950 million years ago, are overlain by a thin veneer of much younger glacial and non-glacial sediments. An irregular glaciated topography with an immature drainage pattern and numerous beaver ponds in lowland areas typify this terrain type.

The geology of the Little Silver Lake site is summarized in chart form as Table 1 of this text. A brief discussion of bedrock and surficial deposits is included below. The reader is referred to the geological references cited in the bibliography of this text if more details of the geological history of the Perth-Maberly region are of interest.

2.1 Bedrock Geology

The site is underlain by a Precambrian crystalline basement complex which includes biotite gneiss, diorite, migmatite, marble, quartzite, pegmatite and related paragneissic rocks. Bedrock is foliated with a northeast - southwest trend and near vertical dips.

The upper rock surface is striated, plucked and grooved and indicates that the last movement of glacial ice across this region was

GEOLOGICAL AGE			LITHOLOGY	THICKNESS	SLOPE	GEOLOGICAL HISTORY
SURFICIAL DEPOSITS	QUATERNARY	Recent	Soils; podzols, acidic and immature. Bog deposits, muck and peat, areas of fen vegetation, marsh.	5 to 10 cm	flat	Formed by interaction of biological, climatic and geological elements. Controlled by beaver population or formed in poorly drained lowlands, produced by high organic deposition in wet areas.
SURFICIAL DEPOSITS	QUATERNARY	Pleistocene	Glacial till, angular pebbles and boulders with a silty sandy brown matrix; pebbly sand facies overlies till.	.3 m to greater than 1 metre	deposited as thin veneer on sloping bedrock	Direct deposit from glacial ice; glacial till ground moraine. Sandy facies restricted to poorly developed small drumlin structures.
BEDROCK	PRECAMBRIAN		Migmatite, biotite gneiss, diorite, marble, pegmatite and other granitized paragneisses	unknown	5 - 40% slopes, steep escarpment in places.	Eroded roots of the Grenville Mountains (950 million years old).

Table 1: Summary of Geological History

in a northeast to southwest direction. Bedrock outcrops at the ground surface throughout the property and forms abrupt bedrock escarpments in many places.

Small outcrops and escarpments are present throughout parts of the land parcel forming a rugged microrelief.

Some evidence of minor open pit feldspar mining activity is present on the property, although excavations are too small to comprise a constraint to site planning.

2.1 Surficial Geology

Bedrock is covered by a veneer of glacial till ground moraine over most of the property. The distribution of the till material and bedrock outcrop areas is shown on Figure 2 of this report.

The till ground moraine material is composed of angular granitic pebbles and cobbles with a fine sand and silt matrix. In several areas of the property, poorly stratified pebbly sand deposits are found associated with the till ground moraine. These deposits apparently range up to 5 metres in thickness, lie stratigraphically above the till material and are oriented parallel to the direction of the last ice movement. They are interpreted as being very poorly developed small drumlin structures based on this evidence. The major drumlin is located just south of the property boundary near Little Silver Lake (just outside area of Figure 2) and has been partially quarried for borrow material. Similar deposits were noticed in several areas of the site but were mapped as a sand facies of the till ground moraine material due to their diffuse form and thinness.

The composition of a typical sample of the till ground moraine material was analyzed in the laboratory with the following results:

Grain Size Distribution	Clay	2 %
	Silt	18%
	Fine Sand	36%
	Medium Sand	12%
	Coarse Sand	8%
	Gravel	24%

Permeability (using Falling Head Permeameter) = 2.42×10^{-4} cm/sec.

Where present, the till unit is usually only a few centimetres to half a metre in thickness on ridge tops. However, in valley areas, a till thickness of 1 metre or greater was found during field investigations.

Swamp deposits include poorly drained black organic soils, muck and peat deposits. Their distribution is restricted to lowland areas and have been greatly extended in recent years by the activities of the beaver population in the area.

In general, soils formed on the sandy till ground moraine are poorly developed, are from 10 to 20 centimetres thick and have a poor potential for agricultural crop production.

3.0 Hydrogeology

In order to provide information on potential well yields and groundwater quality within the Maberly Pines subdivision, existing well logs recorded with the Ministry of the Environment from Concessions 7, 8, 9, Lots 11 to 16 have been assembled and analyzed.

The Precambrian bedrock is the only geological unit in the study region with the potential to provide adequate quantities of groundwater for domestic water supplies. Surficial materials are too thin and discontinuous in nature to furnish reliable water sources. Therefore, dug or driven wells are considered unsuitable for use on this property.

Knowledge of the recharge characteristics, water supply potential and groundwater quality of the Precambrian aquifer is an important factor in the planning of any development of this site. A brief discussion of these points is included in the following sections.

3.1 Recharge Characteristics

Groundwater movement in the Precambrian basement rock is controlled by variations in topography between highlands and lowland areas and the pattern and extent of the fracture system present. Figure 3 illustrates in a theoretical manner how the precipitation which falls on upland recharge areas will flow downwards into the saturated groundwater zone below the water table and hence, in a lateral direction towards lowland swamp and stream discharge zones.

Saturated hydraulic gradients in Precambrian terrain are impossible to measure without detailed drilling data. Gradients in the unsaturated near-surface fracture system, however, should reflect surface topography variations and the orientation of fracture patterns closely and are typically quite high (0.2 to 0.7). Infiltration rates

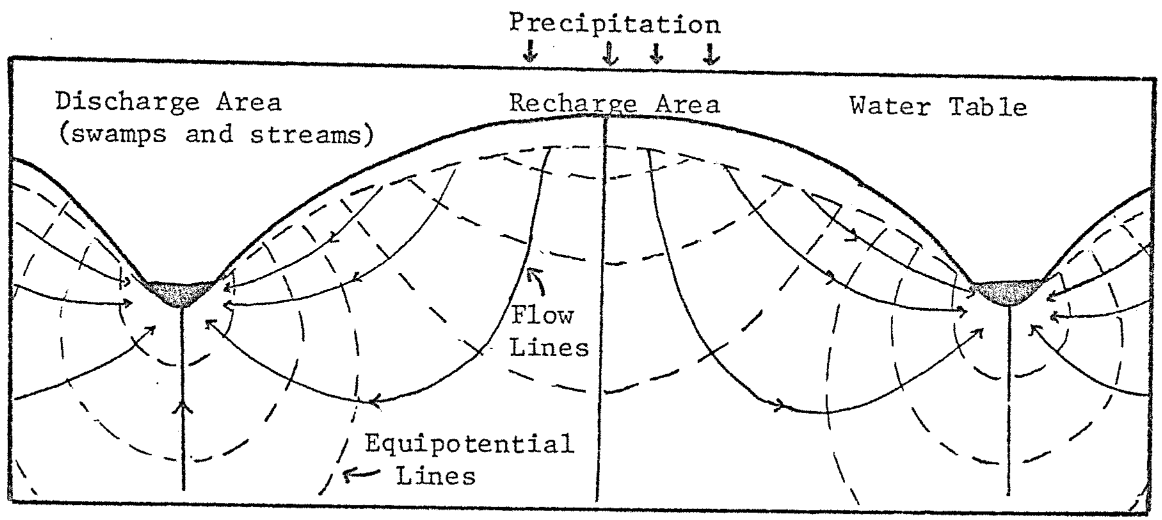


Figure 3: Idealized Model illustrating Groundwater Flow from Recharge on the Topographic Highs to Discharge in the Valleys (Hubbert, 1940)

and groundwater flow velocities should be high in this terrain but cannot be calculated because measurements of the bedrock fracture permeability have not been made. However, groundwater movement in the order of 25 - 50 metres per year is considered a reasonable estimate based on theoretical calculations.

Based on this information, wells should be located on highland areas, for two reasons:

a) septic tile weeping beds can then be located at lower elevations and will flow away from, not towards water wells

b) wells will be recharged by precipitation and will be located at a sufficient distance from lowland marsh areas to avoid drawing water from these sources. Marsh water is often of poor quality due to high organic acid concentrations, low pH or colour and odour problems.

3.2 Aquifer Potential

The water wells for all domestic wells utilizing the Precambrian bedrock aquifer in Concessions 7, 8 and 9, Lots 10 to 16 have been analyzed to provide an assessment of the groundwater supply potential in the Maberly Pines Subdivision. The 17 logs recorded with the Ministry of the Environment are included as Appendix B in this report. There is no well log information from the proposed subdivision with existing cottages along Silver Lake using lake water as a water source.

Well yields in Precambrian terrain vary as a function of the degree of fracture (i.e. fracture permeability) of the bedrock.

Well yields can vary significantly within short distances (i.e. 100 metres or less) in this rock type. It should be noted that fractures usually decrease in density with depth along the metamorphic foliation and the joint pattern in granitic rocks. Well yields are usually not significantly increased if wells are drilled beyond 50 metres as a consequence.

Water was found from 10.0 to 38.4 metres below the ground surface (mean = 21.3 metres) in these wells with a static level variation of 1.21 to 10.0 metres (mean 16.5). Well data are too sparse to permit an analysis of fracture system patterns using depth histograms. However, well depths vary from 8.2 to 35.0 metres which indicate that near surface fracture systems are supplying adequate water supplies from existing residences.

To evaluate well yields, each log was examined and classified as follows:

	Number of Wells
Poor yields (drawdowns were high, 25 - 75' after short term (1-2 hr) pump tests at 5 gpm or less)	12
Moderate yields (drawdowns were fairly low, less than 50' after short term pump tests at 5 - 10 gpm)	3
Good yields (drawdowns were low after short term pump tests at greater than 10 gpm)	2
TOTAL	17 wells

The following conclusions can be drawn from this analysis:

a) twelve of the existing wells in this area have yields close to the minimum required to service a domestic residence (4 igpm or 18 litres per minute). Wells should be drilled and constructed as per the recommendations oulined in Section 4.1 to maximize the well yields and eliminate potential contamination problems.

b) it is unlikely that high volume wells of 200 litres per minute or greater could be drilled on this site. Development planning should preclude high volume water usages as a consequence.

3 .3 Water Quality

The water quality of groundwater from existing wells in the Little Silver Lake area is reported to be fresh, colourless and odourless. This is most likely the case on the study property.

4.0 Type of Development

It is understood that the Little Silver Lake subdivision will be a seasonal recreational development. As a consequence, septic tanks will be used primarily during summer months and water requirements will be lower than in permanent subdivisions. The recommendations proposed in this report however, are based on the assumption that some winter utilization may also occur and that conversion of dwellings to yearly use is a possibility i.e. that the development is a year-round backlot subdivision. A restriction of the subdivision to seasonal use however, should provide a large safety factor to guarantee the integrity of groundwater supplies.

4.1 Suitability for Development

Six terrain units, or land types having a unique association of lithological, ecological and topographic characteristics have been identified on this property from our field work. These are:

1. bedrock, highly sloping
2. bedrock, flat
3. thin till over bedrock
4. thick till and sand over bedrock
5. thick till, poorly drained
6. beaver swamp

The distribution of each terrain unit is mapped on Figure 2 of this report while their characteristics are summarized as Table 2.

Terrain Unit 1 (bedrock, sloping) has little or not capability to attenuate septic tank effluent in its natural state due to the thin nature of the soil cover in these areas. High slopes, abundant outcrops and rock escarpments are major planning constraints throughout this unit. Terrain Unit 1 is not recommended for the installation of septic tank systems.

Terrain Unit 2 (bedrock, flat) has the same constraints as Unit 1 but slopes are usually less than 10% and till material is thicker in isolated pockets. Development on large lots (2 - 3 acres) is considered feasible on this unit provided tile beds are fully raised and well to septic tank spacings of 30 - 50 metres are instituted. Lot planning will require locating suitable tile bed locations first and locating dwellings second in respect to these areas.

Terrain Unit 3 and 4 are distinguised on the basis of till depth. A typical sample of the silty sand till ground moraine gave a falling

TERRAIN UNIT	LITHOLOGY OF UNIT	THICKNESS OF SURFICIAL MATERIALS	HYDRAULIC CONDUCTIVITY	WATER TABLE DEPTH	SLOPE	SUITABILITY FOR CONVENTIONAL SEPTIC TANKS	WELL TO SEPTIC TANK SPACINGS	RECOMMENDED SEPTIC SYSTEM DESIGN
1	Bedrock, sloping, very thin veneer of till	0 - .3 m	greater than 2.43 x 10^{-4} cm/sec where coarse grained and thin	below bedrock surface	5 - 40% with rock escarpments	very poor, not recommended for development	-	-
2	Bedrock, flat outcrop with pockets of till	0 - 1.0 m in pockets	as below	below bedrock surface	0 - 20% rolling, rugged microrelief	poor	30 - 50 metre wells to be "upstream" from tile beds	fully raised 1 m tile beds with soil mantles
3	Thin till over bedrock	.5 - 1.5 m blanket	tested at 2.43 x 10^{-4} cm/sec	below bedrock surface	5 - 10%	fair to good	30 m	partially raised (.5 - 1.0 m) tile beds with soil mantles
4	Thick till and sand over bedrock	1.0 m blanket	as above	well drained, below bedrock surface	5 - 10%	excellent	30 m	septic tanks as per Ministry of Environment standards
5	Thick till poorly drained	as above	as above	within .5 m of surface	0 - 40%	poor no development	-	-
6	Beaver swamp	unknown	low	at surface	0%	nil no development	-	-

Table 2: Maberly Pines
Development Potential of Terrain Units

head permeameter reading of 2.43 x 10^{-4} cm/second. Table 3 summarizes published literature comparing both permeability (hydraulic conductivity) and percolation test data for different types of surficial geological materials.

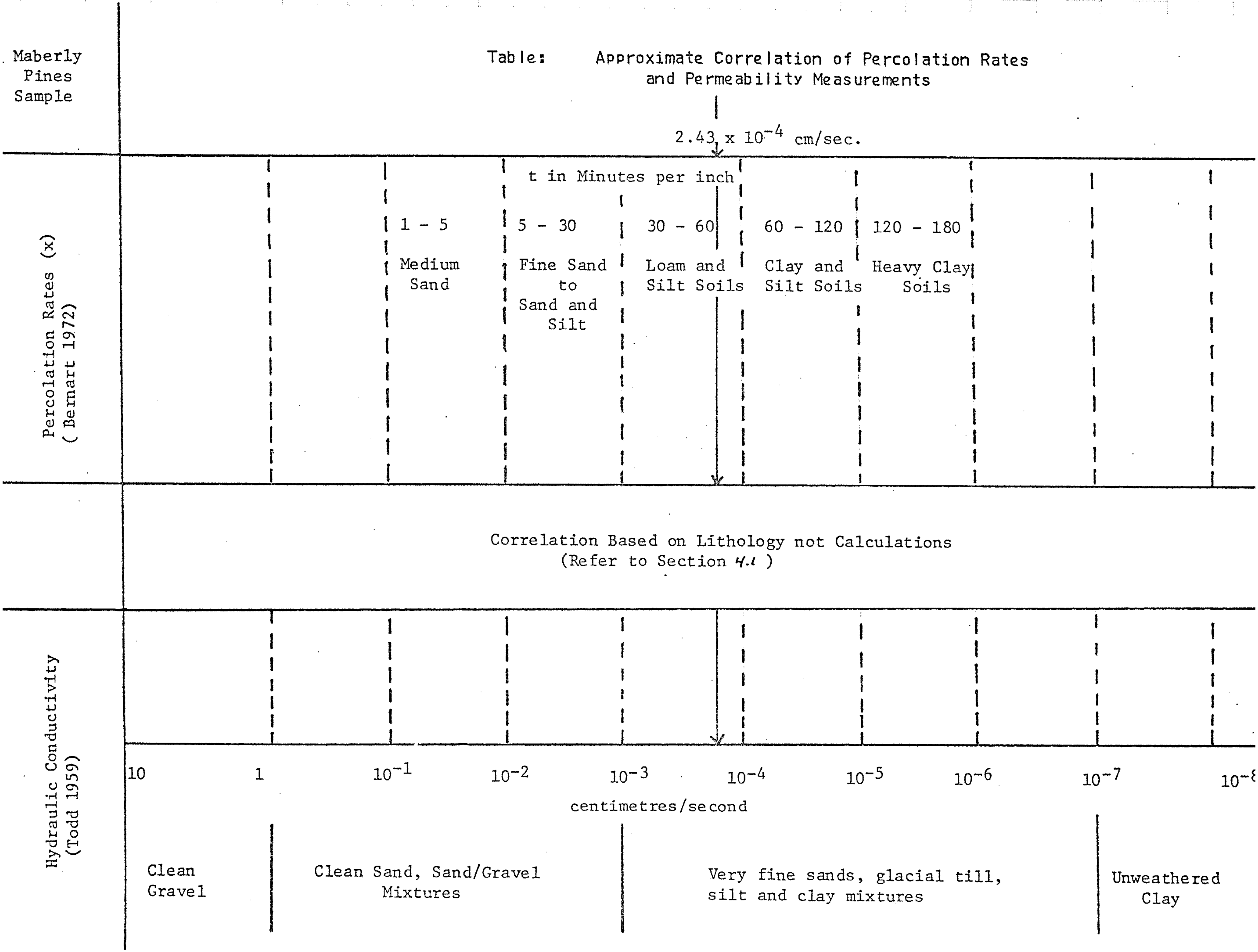
Permeability is expressed as both cm/second and minutes per inch in this Table. It is impossible, however, to relate percolation times and permeability measurements directly because permeameter readings are accurate saturated flow velocity measurements done in the laboratory while percolation readings are simple field tests. Percolation tests are often highly inaccurate due to problems of stratigraphic variation, compaction and partially saturated test holes. Also, percolation tests usually give higher (i.e. more permeable) results due to the presence of temporary structures in the soil horizon (rootlets, worm burrows, fissures, cracks, thin pervious soil lenses, etc.)

The Maberly Pines till sample has a permeability of 2.43 x 10^{-4} cm/second (or 175 minutes per inch if percolation could be calculated directly). According to Bernhart (1972) however, this permeability would yield a field percolation test near 60 minutes/inch and would be an excellent, although slightly impervious porous media for the attenuation of septic tank effluent.

In Terrain Unit 3 and 4 where till thickness is less than 1 metre, partially raised tile beds should be required. Minimum lot sizes of 1 acre are suggested for these units.

Poorly drained till areas have been mapped as Terrain Unit 5 (Figure 2). These areas would require fill and drainage work during development and should be avoided whenever possible.

Terrain Unit 6 is swampland with no potential for development. These areas are highly sensitive ecological zones and should not be filled or altered in any manner.


Maberly Pines Sample
Table: Approximate Correlation of Percolation Rates and Permeability Measurements
2.43 x 10⁻⁴ cm/sec.
Percolation Rates (x) (Bermart 1972)
t in Minutes per inch
1 - 5
Medium Sand
5 - 30
Fine Sand to Sand and Silt
30 - 60
Loam and Silt Soils
60 - 120
Clay and Silt Soils
120 - 180
Heavy Clay Soils
Correlation Based on Lithology not Calculations
(Refer to Section 4.1)
Hydraulic Conductivity (Todd 1959)
10
1
10⁻¹
10⁻²
10⁻³
10⁻⁴
10⁻⁵
10⁻⁶
10⁻⁷
10⁻⁸
centimetres/second
Clean Gravel
Clean Sand, Sand/Gravel Mixtures
Very fine sands, glacial till, silt and clay mixtures
Unweathered Clay

Well and septic tank design and site investigation recommendations are included in the following sections for each terrain unit.

4.1 Recommended Well Design

To minimize the risk of well water contamination and maximize well yields:

1. All wells should be drilled with a cable tool rig or an air rotary rig. Wells should be drilled slowly to minimize blockage and sealing of the fine joints and fractures in the bedrock which are the source of water in the Precambrian bedrock. In addition, wells should be surged every 5 metres during construction. Rotary drilling using "down-the-hole Hammer" technique (i.e. air percussion) seals fractures and result in low yields, over-deepened wells and high well construction costs.

2. All wells should be properly cement-grouted one casing length(about 7.5 metres) into bedrock to seal off near surface fractures close to the well which have a high potential to permit contaminated surface water from recharging the well.

3. Wells should be drilled at least 50 metres from swamps and marshes to avoid the possibility of recharging wells with poor quality water. Swamp water is often enriched in organic acids and may have an objectionable colour and odour.

4.2 Tile Field Design Recommendations

1. It is recommended that the capacity of septic tanks and the lengths of weeping tile used by increased be increased by a

factor of 1.5 over Ministry of Environment guidelines. It is felt that most septic tank systems are underdesigned for the capacity loadings placed on them by modern household appliances (e.g. dish-washers).

2. It is recommended that tile bed or well spacings within individual lots be increased to between 30 and 50 metres as a safety factor in order to minimize any risk of contamination of potable well water. Tile beds should be located blow wells to permit effluent to flow away from and not towards water supplies.

3. Septic tanks on Terrain Units 2 and 3 will require raised tile bed installations. A diagram of this design is included as Figure 4 of this report.

4. Where slopes are high (5 - 10%), tile bed construction will require:

> that a 40 x 50' minimum area be infilled with semi-permeable material to reduce the slope to less than 1%
>
> and
>
> that a mantle of fill (20' minimum width by 2' depth) be constructed around the tile bed.

A generalized sketch of these conditions is included as Figure 5.

Tile bed construction on slopes of 10 - 25% is difficult and might require extensive remedial work with heavy construction machinery. These cases should be designed and approved on an individual basis.

5. Precambrian terrain (especially Terrain Units 1, 2 and 3) which are to be developed for seasonal and recreational uses, have a

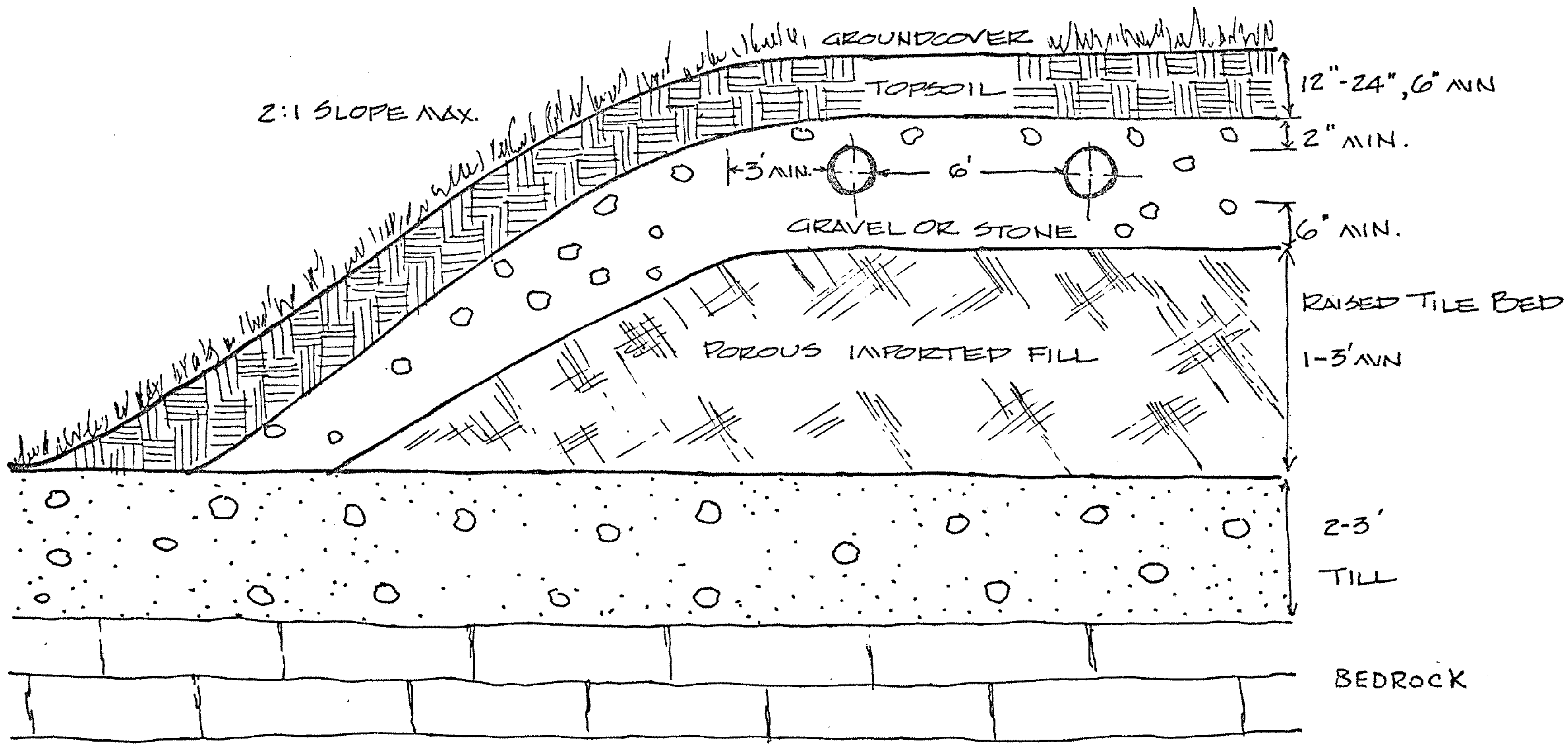
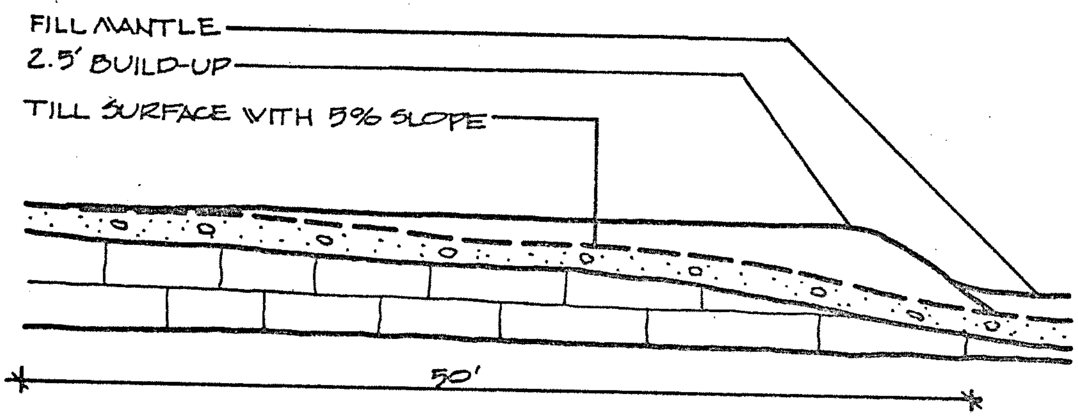
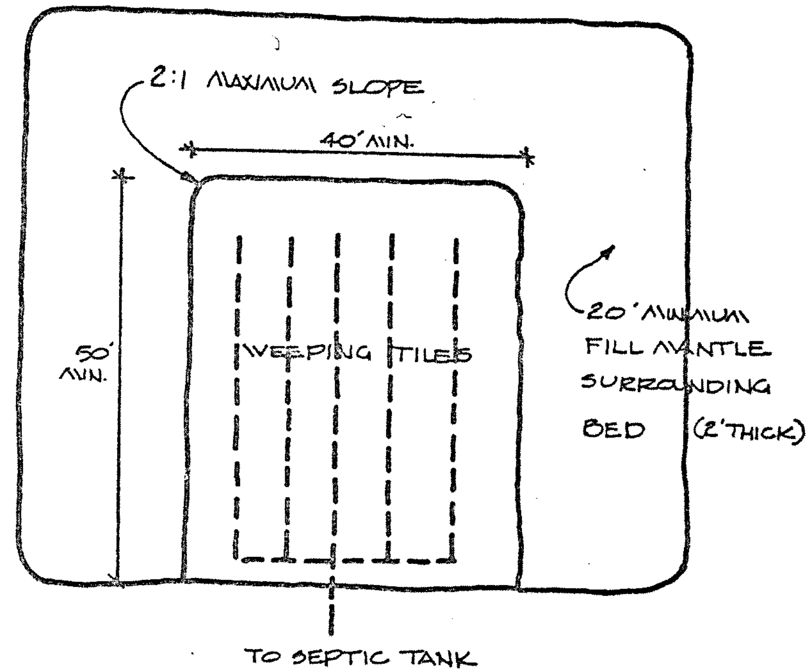


FIGURE 4 RECOMMENDED DESIGN OF LEACHING BED WHERE THIN TILL UNIT IS PRESENT

FIGURE 5: RECOMMENDED SEPTIC TANK TILE BED DESIGN ON SLOPING TERRAIN (10% MAX. SLOPE)



CROSS SECTION SCALE: 1"=10'



PLAN VIEW SCALE 1"=20'

high potential to be serviced with Humus toilets (or some other alternative sewage system brand which does not utilize in-ground disposal methods). These toilets are functional, economical and eliminate all risk of groundwater pollution.

4.3 Site Inspections

It is recommended that a lot by lot field survey of potential tile field locations be made upon completion of the concept plan with officials of the Public Health Unit, Perth Ontario.

Any possible problems with tile bed sitings due to localized drainage channels, minor escarpments or soil thickness variations, would be identified at this time. In addition, any inaccuracies in the base map or contours which might effect site layouts would be verified at this time.

Please note that this is not a lengthy procedure but has recently become a general requirement of the Ministry of the Environment for this type of terrain.

5.0 Vegetation and Wildlife

Methodology and Fromat of Ecosystem Analysis

To assess the vegetation and wildlife components for ecological constraints to development, the site was divided into natural ecosystems. An ecosystem can be defined as the interaction and interdependence of all physical and biological components of any area. The physical and vegetation parameters of an individual ecosystem constitute a biotope. For this discussion, the study site has been categorized into upland biotope, lowland biotope, open field biotope marsh and swamp biotope and lake and shoreline biotope. Each biotope is described under the following headings:

- description and distribution
- threatened species or unique associations
- species of economic importance
- constraints to development

The vegetation component of each biotope is described with regards to species composition and distribution. The discussion of unique associations at particular sites includes consideration of abundance of species and significance of the association of plants and animals to the biotope. Decisions concerning the presence of rare and endangered species are based upon each species' range, the occurrence of suitable habitat, and records in the scientific literature. Species of economic importance include game species of birds and animals, sport fishes, fur-bearers and commercial forest tree speices. Canada Land Inventory capability maps for ungulate, waterfowl and forestry production are referred to where applicable. Constraints to development were derived after evaluating sensitivities of the ecosystems to the types of disturbance generated by an estate lot housing project. Areas of high and moderate sensitivity have been mapped on Figure 2 of this report as a guideline for subdivision planning.

5.1 Upland Biotope (Terrain Units 1 and 2)

A. Description and Distribution

The upland biotope is composed of high, well-drained areas that may be forested or shrub covered and partially bare. The forested portions of upland sites are covered by stands of red oak but varied micro-relief promotes some growth of sugar maple and white birch in more moist situations. Thin soils on high ground are dominated by juniper shrubs that may be associated with small oaks. Small bare rocky sites are scattered intermittently throughout the juniper shrub areas.

B. Unique Associations

No rare or endangered species or unique associations were observed in the upland biotope on the Little Silver Lake property.

C. Species of Economic Importance

During the site reconnaissance on November 16, 1978, three ruffed grouse were flushed from juniper shrubs in the upland areas. These birds are an important upland game species that are hunted during the autumn months. Another game species, snowshoe hare, inhabit areas of scrub vegetation and secondary growth as well. Although the property has moderately severe limitations to the production of ungulates (Canada Land Inventory 1970), a deer was observed on the site in November. Deer may inhabit or wander through the property where there is suitable browse and cover.

The land has severe limitations to the growth of commercial forests of red pine and red oak because of either soil moisture excesses or thin soil layers (Canada Land Inventory 1971).

D. Constraints to Development

Upland clearings have a low degree of ecolocial sensitivity and are suitable for development.

5.2 Lowland Biotope (corresponds to parts of Terrain Unit 3, 4, 5)

A. Description and Distribution

The lowland biotope includes the low-lying, well-drained areas where there are deeper soil deposits and also areas associated with the swamps. The forest stand is composed largely of poplars and sugar maples with white birch and some eastern white cedar. The understory consists of red osier dogwood, willows and ash shrubs. There is a stand of white pine along ridges and low-lying areas between the north end of the small lake and Little Silver Lake. The stand composition changes to a predominance of oak on the ridge hillsides as the soil moisture conditions become drier. Oak stands are not mature but consist of scattered mature individuals among younger trees.

B. Unique Associations

No rare or endangered species or unique associations were observed in the lowland biotope.

C. Species of Economic Importance

The low-lying areas of the Little Silver Lake property have severe limitations to the growth of hard maple commercial forests because of moisture excesses and shallow soil conditions. Ruffed grouse and snowshoe hare are found in virtually all areas of the acreage including the lowland biotope.

D. Constraints to Development

The tree growth in the low areas prevents surficial erosion and is an important input of organic matter (via leaf litter) into the soil. Existing vegetation on the hillsides helps to stabilize the thin soil that has been deposited on these slopes. Tree cutting should be minimized therefore, during construction activities in this terrain unit.

5.3 Open Field Biotope (corresponds to parts of Terrain Units 3 & 4)

A. Description and Distribution

The rugged and shallow and stony soils place severe limitations on agricultural practices in these terrain units. While some open field areas were once cleared for agriculture, they are currently either being used for grazing purposes while other clearings have been left fallow for several years. Unused fields have early successional growths of golden rod, milkweed, staghorn sumac, hawthorn and some poplar saplings. Areas with scrub vegetation provide habitat for ruffed grouse, eastern cottontails, snowshoe hare, raccoon and fox.

B. Unique Associations

No rare or endangered species or unique associations are present in the open field biotope.

C. Species of Economic Importance

Upland game associated with fields, clearings and the vegetation on the edge of these openings include ruffed grouse and snowshoe hare. As previously stated, deer may wander through the property where there is suitable browse and cover.

D. Constraints to Development

The fields and clearings are the most suitable areas for development. These sites, some originally chosen for use as pastures, are the best drained and deepest soiled areas on the property.

They do not have a high degree of ecological sensitivity as they have been disturbed by human activity in the recent past.

5.4 Marsh and Swamp Biotope (corresponds to Terrain Unit 6)

A. Description and Distribution

At the south end of the small lake, along the shallow margins and extending to the Westport-Maberly Road, marsh vegetation consisting of cattails, bulrushes and grasses grow in submerged and water-logged soils. Ash, dogwood and willow shrubs are proliferant in the poorly drained conditions that exist around the perimeter of the lake.

Throughout the rest of the property, there are extensive permanently flooded low-lying areas. These swamps, created by beavers disturbing the natural drainage, are filled with dead and rotting trees, notably poplar. Shrubs, including willow and ash, grow on wet sites at the swamp edges.

B. Unique Associations

The presence of wetlands in a relatively undisturbed tract of land is conducive to a diverse group of wildlife. There is evidence of beaver activity at all the swamp sites and muskrats are almost always associated with them. Although this land is classed as having severe limitations to the production of waterfowl according to Land Capability for Wildlife - Waterfowl, Canada Land Inventory 1971, the extensive swampy sites and the marsh area of the small lake serve as important resting and feeding locations for migrants. They may also support a small resident breeding population for some species of ducks.

Marshes and swamps are also excellent habitats and important production centres for aquatic invertebrates, amphibians and reptiles.

C. Species of Economic Importance

Waterfowl such as mallards, black ducks and blue-winged teal are important game species despite the severe limitations to waterfowl production classification by the Canada Land Inventory 1971. Beaver and muskrat are fur-bearers that inhabit most of the existing wetland areas but their economic potential is unknown.

D. Constraints to Development

Marshes and swamps are vulnerable to pollution by increased inputs of natural and unnatural substances from development. Road and building constructionnear marshes and swamps may cause some siltation, particularly in the shallow waters. Inputs of nutrients from sewage effluents change the chemical conditions of the water. Eutrophication destroys the floating and emergent vegetation and is extremely detrimental to populations of waterfowl and other wetland wildlife. No development activities such as dredging or infilling should be permitted in this terrain unit.

5.5 Lake and Shorēline Biotope (Mapped on Figure 2)

A. Description and Distribution

Included in the property is approximately 4.0 km of Little Silver Lake shoreline and 1.5 km of shoreline of the small lake. There is little emergent aquatic vegetation on Little Silver Lake as shore is rocky, steep-sloped and in most locations forested. The depth of water increases rapidly from the lake edge. This lake is a warm water fishery with such species as smallmouth bass and yellow perch. The small, shallow lake has a rocky shoreline except at the south end where emergent aquatic vegetation is proliferant. Yellow perch and introduced rainbow trout inhabit the lake at the present time. Beaver activity was observed and the lake probably serves as an important resting and feeding site for some migrants and may support a small resident duck population.

B. Unique Associations

No rare or endangered species or unique associations were observed in the lake and shoreline biotope.

C. Species of Economic Importance

Surface-feeding ducks such as mallards, blacks and blue-winged teal as well as diving ducks like ring-necked ducks, scaup, goldeneye and bufflehead are common game species of waterfowl. Sport fishes from a warm water fishery like Little Silver Lake include large and/or smallmouth bass, yellow perch, walleye and northern pike. Approximately 2,000 rainbow trout have been planted in the small lake. Successful over wintering of the trout will not be known until the spring of 1979, and breeding is unlikely.

D. Constraints to Development

As settling basins, the lakes are sensitive to inputs of sewage and silt. Little Silver Lake and the adjacent small lake are relatively small and not tolerant to inputs of effluents from residential developments. In comparison, other much larger lakes are not eutrophied because of unnatural nutrient enrichment from cottage disposal systems.

The fisheries may be affected as a result of damage to spawning areas. The trout in the small lake will tend to move upstream (in this case into Little Silver Lake) if the conditions become too severe.

Accordingly, we endorse the development recommendations made for these lakes by the Ministry of Natural Resources (Little Silver Lake Study Report, M.N.R., Lanark District, December 1978);

1. All development, including septic tanks and tile fields should be set back at least 100 feet from the highwater mark. If the physical limitations of a particular lot indicate a greater setback is required, the Ministry will recommend this when reviewing the specific proposal.

2. The disturbance of the natural vegetation within 100 feet of the highwater mark should be discouraged. This will help to stabilize soils, hold back nutrients, and protect the scenic quality of the shoreline.

3. No development, including dredging and/or filling should be permitted within the wetland areas shown on the accompanying map.

4. Future development should be compatible with existing uses on the lake, and should be consistent with the lake's ability to support the proposed area.

Respectfully submitted

Derek P Smith

Derek P. Smith M.Sc. FGAC

6.0 Selected References

A. Sections 1 - 4

Baer, A.J. et al (1977). Riviere Gatineau Geological Survey of Canada Map Sheet 1334 A.

Bernhart A.P.(1972). A Rational Approach to Determining Sizes of Building Lots According to their Capabilities for On-site Wastewater Treatment, University of Toronto, Department of Civil Engineering Publication.

Central Mortgage and Housing Corporation (1977). CMHC Septic Tank Standards.

Department of Mines (1972). Before You Have a Well Drilled. Report 68-3, Halifax.

Farvolden, R.N. (1961). A Farm Water Supply From Quicksand. Research Council of Alberta, Preliminary Report 61-3, Edmonton.

Gadd, Nelson R. (1963). Surficial Geology of Ottawa Map-Area Ontario and Quebec 31 G/5. Geological Survey of Canada, Paper 62.16, Ottawa.

Gibb, John E. and John F. Jones (1975). Pollution Hazard to Groundwater in Nova Scotia. Bulletin 1. Water Planning and Management Division, Nova Scotia Department of the Environment, Halifax.

Henderson, E.P. (1972). Surficial Geology of the Kingston Area. G.S.C. Paper 72-48.

Hubbert M.K. (1940). The Theory of Groundwater Motion, Journal of Geology, Vol. 48 pp 785-944.

Ministry of the Environment, 1977. Septic Tank Sand Filter System for Treatment of Domestic Sewage (Publication W64, Na Chowdrey).

1976. Phosphate Retention Capability of Granular Soils, Precambrian Shield (by D. A. Aikens)

Ministry of the Environment (1976). Water Well Records for Ontario Regional Municipality of Ottawa-Carleton 1946-1972. Water Resource Bulletin 2-16, Toronto.

Sobanski, A.A. (1970). Groundwater Survey Regional Municipality of Ottawa-Carleton. The Ontario Water Resources Commission.

Todd, D.K. (1959). Groundwater Hydrology, Wiley and Sons, New York 336 pp.

Wilson, Alice E. (1964). Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec. Geological Survey of Canada Memoir 241, Ottawa.

Selected References

B. Section 5

Canada Land Inventory. 1971. Land Capability for Wildlife - Waterfowl. Department of Energy, Mines and Resources, Ottawa.

Canada Land Inventory, 1970. Land Capability for Wildlife - Ungulates. Department of Energy, Mines and Resources, Ottawa.

Canada Land Inventory, 1971. Land Capability for Forestry. Department of Energy, Mines and Resources, Ottawa.

Canada Land Inventory, 1966. Soil Capability for Agriculture. Department of Energy, Mines and Resources, Ottawa.

Cook, F.R. 1970. Rare or Endangered Canadian Amphibians and Reptiles. Can. Field Nat. 84: 9-16.

Goodwin, C.E. 1977. Rare and Endangered Birds of Canada. pp. 85-87. In Canada's Threatened Species and Habitats. Edited by T. Mosquin and C. Suchal. Proceedings of the Sumposium on Canada's Threatened Species and Habitats. Ottawa, 1976. Canadian Nature Federation x + 185 pp.

Macdonald, A.L. 1978. The Biology and Conservation of the Black Rat Snake, Elaphe obsoleta obsoleta (Colubridae), in eastern Ontario. Unpublished H. B.Sc. thesis, Carleton University, Ottawa. v + 41 pp.

Ministry of Natural Resources, Dec. 1978. Little Silver Lake Study Lanark, Ontario.

Ricklefs, R.E. 1973. Ecology. Chrion Press Inc. Newton, Mass. x + 861 pp.

Smith, R.L. 1974. Ecology and Field Biology. Harper and Row Publishers New York, New York. xii + 855 pp.

APPENDIX A

Grain Size Analysis

Matrix of

Glacial Till Ground Moraine

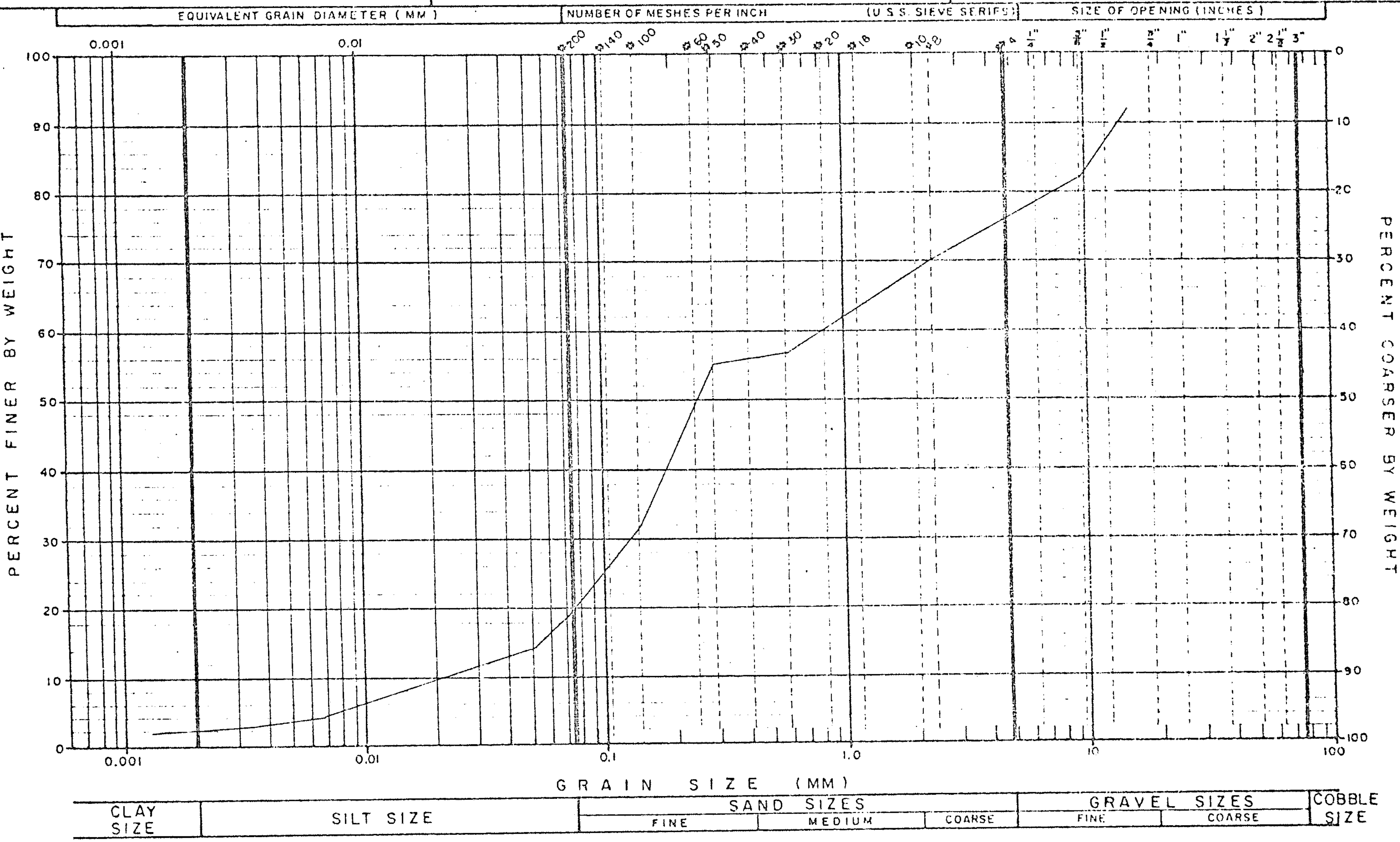
JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers and Geologists
1479 LAPERRIERE AVE. OTTAWA, CANADA K1Z 7S8

GRAIN SIZE DISTRIBUTION

SOIL SAMPLE DESCRIPTION:

Sand - Gravel.

LOCATION: ....
PROJECT: Water & Earth Science Associates
BORE HOLE NO. ____ SAMPLE NO. 4
LAB. NO. ....
TESTED BY: S.W. DATE: ....
CHECKED BY: S.W. DATE: Jan, 15/79



REMARKS:

EFFECTIVE GRAIN SIZE, D_{10}= .... (CM) D_{60}= .... (CM) UNIFORMITY COEFFICIENT, C_u = ...

APPENDIX B

Water Well Logs

Concessions 7, 8, 9

Lots 10 - 16

South Sherbrooke Township

CON	LOT	UTM EASTING NORTHING	ELEV FEET	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG
7	10	377220 4963650	600	6	FR	58	11	76	5	1/00	DO	VILLENEUVE F Tpsl Msnd 0005 Shle 0015 Grey Grnt 0076
7	15	379350 4965130	575	2	FR	78	10	50	1	2/00	DO	SMITH L Msnd 0014 Red Grnt 0115
7	16	380160 4965295	585	6	FR	40	16	48	4	2/00	DO	CONROY J Brwn Tpsl 0001 Whit Lmsn 0036 Blck Grnt 0048
8	11	377220 4964780	610	6	FR	52	10	25	2	1/00	DO	MUNRO S Tpsl 0001 Fill Bldr 0012 Red Grnt 0062
8	13	378040 4965430	609	6	FR	32 64	8	65	2	1/00	ST DO	BRIGGS A Msnd 0007 Blck Grnt 0065
8	14	378100 4965640	600	6	FR	40	10	45	5	3/30	DO	FLEMING Cecil Brwn Msnd 0007 Blck Grnt 0050
8	14	378140 4965800	575	6	FR	35 55	20	63	-1	3/00	DO	FLEMING V Brwn Tpsl 0004 Rock 0018 Blck Grnt 0063
8	14	378300 4965870	565	6	FR	40	25	45	5	/30	DO	MARSHALL H Fill 0012 Shle 0016 Grnt 0054
8	14	378500 4965620	625	6	FR	27	11	15	45	/30	DO	MCFARLAND CONSTRUCT Msnd 0004 Red Grnt 0033

CON	LOT	UTM EASTING NORTHING	ELEV FEET	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG
9	11	376550 4965345	585	6	FR	50	15	63	1	1/00	DO	GRAY A Msnd 0004 Blck Grnt 0063
9	13	377400 4965620	590	6	FR	68	4	70	1	3/15	DO	MACDONNEL B Tpsl Msnd 0008 Grey Grnt 0068 Grn Grnt Shle 0069 Blck Grnt 0070
9	13	377450 4966277	650	6	FR	115	22	126	5	1/00	ST DO	CONBOY R Shle 0003 Blck Grnt 0126
9	14	377615 4966220	650	6	FR	40	12	16	30	1/00	PS	MABERLY SCHOOL Msnd 0001 Grey Grnt 0048
9	14	377670 4966690	550	6	FR	80	18	100	7	1/30	DO	VANALSTINE K Brwn Tpsl 0001 Grey Grnt 0018 Red Grnt 0040 Grey Grnt 0100
9	14	378020 4965820	595	6	FR	35 80	10	75	2	1/00	DO	ORSER W Clay 0001 Bldr 0011 Grnt 0085
9	16	378400 4967791	607	6	FR	65	33	72	4	1/30	ST	VANALSTINE D Whit Lmsn 0072
9	16	378740 4967676	620	7	FR	30	18	56	5	1/30	DO	VANALSTINE D Brwn Tpsl 0015 Grvl 0018 Whit Lmsn 0056