HYDROGEOLOGICAL STUDY & TERRAIN ANALYSIS
CONSENT APPLICATIONS
CR-029-2004 & CR-034-2004
LOTS 19 AND 20, CONCESSION 10
GEOGRAPHIC TOWNSHIP OF CLARENCE
NOW CITY OF CLARENCE-ROCKLAND

Prepared for

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1 INTRODUCTION

Further to your request, Levac Robichaud Leclerc Associates Ltd. (LRL) performed a hydrogeological study and terrain analysis for the consent application of two (2) residential lots.

The purpose of the study is to demonstrate that the proposed non extraction development can be adequately serviced by a private well and sewage system in a manner that will not impede the existing and proposed extraction operations of the neighbouring pit to the north based on the geological and hydrogeological characteristics of the site. Furthermore, the study will determine if the geological and hydrogeological settings underlying the proposed lots can support the septic impact that will be generated by development as well as supply potable water having adequate quantity and quality to the future dwellings.

2 SITE DESCRIPTION

The site under investigation is legally described as part of lots 19 and 20, Concession 10, geographic Township of Clarence now within the amalgamated City of Clarence-Rockland. The property is located within the north boundaries of the Village of Cheney, Ontario.

The main property (**Part B – retained portion**) has an irregular rectangular shape with an approximate surface area of 41.57 hectares (102.72 acres). This property fronts 88.47m on Indian Creek Road (west limit) and 97.23m on Drouin Road (east limit) with an approximate length (east-west) of 1417.54m. The retained portion of the property is used for agricultural activities.

The proposed severed lots are both shown as **Part A** on the attached plan or CR-029-2004 and CR-034-2004, hereafter referred to as lots 29 and 34. They will be located on the west limit of the property fronting Indian Creek Road. Lot 29 is 54.20m (177.82 feet) wide by 87.54m (287.20 feet) deep with a total area of 0.47 hectares (1.17 acres). The lot will be detached from the most northwest corner of the main property. Lot 34 is located directly south of Lot 29. It has the same depth but with a frontage of 34.27m (112.43 feet) on Indian Creek Road for a total area of 0.30 hectares (0.74 acres).

Currently both lots are vacant and contain no building structures. They both front the north limits of Indian Creek Road, which falls at a dead-end at approximately 730m north of Russell Road. The lots themselves are generally flat with a gentle slope to the south. Both lots are covered with mature trees. There is a 3.0m high escarpment at the east limit of the lots, where an exposed sand bank is seen. This may indicate some sand exploitation in the past. An old access road is seen along the north property line leading up to the escarpment.

Some numerous small stockpiles are found across the lots set in rows. It is assumed that these stockpiles have been there for some years as mature trees have since grown over them. This would also indicate that the lots have once been clear cut. A man-made drainage swale is located between the south lot and the existing property to the south C.N 3661 as well as along Indian Creek Road. It appears that the swale is sloped towards the west.

Regionally, the lots are located on the south-western limits of a topographic high point. Based on topographic maps, the local topographic of the land is to the south to southeast. The site is located between elevations 75m (top of sand bank) to 70m (general grade of lots), sloping towards the south where grades vary between 69m to 68m.

Both lots are located with the urban "land uses designation" of the Village of Cheney. The urban land uses extends along Indian Creek Road and to the south onwards. Rural land uses are located directly east of the proposed lots and again to the west and northwest following the urban designation along Indian Creek Road. Directly to the northeast of the lots, the land use consists of sand pit.

The land activities conducted within 0.5km of the proposed development consist mainly of low density single-family residential dwelling along Indian Creek Road followed by vacant properties onwards. The vacant properties typically include forested areas to the north and southwest of the site along with some agricultural field mostly used for pasturing.

Directly to the northeast of the proposed lots are three (3) consecutive sand pits (Fillion, Guindon and Saumure pit). It is our understanding that all three operate or will operate under a Category 1 – Class A - Pit Below Water exploitation license as per the Ministry of Natural Resources' (MNR) Aggregate Resources Act and Regulations. The maximum exploitation depth is to the clay layer anticipated to be near elevations 66m. Dewatering to some degree occurs as part of the exploitation activities through drainage ditches.

There are no open body of water or major water courses near the proposed lots. As stated above a small man-made drainage swale is located south of Lot 34, which appears to be flowing west. The road drainage ditch also outlets into this swale. It is noted that a marshy area is located approximately 300m north in the forested area. Some small drainage ditches, which are tributaries to the Indian Creek and Bearbrook Creek, are located within the 500m radius with the closest in relation to the proposed lots located 150m.

Please refer to **Appendix A**, which shows the proposed development plan, site location maps and other general maps showing the existing site features described herein.

3 SITE GEOLOGY

A review of surficial soil deposit maps provided by Department of Energy, Mines and Resources Canada, and the Urban Geology of the National Capital (UGNC), published by Natural Resources Canada (2001), revealed that the surficial geology of the property under investigation is composed of reworked marine sediments from former landslides that occurred at unconsolidated material escarpments. The soil generally consists of thin sand layer resting over marine clay or an admixture of the two. The site is bordered to the north by Deltaic and Estuarian Deposits (sand) forming the regional topographic high point, which gradually tapers-off to the south into Floodplain Sediments (sand, silt and clay) as grade changes occur, and onwards into Erosional Terraces (clay).

The geological maps show that the overall drift thickness at the site location varies between 25m and 50m below ground surface (bgs). The drift thickness extends more than 1km in any direction. Local well records indicate that the sand deposit is between 2.4m to 3.7m thick and rest over a clay deposit extending between 27.4m to 35.7m bgs. Underlying the clay deposit, a thin layer (1m to 6m) of glacial till is encountered mantling the bedrock formation. The till is described as gravely. The bedrock is part of the Lindsay Formation (Upper Ottawa Group), consisting of limestone with interbeds of shale.

Computer generated maps showing the site's geological characteristics are presented in **Appendix B** (Bedrock Geology, Surficial geology and Drift Thickness).

3.1 Soil Stratigraphy

In order to confirm the soil stratigraphy underlying the lots, several manual boreholes were drilled across the proposed severances. The boreholes were performed on December 22, 2004 using a manual auger. The boreholes were drilled down to a depth of 2.0 m bgs.

The subsurface soil conditions encountered consisted of 0.5m to 0.68m of peat over Lot 34 and the south portion of Lot 29. The north potion of Lot 29 only encountered 150 mm of sandy topsoil. The organic soil rests over a sand deposit. The sand is uniform, fine grained with traces of silt, brown to light brown in colour at surface becoming brownish grey with depth. It is however noted that the sand is dark brown with traces of organic in the north portion of Lot 29 over its first 0.8m. The sand was found to be moist but saturated near the peat/sand interface. Well records indicate that the sand can be between 2.4m to 3.7m thick in this area and rests over a clay deposit.

Following a stabilisation period, the groundwater table level was measured in the open borehole at an average depth of 0.5m bgs. The water table is considered a perched overburden water table flowing within the pervious sand deposit over the clay aquitard.

4 SITE HYDROGEOLOGY

Information on groundwater availability was obtained by reviewing the Ontario Ministry of the Environment (MOE) water well records database. In addition to the spreadsheet, distinct water well records of three (3) existing residential dwelling were obtained for review. The well records obtained are for the residences located at C.N. 3690, C.N. 3670 and C.N. 3661, which are all situated adjacent or near of the proposed development as shown on the site location map attached in **Appendix A**. The water well records obtained as part of this study are presented in **Appendix C**.

Our review of approximately forty-five (45) water well records from the MOE's data base located within 1km radius (UTM Coordinates: 479300E and 5028550N) revealed that the majority of the wells (75%) are tapped within a bedrock aquifer with the remaining wells (21%) within an overburden till aquifer and two (2) dug wells. Based on the UTM coordinates, the two (2) dug wells are located at more than 0.5km south of the lots in question.

According to the information obtained from the well records, the wells located within the bedrock aquifer have highly variable yields, which vary from 4.5 L/min to more than 135 L/min. Wells tapped within the bedrock formation have an average yield of 67.5 L/min (15 IGPM), with only one percent of the wells having a yield of less than 22.5 L/min (5 IGPM). All wells are tapped within shale or limestone formations or interbeds of both.

The wells formed in the overburden glacial till deposit mantling the bedrock have an average yield of 84 L/min (18.6 IGPM), with flow rates between 31.5 to 203 L/min. The two (2) dug wells are 7.5m to 10m deep and tapped within a clay deposit. The well records indicate that these wells have yields varying from 13.5 to 27 L/min (3 to 6 IGPM). However, long term well capacity is questionable considering the nature of the overburden soil and given that the yield of the well is often obtained from only a one-hour pump test.

The best supply aquifers in relation to quantity are located in the till aquifer found mantling the bedrock formation between the depths of 27m to 44m bgs and within the first 15m of the bedrock formation. It is anticipated that both these aquifers are interconnected. Low yields were obtained from wells than were extended below 51m bgs in the bedrock formation.

Of the forty-five (45) well records reviewed, thirty-five (35) were recorded to be fresh with four (4) having a sulphurous condition and the remaining having unknown condition.

5 SUPPLY AQUIFER CHEMISTRY/QUALITY

The supply aquifer was sampled from a neighbouring property located directly across the street from the site in question (Ms. Sylvie Savard; C.N. 3670, Indian Creek Road). The well record for this well is included in **Appendix C**. According to the well record (dated March 1990), the well is tapped within the till aquifer at a depth of 33.53m.

Ms. Savard informed us that she never ran out of water since occupying the dwelling. She has no water treatment system but is nevertheless aware that the raw water has a yellowish colour with some odour and taste associated problems. She has the water tested for bacterial contamination on regular basis with no past incidences reported.

The water sample was collected from the kitchen tap and is representative of the raw water. Prior to sampling the water, the tap was flamed and left running over 10-minutes. The sample was collected using laboratory prepared bottles and submitted to Paracel Laboratories Ltd of Ottawa for analysis of a subdivision package. The laboratory certificate of analysis is presented in **Appendix D**. The following table presents a summary of the water analysis.

5.1 Table 1: Water Analysis Summary of Supply Aquifer

Parameter	MDL (mg/L)	ODWS (mg/L)	3670, Indian Creek Road (mg/L)
Aesthetic and Operational Parameters			
Calcium	0.20	NV	1.2
Iron	0.10	0.30	<0.1
Magnesium	0.20	NV	3.0
Manganese	0.05	0.05	<0.05
Potassium	0.20	NV	6.8
Alkalinity	5.00	30 - 500	**710**
Ammonia/ammonium as N	0.01	NV	0.11
Colour (TCU)	1.0 TCU	5	**89**
Chloride	1	250	37
Conductivity (uS/cm)	5.0 uS/cm	NV	1300
Hardness, $CaCO_3$	1.0	80 - 100	15
pH	0.050 pH units	6.5 - 8.5	**8.87**
Phenols	0.001	NV	0.02
Solids – Dissolved	1.0	500	**1000**
Sulfide	0.020	0.05	<0.02
Sulphate	1.0	500	<1
Kjeldahl Nitrogen	0.10	NV	2.7
Organic Nitrogen	--	0.15	**2.61**
Tannin/Lignin	0.10	NV	2.6
Dissolved Organic Carbon	0.20	5	**17**
Health Related Parameters			
Fecal Coliforms (count/mL)	1.0 / 100 mL	Absent	Absent
Total Coliforms (count/mL)	1.0 / 100 mL	Absent	Absent
E. Coli (count/mL)	1.0 / 100 mL	Absent	Absent
Heterotrophic Plate Count (count/mL)	2.0/mL	500/ml	**>500**
Nitrate as N	0.10	10	<0.1
Nitrite as N	0.05	1	<0.05
Nitrates + Nitrites as N	0.15	10	<0.15
Fluoride	0.1	1.5/2.4	**2.7**
Sodium	0.20	20/200	**300**
Turbidity (NTU units)	0.10	1	0.4

MDL: Maximum Detection Limit
ND: Not Detected
ODWS: Ontario Drinking Water Standards (2003)
BOLD: Exceeding parameters

5.2 Discussion of Results

The raw water sample collected from the nearby well indicates that the water chemistry is in general compliance with the Ontario Drinking Water Standards, except for alkalinity, colour, pH, dissolved solids, organic nitrogen, dissolved organic carbon, Heterotrophic Plate Count, fluoride and sodium. In general, the water is slightly brackish and alkaline with elevated parameters associated with the presence of suspended organic particles. Of these parameters, only HPC, sodium and fluoride are considered health related with the remaining parameters being operational or aesthetic guidelines in drinking water.

Typically, water with high alkalinity and pH has a soda-like taste and can cause scaling on fixtures and throughout water distribution systems. This scaling is undesirable because it begins to decrease the efficiency of plumbing systems, which results in greater power consumption and increased costs. The high alkalinity levels are likely due to the presences of bicarbonates in the water. A reverse osmosis system will reduce the alkalinity levels by removing the associated bicarbonates, which may then stabilise the pH. If not, a pH neutralizer would be required to reduce the pH to a more neutral level.

In our case, the elevated colour and the tannin/lignin levels are directly associated with the elevated organic parameters (DOC and organic nitrogen), which typically give a yellowish colour to the water as seen during our sampling. These parameters posed no health risk and can be easily removed from drinking water using activated carbon filters. However, these filters need to be replaced periodically to maintain their efficiency.

The high dissolved solids content can be attributed to the high concentrations of dissolved mineral salts (mostly sodium) and the alkalinity (in the form of bicarbonates). The sodium levels are above the ODWS guidelines and higher than the Ministry notification limit of 20 ppm for homeowners who follow a sodium-restricted diet on the advice of their physician. The same is said for the fluorides levels, which are above the ODWS guidelines and higher than the Ministry notification limit of 1.5 ppm. To that effect, a letter to the local Medical Officer of Health should be transmitted to notify the health unit of the sodium and fluoride levels found in this area.

The water is soft with no detectable traces of iron and manganese. Therefore, the use of a water softener is not required as it will only increase the sodium level in the water. In order to reduce the dissolved solids as well as the exceeding sodium and fluoride levels, a reverse osmosis system is recommended

HPC is present in a concentration greater than the ODWS 500 counts/mL limit. HPC are counts of natural organisms (bacteria, yeasts and moulds) and is an indicator of possible pollution in drinking water. They are a greater risk for people with depleted immune system such as elderly and infants. The abnormal HPC counts can also be attributed to water that remains stationary for long periods of time and from incrusted piping, where bacterial growth may occur. Considering the water quality obtained and that the owner has no water treatment, the last explanation is likely the case for the abnormally high level HPC. It is noted that there were no other bacterial contamination and that nitrates/nitrite were not detected in the water, which could indicate another source of the contamination. Ms. Savard was informed of the water quality obtained from her well and instructed in how to remediate the problem.

6 TERRAIN ANALSYSIS

The site is underlain by a thin organic deposit (0.5m to 0.7m) resting over a fine sand deposit with a high water table. It is assumed that the proposed residential construction will consist of one or two storey single-family dwellings, which will be serviced by a private septic system and drilled well.

6.1 Foundations

After reviewing the subsurface soil conditions, the footings of the proposed residential construction may be founded over the undisturbed sand deposit located above the groundwater table. It is noted that all peat (0.5m to 0.7m) shall be removed from the building footprint. Depending on the final grading of the lots, some structural fill may be required.

The foundation for the proposed residential construction may be supported by conventional strip and column footings founded on the native sand or properly prepared structural fill. A safe-net bearing value of 75 kPa may be used for the design of footings. In the event that the groundwater level is located at a depth of less than the footing width below the subgrade, the footings shall be designed according to the Ontario Building Code (1997), Article 9.15.3.4 as to minimum footing width.

All other aspects of residential construction must comply with Section 9 of the Ontario Building Code's latest edition. Finally, it is recommended that the subgrade soil be inspected by a geotechnical engineer prior to pouring the footings to confirm the bearing capacity given herein.

6.2 Proposed Lot Size Review

The Official Plan policies of the City of Clarence Rockland states that the minimum lot size of a consent application in a rural area must be 0.4 hectares or greater without requiring a hydrogeological assessment. Of the two (2) proposed lots, only Lot 29 meets this requirement. Therefore, Lot 34 was reviewed in accordance with the Ministry of the Environment Hydrogeological Technical Information Requirements for Land Development Applications as well as MOE's procedure D-5-4 "Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment".

Due the geological and hydrogeological settings underlying the development, the system isolation method was considered to assess the impact of the septic influent generated by the proposed development on the supply aquifer.

Receiving Aquifer

The receiving aquifer within the area of the proposed development is located within the surficial sand deposit. The thickness of this aquifer is 3.0m or less at the lot location. Based on the topography of the land, the flow direction of the surficial overburden aquifer is towards the south.

Sensitive Receptors

Our inspection of the neighbouring properties did not reveal the presence of any dug wells near the proposed development. In addition, MOE's water well database has only two (2) records of potable wells tapped within the surficial overburden aquifer, which are both located more than 0.5Km from the site in question. Moreover, the well records indicated that the wells are tapped within a clay formation. Finally, there are no major water bodies near the proposed development. In conclusion, there are no sensitive receptors to this aquifer.

Geological Isolation Features

The supply aquifer for the proposed development is located in the glacial till deposit or the upper bedrock formation. According to local wells records, this aquifer is protected by a clay aquitard that is more than 25m thick. All well records indicated the clay as being blue in colour and soft, thus meaning of high moisture content and plasticity, thus meaning massive texture. In addition, the well records and geological mapping show that the clay deposit extends 500m or more in any direction from the site. Therefore, the surficial aquifer is not interconnected with the aquifers underlying the clay aquitard.

Based on the well records, the supply aquifer is under a strong artesian pressure and upward gradient. The water is found between 33.5m to 35m bgs and the static water level varies between 10.4m and 11.2m bgs. Due to the high yield of the aquifers (bedrock and till), the strong upward gradient will not be lowered by pumping, as both the specific yield and the coefficient of transmissivity of the supply aquifer are considered excellent.

Background Quality of receiving aquifer

The background nitrate concentration of the receiving aquifer was obtained by installing a piezometer within the sand deposit. The piezometer was sampled on December 22, 2004 using laboratory prepared bottles and submitted to Paracel Laboratories Ltd of Ottawa for analysis of a nitrates. The laboratory "Certificate of Analysis" is presented in **Appendix E**.

The laboratory results revealed that the nitrate concentration in the receiving aquifer is 0.1 ppm. This indicates that the receiving aquifer within the proposed development is not impacted by potential surficial contamination generated by the neighbouring septic systems nor from nearby agricultural activities. In addition, the water sampled collected from the supply aquifer have non-detectable levels of nitrates.

DRASTIC Analysis

DRASTIC is a groundwater quality model for evaluating the pollution potential of large areas using the hydrogeological settings of the region. DRASTIC includes various hydrogeological settings that influence the pollution potential of a region. This model employs a numerical ranking system that assigns relative weights to various parameters that help in the evaluation of relative groundwater vulnerability to contamination.

DRASTIC evaluates pollution potential based on seven hydrogeological settings. The hydrogeological settings which make up the acronym DRASTIC are given in Table 5. Each factor is assigned a weight based on its relative significance in affecting the pollution potential. Each factor is further assigned a rating for different ranges of the values. The DRASTIC Index is computed by summation of the products of rating and weights for each factor. An index below 120 is considered low vulnerability, index between 120 and 160 are considered moderate vulnerability and finally an index above 160 is considered to be a high vulnerability.

The DRASTIC calculation for the proposed development is below in Table 2.

Table 2: DRASTIC Analysis

Parameter	Value	DRASTIC INDEX CALCULATION		
		Factor Value (V)	Weight (W)	V x W
Depth of Water found (D)	30 to 35 m	2	5	10
Annual Recharge (R)	10 to 18 cm	6	4	24
Aquifer Media (A)	Till, shale or Limestone	6	3	18
Soil Media (S)	Fine Sand	9	2	18
Topographic Factor (T)	0-2 percent slope	10	1	10
Impact of the Vadose Zone (I)	Impervious Clay	1	5	5
Hydraulic conductivity of Aquifer (C)	4 to 12 m/day	3	3	9
DRASTIC INDEX				**94**

The DRASTIC index was calculated to be 94, which indicates that the supply aquifer underlying the development has a low vulnerability rating.

Conclusions

Our review of the geological and hydrogeological features and settings of the area of the proposed development shows that the aquifer is isolated from the septic influent. Furthermore, our analysis of the aquifer's vulnerability using the DRASTIC method gives a low vulnerability index.

In conclusion, if the wells and septic systems are properly constructed as per their respective regulations and the recommendations given herein, the septic influent is considered isolated from the supply aquifer. Therefore, the minimum lot size for the proposed development is dictated by factors such as minimum distances between individual septic system and potable wells and the need for a sewage replacement area. Finally, the lot size must also meet the minimum size and set back requirements set forth by the Municipality. Based on these requirements, a draft development plan was prepared and is attached in **Appendix F**.

6.3 Impact on neighbouring pit operations

Lot 29 is bordered to the north by a sand pit. However, the pit exploitation only starts near the northeast corner of the said lot. This sand pit (Fillion Pit) is also bordered to the north by two (2) consecutive sand pit (Guindon and Saumure pit). It is our understanding that all three (3) operate or will operate under a Category 1 – Class A - Pit Below Water exploitation license as per the Ministry of Natural Resources' (MNR) Aggregate Resources Act and Regulations. The maximum exploitation depth is to the clay layer anticipated to be near elevations 66m. Dewatering to some degree occurs as part of the exploitation activities through drainage ditches.

Regulation governing pits requires that a minimum set back be establish between pit operations and a residential property is 30m. From our inspection of the property, the set back appears to be respected. Considering that the overburden sand is drained by drainage ditches and the general topography of the terrain, the anticipated maximum drawdown obtained would be near elevation 70.0m due to lack of slope. This elevation is near the existing elevation of the proposed lots. Any excavation below this depth would create ponds.

The majority of the drawdown in overburden soil occurs over short distances. In considering, the existing setbacks and that the pit operation is only to the northeast of Lot 29, any drawdown from the pit operations will be minimum across the proposed lots. The fact that the water table is still fairly high on the property supports this statement.

The proposed water supply of the proposed development will be obtained from the bedrock aquifer. The surficial overburden aquifer will not be used as a water supply for this development.

As stated herein, the flow direction of the overburden aquifer follows the genera slope of the existing terrain, which in our case is towards the south. Furthermore, the septic system will be construction in front portion of the lot. Therefore, there is minimal risk that septic influent would leach into the open pit area. In any case, considering the size of the lots (0.4 and 0.3 hectares), the septic influent would have been attenuated naturally by dilution.

Considering the above rationalities, the proposed non extraction development can be adequately serviced by a private well and septic system in a manner that will not impede the existing and proposed extraction operation of the neighbouring pit.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Proposed Lot Size

Based on the information presented herein, the lot size of both proposed lots are considered adequate to support a residential dwelling serviced by a private well and septic system in manner that will not impact the supply aquifer nor impede the neighbouring pit operations.

7.2 Septic System

The surficial overburden soil found across the property consists of 0.5m to 0.7m of peat underlined by a fine sand deposit and a high groundwater table. The groundwater table was measured at the interface of the peat/sand layer or at average depth of 0.5m below the existing ground surface.

Based on the soil and groundwater condition, the construction of a conventional Class-4 fully raised septic system is possible on the proposed lot. The system shall be constructed above the ground water table over the native sand once entire peat layer has been stripped from the footprint of the septic system. The septic system shall be designed using the percolation time of the imported sand and according to Section 8 of the Ontario Building Code, 1997.

The lot lize and soil type are suitable to attenuate the septic influent that will be generated by the septic system. The area is considered low density with resdiential development along along Indian Creek Road only. The existing neighbouring residences are serviced with potable water by drilled wells tapped within the overburden till or surficial bedrock aquifers, which are both adequately protected by a thick clay aquitard.

A minimum set back of 15m shall be respected between the new septic sytem and drilled well constructed on the new lots and from the existing septic system and wells on the adjacent property to the south. Considering the proposed lot size, this can be easily achieved as shown on the attached preliminary site plan.

7.3 Well Construction

This study has showed the existence of a suitable aquifer located within the overburden till and upper bedrock formation, which have sufficient yields to support a single-family dwelling. The aquifer is suitably protected by a thick clay aquitard and is not interconnected with surficial overburden groundwater tables.

Based on the information gathered through this study, it is recommended that the supply aquifer be obtained from the upper bedrock formation. Though, the till aquifer is considered adequate, there is less of a chance in obtaining low turbidity levels from a well tapped into the bedrock than an overburden till aquifer. In considering the above, we offer the following recommendations in relation to well design and construction.

1. All well shall be tapped in the upper portion of the bedrock. Depth to the bedrock aquifer is expected to be between 36m to 44m bgs in the area of the proposed development.

2. The well shall be drilled slowly using suitable equipment that will not interfere with the well's yield. Drilling too quickly using air rotary drilling method can reduce the well's yield. Precautions will be taken not to over drill wells into the bedrock, as the resulting yield will be low and water quality will likely be poor or un-potable.

3. All wells tapped in the bedrock formation shall be constructed using a watertight steel casing extended through the full depth of the overburden and set a minimum

of 1.0 m into the sound bedrock. The casing shall be extended to at least 40 cm above the highest point on ground surface within a three-meter radius of the proposed finish landscape.

4. The casing's annular space shall be sealed over its entire length from the bedrock to the surface to prevent impairment of the quality of the aquifer. The sealant material shall consist of high early strength cement grout or cement bentonite grout, which shall be allowed to set for at least 24 hours prior to performing any further drilling.

5. The wells shall be equipped with a submersible pump and a pit-less adapter as well as a baker cap to complete well heads to facilitate maintenance and to ensure sanitary conditions around the top of each well. The pump shall be located near the bottom of the well to ensure the maximum water reserve in the well.

6. Where possible, the wells shall be located up-gradient and at minimum distance of 15m from any septic field beds and a minimum distance of 10m from any other wells.

7. All wells shall be drilled by a licensed well contractor according to the recommendations given herein and in accordance with Ontario Regulation 903/90 as amended by Ontario Regulation 128/03.

7.4 Proposed Water Treatment

Based on the water quality obtained from the supply aquifer, the recommended water treatment should consist the following:

- An activated carbon filter to reduce the colour, organic nitrogen DOC and tannin/lignin levels. This will also eliminate the odour and foul taste in the water.

- A reverse osmosis system to reduce the dissolve solids, bicarbonates, alkalinity, sodium, fluorides levels. This will also prevent incrusted piping that may lead to bacterial growth in the system.

A pH neutraliser may be required to stabilise the pH level. In addition, manufacturers generally require a turbidity filter in order to protect the membranes of the reverse osmosis system.

In any case, the water should be tested on an individual basis prior to installing any water treatment system. Furthermore, it is important that any water treatment system be maintenance on a regular basis and in accordance with the manufacturer's recommendations to ensure that it is properly functioning and providing a safe drinking water.

We trust that this report will meet your requirements. Should you have any questions or comments, please contact the undersigned.

Yours truly,
Levac Robichaud Leclerc Associates Ltd.

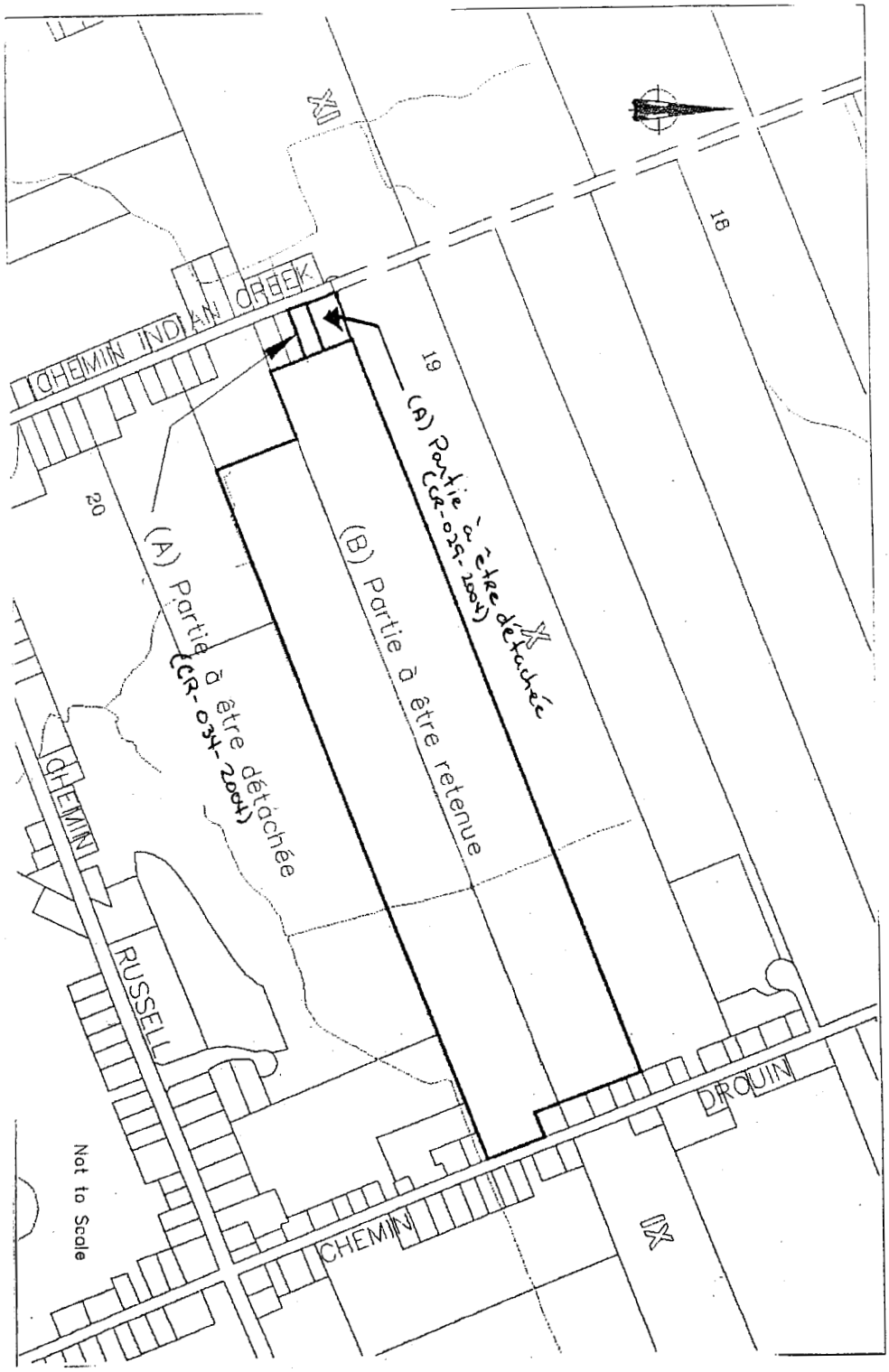
Mario Elie, Sr. Technologist

Marc-Antoine Laforte, P. Eng. Ph. D.

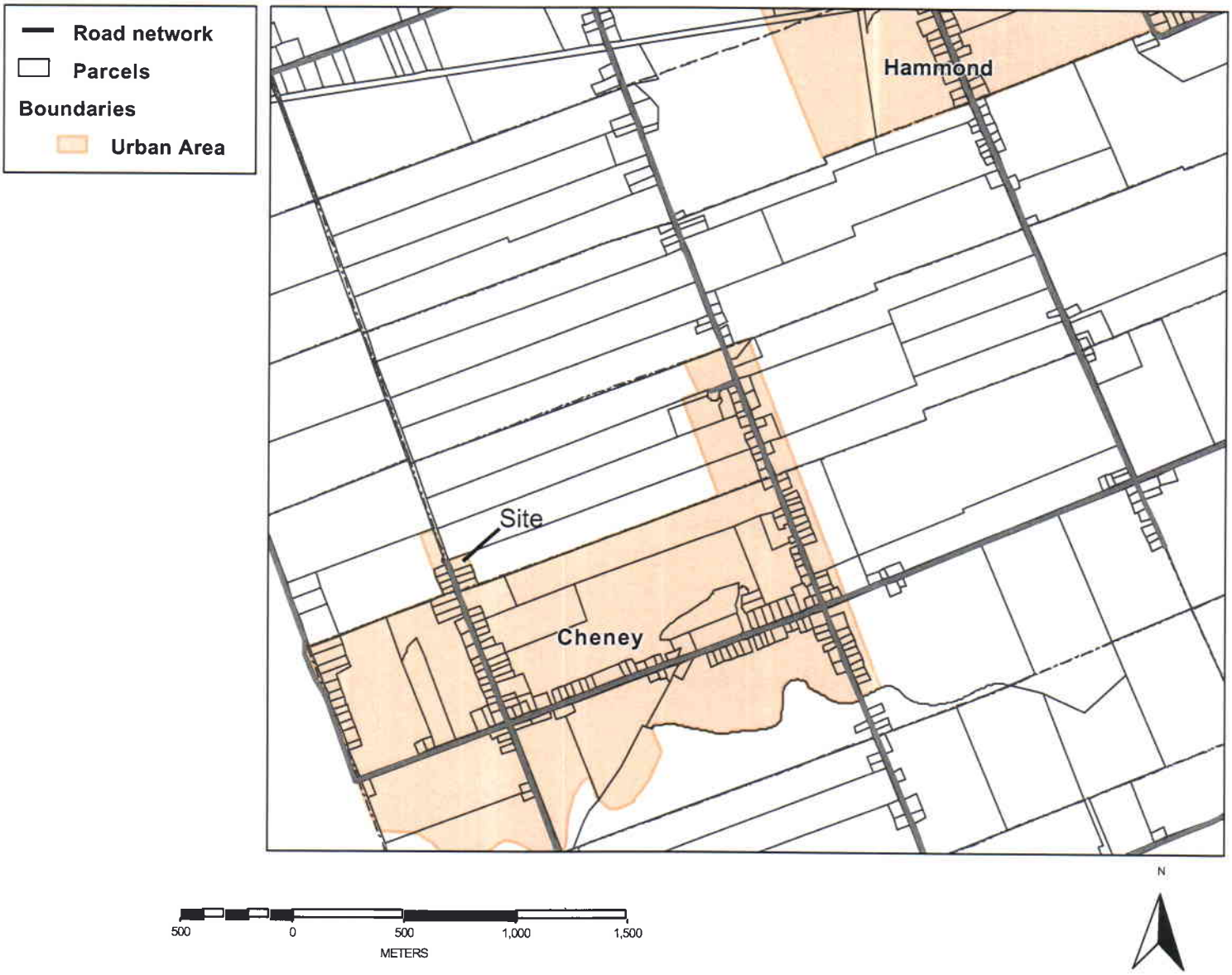
APPENDIX A

SITE LOCATION MAPS

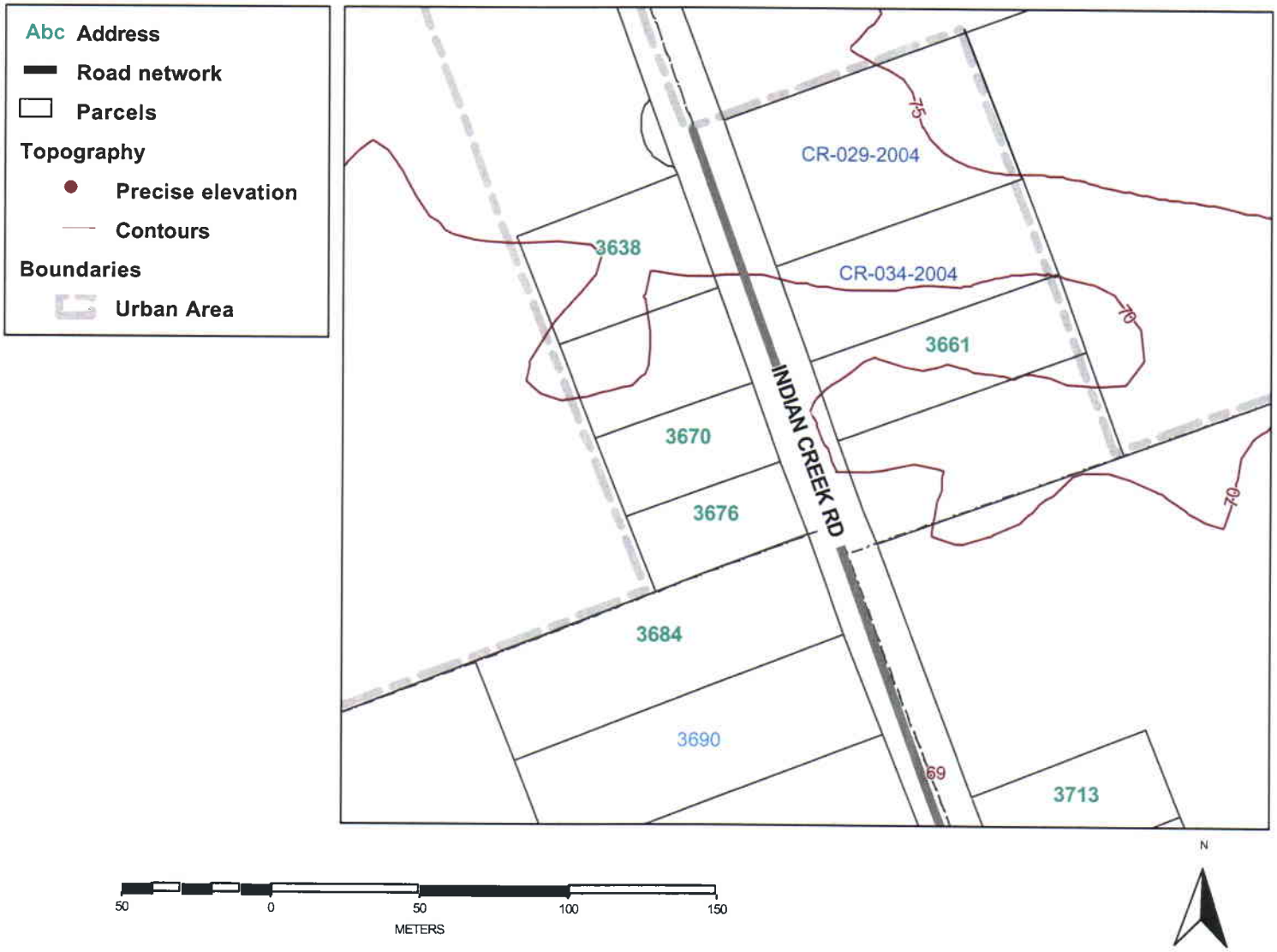
PROPOSED DEVELOPMENT



LOCATION MAP

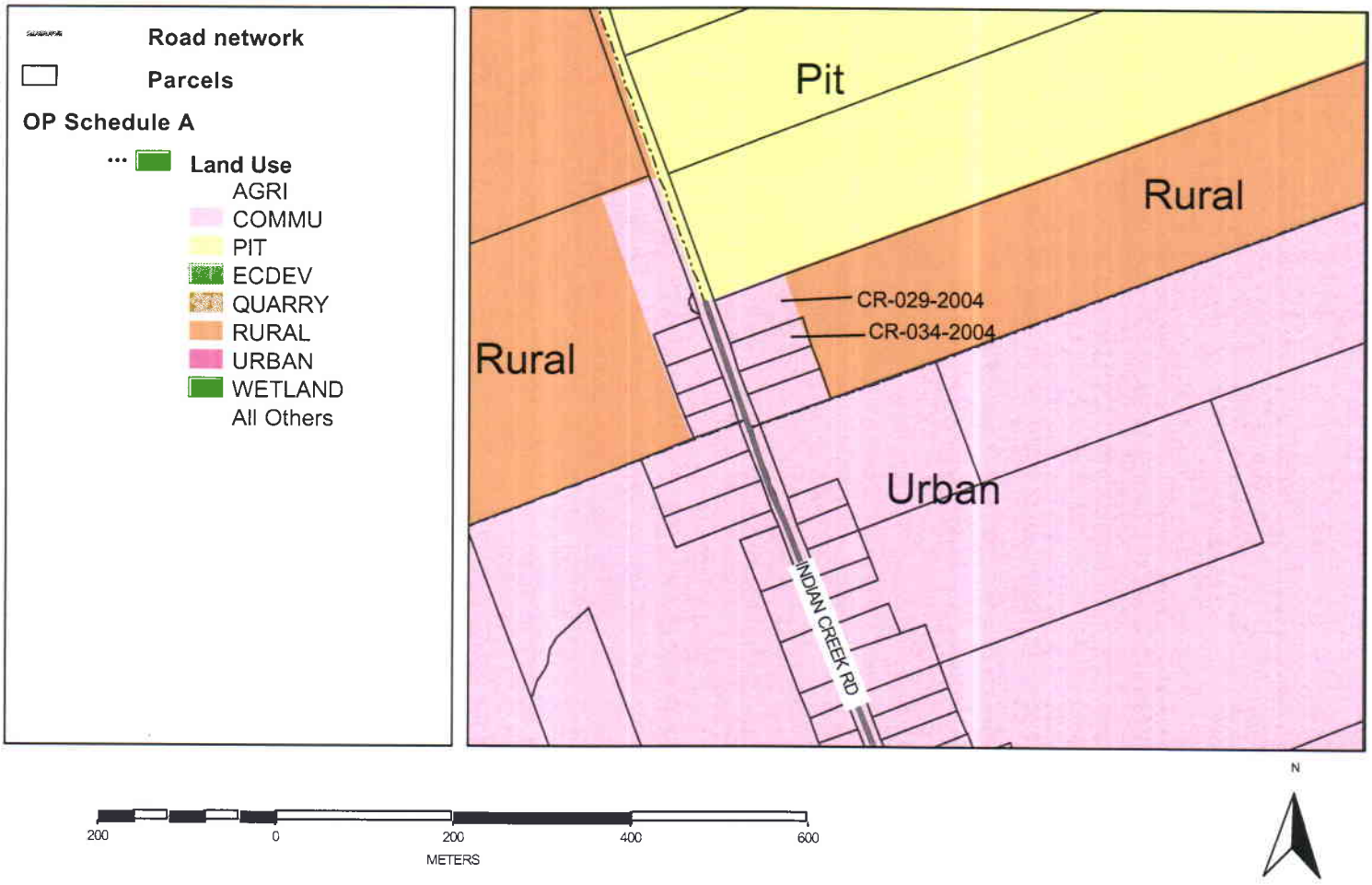


SITE LOCATION MAP



Land Uses

United Counties of Prescott & Russell



Topographic Map

United Counties of Prescott & Russell

Road network

Parcels

Topography

Precise elevation

Contours

Hydrography

Streams

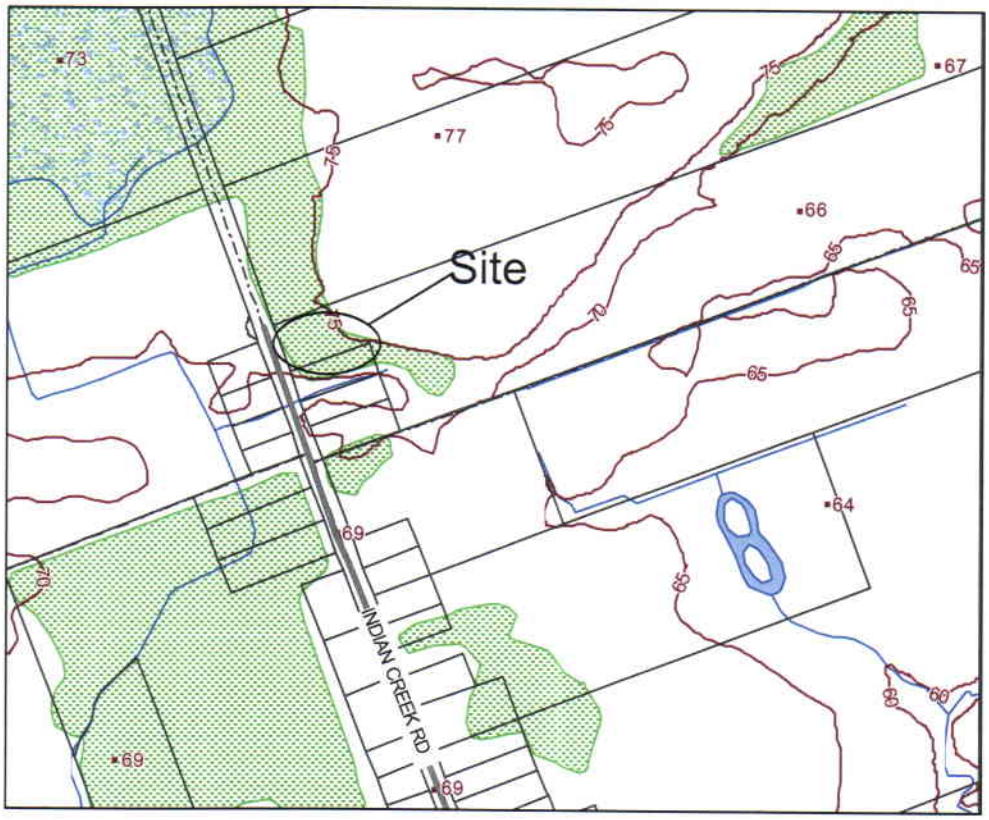
Rivers and Wetlands

River

Wetland

Vegetation

Wooded Area



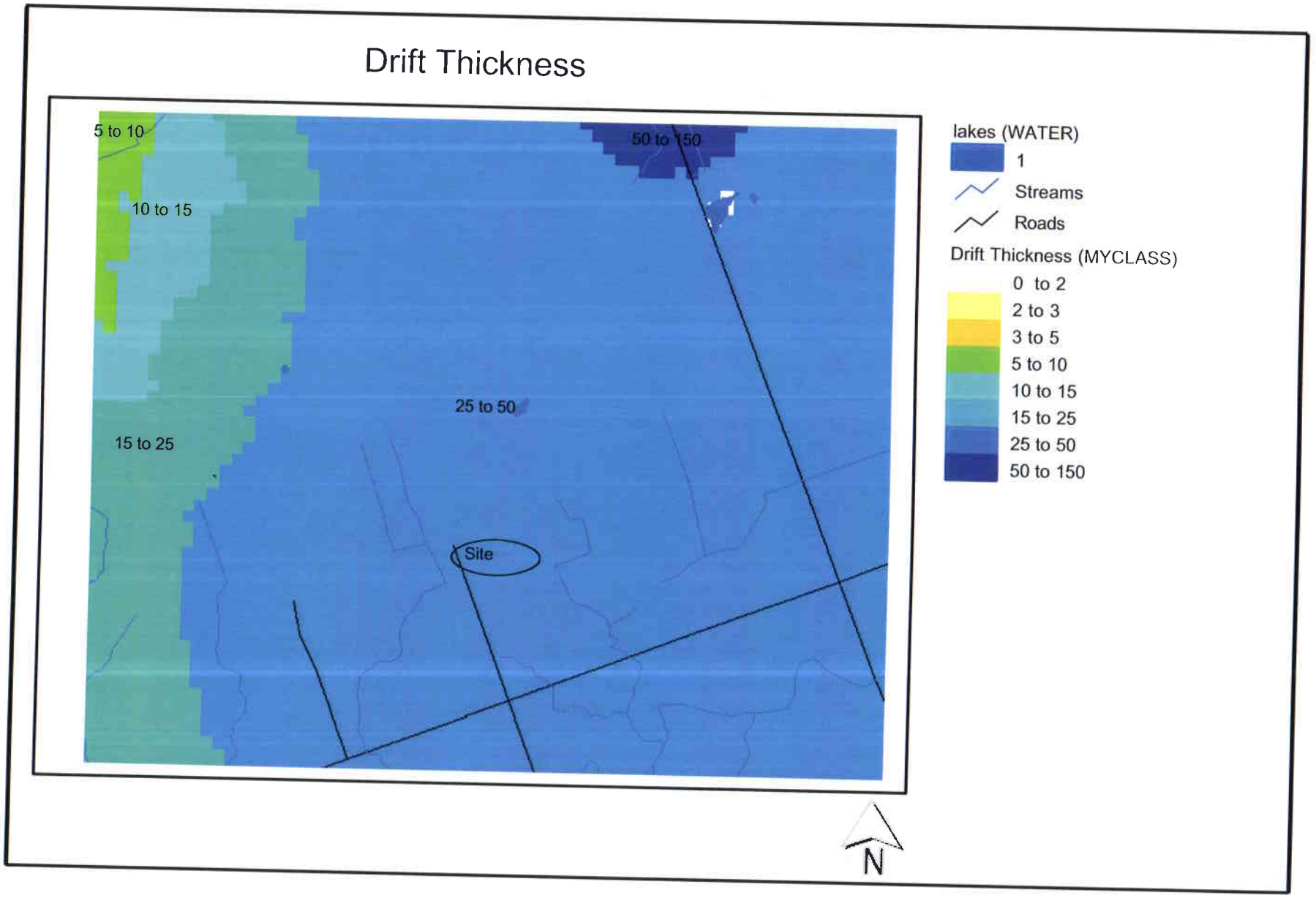
200 0 200 400 600

METERS

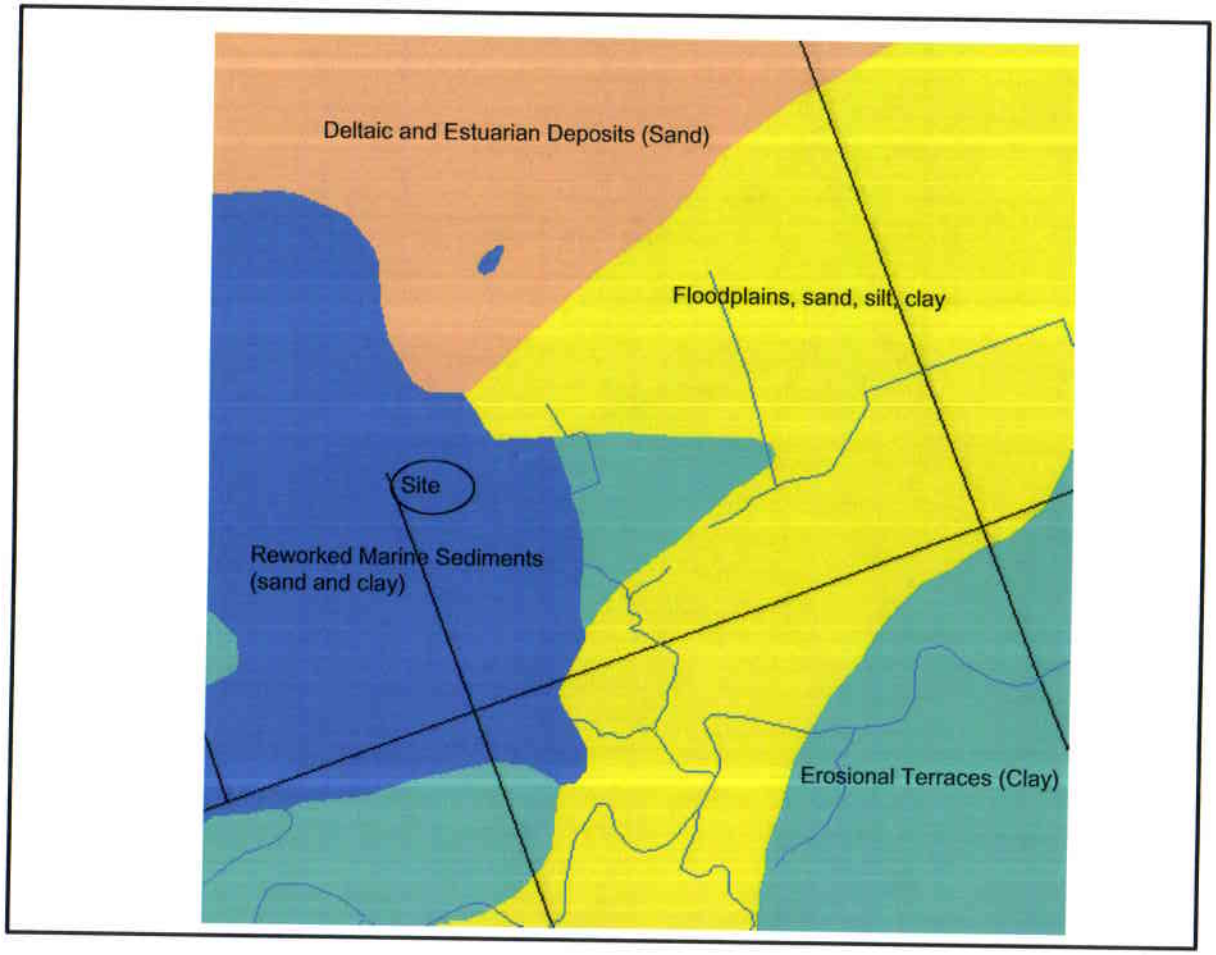
N

APPENDIX B

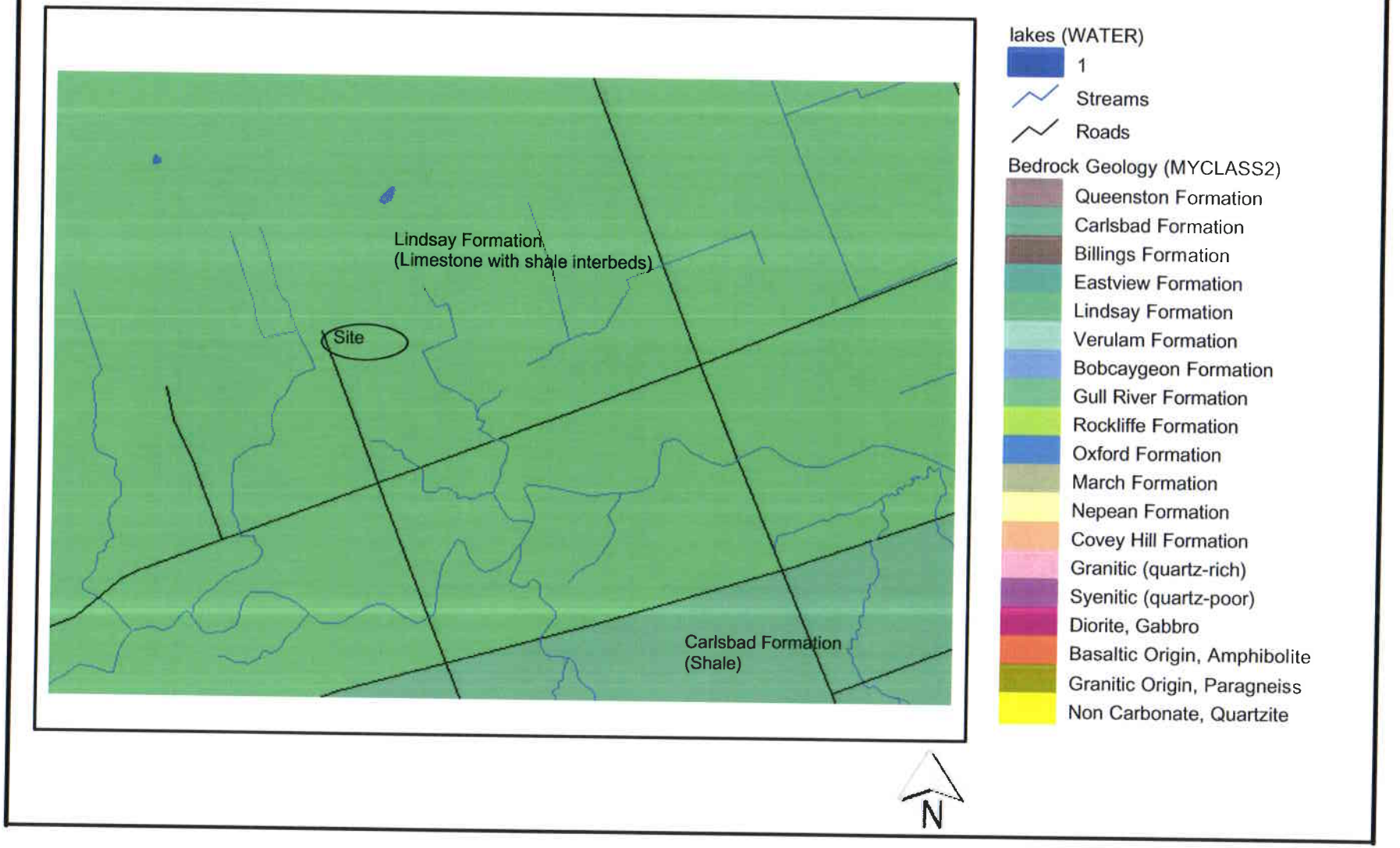
GEOLOGICAL AND HYDROGEOLOGICAL MAPS


Drift Thickness
5 to 10
10 to 15
15 to 25
25 to 50
50 to 150
Site
N
lakes (WATER)
1
Streams
Roads
Drift Thickness (MYCLASS)
0 to 2
2 to 3
3 to 5
5 to 10
10 to 15
15 to 25
25 to 50
50 to 150

Surficial Deposits



Bedrock Geology



APPENDIX C

MOEs WATER WELL RECORDS

Ontario Ministry of the Environment

Well Tag Number (Plate) A012122 (W) A012122

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: Roger | Last Name: KIRKwood | Mailing Address (Street Number/Name, RR, Lot, Concession): 3690 Indian Creek

County/District/Municipality: Clarence Rockland | Township/City/Town/Village | Province: Ontario | Postal Code: K0A 2A0 | Telephone Number (include area code): 613-880-2022

Address of Well Location (County/District/Municipality): Russell | Township: Clarence Rockland | Lot: 20 | Concession: 11

RR#/Street Number/Name: 3690 Indian Creek | City/Town/Village: Cheney | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 18 | Easting 475366 E | Northing 5028558 | Unit Make/Model: Magellan | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Yellow	Topsoil		Soft	0	3.75
blue	clay		Soft	3.75	35.66
grey	gravel		Packed	35.66	36.76
Grey	limestone		layered	36.76	41.14

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	36.7	2223
36.7	41.14	1555

Water Record

Water found at ___ Metres / Kind of Water

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free ☐ Other, specify

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	36.96
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		36.96	41.14

Test of Well Yield

Pumping test method: 1/2 HP sub

Pump intake set at - (metres): 33

Pumping rate - (litres/min): 50

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 13.89 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 32 metres

Recommended pump rate: 50 (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		11.70		13.89
1		12.29	1	12.57
2		12.65	2	13.43
3		12.93	3	12.06
4		13.60	4	11.79
5		13.08	5	11.61
10		13.44	10	11.33
15		13.56	15	11.32
20		13.61	20	11.28
25		13.66	25	11.27
30		13.70	30	11.26
40		13.76	40	11.26
50		13.77	50	11.25
60		13.85	60	11.25

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	20	Cement Grout	10 Bags

Method of Construction

☐ Cable Tool ☑ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

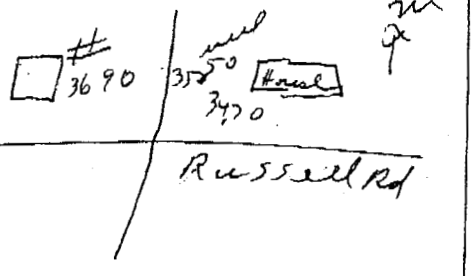
☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 12165

Date Well Completed: 2004 / 07 / 14

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered: 2004 / 07 / 14

Well Contractor/Technician Information

Name of Well Contractor: Gilles Bourgeois | Well Contractor's Licence No.: 1414

Business Address (street, number, city etc.): 5 A Bell

Name of Well Technician (last name, first name): Bourgeois, Roger | Well Technician's Licence No.: 2710

Signature of Technician/Contractor | Date Submitted: 2004 / 07 / 14

Ministry Use Only

Data Source | Contractor

Date Received | Date of Inspection

Remarks | Well Record Number

6506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

C.R.: 3870

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK	TRACT	SURVEY, ETC.	LOT
Russell	Clarence					19

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Charlebois Bernard	Cheney ON	DAY 22 MO mars YR 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Yellow	Sand		Soft	0	8
Blue	clay		Soft	8	90
Grey	gravel		Hard	90	110

DEC 20 '90

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
110	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS

CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	1.58	0	110
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	25	cement grout

PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☒ PUMP ☐ BAILER	7 GPM	1 HOURS 0 MINS

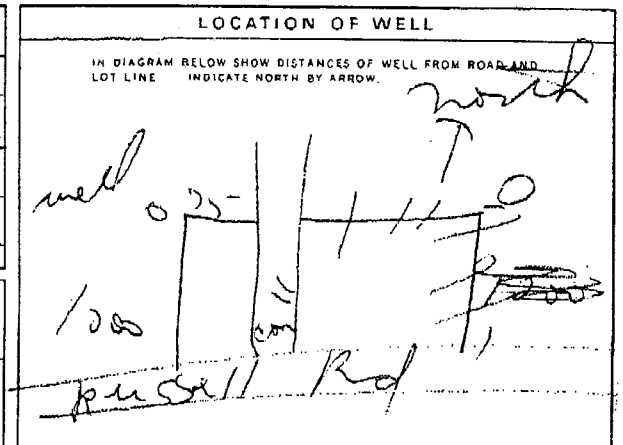
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING ☐ PUMPING ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
34 FEET	70 FEET	45 FEET	58 FEET	62 FEET	70 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	☐ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	90 FEET	5 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

48649

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED ☐ DEWATERING

WATER USE

☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ OTHER ☐ NOT USED

METHOD OF CONSTRUCTION

☐ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☒ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Gilles Bourgeois	1414
ADDRESS: St Albert Ont	
NAME OF WELL TECHNICIAN: Steve	WELL TECHNICIAN'S LICENCE NUMBER
SIGNATURE OF TECHNICIAN/CONTRACTOR: Gilles Bourgeois	SUBMISSION DATE: DAY 22 MO mars YR 91

OFFICE USE ONLY

FORM NO. 0506(11/78) FORM 9

Ontario of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: Russell
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Clarence
CON: 10
LOT: 19
C.N.: 36610
OWNER (SURNAME FIRST): Charlebois Bernard Cleary
ADDRESS:
DATE COMPLETED: DAY 22 MO March YR 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Yellow	Sand		SOFT	0	12
blue	Clay		Soft	12	115
grey	Gravel		Hard	115	119

WATER RECORD

R FOUND - FEET	KIND OF WATER		
8	☒ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS	

CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	1.58	0	119
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	21	Cement Grout

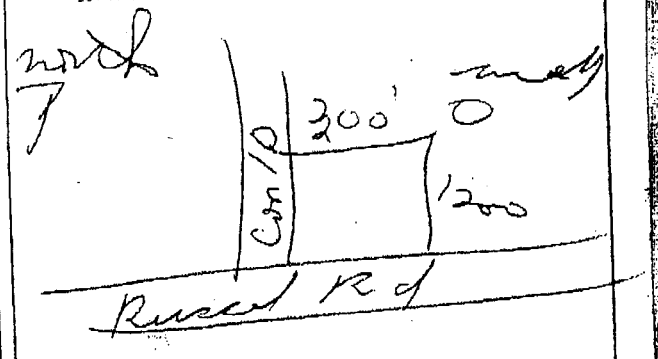
PUMPING TEST METHOD: ☒ PUMP ☐ BAILER
PUMPING RATE: 7 GPM
DURATION OF PUMPING: 1 HOURS ___ MINS
WATER LEVELS DURING: ☒ PUMPING ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
36 FEET	85 FEET	48 FEET	55 FEET	80 FEET	85 FEET

IF FLOWING, GIVE RATE: ___ GPM
PUMP INTAKE SET AT: ___ FEET
WATER AT END OF TEST: ☐ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 90 FEET
RECOMMENDED PUMPING RATE: 5 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



48650

DRILLERS REMARKS:

FINAL STATUS OF WELL: ☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED ☐ DEWATERING

WATER USE: ☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF CONSTRUCTION: ☐ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☒ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR:
NAME OF WELL CONTRACTOR: Gilles Bourgeois
WELL CONTRACTOR'S LICENCE NUMBER: 1414
ADDRESS: St Albert
NAME OF WELL TECHNICIAN:
WELL TECHNICIAN'S LICENCE NUMBER:
SIGNATURE OF TECHNICIAN/CONTRACTOR:
SUBMISSION DATE: DAY 22 MO March YR 90

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FORM NO. 0506 (11/86) FORM 9

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CLARENCE TOWNSHIP																	
	10	020	56-03623	480192-5028462		1988/10	1414	06	FR	0134	12	90	15	1 :0	DO		--- YLLW SAND SOFT 0008 BLUE CLAY SOFT 0122 GREY GRVL HARD 0129 GREY ROCK HARD 0136
CON	10	019	56-03945	479975-5029033		1990/07	1517	06	UK	0128	40	220	18	:	DO		BRWN LOAM SNDY 0005 BRWN LMSN ROCK 0130
CON	10	019	56-03868	479975-5029033		1990/03	1414	06	FR	0118	36	85	7	1 :0	DO		--- YLLW SAND SOFT 0012 BLUE CLAY SNDY SOFT 0115 GREY GRVL HARD 0118
CON	10	019	56-03944	479975-5029033		1990/06	1517	06	FR	0160		150	14	:	DO		GREY HPAN STNS CLAY 0009 GREY LMSN ROCK 0040 BRWN LMSN ROCK 0164
CON	10	019	56-04189	479975-5029033		1991/05	6006	06	FR	0121	40	60	30	2 :0	DO		--- GREY CLAY SOFT 0080 BLUE CLAY SAND SOFT 0085 BLCK GRVL SAND SOFT 0117 BLCK GRVL HARD 0119 BLCK SHLE SOFT 0122
CON	10	019	56-04615	479975-5029033		1993/11	6587	06	SU	0130	33	100	15	1 :0	DO		--- BRWN SAND SOFT 0017 GREY CLAY SAND SOFT 0021 GREY CLAY SOFT 0060 GREY CLAY SAND SOFT 0095 GREY SAND SOFT 0118 GREY GRVL SOFT 0130 GREY SHLE PORS 0132
CON	10	020	56-03892	480192-5028462		1990/06	1517	07	FR	0135	50	75	16	1 :0	DO		--- BRWN SAND 0025 GREY CLAY 0120 BRWN SAND GRVL 0134 BRWN SHLE 0136
CON	10	020	56-02905	479599-5028499	230	1984/05	2351	06	FR	0125	45	75	15	1 :50	DO		--- YLLW SAND 0024 BLUE CLAY 0118 BLCK SHLE 0125
CON	10	020	56-02932	480299-5028299	200	1984/08	1414	06	FR	0139	30	65	25	1 :0	DO		--- YLLW LOAM SOFT 0015 BLUE CLAY SOFT 0098 GREY SAND GRVL HARD 0137 BLCK SHLE SOFT 0140
CON	10	020	56-02982	480192-5028462		1984/11	1414	06	FR	0118	27	90	10	1 :0	DO		--- RED CLAY SOFT 0018 BLUE CLAY SOFT 0110 GREY GRVL HARD 0115 BLCK ROCK HARD 0119
CON	10	020	56-03030	480192-5028462		1985/05	1414	06	FR	0135	30	65	20	1 :0	DO		--- YLLW LOAM SOFT 0006 RED CLAY SOFT 0019 BLUE CLAY SOFT 0130 BLCK GRVL SOFT 0136 BLCK SHLE SOFT 0139
CON	10	020	56-03032	480192-5028462		1985/05	2351	06	FR	0126	36	91	25	1 :0	DO		--- BRWN SAND 0005 RED CLAY 0027 BLUE CLAY 0116 BLCK GRVL SAND 0125 BLCK SHLE 0126
CON	10	020	56-03893	480192-5028462		1990/05	1517	07	SU	0133	60	130	10	1 :0	DO		--- BRWN SAND 0020 GREY CLAY 0085 BLUE CLAY 0100 GREY GRVL SAND 0120 GREY GRVL 0130 BRWN SHLE 0135
CON	10	020	56-05604	480192-5028462		2001/09	6799	48	FR	0010		18	3	2 :30	DO		--- BRWN LOAM 0001 YLLW SAND 0003 WHIT SAND 0008 GREY CLAY 0025
CON	10	020	56-05263	480192-5028462		1998/06	1414	08	FR	0147	30	90	20	1 :0	DO		--- BRWN TILL SOFT 0020 BRWN SAND SOFT 0022 BLUE CLAY SOFT 0120 GREY SAND PCKD 0145 GREY GRVL PCKD 0150
CON	10	020	56-00260	479590-5028195	225	1957/10	1526		FR	0200	44	67	3	1 :0	DO		--- PRDR 0052 BLCK SHLE 0214
CON	10	020	56-04051	480192-5028462		1991/02	6006	06	FR	0170	40	60	10	4 :0	DO		--- GREY CLAY SAND SOFT 0090 GREY GRVL SOFT 0120 GREY SHLE PORS HARD 0135 GREY LMSN HARD 0175

MUNICIPALITY CONCESSION STC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... CLARENCE TOWNSHIP																	
CON	10	020	56-04052	480192~5028462		1991/02	6006	06	FR	0140	35	70	20	2 :0	DO		--- YLLW SAND SOFT 0007 GREY CLAY SAND SOFT 0040 BLUE CLAY SOFT 0130 BLCK GRVL SAND SOFT 0135 BLCK SHLE HARD 0140
CON	10	020	56-04333	480192~5028462		1992/07	6006	07	FR	0102	40	165	5	1 :30	DO		--- BRWN SAND SOFT 0003 RED CLAY SOFT 0018 GREY BLDR SOFT 0023 GREY GRVL SOFT 0100 BLCK SHLE PORS 0102 BLCK SHLE HARD 0170
CON	10	020	56-04066	480192~5028462		1991/05	6006	06	FR	0141	25	35	20	2 :0	DO		--- BRWN LOAM SOFT 0002 YLLW SAND CLAY SOFT 0009 GRVY CLAY SAND SOFT 0085 GREY GRVL SAND SOFT 0139 BLCK GRVL SOFT 0141
CON	10	020	56-04188	480192~5028462		1991/05	6006	06	FR	0132	45	65	30	2 :0	DO		--- GREY CLAY SOFT 0080 BLUE CLAY SAND SOFT 0095 BLCK GRVL HARD 0105 BLCK GRVL SAND SOFT 0129 BLCK SHLE SOFT 0132
CON	10	020	56-04879	480192~5028462		1994/07	1414	06	FR	0122	35	125	25	1 :0	DO		--- BRWN SAND PCKD 0015 GREY CLAY SAND SOFT 0100 GREY SAND GRVL LOOS 0121 BLCK SHLE SOFT 0125
CON	10	020	56-04053	480192~5028462		1991/02	6006	06	FR	0120	35	60	20	4 :0	DO		--- GREY CLAY SAND SOFT 0080 GREY CLAY SOFT 0095 GREY GRVL SAND SOFT 0108 GREY SHLE PORS HARD 0113 GREY LMSN ROCK HARD 0120
CON	10	020	56-05305	480192~5028462		1998/09	1517	06	UK	0132	32	45	15	6 :	MN		--- RED CLAY 0068 BRWN CLAY 0060 BLUE CLAY 0095 GREY SAND 0106 GREY GRVL SAND 0108 BLCK LMSN ROCK 0135
CON	10	020	56-04317	480192~5028462		1992/07	1414	06	SU	0128	40	80	10	1 :0	DO		--- BRWN SAND PCKD 0005 GREY CLAY SOFT 0108 GREY GRVL LOOS 0122 BLCK SHLE SOFT 0130
CON	10	021	56-02850	479799	225	1983/10	1504	06	FR	0106	28	80	20	1 :0	DO		--- YLLW SAND 0006 BRWN CLAY 0020 BLUE CLAY 0060 GREY SAND 0070 GREY PGVL 0100 GREY CGVL 0106
CON	10	021	56-02179	480100	200	1978/08	1414	06	FR	0138	45	100	10	1 :0	DO		--- PRDG 0012 BLUE CLAY SOFT 0132 GREY GRVL HARD 0138 GREY STNS HARD 0140
CON	11	019	56-04599	478949~5028663		1993/10	1414	06	SU	0130	30	50	10	1 :0	DO		--- BRWN SAND PCKD 0008 GREY CLAY SOFT 0020 GREY MEAN BLDR SOFT 0101 GREY SHLE SOFT 0135
CON	11	019	56-05299	478949~5028663		1998/09	1414	08	FR	0121	30	110	12	1 :0	DO		--- YLLW SAND 0012 BLUE CLAY 0110 GREY GRVL 0121
CON	11	019	56-03413	478949~5028663		1987/08	2351	06	FR	0138	65	170	1	0 :25	DO		--- BRWN SAND 0009 BLCK GRVL SAND 0138 BLCK SHLE 0177
CON	11	019	56-03867	478949~5028663		1990/03	1414	06	UK	0110	34	70	7	1 :0	DO		--- YLLW SAND SOFT 0008 BLUE CLAY SNDY SOFT 0090 GREY GRVL HARD 0110
CON	11	020	56-04963	479169~5028078		1994/11	6006	07	FR	0118	30	120	8	2 :0	DO		--- RED CLAY SOFT 0012 GREY CLAY SOFT 0070 GREY GRVL SAND SOFT 0118 BLCK SHLE HARD 0128
CON	11	020	56-01492	479420	230	1973/05	1517	05	FR	0126	FLW	45	10	1 :0	DO		---
CON	11	020	56-05169	479169~5028078		1997/08	1414	08	FR	0124	50	128	20	1 :0	DO		--- BRWN SAND PCKD 0012 GREY CLAY SOFT 0090 GREY GRVL BLDR DNSE 0120 GREY SHLE LMSN LYRD 0128
CON	11	020	56-03210	479169~5028078		1965/10	2351	06	FR	0128	70	85	17	1 :0	DO		--- BRWN LOAM 0007 BLUE CLAY 0122 BLCK GRVL 0127 GREY LMSN 0128

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... CLARENCE TOWNSHIP																	
CON	11	020	56-03275	479169-5028078		1985/12	4006	06	FR	0068	15	60	45	6 :0	DO		--- GREY CLAY SAND STNS 0065 GREY GRVL SAND STNS 0072 GREY CLAY SILT STNS 0090
CON	11	020	56-05692	478679 5028408		2002/06	1119	08						:	DO		--- RED SAND 0007 BRWN CLAY 0033 SAND GRVL BLDR 0135 BLCK SHLE 0292 GREY LMSN 0402
CON	11	020	56-04549	479169-5028078		1993/07	1517	07	FR	0125	40	60	25	1 :0	DO		--- BRWN SAND 0017 GREY CLAY 0080 BLUE CLAY 0107 GREY GRVL SAND 0125 BRWN SHLE 0128
CON	11	020	56-05409	479169-5028077		1999/12	6799	48	FR	0014		9	6	2 :	DO		--- GREY CLAY 0030
CON	11	020	56-05764	478826 5028027		2002/11	1119	06	UK	0215	45	280	5	:	DO		--- GREY CLAY 0047 GREY SAND BLDR 0130 BLCK SHLE 0253 BRWN SHLE 0280 GREY LMSN 0301
CON	11	020	56-03067	479169-5028078		1985/06	1414	06			35	120	9	1 :0	DO		--- BRWN LOAM SOFT 0010 BLUE CLAY SOFT 0100 BLUE CLAY GRVL SOFT 0131 BLCK ROCK HARD 0142
CON	11	021	56-02938	479699 5028699	225	1982/10	4550	06	FR	0126	10	25	10	1 :0	DO		--- PRDG 0020 BLUE CLAY SOFT 0090 GREY GRVL SAND LOOS 0124 GREY LMSN HARD 0128
CON	11	021	56-02283	479599 5027799	200	1979/09	1414	06	FR	0126	24	100	8	1 :0	DO		--- PRDG 0018 BLUE CLAY SOFT 0105 GREY CGVL CSND 0126 BLCK STNS HARD 0128
CON	11	021	56-01718	479400 5027750	220	1975/04	1414	05	FR	0134	41	65	10	1 :0	DO		--- RED CLAY SOFT 0015 BLUE CLAY SOFT 0099 GREY GRVL HARD 0131 BLCK SHLE HARD 0135
CON	11	021	56-01661	479100 5027850	225	1974/10	1558	06	FR	0145	40	75	15	1 :0	DO		--- BRWN SAND 0020 BLUE CLAY 0100 BLCK GRVL 0110 BLCK SHLE 0150

TABLE

WATER WELL RECORDS

TOTAL WELLS DRILLED	WELLS ENDING IN: OVER-BURDEN	WELLS ENDING IN: BED-ROCK	KIND OF WATER: FRESH	KIND OF WATER: SALT	KIND OF WATER: SULPH	KIND OF WATER: MIN-BRAL	KIND OF WATER: DRY HOLE	KIND OF WATER: DOM. OR STOCK	WATER USE, ETC.: IRRIG-ATION	WATER USE, ETC.: INDUS-TRIAL	WATER USE, ETC.: COMM-ERCIAL	WATER USE, ETC.: MUNI-CIPAL	WATER USE, ETC.: PUBLIC SUPPLY	WATER USE, ETC.: COOL/ AIR COND	WATER USE, ETC.: NOT USED	WATER USE, ETC.: TEST HOLE	WATER USE, ETC.: ABAN-DONED
45	11	33	35	0	4	0	0	44	0	0	0	1	0	0	0	3	0

- The location of these wells are either estimated from the centroid of the lot or they are uncertain

APPENDIX D

SUPPLY AQUIFER CHEMISTRY
LABORATORY "CERTIFICATE OF ANALYSIS"

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd.
Ottawa ON K1G 4J8
Phone: (613) 731-9577
Fax: (613) 731-9064
Toll Free: 800-7491947
email: paracel@paracellabs.com

Order #: K6061

Certificate of Analysis

Levac Robichaud Leclerc Associates Ltd.

1-2884, Chamberland Street
Rockland, ON K4K 1M6
Attn: Mr. Mario Elie

Phone: (613)-446-7777
Fax: (613)-446-1427

Client PO:
Project: **04590**
Custody #: **26310**

Report Date: 12-Jan-2005
Order Date: 06-Jan-2005

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
K6061.1	CN 3670

Approved By: _____ Dale Robertson, B.Sc.
Laboratory Director

Paracel Laboratories Ltd.

Order #: K6061

Certificate of Analysis

Report Date: 12-Jan-2005
Order Date: 06-Jan-2005

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590**

Analysis Summary Table

Analysis	Method Reference/Description
Metals	EPA 200.8 - ICP-MS
Alkalinity	EPA 310.1 - titration
Ammonia, total	MOE SDNP-E3223A - colourimetric
Anions	EPA 300.1 - ion chromatography
Colour	based on SM17 2120 - spectrometer
Conductivity	EPA 120.1 - electrode
Hardness	Calculation
pH	EPA 150.1 - pH probe
Phenols, total	MOE ROPHEN-002BC2.1 - distillation, colourimetric
Solids, dissolved	SM17 2540C - filtration, gravimetric
Sulfide	SM17 4500-S.E. - colourimetric
Total Kjeldahl Nitrogen	MOE RTNP-E3180A - digestion, colourimetric
Turbidity	SM17 2130B - spectrometer
DOC	E3247B - combustion IR
Tannin & Lignin	SM20 5550B
E. Coli	Subcontracted
Heterotrophic Plate Count	Subcontracted
Total/Fecal Coliforms	Subcontracted

n/a: not applicable
MDL: Method Detection Limit

Paracel Laboratories Ltd.

Order #: K6061

Certificate of Analysis

Report Date: 12-Jan-2005
Order Date: 06-Jan-2005

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590**

Matrix: Water

Parameter	Sample ID: / Sample Date: / MDL/Units	CN 3670 / 05/01/2005 / K6061.1
Calcium	0.2 mg/L	1.2
Iron	0.1 mg/L	< 0.1
Magnesium	0.2 mg/L	3.0
Manganese	0.05 mg/L	< 0.05
Potassium	0.2 mg/L	6.8
Sodium	0.2 mg/L	320
Alkalinity	5 mg/L	710
Ammonia, total as N	0.01 mg/L	0.11
Chloride	1 mg/L	37
Fluoride	0.1 mg/L	2.7
Nitrate as N	0.1 mg/L	< 0.1
Nitrite as N	0.05 mg/L	< 0.05
Sulphate	1 mg/L	< 1
Color	1 TCU	89
Conductivity	5 uS/cm	1,300
Hardness, CaCO3	1 mg/L	15
pH	0.05 pH units	8.87
Phenols	0.001 mg/L	0.020
Solids, dissolved	1 mg/L	1,000
Sulfide	0.02 mg/L	< 0.02
Total Kjeldahl Nitrogen	0.1 mg/L	2.7
Turbidity	0.1 NTU	0.4
DOC	0.5 mg/L	17
Tannin/Lignin	0.1 mg/L	2.6
Fecal Coliforms	1 /100mL	< 1
Total Coliforms	1 /100mL	< 1
E. Coli	1 /100mL	< 1
Heterotrophic Plate Count	2 /mL	> 500

Paracel Laboratories Ltd.

Order #: K6061

Certificate of Analysis

Report Date: 12-Jan-2005
Order Date: 06-Jan-2005

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590**

QA/QC Results

	Blank	Spike (QC Limits)	Duplicate	
Manganese	< 0.05 mg/L	106% (70 - 130%)	< 0.05	< 0.05
Alkalinity	< 5 mg/L	n/a	< 5	< 5
Ammonia, total as N	< 0.01 mg/L	112% (75 - 125%)	0.11	0.11
Chloride	< 1 mg/L	105% (75 - 125%)	37	37
Fluoride	< 0.1 mg/L	95% (75 - 125%)	2.5	2.7
Nitrate as N	< 0.1 mg/L	108% (75 - 125%)	< 0.1	< 0.1
Nitrite as N	< 0.05 mg/L	94% (75 - 125%)	< 0.05	< 0.05
Sulphate	< 1 mg/L	104% (75 - 125%)	< 1	< 1
Color	< 1 TCU	n/a	88	89
Conductivity	< 5 uS/cm	n/a	1,300	1,300
pH	n/a	n/a	7.75	7.85
Phenols	< 0.001 mg/L	86% (75 - 125%)	< 0.001	< 0.001
Solids, dissolved	< 1 mg/L	n/a	980	1,000
Sulfide	< 0.02 mg/L	96% (75 - 125%)	< 0.02	< 0.02
Total Kjeldahl Nitrogen	< 0.1 mg/L	97% (75 - 125%)	2.6	2.7
Turbidity	< 0.1 NTU	n/a	0.4	0.4
DOC	< 0.5 mg/L	93% (70 - 130%)	2.0	2.0

APPENDIX E

RECEIVING AQUIFER NITRATE LEVELS
LABORATORY "CERTIFICATE OF ANALYSIS"

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd.
Ottawa ON K1G 4J8
Phone: (613) 731-9577
Fax: (613) 731-9064
Toll Free: 800-7491947
email: paracel@paracellabs.com

Order #: J5978

Certificate of Analysis

Levac Robichaud Leclerc Associates Ltd.

1-2884, Chamberland Street
Rockland, ON K4K 1M6
Attn: Mr. Mario Elie

Phone: (613)-446-7777
Fax: (613)-446-1427

Client PO:
Project: **04590 Indian Creek**
Custody #: **14631**

Report Date: 30-Dec-2004
Order Date: 24-Dec-2004

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
J5978.1	#1

Approved By: Mark Foto for Dale Robertson, B.Sc.
Laboratory Director

Certificate of Analysis

Report Date: 30-Dec-2004
Order Date: 24-Dec-2004

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590 Indian Creek**

Analysis Summary Table

Analysis	Method Reference/Description
Anions	EPA 300.1 - ion chromatography

n/a: not applicable
MDL: Method Detection Limit

Certificate of Analysis

Report Date: 30-Dec-2004
Order Date: 24-Dec-2004

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590 Indian Creek**

Matrix: Water

	Sample ID:	#1
	Sample Date:	23/12/2004
Parameter	MDL/Units	J5978.1
Nitrate as N	0.1 mg/L	0.1
Nitrite as N	0.05 mg/L	< 0.05

Certificate of Analysis

Report Date: 30-Dec-2004
Order Date: 24-Dec-2004

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590 Indian Creek**

QA/QC Results

	Blank	Spike (QC Limits)	Duplicate	
Nitrate as N	< 0.1 mg/L	97% (75 - 125%)	< 0.1	< 0.1
Nitrite as N	< 0.05 mg/L	87% (75 - 125%)	< 0.05	< 0.05

APPENDIX F

PRELIMINARY DEVELOPMENT PLAN

PROJECT

HYDROGEOLOGICAL STUDY & TERRAIN ANALYSIS
PART OF LOT 19 & 20, CONC. 10
GOEGRAPHIC TOWNSHIP OF CLARENCE
NOW CITY OF CLARENCE–ROCKLAND

DRAWING TITLE

PRELIMINARY SITE PLAN
SCALE:1:600

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

ROCKLAND, ON
TEL: (613) 446–7777

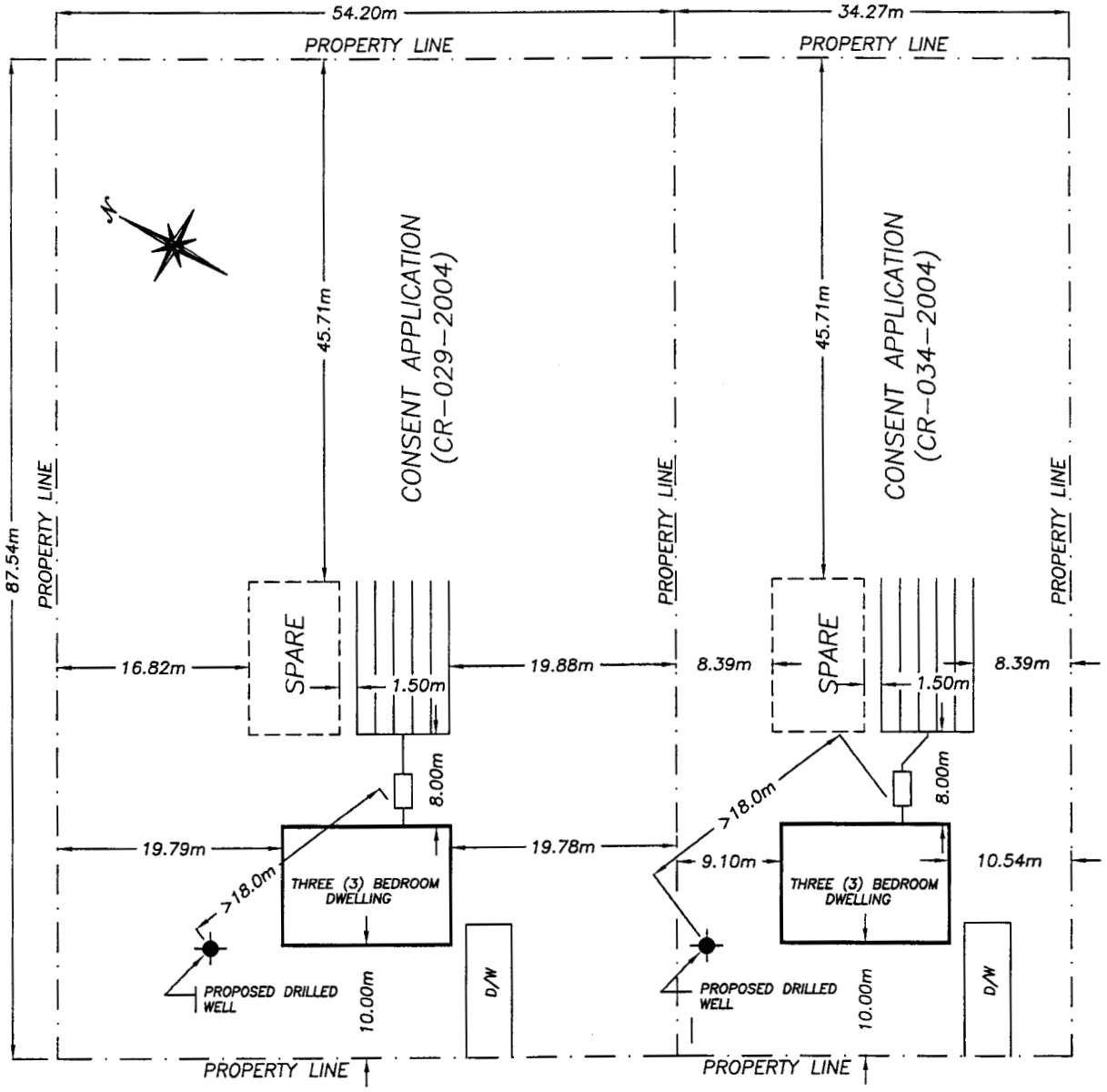
GATINEAU, QUE
TEL: (819)663–1639

HAWKESBURY, ON
TEL: (613) 632–5105

CLIENT

Mr. BERNARD CHARLEBOIS

DATE	FILE	DWG No.
JAN. 2005	04590	04590–01



LEVAC ROBICHAUD LECLERC ASSOC. LTD/LTÉE

REÇU

0 6 AVR. 2005

CITÉ CLARENCE-ROCKLAND

1-2884, rue Chamberland Street
Rockland (Ontario), Canada, K4K 1M6

Telephone/Téléphone: (613)446-7777
Télécopieur/Fax: (613)446-1427

Date: Apr 05 2005

TÉLÉCOPIE	FAX TRANSMISSION SHEET

To/À: Tim Blair

Firm:
Compagnie: Clarence-Rockland

Fax No:
Votre télécopieur: 728-6012
+ 446-1497

Your file Ref:
Votre # Dossier: Charlebois
Consent

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD
ASSOCIÉS LTÉE

Project Management and Consulting Engineers/Gérants de projets et Ingénieurs conseils

Mario Élie

E-mail: nlevac@irl.ca Fax:(613)446-1427

1-2884 Chamberland St.	1 rue Main St (Suite 200)	170 Broadway St.
Rockland, ON	Hawkesbury, ON	Gatineau, QC
K4K 1M6	K6A 2S2	J8P 3V3
(613)446-7777	(613)632-5105	(819)663-1539

Notre Dossier/Our File
Ref: 04590

Description:

Supplemental Info as requested

Regards.

Copies to / copies à:

cc: Denis Lacelle, Agent — No: 613-632-1186
cc: Barclay Comark, SRC — No: 613-984-2872
cc: Tim Blair, Clarence-Rockland — No: 613-728-6012
cc: Ashley Rizzi, Eastern Valley — No: 613-692-1507
Bernard Charlebois, owner — By Hand

Number of pages including cover page:
Nombres de pages incluant l'introduction: 17

Original to follow / Original suivra yes/oui X no/non ___

If you do not receive all pages, please contact us as soon as possible.
Si vous ne recevez pas toutes les pages, veuillez nous en informer le plus rapidement possible.

THANK YOU/MERCI

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD
ASSOCIÉS LTÉE

Project Managers and Consulting Engineers/Gérants de projets et Ingénieurs conseils

Our file: 04590

April 01, 2005

Mr. Bernard Charlebois
3595, Indian Creek Road
Bourget, Ontario K0A 2A0

RE: Hydrogeological Study & Terrain Analysis – Supplemental Information
Consent Applications
CR-029-2004 & CR-034-2004
Lots 19 & 20, Concession 10
Geographic Township of Clarence
Now City of Clarence-Rockland

In response to South Nation Conservation's (SNC) review of our Hydrogeological Study for the above referenced consent applications, we offer the following response to their comments. The following letter report should be read conjunctly with our original Hydrogeological Study & Terrain Analysis report dated January 2005.

1- Groundwater Quality

The owner of C.N. 3670 Indian Creek Road was informed of the bacterial contamination and has since disinfected his well. A subsequent water analysis was collected on March 23, 2005 and tested for HPC. The results showed that the HPC levels are now within the Ontario Drinking Water Standards (ODWS); 140 count/mL versus the 500 count/mL guideline. The laboratory Certificate of Analysis is attached to this letter.

SNC requested that the local medical officer of health provide recommendations and comments regarding the fluoride levels. Our discussion and correspondence with the Eastern Ontario Health Unit (Sylvain Diotte, Part VIII Program Coordinator) revealed that they hold no objections in approving both consent applications despite the marginally exceeding fluoride levels. The fluoride levels as well as the other parameters have already been registered on title warning potential purchasers of probable exceedances in the drinking water. The relevant documentation is attached to this letter.

2 - Isolation clay layer

The following table presents a summary of several wells located around the severed and retained lots. The MOE's well data spread sheets for these wells were given in the original report, while the approximate locations of the referenced wells are shown on the attached map.

E-mail: melie@lrl.ca Fax (613) 446-1427
☐ 1-2884, rue Chamberland Street, Rockland, Ontario K4K 1M6 Tel (613) 446-7777
☑ 1, Main Street, Suite 200, P.O. Box 414, Hawkesbury, Ontario K6A 1A1 Tel (613) 632-5105
☐ 2836 Maple Lane, Dunrobin, Ontario, K0A 1T0 Tel (613) 831-5497
☐ 170, rue Broadway East/est, Gatineau, Québec, J8P 3V3 Tel (819) 663-1639

The local supply aquifers for this area are located below the massive clay layer within the till deposit or the upper bedrock formation. According to local wells records, the bedrock and till aquifers are protected by a thick clay aquitard that varies between 23m to 34m thick locally. The clay aquitard is present all around the two (2) severed lots as well as the retained portion of the property, which is more than 41.57 hectares (102 acres).

Well #	5603868	5603867	5604615	5602905	5605305	5602881
Year Built	1990/03	1990/03	1993/11	1984/05	1998/09	1983/10
UTM Northing	5029033	5028663	5029033	5028499	5028462	5028999
UTM Easting	479975	478949	479975	479599	480192	480899
Ground EL. (m)	70.0	70.0	70.0	66.1	61.80	63.70
Well Bottom EL. (m)	34.1	36.5	29.8	28.0	20.70	24.70
Overall depth (m)	35.9	33.5	40.24	38.01	41.15	39.0
Sand (m)	0.0 – 3.7	0.0 – 2.4	0.0 – 5.2	0.0 – 7.3	NE	0.0 – 1.5
Clay (m)	3.7 – 35.1	2.4 – 27.4	5.2 – 28.9	7.3 – 35.9	0 – 28.9	1.5 – 35.1
Till (m)	35.1 – 35.9	27.4 – 33.5	28.9 – 39.6	NE	28.9 – 32.9	35.1 – 39.0
Bedrock (m)	NE	NE	39.6 – 40.2	35.9 – 38.1	32.9 – 41.2	NE
Water found (m)	35.9	33.5	39.6	38.1	40.2	36.6
Static Water Level (m)	10.97	10.36	10.1	13.7	9.75	5.1
Kind of water	Fresh	Fresh	Fresh	Fresh	Unknown	Fresh
Yield (L/min or IGPM)	31.5 or 7	31.5 or 7	67.5 or 15	67.5 or 15	67.5 or 15	225 or 50

NE: Not Encountered

It is noted that no well records were available to the north of the site, since the lands in this direction are undeveloped or occupied by sand pits. Considering the local thickness of the clay, it is anticipated that the clay also extends towards the north. In any case, the shallow overburden groundwater table is to the south.

In conclusion, if the wells and septic systems are properly constructed as per their respective regulations and the recommendations given in our original report, the septic influent is considered isolated from the supply aquifer.

2- Septic Effluent Impacts

The septic effluent impacts of the existing sand pits were addressed in **section 6.3** of the original report. In any case, these additional comments are provided.

The receiving aquifer to the septic effluent will be the shallow overburden groundwater table found in the sand deposit resting over the clay. The sand deposit is too thin to support a dug well. The flow direction of the shallow overburden aquifer is dictated by the general topography of the terrain. In this case, the sand pits are located upgradient of the flow direction (Elev. 77m to 75m), while the severed lots are located at Elev. 75m to 70m gently sloping towards the southeast where grades vary from 70m to 65m.

E-mail: melle@lrl.ca Fax (613) 446-1427
☐ 1-2884, rue Chamberland Street, Rockland, Ontario K4K 1M6 Tel (613) 446-7777
☑ 1, Main Street, Suite 200, P.O. Box 414, Hawkesbury, Ontario K6A 1A1 Tel (613) 632-5105
☐ 2638 Maple Lane, Dunrobin, Ontario, K0A 1T0 Tel (613) 831-5497
☐ 170, rue Broadway East/est, Gatineau, Québec, J8P 3V3 Tel (819) 663-1639

The overburden groundwater flow is not towards the sand pit (northeast), but contrarily, to the southeast. A topography map was included in the original report.

Furthermore, considering the size of the proposed lots (0.4 and 0.3 hectares respectively for a total of 0.7 hectares), the septic influent will be attenuated naturally by dilution at the property boundary. This is supported by applying the contaminant attenuation method in accordance with the Ministry of the Environment Hydrogeological Technical Information Requirements for Land Development Applications as well as MOE's procedure D-5-4 "Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment".

The calculation was performed in considering that nitrate nitrogen as the critical contaminant originating from the discharge of a conventional Class 4 septic system at a loading rate of 40 grams/lot/day per residential dwelling unit. The lot size must have the capacity to attenuate the influent generated by the septic system so that the nitrate nitrogen levels at the downgradient property limit do not exceed 10 mg/l minus any local background nitrate concentration already present in the receiving aquifer. The background nitrate levels in the receiving aquifer was established to be non detectable as showed in our original report.

Based on the nitrate attenuation calculation, the nitrate level at the property boundaries will be 9.6 mg/L, which is considered acceptable. The calculation sheet has been attached to this letter. In conclusion, the septic impacts on the sand pit are considered negligible.

Trusting that this supplemental information presented herein meets your requirements. Should you have any questions or comments, please do not hesitate to contact the undersigned.

Yours truly,
Levac Robichaud Leclerc Associates Ltd.

Mario Elie, Sr. Technologist

Marc-Antoine Laforte, P. Eng. Ph. D.

LICENSED PROFESSIONAL ENGINEER
J.R.M.A. LAFORTE
PROVINCE OF ONTARIO

E-mail: melie@lrl.ca — Fax (613) 446-1427
☐ 1-2884, rue Chamberland Street, Rockland, Ontario K4K 1M6 — Tel (613) 446-7777
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☐ 2838 Maple Lane, Dunrobin, Ontario, K0A 1T0 — Tel (613) 831-5497
☐ 170, rue Broadway East/est, Gatineau, Québec, J8P 3V3 — Tel (819) 663-1639

EASTERN ONTARIO HEALTH UNIT CORRESPONDENCE

Eastern Ontario Health Unit
Bureau de santé de l'est de l'Ontario

Ontario's First County Health Unit
Le premier bureau de santé de comté en Ontario

January 20, 2005

Consent Approval Authority
Clarence-Rockland
1560 Laurier St.
Rockland, Ontario
K4K 1P7

RE: Consent Application CR-29-2004
Lot 19, Concession 10
Township of Clarence-Rockland
Owner: Bernard Charlebois

Attention: François Loiselle

The Eastern Ontario Health Unit holds no objection to the Consent Approval Authority granting the above noted consent.

Yours truly,

Sylvain Diotte
Part VIII Program Coordinator

☐ Head Office/Siège social, 1000 rue Pitt Street, **CORNWALL**, ON K6J 5T1 • Tel/tél.: (613) 933-1375 or/ou 1 800 267-7120 • Fax/télec.: (613) 933-7930
☐ 60 rue Anik Street, Unit/unité #2, **ALEXANDRIA**, ON K0C 1A0 • Tel/tél.: (613) 525-1112 • Fax/télec.: (613) 525-2603
☐ 767 rue Principale Street, P.O. Box/C.P. 338, **CASSELMAN**, ON K0A 1M0 • Tel/tél.: (613) 764-2841 or/ou 1 800 267-8260 • Fax/télec.: (613) 764-0264
☐ 134 Main Street East/rue Main est, Suite/bureau 301, **HAWKESBURY**, ON K6A 1A3 • Tel/tél.: (613) 632-4355 or/ou 1 800 565-2314 • Fax/télec.: (613) 632-4171
☐ 2884 rue Chemberland Street, Unit/unité #2, 2nd floor/à l'étage, **ROCKLAND**, ON K4K 1M6 • Tel/tél.: (613) 446-1400 • Fax/télec.: (613) 446-1454
☐ 457 Main Street East/rue Main est, P.O. Box/C.P. 616, **WINCHESTER**, ON K0C 2K0 • Tel/tél.: (613) 774-2739 • Fax/télec.: (613) 774-4079

Eastern Ontario Health Unit
Bureau de santé de l'est de l'Ontario

Ontario's First County Health Unit
Le premier bureau de santé de comté en Ontario

January 20, 2005

Consent Approval Authority
Clarence-Rockland
1560 Laurier St.
Rockland, Ontario
K4K 1P7

RE: Consent Application CR-34-2004
Lot 19, Concession 10
Township of Clarence-Rockland
Owner: Bernard Charlebois

Attention: Francois Loiselle

The Eastern Ontario Health Unit holds no objection to the Consent Approval Authority granting the above noted consent.

Yours truly,

Sylvain Diotte
Part VIII Program Coordinator

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☐ 787 rue Principale Street, P.O. Box/C.P. 336, **CASSELMAN**, ON K0A 1M0 • Tel/tél.: (613) 764-2841 or/ou 1 800 267-8260 • Fax/télec.: (613) 764-0284
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☐ 2884 rue Chamberland Street, Unit/unité #2, 2nd floor/à l'étage, **ROCKLAND**, ON K4K 1M6 • Tel/tél.: (613) 446-1400 • Fax/télec.: (613) 446-1454
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Province of Ontario

Document General

Form 4 — Land Registration Reform Act, 1984

CONS
58 Gerrard St. East
Toronto, Ont. M5B 1G3
Form L1206

D

FOR OFFICE USE ONLY

149564

CERTIFICATE OF REGISTRATION
CERTIFICAT D'ENREGISTREMENT
RUSSELL (50)
DEPUTY LAND REGISTRAR
REGISTRATEUR ADJOINT

'94 MAR 16 PM 3 43

(1) Registry [X] [ ] (2) Page 1 of 2 pages

(3) Property Identifier(s) Block Property Additional See Schedule [ ]

(4) Nature of Document: CERTIFICATE OF APPROVAL UNDER THE ENVIRONMENTAL PROTECTION ACT WITH CONDITIONS, RESTRICTIONS AND COVENANTS

(5) Consideration

----------TWO----------xx/ Dollars $ 2.00

(6) Description

part of lot 19 concession II Township of Clarence County of Russell desiganted as parts 1,2,3,4,5,6, 7,8,9 on Plan 50R-7445.

New Property Identifiers Additional See Schedule [ ]

Executions Additional See Schedule [ ]

(7) This Document Contains: (a) Redescription New Easement Plan/Sketch [ ] (b) Schedule for: Description [ ] Additional Parties [ ] Other [ ]

(8) This Document provides as follows:

1. The attached Certificate of Approval has been duly issued under Part VIII of the Environmental Protection Act.
2. Pursuant to subsection 1 of Section 132 of the Environmental Protection Act, this Certificate of Approval is binding upon the successors and assigns of the person(s) to whom it is directed.
3. This Certificate of Approval is being registered for the purpose of providing notice of said Certificate of Approval and notice of the covenants affecting this land to any person obtaining a subsequent interest in the said lands.

Continued on Schedule [ ]

(9) This Document relates to instrument number(s)

(10) Party(ies) (Set out Status or Interest)

Name(s)	Signature(s)	Date of Signature Y	M	D
CHARLEBOIS, Bernard	x B Charlebois	1994	03	1

(11) Address for Service: r.r.1, Hammond, Ont. K0A 2A0

(12) Party(ies) (Set out Status or Interest)

Name(s)	Signature(s)	Date of Signature Y	M	D
MINISTRY OF THE ENVIRONMENT (EASTERN ONTARIO HEALTH UNIT)	Sylvain Diotte Part Eight Director Environmental Protection Act	1994	03	16

(13) Address for Service: P.O.box 338, Casselman, Ontario, K0A 1M0

(14) Municipal Address of Property: r.r.1, Hammond, Ont. K0A 2A0

(15) Document Prepared by: Denis Lacelle Hammond, Ont. K0A 2A0

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Fees and Tax	
Registration Fee	
Total	

4 Province de l'Ontario

Annexe

Formule 5 — Loi de 1984 portant réforme de l'enregistrement des droits immobiliers

S

Cote(s) foncière(s) additionnelle(s) et renseignements supplémentaires

continued from Section 8 of page 1.

Requirements and conditions of the Certificate of Approval.

1. This notice be registered on title and a duplicate copy with registration particulars be returned to the Director.
2. The sewage disposal system and the residence must be located in accordance with drawing No. CHA001-SE, dated December 189 and REvision 1 and 2 dated Mar. 10, 1994 by Atrel Engineering Ltd.
3. The above noted drawing and all addendums must be made available to prospective purchasers for their information.
4. The sewage system envelope leaching bed and spare area as indentified on the Site Plan must be maintained free of the deposit, disposal or operation of any material,structures or equipment other than material or equipement required for the construction of the leaching bed within the sewage system envelope.
5. The sewage system envelope of each lot as identified on the Site Plan could be increased if the site specific Certificate of Approval inspection for a private sewage disposal system warrants a larger area than specified.
6. The review of this proposal for a sewage system installation was based on a three bedroom non-luxury residence (fixture unit count less than 25). Houses with more than three bedrooms will be accepted only if native soil conditions are demonstrated by the developer, and his consultant, to be favourable.
7. That lots shall be made suitable for the installation of sewage systems prior to or at the building permit stage to the satisfaction of the Eastern Ontario Health Unit in accordance with Ontario Regulation 358 made under the Environmental Protection Act.
8. The installaion of the sewage disposal system must be supervised and certified by a private professional engineering consultant.
9. The following covenants shall be incorporated in all contracts for sale and in all transfers from the Owner with the express intent that they shall be covenants running with the lands for the benefit of the owners.
10. Wells shall be located in accordance with the approved site plan.
11. Potential Purchasers are warned that:

Water quality is described as hard, slightly basic, sodium bicarbonate type water. Following elements exceed the Ministry of the Environment and Energy's (MOEE) maximum concentrations.

- Sodium may exceed MOEE maximum concentration of 200mgl.
- Hardness may exceed MOEE maximum concentration of 500mgl.
- Fluoride may exceed MOEE maximum concentration of 1.5mgl.
- Organic nitrogen may exceed MOEE maximum concentration of 0.15mgl.
- Iron may exceed MOEE maximum concentration of 0.3mgl.
- Manganese may exceed MOEE maximum concentration of 0.05mgl.
- Colour may exceed MOEE maximum concentration of 5 TCU.
- Turpidity may exceed MOEE maximum concentration 1 NTU.
- pH may fall outside of the MOEE desirable range for drinking water of 6.5-8.5 pH units.
- Total dissolved solids may exceed the MOEE maximum concentration of 500mgl.

USAGE INTERNE

LABORATORY CERTIFICATE OF ANALYSIS

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd.
Ottawa ON K1G 4J8
Phone: (613) 731-9577
Fax: (613) 731-9064
Toll Free: 800-7491947
email: paracel@paracellabs.com

Order #: K7371

Certificate of Analysis

Levac Robichaud Leclerc Associates Ltd.

1-2884, Chamberland Street
Rockland, ON K4K 1M6
Attn: Mr. Mario Elie

Phone: (613)-446-7777
Fax: (613)-446-1427

Client PO:
Project: **04590 Charlebois**
Custody #: **10619**

Report Date: 28-Mar-2005
Order Date: 24-Mar-2005

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
K7371.1	C.N. 3670

Approved By: _____ Dale Robertson, B.Sc.
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description
Heterotrophic Plate Count	Subcontracted

n/a: not applicable
MDL: Method Detection Limit

Certificate of Analysis

Report Date: 28-Mar-2005
Order Date: 24-Mar-2005

Client: **Levac Robichaud Leclerc Associates Ltd.**

Client PO: Project: **04590 Charlebois**

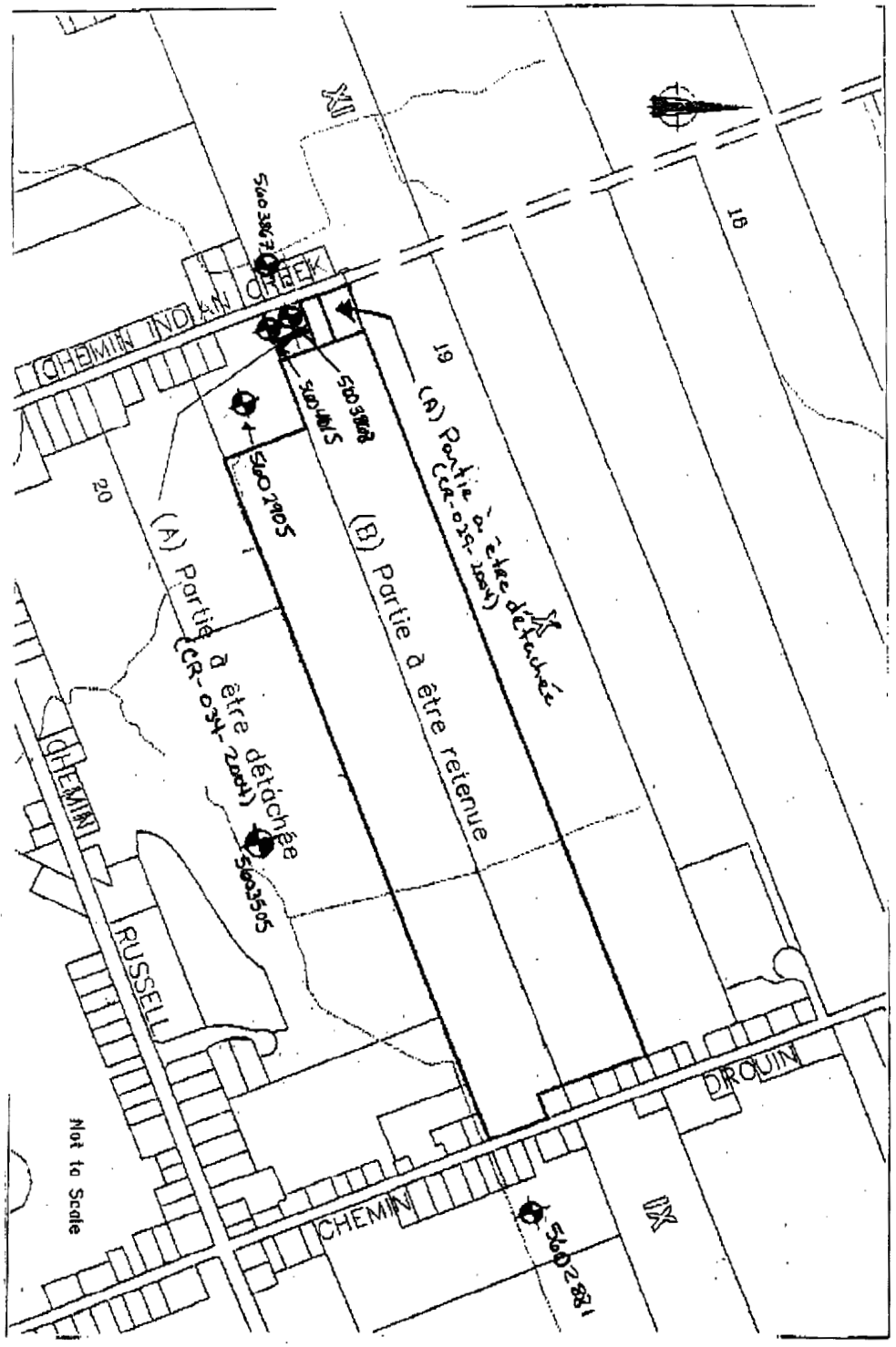
Matrix: Water

	Sample ID:	C.N. 3670
	Sample Date:	22/03/2005
Parameter	MDL/Units	K7371.1
Heterotrophic Plate Count	2 /mL	140

WELL LOCATIONS

PROPOSED DEVELOPMENT

Well Location



Legend

Well Location + Number.

NITRATE ATTENUATION CALCULATION

Mr. Bernard Charlebois - Severance Applications
Part of lots 19 & 20, Concession 10
Cheney, Ontario

Septic Effluent Impact - Nitrate Attenuation Calculations

Moisture Surplus[1]	MS		380 mm
Infiltration Factor[2]			
Topography	Flat	0.3	
Soil	Sandy Loam	0.4	
Cover	Forested Land	0.2	
	Total (IF)	0.9	
Potential Infiltration	PI = IF*MS		342 mm
Number of Lots	n		2
Approximate foot print of houses	H		100 m^2
Area of Infiltration			
Area of Lot			7000 m^2
Impervious Area	Roads		0 m^2
	Houses (n*H)		200 m^2
	A		6800 m^2
Nitrate Concentration of Infiltration	C_i		0.1 mg/L
Site Infiltration	$Q_i = A*PI$		2326 m^3
Daily Sewage Volume per Lot[3]	Q_d		1 m^3
Maximum Yearly Sewage Volume (water)	$Q_e=365*n*Q_d$		730 m^3
Nitrate Concentration in Sewage[3]	C_e		40 mg/L
Reduced Rain Volume	$Q_r = (Q_i-Q_e)$		1596 m^3
Background Nitrate Concentration[4]	C_b		0 mg/L
Maximum Nitrate Concentration[3]	C_m		10 mg/L
Acceptable Nitrate Concentration (Maximum - Background)	$C_a = (C_m-C_b)$		10 mg/L
Nitrate concentration at Boundary	$C = (Q_eC_e+Q_rC_i)/(Q_e+Q_i)$		9.6 mg/L

NOTES

[1] Moisture suplus for sand soil (water holding capacity of 50 mm) for Ottawa ON (Environment Canada Meteorological Service of Canada, 2004).

[2] Table 2: Infiltration Factors, *Hydrogical Technical Information Requirements for Land Development Applications*, Ministry of the Energy and Environment, April 2004.

[3] As per *Technical Guideline for Individual On-Site Sewage Systems: Water Quality and Impact Risk Assessment*, Ministry of the Energy and Environment, August 1996.

[4] From chemical analysis of groundwater (October 2004). Nitrates not detected therefore laboratory detection limit used a background.