Golder Associates Ltd.

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DRAFT
REPORT ON

EVALUATION OF LONG-TERM AQUIFER TEST AT MUNICIPAL WELLS NO. 5 AND NO. 6 MAPLE RIDGE GLACIOFLUVIAL COMPLEX VILLAGE OF CHESTERVILLE ONTARIO

Submitted to:

The Corporation of the Township of
North Dundas
636 St. Lawrence Street
Winchester, Ontario
K0C 2K0

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November 2005

04-1120-773/5000

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November 11, 2005

04-1120-773/5000

Corporation of the Township of North Dundas
547 St. Lawrence Street, P.O. Box 489
Winchester, Ontario
K0C 2K0

Attention: Mr. Howard Smith, Clerk Administrator

RE: EVALUATION OF LONG-TERM PUMPING TEST AT MUNICIPAL WELLS NO. 5 AND NO. 6, MAPLE RIDGE GLACIOFLUVIAL COMPLEX VILLAGE OF CHESTERVILLE, ONTARIO

Dear Sir:

Please find attached our report on the analysis of the long term aquifer test carried out at municipal wells 5 and 6, which are located on the Maple Ridge aquifer near Chesterville. The report presents the results of the 30-day pumping test conducted by simultaneously pumping Well 5 (production) and Well 6. Recommendations are provided with regard to the long-term yield of the aquifer. This report is suitable for submission to the Ministry of the Environment in conjunction with the *Report on Hydrogeological Evaluation of Municipal Water Supply (Well 6) Located in the Maple Ridge Glaciofluvial Complex, Village of Chesterville, Ontario* (Golder Associates, 2003) as supporting information for an application for a Permit to Take Water.

Golder Associates Ltd. appreciates the opportunity to provide these services to the Municipality. If you have any questions concerning this report, or if we can be of further service to you on this project, please contact us.

Yours truly,

GOLDER ASSOCIATES LTD.

Stephen Wilson, P.Geo.
Senior Hydrogeologist

B.J. Velderman, M.Sc., P.Geo.
Senior Hydrogeologist/Principal

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EXECUTIVE SUMMARY

The following Executive Summary highlights key points of the report only; for complete information, as well as limitations, it is necessary for the reader to examine the complete report.

The Village of Chesterville, within the Township of North Dundas, Ontario, obtains potable water from groundwater sources. Due to the decommissioning of Chesterville Well 1, one of the two existing supply wells, a new well was required to provide the lost capacity and to provide redundancy in the system. Well 6 was constructed in sand and gravel deposits to the northwest of Chesterville, adjacent to the existing Well 5 (production), which currently provides all potable water to the Village. Aquifer testing undertaken by Golder in 2003 concluded that the new well had a short term yield of at least 30 L/sec, but that a long term aquifer test should be undertaken to assess the capacity of the aquifer, and to provide the technical support required for an application for a Permit to Take Water for Well 6.

A 30-day aquifer test was undertaken at the site during the period June 27 to July 27, 2005. During the test, Well 5 (production) and Well 6 were simultaneously pumped at rates of 17 to 20 L/sec and 29.3 L/sec respectively for the initial 25 days, and then at rates of 16.5 and 22.7 L/sec respectively until the end of the test. During the test water levels were monitored in the pumping wells, in a network of monitoring wells and at a nearby surface water feature. Groundwater temperature, basic chemistry and bacteriological quality were also monitored on a regular basis through the test. Water level measurements were recorded for up to 27 days following the test.

Based on the results of the test, it was concluded that the yield of Well 6 was at least 30 L/sec, and the long term aquifer yield is at least 40 L/sec. With proper monitoring, a yield of 50 L/sec may be sustainable. The program also indicated that Well 5 (production) is relatively inefficient, and efforts to rehabilitate the well should be undertaken.

The groundwater available from the Maple Ridge aquifer is of potable quality, and did not appreciably change during the testing. No complaints of water quality or quantity interference were received during or after the test.

The testing indicates that the capture zone for the municipal well field will extend for several kilometres, and will likely include the entire Maple Ridge complex.

The rate of water taking to be applied for in the Permit to Take Water for Well 6 should be 30 L/sec for peak usage, with the average daily rates determined by demand.

A monitoring program should be established to determine the effects of pumping, precipitation and spring recharge. This program should include regular water level measurements (e.g. weekly) at the existing monitoring well network and at monthly or quarterly intervals at local wells located within 2000 metres of the wells. This data will help confirm the effects of the water taking and document the annual recharge cycle. Depending upon the results, an increase in water taking at a later date may be justified.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the Township of North Dundas to conduct an extended aquifer test to evaluate the long term-yield of the Maple Ridge aquifer, located near the Village of Chesterville, Ontario. The following report presents the objectives, methodology, and the results of the testing and discussed conclusions and recommendations that arose as a result of the testing program.

The report is organized into sections as follows:

Section 1 presents background information on the water supply issues in the areas, outlines the scope of the investigation and discusses the water supply system that services Chesterville;

Section 2 presents a description of the site and surrounding area, and discusses local geology including the municipal well site;

Section 3 of the report discusses the hydrogeology of the area and the Maple Ridge Aquifer in particular;

Section 4 presents the work program undertaken for this investigation;

Section 5 discusses the aquifer test and the data collected during the test, and presents an analysis of the data;

Section 6 presents information specific for an Application for a Permit to Take Water for Well 6, including an analysis of the long term yield of the Maple Ridge Aquifer;

Section 7 discusses the conclusions of the testing program and presents recommendations for use and proper management of groundwater resources at the Maple Ridge municipal site.

1.1 Background

The Village of Chesterville is located within the Township of North Dundas, and is located about 50 kilometres southeast of Ottawa, Ontario (Figure 1). Potable water in the Township is generally obtained from groundwater sources, either from private water wells or from municipal groundwater supplies. The Village of Chesterville has been and continues to be serviced through a municipal groundwater supply. In the past both bedrock and overburden wells have provided water to Chesterville residents.

The water supply for the Village of Chesterville is currently supplied by one well, referred to as Well 5 (production). This well is completed in unconsolidated sand and gravel deposits of the

Maple Ridge glaciofluvial complex, located about 3.5 km to the west of the Village of Chesterville (Figure 2).

An additional well, referred to as Well 6, was constructed in August of 2003 in the same aquifer. This well is situated about 97 metres the north of Well 5 (production). Well 6 was constructed to replace the capacity lost when an older bedrock well (Chesterville Well 1) was decommissioned. Studies undertaken by Golder in 2003 included a 72-hour pumping test conducted on Well 6. The report documenting these studies indicated that the aquifer in the area is highly transmissive and the long term capacity of Well 6 was at least 26.5 L/sec.

However, the major concern associated with increased water taking from the Maple Ridge aquifer through combined pumping at Well 5 (production) and Well 6 at high discharge rates is the possibility of withdrawing more water from the aquifer than can be replenished (aquifer mining). In order to evaluate the long-term safe yield of the aquifer, a 30-day pumping test was recommended.

1.2 Previous Studies

A number of studies of the Maple Ridge Glaciofluvial Complex, particularly in reference to its potential as a water supply source, have been previously undertaken. Documents produced by these studies are detailed as follows.

- **Water and Earth Science Associates Ltd.** (WESA) undertook investigations for a new municipal supply in the mid and late 1980's. A document entitled *Municipal Water Supply Investigation, Groundwater Source, Maple Ridge Aquifer Complex* was submitted to the Ontario Ministry of the Environment and Village of Chesterville in a revised form in 1988.

  The work undertaken by WESA included the construction and testing of two screened overburden wells on the Maple Ridge deposits. One of the wells is referred to in this report as Well 5 (standby) and is located a few metres from Well 5 (production). The report concluded that the aquifer had the capacity to produce the required amount of water and recommended that the Maple Ridge aquifer be developed to meet the long term needs of the Village of Chesterville. WESA also recommended that a screened, gravel packed well be constructed near Well 5 (standby).

- **Morrison Beatty Ltd.** Morrison Beatty documented the construction and testing of a new municipal well in a 1989 report entitled *Report on a Construction and Pumping Test Project for a Municipal Production Well, Village of Chesterville.* The new well, referred to in this report as Well 5 (production), was subjected to a number of performance tests, including a 72 hour constant rate test. The report concluded that the well could produce up to 22.7 L/sec, and that water quality was good.

- **Golder Associates Ltd.**, 2002a. *Report on Groundwater Under the Direct Influence of Surface Water Studies, Chesterville Water Supply Wells*, Report no. 021-2748-2, submitted to the Township of North Dundas, May 2002. Golder undertook a study of Well 5 to determine if the well was groundwater under the direct influence of surface water (GUDI) in accordance with criteria developed by the Ministry of the Environment in 2001 (MOE, 2001b). The results of the study indicated that the well was potentially under the direct influence of surface water according to the MOE definitions. It was recommended that a particle counting study be undertaken to determine if adequate in-situ filtration existed at the site of Well 5 (production).

- **Golder Associates Ltd.**, 2002b. *Results of Particle Count Study, Chesterville Water Supply Wells, Township of North Dundas, Ontario, MOEE Ref. No. 9870-5ASPDP*, letter-report referenced no. 021-2748/6000, submitted to the Township of North Dundas, September 10, 2002. Golder undertook the particle counting study and concluded that adequate in-situ filtration existed, and that treatment in addition to disinfection was not required.

- **Golder Associates Ltd.**, 2003. *Hydrogeological Evaluation of Municipal Water Supply (Well 6) Located in the Maple Ridge Glaciofluvial Complex, Village of Chesterville, Ontario,* Report No. 021-2859/1070, submitted to The Corporation of the Township of North Dundas, December 2003. The 2003 study included the construction and testing of a Well 6. A stepped rate pumping test and a 72-hour constant rate pumping test were conducted on Well 6. During the test, water level measurements were collected in the municipal supply wells and in a network of monitoring wells constructed in boreholes on the property. The report presented conclusions on the potential capacity of the aquifer, and recommended that a long term pumping test be undertaken to better define aquifer capacity. Other recommendations included the development of a ground and surface water monitoring program, a groundwater under the direct influence of surface water study for Well 6 and the establishment of a wellhead protection area for the wellfield.

- **Robinson Consultants et al.**, 2004. *Municipal Groundwater Study, Township of North Dundas*. This report was prepared for the Eastern Ontario Water Resources Committee and was funded under the provincial Groundwater Studies initiative of 2001/2002. The report presented Wellhead Protection Areas (WHPA) for 30 municipal wells supplying drinking water to 13 village/hamlets, presented an assessment of contaminant sources and contaminant pathways within each of the WHPAs and recommended a groundwater protection strategy for the municipality.

1.3 Scope of work

The scope of work for the evaluation of the long-term yield of the Maple Ridge aquifer included five major tasks:

1. ***Preliminary requirements*** included an application for a temporary Permit to Take Water (PTTW) from the Ministry of the Environment for a combined pumping rate of 53 L/sec (700 IGPM) from Well 5 (Production) and Well 6. In addition, a contingency plan establishing maximum allowable drawdown in the two pumping wells for use by Ontario Clean Water Agency (OCWA) was prepared.

2. ***Site preparation*** included the installation of overland pipe used to discharge water being pumped from Well 6 and excess water pumped from Well 5. It also included the installation of monitoring equipment: pressure transducers/data loggers to record water level measurements at key monitoring locations (i.e., Well 6, Well 5 (standby), monitoring wells MW03-1, MW03-2A, MW03-2B), and gauges in an adjacent surface water feature (Monast pit) to monitor the surface water response to pumping.

3. ***Monitoring before and during the test***, including the collection and analysis of groundwater samples from local well users, pre-testing water levels, daily analysis of discharge rates, and collection of water level data from the pumping wells, the monitoring wells and the surface water gauges during the test. In addition daily readings of groundwater temperature and turbidity at Well 5 and 6 were to be collected and samples were to be collected and analyzed for the bacteriological parameters Total Coliforms and Escherichia coli on raw water at Well 5 (approximately daily basis) and at Well 6 (ten times during the test). Monitoring also included continuous measurement of temperature of raw water at both wells using data loggers, and groundwater sampling and analysis for general water quality at pumping wells No. 5 and 6 at the initiation of the pumping test, once per week throughout the pumping test, and immediately prior to pump shut down.

4. ***Analysis of the data*** collected from previous studies and from the pumping wells and the monitoring stations during the 30 day test.

5. ***Completion of Tasks Specific to a Permit to Take Water***, including the determination of the zone of influence of the wells, an assessment of sensitive receptors and the assessment of potential contaminant sources.

6. ***Preparation of a Report*** describing field activities, results of aquifer testing and groundwater sampling, and recommendations related to long-term water supply potential of the Maple Ridge aquifer. The report, in conjunction with the *Report on Hydrogeological Evaluation of Municipal Water Supply (Well 6) Located in the Maple Ridge Glaciofluvial Complex, Village of Chesterville, Ontario* (Golder, 2003), will be submitted in support of a PTTW application for Well 6.

1.4 Municipal Water Supply System

The Village of Chesterville currently obtains its potable water from Well 5 (production), completed in the Maple Ridge aquifer. This well was constructed and tested under the supervision of Morrison Beatty Ltd. (1989) and has a maximum permitted pumping rate of 22.7 L/s. Under current demand, Well 5 (production) is generally operated at a rate of about 15.2 L/sec for about ten hours each day through three daily cycles. Each cycle lasts about 200 minutes. Water is pumped from the well to a reservoir a high lift pumping station which supplies the water to the distribution system. Pumping is controlled based on the water level in the reservoir, which is located on Industrial Drive in the Village of Chesterville. A disinfection system adds sodium hypochlorite to the water before it enters the reservoir. OCWA is the current operating authority of the Chesterville municipal water supply system.

Another well, referred to as Well 5 (standby) was constructed in 1987 in order to test the yield of the overburden aquifer (WESA, 1988). This well is located about six metres to the northeast of Well 5 (production). Well 5 (standby) is currently not being used to supply potable water, primarily because its capacity has significantly decreased since it was originally constructed and because the turbidity in the water tends to be somewhat elevated at the start of a pump cycle. These problems may be a function of the well design, since it does not have an engineered gravel pack. Diagrams of Well 5 (production) and Well 5 (standby) are included in Appendix A.

Studies that considered the potential for groundwater under the direct influence of surface water (GUDI) were completed by Golder for Well 5 (production) and Well 5 (standby) in 2002 (Golder 2002a, 2002b). These evaluations, which included a particle count study, concluded that adequate filtration exists at the two wells, and that water quality in the wells is not adversely affected by nearby surface water features. A GUDI study for Well 6 was undertaken as part of the 2005 work program, and is included in this report as Appendix H. This study reaches the same conclusions as were reached in 2003, and demonstrates that Well 6 is not under the direct influence of surface water.

Previously, Chesterville also obtained water from the bedrock supply Well No. 1 located approximately 120 metres north of the South Nation River, immediately to the west of Chesterville. This well was removed from the system after the construction of Well 6 because of high iron concentrations in the raw water, evidence of bacteriological contamination in the well and the determination that the well was under the direct influence of surface water in a study by Golder (2002a). Well No. 1 was decommissioned on March 31, 2005.

Well 6 was constructed to replace the supply lost (9.5 L/sec) when Well 1 was decommissioned. The current study demonstrates that Well 6 not only can replace the Well 1 water supply, but can provide additional capacity to the water supply system. Well 6 provides supplemental capacity, which can respond to additional water supply demand from potential industrial and/or residential expansion in the Village.

Well 6 was constructed on the same municipal property where Well 5 is located, about 100 metres to the north of Well 5 (production). The well was drilled by International Water Supply Ltd. (IWS) during the period August 5 to August 15, 2003 (Golder, 2003). The water well record and a construction sketch of Well 6 are included in Appendix A. The locations of all current and former production wells for the Village of Chesterville are shown in Figure 3.

2.0 SITE DESCRIPTION AND GEOLOGIC SETTING

2.1 Site Description

The municipal property containing Well 5 (production) and Well 6 is located in the United Counties of Stormont, Dundas and Glengarry, in Concession V, Lot 12 in the geographic Township of Winchester, now the Township of North Dundas (Figure 1). It is sited some 3.5 kilometres west of the Village of Chesterville, to the north of County Road 43, and covers an area of approximately 16 hectares. The southern boundary of the property is defined by a Canadian Pacific Railway (CPR) right-of-way. A granular extraction pit operated and owned by Mr. Peter Monast is located to the west of the property. The site and the lands to the east are forested, with the exception of areas where trees have been cleared for the installation of the municipal water supply infrastructure. The ground surface on the site is relatively flat, sloping slightly downward towards the north. The ground elevation at the municipal property varies from approximately 76.5 to 80.0 metres above sea level (masl).

An aerial photograph of the site is provided in Figure 2. The land use in the vicinity of the property is mostly agricultural, mineral extraction (sand and gravel) and rural residential. The current location and extent of the pit excavation which is found immediately adjacent to the west of the municipal property was added to Figure 2 as excavation activities have expanded the area of the pit since the aerial photograph was taken.

2.2 Regional Geology

The surficial geology in the Chesterville/Winchester area consists mainly of glacial deposits and relatively younger Champlain Sea sediments that were deposited in the Cenozoic. Isolated areas are overlain with post-Champlain Sea sediments, consisting of organic muck and peat (Geological Survey of Canada, 1982). The overburden geology of the study area is illustrated in Figure 3. The four main physiographic regions in the area are: till plains (unit 1a); clay plains (unit 3), glaciofluvial outwash deposits (units 5a and 5b), and the organic deposits (unit 7).

The till and clay plains dominate the study area. The glacial till plains are composed of sandy and silty compact diamicton, interpreted as consisting dominantly of lodgement till. In areas that lie below approximately 160 masl, the till plains are in places overlain by a discontinuous deposit consisting of gravel, sand, and boulders. A basal gravel till is often found at the interface between glacial till and the bedrock surface (Geo-Analysis Inc., 1992).

The clay plains are composed of offshore marine deposits that consist of massive blue-grey clay, silty clay, and silt. They are calcareous and fossiliferous and locally overlain by thin sands. The thickness of the till and clay plains ranges from absent in small isolated areas to approximately 20 metres.

Glaciofluvial deposits cover isolated locations in the area. These deposits are comprised of an assortment of sand, gravel, clay, ice-contact stratified drift, and till. The most prominent glaciofluvial features in the study area are the north-south trending Morewood Esker located to the north of Chesterville near the Village of Morewood and the Maple Ridge glaciofluvial complex, where the municipal well site is located.

The bedrock underlying the Maple Ridge glaciofluvial complex consists of limestone, dolomite, shale and thin-bedded sandstone, and is part of the Gull River Formation (Ontario Ministry of Natural Resources, 1985). The bedrock is found at depths of ten to twenty metres below ground surface in the vicinity of the municipal property where the wells are located.

2.3 Subsurface Conditions at Municipal Property and Surroundings

The Maple Ridge glaciofluvial deposits are comprised of an assortment of coarse-grained (sand and gravel) and finer sediments (clay, ice-contact stratified drift, till). The surface expression of the Maple Ridge aquifer is approximately 3.5 kilometres long and between 0.2 and 1.5 kilometres wide, with a total area of approximately 300 hectares (Figure 3). The western part of the deposit is elongated in an east-west direction, while the eastern half measures 1.5 to 2 kilometres in both an east-west and north-south direction.

Geological logs for boreholes drilled during investigations by WESA (1988) and Morrison Beatty Ltd. (1989) along with geological logs for boreholes, hand auger holes and tests pits conducted by Golder (2003) have provided sufficient information to define the subsurface conditions at the municipal property and in the surrounding area. The locations of the Golder (2003) hand auger holes, test pits and boreholes are shown in Figure 2. Logs of the materials encountered in the holes can be found in the 2003 Golder report.

Based on the data, it is interpreted that the granular esker deposits extend to the north of the well sites to approximately the northern extent of the gravel excavation pit shown in Figure 2. The interpreted boundary where sand and gravel deposits are found near surface (at a depth less than 3 metres) is shown as a yellow-coloured outline in Figure 2. This boundary is consistent with information available from the literature and shown on the surficial geology map in Figure 3.

Rapid transitions from granular to finer-grained sediments were observed within deposits of the Maple Ridge complex. Within the interpreted boundary of near-surface granular sediments discussed above, the granular sand and gravel deposits were generally encountered either near the ground surface or overlain by variable thicknesses of sandy sediments containing a more significant fraction of fines (silt and/or clay particles). Deposits of yellow-brown to medium-brown fine to medium sand with little or no gravel were in general encountered to depths of four to seven metres. These sands were in turn underlain by mixtures of dark grey gravels and coarse-grained sands. The gravels usually ranged from pebble to cobble size, but boulders were also encountered at some locations, including at the site of Well 5 (production), Well 5 (standby), piezometer P5 and pilot hole BH03-1 and Well 6.

Finer grained horizons were on occasion layered throughout the granular deposits; examples of these include Well 5 (production) where 1.2 metres of silty clay were intercepted at depths of 7.3 to 8.5 metres, immediately above the water-bearing gravel-rich horizon, and a test well TW4, where 0.6 metres of dark grey clay with minor sand and fine gravel was encountered above the sand and gravel formation into which the well screen was installed. Glacial till composed of blue-grey to dark grey silty sand with cobbles and boulders was encountered before intercepting the bedrock surface at several locations across the study area. The glacial till was 8.4 metres thick at MW03-2, 3.9 metres thick at piezometer P6 and 6.5 metres thick at piezometer P1, located to the south of the municipal property. In a few locations, the gravelly deposits were found directly over bedrock. The inferred depth to limestone bedrock beneath the municipal property varied from 16.8 metres at monitoring well MW03-2 to 12.8 metres at supply Well 5 (production).

The eastern part of the municipal property was found to be geologically distinct from the rest of the site. Dark black peat with abundant organic matter and roots ranging between 0.30 and 0.65 metres in thickness was found at ground surface at the location of auger holes AH03-2 to AH03-6, test pit TP03-1 and borehole MW03-3. The peat was underlain by grey-brown silty clay (to 1.2 and 1.5 metres depth at TP03-1 and MW03-3 respectively) which in turn was underlain by yellow-brown fine-grained sand (TP03-1) or grey silt with some fine sand and trace clay (MW03-3). These observations correlate well with surficial geology data available from the literature and illustrated in Figure 3, which suggest the occurrence of organic deposits to the east of the municipal property.

It is also interpreted that fine deposits underlie the northern section of the municipal property. At the former location of piezometer P8, grey clay mottled with sand lenses was encountered down to a depth of 7 metres depth, underneath which layered dark grey silt and pebble gravel beds (probably glacial till) were encountered until auger refusal was experienced at 10.0 metres below surface.

2.4 Details of Subsurface Conditions at Well 5 and Well 6

The subsurface conditions at Well 5 (production) were inferred from the well logs for Well 5 (production) and Well 5 (standby). Light brown sand mixed with gravel was encountered from ground surface to approximately 6.7 metres depth. A layered unit of heterogeneous composition with coarse gravel, sand and dark grey clay underlies this unit. From approximately 9.3 to 12 metres depth, a horizon defined by coarse-grained gravel and cobbles was intercepted. The well screen in Well 5 (production) was installed in this layer.

Subsurface conditions at Well 6 were inferred from geological descriptions available from the drilling of borehole BH03-1 and from the log of Well 6. Yellow-brown sandy gravel was encountered from ground surface to 4.2 metres depth. A trace of finer grained material was observed within this unit to approximately 2.4 metres depth, and the grain-size of sands was generally observed to increase with depth. From 4.2 to 7.3 metres depth, the deposits generally became coarser as yellow-brown to grey gravel with some sand was encountered. The fraction of cobble-sized gravel increased with depth within this second unit and the sands also became coarser with depth. From 7.3 to 8.3 metres depth, grey sandy gravel with cobbles and boulders was encountered. The percentage of finer grained material within this unit was greater than the previous formation. Finally, blue-grey silty sand with pebble and cobble-sized gravel, interpreted to be glacial till, was encountered from 8.3 to 10.1 metres depth. The screen at Well 6 was installed in the coarser material, at a depth between 5.25 and 8.3 metres below ground surface.

3.0 HYDROGEOLOGY

3.1 Maple Ridge Aquifer

The Maple Ridge glaciofluvial complex is composed of outwash deposits comprised of an assortment of coarse-grained (sand and gravel) and finer sediments (clay, ice-contact stratified drift, till). The coarser deposits are considered highly permeable and transmit water readily and are therefore considered an aquifer. The Maple Ridge aquifer is bordered by a lower hydraulic conductivity, clay till unit. The base of the clay/till unit is in some locations characterized by a thin sand and gravel layer varying from absent to several metres in thickness. In some areas this unit can transmit water readily.

The geological context and the results of pumping tests carried out at Well 5 (production), Well 5 (standby) and Well 6 (Golder, 2003) indicate that the Maple Ridge aquifer is unconfined. An unconfined aquifer is a water-bearing geological unit that is located close to the land surface, with continuous layers of conductive, generally granular material extending from the land surface to the base of the aquifer. By definition, the water table in an unconfined aquifer is at atmospheric pressure.

Most of the recharge in an unconfined aquifer occurs from downward seepage of precipitation or melt water; especially in situations where the aquifer is surrounded with low-permeability material, such as in the case of the Maple Ridge aquifer in the vicinity of the municipal wells. Some recharge to this aquifer, especially when under stress from pumping, comes from the underlying bedrock aquifer and the basal glacial till deposits that extend beneath the lower permeability deposits that extend beyond the aquifer. Results of the 72-hour pumping test conducted at Well 6 indicate that the contributing area of water to the wellheads extends beyond the surface expression of the Maple Ridge aquifer.

The transmissivity of the Maple Ridge aquifer in the vicinity of Well 6 was calculated to be about 1,300 m^2/day and the corresponding horizontal hydraulic conductivity was calculated to be about 195 m/day (Golder, 2003). A specific yield of 0.045 was also determined in this study.

3.2 Local Surface Water Features

Wells No. 5 and 6 are located in the watershed of the South Nation River. The most significant surface water features in the area are the man made gravel pits to the east and southeast of the municipal well site. Extraction of sand and gravel deposits below the water table has resulted in the creation of shallow ponds in this area. The nearest of these ponds, the Monast pit, is located on the adjacent property to the west, slightly in excess of 100 metres from the Well 6 (Figure 2).

A drainage ditch is present along the north side of the CPR right of way, about 200 metres to the south of Well 5 (production). Water flows from west to east within this ditch, which crosses beneath the railway line to the southeast of the municipal property, adjacent to the access road to the municipal property. The ditch then drains to the south, eventually reaching the South Nation river system.

The Maple Ridge glaciofluvial deposit forms a gentle local topographic high, and surface water drainage is generally radial from the deposit. The land on the northern part of the Maple Ridge complex drains to the north, while the drainage to the south of the deposit is to the south. Ministry of Natural Resources topographic mapping indicates that drainage from the municipal well site is to the north.

4.0 WORK PROGRAM

4.1 Temporary Permit to Take Water

In order for the pumping test to proceed, a temporary Permit to Take Water (PTTW) for a combined pumping rate of 53 L/sec at Well 5 (production) and Well 6 was obtained from the MOE. The PTTW was issued by MOE for the requested pumping rate, with an expiry date of December 31, 2005.

4.2 Contingency Plan

A contingency plan was prepared by Golder and submitted to OCWA, the Township of North Dundas and the Ministry of the Environment. The plan contained measures to be undertaken should the results of the test indicate that excessive drawdown or indications of surface water impact occur. The specific events that would trigger a response and the measures to be undertaken included:

- **Water Levels** - If the water level in Well 5 (production) or Well 6 reached 0.5 metres above the top of the respective well screen, Golder staff was to be notified. An updated contact list, including office, home and cellular numbers of primary and two secondary Golder staff was provided. Golder was to assess the situation and provide guidance to OCWA staff. If the water level in either Well reached 0.3 metres above the top of the well screen, and Golder had not provided specific instructions to the contrary or could not be contacted, the pumping rate was to be reduced by 7.6 L/sec.

- **Bacteria** - Raw water bacteria samples were to be collected on a regular (approximately daily) basis from Well 5. If any sample exceeded an appropriate drinking water standard, Golder was to be notified immediately, and the water should be resampled as soon as possible. Should the resample show bacteria in excess of the appropriate standard, Golder was to provide guidance to OCWA regarding reducing the pumping rate or ceasing the test.

- **Particle Counting** - As part of the studies to assess whether the aquifer and Well 6 were under the direct influence of surface water (GUDI), Golder supplied a liquid particle counter for Well 6. The data from the particle counter was to be reviewed on a minimum daily basis by OCWA and/or Golder, and was be compared to the particle count data collected in 2002 from Well 5 (production). Should anomalous elevated particle counts be noted in Well 6, Golder was to be immediately notified. Possible measures to be undertaken included increasing bacteriological testing, including beginning testing on Well 6, installing the particle counter on Well 5 or reducing the pumping rate of one or both wells.

None of the water quality contingency measures were enacted. Although the water level in Well 5 (production) did not reach the contingency limit of 0.5 metres above the screen, the pumping rates were reduced for the last five days of the test as a cautionary measure when the level reached 0.7 metres above the screen in Well 5.

4.3 Installation of Pitless Adapter at Well 6

Well 6 was not equipped to connect to the municipal system prior to the test. International Water Supply (IWS) reconstructed Well 6 in May of 2005, by installing a pitless adapter, vent pipes and service lines (electrical and water).

In order to minimize excavation around the well and to avoid damaging the previously installed concrete seal, the pitless adaptor was installed at the approximate elevation of the surrounding natural ground surface, which was about 77 metres above sea level (masl). A 356 mm diameter casing was installed from 76.5 to 78.8 masl and the ground adjacent to the well casing was backfilled to approximately 78.4 masl for frost protection purposes. Two 50 mm diameter vent pipes were installed within the well casing and a protective cover fitted to the wellhead. The work was undertaken in accordance with Regulation 903 under the Ontario Water Resources Act.

4.4 Pumping Test Set-Up and Responsibilities

The 30-day pumping test was planned to involve the simultaneous pumping of Well 5 (production) and Well 6 at discharges rate of 22 and 30 L/sec respectively. After a number of delays related to site preparation work, the test began on June 27, 2005 and continued until July 27, 2005. During the test Well 5 (production) continued to supply water to the Village of Chesterville.

The pump installed in Well 5 (production) was shut off at 11:45 AM on June 27, 2005 to allow for some recovery of the water table before the start of the test. The pump at Well 5 (production) was turned on at 1:01 PM of the same day, at the start of the test. The pump servicing Well 6 was turned on 51 minutes later, at 1:52 pm. Discharge rates from both the wells were monitored and adjusted by OCWA staff. The discharge rate at Well 6 was maintained constant at a rate of 29.3 L/sec. Due to differing friction losses, the rate of discharge at Well 5 (production) varied cyclically between 17 and 20 L/sec, depending upon whether the water was directed to the Chesterville reservoir (20 L/sec) or the discharge pipe (17 L/sec).

An overland pipe was used to convey the water being pumped from Well 6 and the excess water pumped from Well 5 (production) to the drainage ditch located approximately 200 metres to the south of Well 6, on the north side of the railway. Permission to discharge the excess pumped water to this ditch was granted by the South Nation Conservation Authority (SNCA) prior to the initiation of the pumping test. The high flow capacity of the ditch and the low permeability of the materials comprising the base of the ditch precluded any significant recharge to the Maple Ridge aquifer from this source during the test.

Surface water levels in the neighbouring Monast pit were monitored using surface water gauges. Two gauges, one on the east and one on the west side of the pit were installed by Golder personnel prior to the start of the test. Groundwater levels were monitored in the two pumping wells and in five monitoring wells distributed across the site. A list of the monitoring wells is provided in Table 1. The radial distance from Well 6 and the depth of the screened interval of each well is also provided.

TABLE 1 - MONITORING WELLS

Location	Radial Distance from Well 6 (metres)	Depth to Screened Interval (mbgs)
Well 5 (standby)	94	9.1 - 13.0
MW03-1	30	0.88 - 5.46
MW03-2A	45	9.75 - 11.37
MW03-2B	45	1.34 - 5.91
Windmill well	300	unknown

Pressure transducers and data loggers were used to monitor the water level at the pumping and monitoring wells in a continuous manner. The loggers were installed by Golder personnel at Well 6, Well 5 (standby) and at monitoring wells MW03-1, MW03-2A, MW03-2B on June 20, 2005. On the same day, a logger recording atmospheric pressure for post processing barometric compensation was installed within the protective casing of Well 5 (standby). The loggers were programmed to take readings every five minutes. A logger was not installed at Well 5 (production), as OCWA had suitable equipment for measuring and recording the water level in this well.

In order to permit immediate flow rate adjustment, water levels in Well 5 (production) and in Well 6 were remotely monitored in real-time by the Chesterville branch of OCWA. At the time of the installation of the loggers, manual readings of water levels in all the monitoring wells were also conducted. The measurements were repeated on June 27, 2005, just before the start of the test. Depths to water table (metres below top of casing) from the two measuring sessions are provided in Table 2.

TABLE 2 – WATER TABLE DEPTHS

Location	Depth to water table on June 20, 2005 (m below TOC)	Depth to water table on June 27, 2005 (m below TOC)
Well 6	2.88	2.92
Well 5 (standby)	2.66	2.04
MW03-1	1.52	1.57
MW03-2A	2.17	2.18
MW03-2B	2.14	2.23
Windmill well	Not recorded	2.63

The anomalous water level change noted for Well 5 (standby) is attributed to effects of pumping the adjacent Well 5 (production) which continued to supply Chesterville during this period.

After the pumping period, the water level recovery in the pumping and observations wells was monitored on a continuous basis for 27 days, as was the water level in the Monast pit. During the recovery period, Well 5 (production) returned to normal operations, which consists of pumping at a discharge rate of about 5.2 L/sec for approximately ten hours per day through three daily cycles of pumping of about 200 minutes duration.

4.5 Monitoring Procedures

The discharge rates and the water level data from pumping Wells 5 (production) and 6 were monitored in real-time by OCWA. The depths to water table in all the monitoring wells and surface water levels in the Monast pit were also measured by OCWA personnel on a daily basis throughout the pumping period. The data was also provided to Golder for review on a daily basis.

Daily field measurements of groundwater temperature and turbidity at Well 5 (production) and Well 6 were conducted throughout the duration of the pumping period. As a means to verify that Well 5 (production) did not become under the influence of surface water during the pumping test, OCWA personnel collected groundwater samples from Well 5 on an approximately daily basis during the 30-day of pumping. The samples were analyzed for the bacteriological parameters total coliforms and Escherichia coli. The same bacteriological analysis was also performed for ten groundwater samples collected from Well 6.

Three groundwater samples collected from Well 5 (production) and five groundwater samples collected from Well 6 during the 30-day pumping period were analyzed for a suite of parameters typically used to characterize municipal water supplies. Analysis for general groundwater chemistry was also conducted for one surface water sample collected from the Monast Pit and groundwater samples collected from the private wells closest to the well field before and after the 30-day pumping period. The private wells sampled are servicing the houses located at 12909, 12949 and 12975 on Highway 43, approximately 1,000 to 1,500 metres from the well field. All samples were preserved as necessary and submitted, under Chain-of-Custody documentation, to Accutest Laboratories Ltd. (Accutest) in Ottawa, Ontario.

Water levels and groundwater temperature at Well 6, Well 5 (standby) and at monitoring wells MW03-1, MW03-2A, MW03-2B were obtained by post-processing of the data collected from the pressure transducer/data loggers installed by Golder.

5.0 PUMPING TEST

5.1 Description

The 30-day pumping test was carried out by simultaneously pumping Well 5 (production) at a discharge rate of between 17 to 20 L/sec and Well 6 at a rate of 29.3 L/sec during the period June 27, 2005 to July 22, 2005. A reduction in discharge rate was adopted on July 22, after approximately 36,000 min (25 days) of pumping. The rate from Well 5 (production) was reduced to 16.1 to 16.7 L/sec and the rate from Well 6 was reduced to 22.7 L/sec. Pumping continued at the new rates until the end of the discharge part of the test on July 27, 2005.

The reduction in testing was undertaken not due to concerns of possible aquifer depletion but rather because of inefficiency noted in Well 5 (production). The drawdown noted in Well 5 (production) was considerably greater than that noted in Well 6 or in Well 5 (standby), which is located within six meters of Well 5 (production). The water level in Well 5 (production) was within 0.7 metres of the top of the screen by Friday July 22, and there was some concern that the water level in the well might reach the screen prior to the end of the test, scheduled for the following Tuesday. With a weekend approaching, it was decided that a cautious approach would be appropriate and hence the reduction. At no time was there any indication that excessive drawdown was occurring anywhere else in the aquifer. Section 5.4 provides additional discussion regarding the efficiency of Well 5.

Recovery was monitored on a continuous basis for 27 days at the test wells and at all the monitoring locations. The drawdown produced at Well 5 (production), Well 6 and at all monitoring locations throughout the 30-day pumping phase and subsequent recovery period is plotted on Figure 4.

Three distinct segments in the time-drawdown curves for the two pumping wells and the closest monitoring wells MW03-1, MW03-2A and MW03-2B can be recognized. In the first stage (0-400 minutes), water is released instantaneously from storage and the unconfined aquifer reacts in the same way as a confined aquifer. While the water table responds almost instantaneously to pumping, the response of the capillary fringe lags behind the water table (Nwankwor et al, 1992). When the capillary fringe reaches the transient water table, the equilibrium is re-established and the curves tend to flatten out (400-1000 min). After approximately 1000 min of pumping the time-drawdown curves become steeper again in response to the reduction of vertical gradients. The slope of the curves increases over time, until precipitation recharges the aquifer.

The time-drawdown plots generated at the pumping and the monitoring wells during the 30-day pumping test do not show any negative boundary effects, even though the wells are constructed on the north-eastern edge of the Maple Ridge complex, in close vicinity to fine-grained organic sediments. In addition, the plots do not show any positive boundary effects, despite the proximity

of the pond at the Monast Pit to the pumping wells and the hydraulic connection to the pit. It is likely that the negative boundary effects expected as the drawdown cone intersected the finer grained deposits to the north and east occurred very early in the test and was not captured by the recording data in the monitoring wells.

The occurrence of three precipitation events resulted in partial water level recovery observed in all the monitoring locations on July 9 (16,830 minutes or 11.7 days), July 14 (24,100 minutes or 16.7 days) and July 17 (28,600 or 19.9 days) (Figure 5). Precipitation data for the Village of Russell, Ontario, located approximately 20 kilometres north of the Village of Chesterville were obtained from the Environment Canada Web Site. Precipitation totals of 26 mm were measured on July 8, 14.6 mm was measured on July 13 and 6.2 mm was recorded on July 16, 2005. Reports from OCWA field staff confirmed that heavy rainfall occurred at the municipal well location on the three occasions.

The reduction in discharge rate after approximately 36,000 min (25 days) of pumping resulted in a limited water level recovery in all of the wells (Figure 5). Only the furthest monitoring well, referred to as the Windmill well, located at approximately 300 metres from Well 6, did not reflect any reduction in drawdown at that time. The test proceeded at the reduced rate and drawdown resumed in the pumping and monitoring wells, at about a third to half of the rate noted during the previous part of the test.

5.2 Hydraulic Response at Monitoring Locations

The pumping test was conducted during a relatively warm and dry summer. Rainfall in May was only about 60% of normal, and June was three degrees warmer than average (Environment Canada). An unconfined aquifer, such as occurs within the Maple Ridge deposits, is subject to seasonal water table variations in response to climatic conditions. The water table would be expected to decline during warm and relatively dry weather. Previous studies undertaken by Golder (1996-2001) have demonstrated that there is a net moisture deficit in the area during the period of May through August, and groundwater levels in this period would reach annual minima.

This variation has been observed consistently during summer seasons. Water level measurements are collected on a quarterly basis by OCWA at well P7, located about 1,000 metres to the southwest of the municipal well site, near the North Dundas District High School. This well is screened within the Maple Ridge aquifer. Historic annual water table variations of in excess of one metre have been noted in this well. The drawdown observed in the pumping wells, in the monitoring wells and in the Monast pit during the 30-day pumping test is therefore not exclusively a result of the withdrawal of water during the test.

The total drawdown measured in the pumping wells, the monitoring wells and the Monast pit on July 27, 2005 just before the pumps at Well 5 and No. 6 were shut down at the end of the test are provided in the Table 3, along with the total drawdown observed just before the discharge rate reduction applied on July 22, 2005.

TABLE 3 – OBSERVED DRAWDOWN

Location	Drawdown (m) July 22, 2005	Drawdown (m) July 27, 2005
Well 6	3.10	2.74
Well 5 (production)	5.05	4.49
Well 5 (standby)	2.06	2.02
MW03-1	1.94	1.92
MW03-2A	1.78	1.80
MW03-2B	1.81	1.82
Windmill well	1.01	1.14
Monast pit	1.14	1.30

After shut down of the pumps on July 27, 2005, Well 6 recovered 50% of the imposed drawdown within nine hours. Well 5 (production) recovered 75% of the drawdown within six hours after the end of the pumping period. As expected, the water level in the Monast pit was considerably slower, recovering 0.11 metres of the total drawdown of 1.30 metres between July 27, and August 3, 2005. Recovery data are presented in the plot in Figure 6 (linear time scale). The data from Well 5 (production) are not included in Figure 6 to allow for better visualization of the data from the other monitoring locations.

Nine hours after the pumping phase of the test ended, Well 5 (production) was brought back to normal operation and was subsequently cyclically pumped to supply water to the municipality. The effects of the cyclical pumping of Well 5 (production) on water levels at Well 6 and at monitoring wells 5-standby, MW03-1, MW03-2A and MW03-2B are evident in Figure 6. This confirms the hydraulic connection between the sand and gravel deposits extending from 9 to 12 metres depth at Well 5 (production) and the sand and gravel deposits extending to 8.3 metres depth at Well 6, the granular deposits encountered in the shallow monitors MW03-1 and MW03-2B, and the glacial till intercepted from 9.7 to 11.4 metres depth in monitor MW03-2A.

The three private wells that were located within one kilometre of the municipal wells were sampled for water quality (see Section 5.7). An offer to monitor water levels in these wells was also extended, but not of the wells could be easily accessed, and water level monitoring of these wells was not therefore undertaken. It is important to note that no complaints of well interference were received during or subsequent to the testing.

5.3 Radius of Influence & Well Interference

A theoretical radius of influence associated with a pumping well can be estimated from a distance drawdown graph using data from the pumping test. Using the drawdown observed at monitoring wells MW03-1, MW03-2B and the Windmill well at the end of the pumping period and extrapolating the data to the zero drawdown intercept produces a theoretical radius of influence of 3,000 to 9,000 metres using data from Day 25 and Day 30 respectively (Figure 7).

However, there are a number of limitations in this method. The three monitors used are relatively close together, especially as compared to the predicted zone of influence. The effects of natural water level decline due to the hot weather are not considered, which would tend to overestimate the influence of the test. Furthermore, the distance-drawdown method assumes that the aquifer material is consistent throughout the predicted radius of influence, which is clearly not the case at the Maple Ridge aquifer. In areas beyond the extent of the aquifer, where the overburden geology is characterized by low permeability deposits, the radius of influence would be far less than predicted.

Accurate evaluation of the magnitude of the water table decline in response to warm and dry climatic conditions between June 27 and July 27, 2005 is a challenging exercise. Based on quarterly water level measurements conducted by OCWA at P7 near the high school and approximately 1,000 metres from the municipal wells, the natural water table decline occurred over the 30-day pumping period in the Maple Ridge aquifer could be as much as of 0.3 to 0.5 metres. The actual radius of influence of the two wells is therefore interpreted to be substantially less than calculated from the distance drawdown data alone and would be less than 1,000 to 2,000 metres, which would seem more reasonable and likely.

The water level in P7 was 10.73 metres from the top of the well casing on July 9, 2005, twelve days after the start of the test. This level is somewhat higher than that historically recorded at this time of the year. On August 9, 2005, twelve days after the end of the pumping part of the test, the depth to the water table had increased by 40 cm (11.13 metres from the top of the well casing). The theoretical drawdown at this distance at 25 and 30 days, based on the distance-drawdown relationship from Figure 7, would be 0.5 to 0.7 metres and supports a theoretical radius of influence of 2,000 metres at 30 days.

Using the data from the monitoring well network and the analytical solutions developed by Theis, it is possible to calculate the potential drawdown at a given distance from a pumping well at a given time. This calculation assumes that hydraulic boundaries are not intersected and that no recharge is present. Because recharge, which is estimated to be 160 to 200 mm/year on the aquifer, is not accounted for in the model, the drawdown prediction is considered highly conservative.

Table 4 presents the 20-year predicted drawdown at various distances from the pumping wells. The calculations assume that the wells are pumping at a sustained combined rate of 40 L/sec.

TABLE 4 – PREDICTED DRAWDOWN

Distance From Wells (metres)	Theoretical Predicted Drawdown (metres)
300	1.44
500	1.33
1000	1.20
2000	1.06
3000	0.98
5000	0.88

The drawdown predicted is within tolerable limits and is not forecasted to cause interference.

The time/drawdown relationship observed during the pumping test can be extrapolated to provide a theoretical drawdown in the pumping well at a given time. Using the same conservative assumption of no recharge, the drawdown in Well 6 would be approximately 4.2 metres if the test were extended to two years at the combined rate used during the last five days of the test (Figure 8). This magnitude of drawdown would result in the water level in the well reaching to within a few centimetres of the top of the well screen in Well 6. However, this is considered highly unlikely based on the previously noted water table increases as a result of recharge, particularly during the spring freshette. The proposed monitoring plan will include regular measurement of water levels, and a re-evaluation of the long term effects of pumping at increased rates should be undertaken on a regular basis, at least annually. A quantification of the annual recharge received by the aquifer should also be undertaken on an annual basis.

5.4 Well Efficiency

The studies conducted by Golder in 2003 indicated that the well efficiency of Well 6 was 97%, which is very high, indicating that the gravel pack and screen were properly sized and located, and the well was sufficiently developed. The data collected during the 2005 test were consistent with this conclusion.

The data indicates, however, that Well 5 (production) is far less efficient than Well 6. Although pumped at lower flow rate (17-20 L/sec compared to 29.3 L/sec at Well 6), the drawdown in Well 5 (production) was 1.5 metres greater than noted at Well 6 at the end of the test.

A larger magnitude of drawdown at a lower pumping rate can be caused by less transmissive deposits near the lower producing well. However, the earlier Morrison Beatty study reported an aquifer transmissivity of 2,000 m^2/day based on data collected from Well 5 (production). The same study indicated that the calculated well efficiency of Well 5 (production) shortly after construction was only 76%.

It is also noted that a maximum drawdown of 4.57 metres was observed at Well 5 (production), whereas a drawdown of only 2.02 metres was measured at Well 5 (standby) located at a distance of six metres from the pumping well. It is apparent that the excessive drawdown is a function of the well and not the aquifer. A steep drawdown cone in the vicinity of a pumping well indicates that the water is not able to flow into the well as easily as it should. This could be the result of less than ideal sizing of the gravel pack and/or screen, or fouling or encrustation of the well screen.

A down-hole video inspection of Well 5 (production) was performed on June 8, 2005. Considerable encrustation of the well screen is evident in the video, and it is estimated that about 50% of the screen was fouled to the point where water transmission through the screen would be substantially reduced or blocked altogether. It should be possible to increase the efficiency of Well 5 (production) by cleaning the well screen, and the water well contractor has made this recommendation.

5.5 Aquifer Hydraulic Parameters

Time-drawdown data recorded at monitoring wells MW03-1, MW03-2A and MW03-2B during the 30-day pumping period were used for the calculation of aquifer parameters. The time-drawdown curves were fitted using the Cooper and Jacob (1946) approximation of the Theis (1939) solution for simultaneous pumping of Well 5 (production) and Well 6. The component of the total drawdown due to pumping of Well 5 and the component of the total drawdown due to pumping of Well 6 were obtained. The time-drawdown data due to pumping of Well 6 only were then re-analyzed with the Neuman (1972) equation to provide confirmation of the previous result. The values of transmissivity and specific yield calculated are summarized in Table 5.

TABLE 5 – CALCULATED HYDRAULIC PARAMETERS

Location	Cooper and Jacob		Neuman	
	Transmissivity (m^2/day)	Specific Yield	Transmissivity (m^2/day)	Specific Yield
MW03-1	1300	0.05	1063	0.10
MW03-2A	1000	0.06	1333	0.02

MW03-2B	1050	0.04	1172	0.04

An average transmissivity value of 1,153 m2/day and an average specific yield of 0.05 were obtained. These results are in good agreement with the aquifer parameters calculated from the 72-hour pumping test conducted at Well 6 in 2003 (Golder, 2003).

5.6 Groundwater Temperature

Groundwater temperature data were recorded by the loggers installed at pumping Well 6 and the monitoring Wells 5 (standby), MW03-1, MW03-2A, and MW03-2B. A plot of the temperature values measured over time is provided in Figure 9. The groundwater temperature at pumped Well 6 increased from 9.3 to 10.8 °C during the first day of the test and then progressively decreased during the next eleven days, reaching a minimum value of 9.1 °C on July 9, 2005. A one-degree drop occurred on July 27, 2005 at the time the pump was shut down. A similar drop was also observed for the groundwater temperature at MW03-2B.

During the recovery period the groundwater temperature at Well 6 oscillated between 8.3 and 8.6 °C, in response to pump cycling at Well 5. Effects of the cycling of Well 5 was also observed in the temperature profile for Well 5 (standby) and monitor MW03-2B. The average temperature profile for groundwater in Well 5 (standby) progressively increased during the 30-day pumping phase. An increase in the average groundwater temperature was also observed at MW03-2B and MW03-1 during the recovery phase.

The range of groundwater temperatures (7.6 to 10.8 degrees Celsius) and the temperature is indicative of a contribution of deeper, colder groundwater during the pumping test. This contribution is supported by mass balance calculations, which suggests that a significant influx of water from the bedrock occurred during the test (Section 6).

5.7 Groundwater Quality

Bacteriological analyses (total coliform and Escherichia coli) were conducted on untreated groundwater samples collected regularly from Well 5 (production) and Well 6 during the pumping phase of the test. Well 6 was sampled on ten occasions, while Well 5 (production) was sampled twenty-four times. Certificates of analysis and analytical results are presented in Appendix E.

Neither E. coli nor total coliforms were detected in any of the ten groundwater samples collected from Well 6 with the exception of a sample collected on July 4, 2005 where a count of two total coliforms per 100 mL was recorded.

E. coli and total coliforms were not detected in any of the groundwater samples collected on a daily basis from Well 5 (production) with exception of a sample collected on July 15, 2005. In this sample, a total coliform count of 148 counts per 100 mL was detected in the lab. OCWA staff has confirmed that the bacteria reading was attributable to the sampling methodology and was not indicative of bacteria present in the raw groundwater. Subsequent bacteriological samples collected from Well 5 (production), both during and after the test, indicated that the bacteriological quality remained satisfactory.

The turbidity of the groundwater at Well 5 (production) and Well 6 was measured in the field on a daily basis using a portable turbidity meter. The results are included in Appendix F. The turbidity at both Well 5 and Well 6 generally fluctuated around 0.20 NTU and always remained below 0.4 NTU except for the readings recorded on July 20, 2005. These readings, 1.53 NTU at Well 5 and 1.59 NTU at Well 6, were interpreted to be associated with technical difficulties in completely removing water condensation from the sample glass vials in the extremely warm and humid conditions present at the time, and are not indicative of raw water turbidity.

Good microbiological quality and low values of turbidity were therefore encountered at both Well 5 and Well 6 throughout the 30-day pumping period. This finding confirms that Well 5 (production), which continued to supply the Village of Chesterville, did not become groundwater under the influence of surface water at any time during the pumping test.

Chemical analyses of untreated groundwater collected from Well 5 (production) and Well 6 were also carried out for a suite of parameters typically used to characterize municipal water supplies. Certificates of Analysis and analytical results are presented in Appendix G. Results show no exceedances of the Maximum Acceptable Concentration (MAC), Interim Maximum Acceptable Concentration (IMAC), or Aesthetic Objectives (AO) outlined in the Ontario Drinking Water Standards (ODWS). Groundwater hardness exceeded the ODWS Operational Guidelines. No significant changes with time were noted in any of the parameters tested. Supplementary water quality analyses are provided in the 2003 Golder report, including the full suite of parameters required under Ontario Regulations 170/169.

A surface water sample was collected from the Monast pit and analyzed for the same parameters used to characterize the groundwater. Certificates of Analysis and analytical results are included in Appendix G. The analytical results indicate that the water from the pit is similar in composition to the groundwater with the exception of calcium and magnesium concentrations, which are approximately half of that noted in the groundwater.

Groundwater samples were collected from three private wells servicing the closest houses to the well field on May 30, prior to the start of the pumping test. The Certificates of Analysis and analytical results are included in Appendix G. Only one of the three wells could be sampled at the end of the test. This sample indicated that the water was similar in quality to that noted prior to the test, and no changes attributable to pumping were noted. No complaints or comments regarding changes to groundwater quality were received.

It is important to emphasize that the water quality remained good throughout the test, and did not significantly change as the test progressed. This suggests that long-term aquifer utilization at greater rates than used presently will not result in a reduction of water quality available to Chesterville residents or to local groundwater users.

6.0 WATER SUPPLY POTENTIAL OF THE MAPLE RIDGE AQUIFER

6.1 Aquifer Yield

Despite being conducted during an warm and relatively dry period, the 30-day pumping test demonstrated that municipal wells No. 5 (production) and No. 6 could be simultaneously pumped at a combined discharge rate of 50 L/sec for an extended period without causing undue stress to the aquifer or negative effects on local groundwater or surface water resources. The pumping rate was reduced for the last five days of the test, but primarily due to the low efficiency of Well 5 (production) that and not due to concern over aquifer depletion.

Based on an assumed recharge of 200 mm/year over an area of 300 hectares, which is the area of the surface expression of the Maple Ridge Aquifer, a total of 600,000 cubic metres of water will recharge the aquifer from precipitation from the surface. This represents about half of the annual taking if the wells are pumped at a combined rate of 40 L/sec for the entire year. If recharge from above was the only source of water to the Maple Ridge Aquifer, then pumping at this rate would result in aquifer mining. However, the pumping test provided clear evidence that recharge from other sources (bedrock and/or lateral flow from adjacent granular material) accounted for a considerable percentage of the water pumped from the wells.

During the pumping test, about 120,000 cubic metres of water was removed from the aquifer. Assuming an average drawdown of 1.5 metres over an area of 100,000 m^2 (400 x 250 metres) and an aquifer porosity of 25%, it is calculated that approximately 37,500 m^3 of the total was removed from aquifer storage. The Monast pit water level dropped about 1.3 metres over an area of approximately 30,000 m^2, providing about 35,000 cubic metres after allowing for 0.2 metres of evaporation. Infiltration from the three precipitation events noted during the test would have accounted for approximately 8,000 m^3 over the area in question. Subtracting the storage, inflow from the pit and infiltrating rainfall leaves from the total pumped during the test leaves approximately 40,000 cubic metres of water originating from outside the Maple Ridge aquifer, from either the surrounding unconsolidated tills or upward from the bedrock. The relatively cold groundwater temperatures discussed in the previous section suggest that the bedrock is an important source of recharge for this aquifer, and the relatively limited areal extent of the eastern end of the Maple Ridge deposit where the municipal wells are located may not limit the aquifer yield as much as may have been previously assumed.

The ultimate long-term yield of the aquifer at this location will depend upon the amount of recharge received. As bulk of the recharge would be expected to occur during the spring melt, it is difficult to assign a maximum acceptable withdrawal rate from the aquifer without many seasons of monitoring data collected during pumping.

It is evident from the time drawdown plots that the rate of water level decline in both Well 5 (production) and in Well 6 was increasing prior to the rate reduction on day 25 of the test, and it is unlikely that the Maple Ridge aquifer could sustain the higher rate of water removal for an extended period of time. It is Golder' professional opinion, based on the studies undertaken to date, that a rate of 50 L/sec could be sustained for periods of several weeks up to a month or more, particularly if Well 5 (production) is rehabilitated to increase well efficiency. A more conservative aquifer yield of 40 L/sec is interpreted to be sustainable in the long term, subject to a regular monitoring program, including a detailed assessment of aquifer recharge.

6.2 Well Capture Zone and Interpreted Travel Times

A capture zone for Chesterville Well 5 was previously modelled as part of the municipal groundwater studies undertaken in 2003/2004 (Robinson et al). The capture zone determined from the modelling extended several kilometres to the north of the municipal well property, but did not extend laterally within the Maple Ridge aquifer to the extent that would be expected based on the aquifer testing program. The model used for the report apparently assumed that the glaciofluvial deposits were much more widespread and contiguous than is supported by evidence from field investigations completed predating that study, which have demonstrated that the Maple Ridge aquifer does not extend to the north.

Based on the results of this aquifer testing program, and the predicted extent of drawdown using data from the test (Section 5.3) it is clear that the entire Maple Ridge aquifer is within the theoretical capture zone for the municipal wells. The underlying bedrock aquifer is also, to some degree, a contributor to the municipal wells.

Groundwater flow velocity and travel times can be estimated from Darcy's Law:

$$v = Ki / \theta$$

where v = average groundwater flow velocity (cm/s)

K = hydraulic conductivity (cm/s)

i = horizontal hydraulic gradient

θ = effective porosity

A hydraulic conductivity of 200 m/day or 0.2 cm/s was assumed based on the testing data. The hydraulic gradient will vary with topography and distance to pumping wells, but is generally very low in the area, due to the flat topography. A hydraulic gradient of 0.001 was used in the calculations. An effective porosity of 0.25, typical for sand and gravel (Freeze & Cherry) was also used.

An average linear groundwater flow velocity of 8 x 10^{-4} cm/s or about 0.7 metres per day is estimated in the coarse sand and gravel deposits. Near the pumping wells, the gradient will be steeper and the velocity will be higher.

The surface expression of the Maple Ridge Aquifer is shown on Figure 3. It is interpreted that the subsurface extent of the aquifer is generally similar, and it is believed that the mapped unit represents most of the capture zone of the municipal wells.

6.3 Potential Contaminant Sources

The 2004 study completed by Robinson et al included an assessment of potential contamination sources located within 2000 metres of Well 5, plus an inventory of waste disposal sites in the general area. No potential contamination sources within 2,000 metres of the well were listed in any of the databases searched by Ecolog Eris. The Boyne Road Landfill, which is located about three kilometers to the northwest of the municipal well site, was noted in the database.

The landfill is located on the edge of the 25-year capture plume modeled in the Robinson et al report. However, as indicated previously, the model does not properly account for the geology of the Maple Ridge deposit, and it incorrectly assumes that the aquifer utilized by the wells is contiguous with the landfill. In addition, the Robinson et al study indicates that groundwater flow is roughly north to south in the area. That is true for the deeper bedrock aquifer, but studies of the landfill by Oliver, Mangione, McCalla and Associates (1991), Trow (1998-2003), Geo-Analysis (1992), J.L. Richards & Associates (1992) and others have demonstrated that the shallow groundwater flow within the glacial till deposits in the area of the landfill is generally to the north, in the opposite direction of the municipal wells. It is this shallow groundwater that receives leachate from the waste disposal site.

A pressure transducer was installed in monitoring well MW19, located to the south of the Boyne Road landfill, approximately 3,000 metres northwest of the municipal wells on July 8, 2005, eleven days after the start of the test. The water level in this well rose until July 17, twenty days into the pumping part of the test, when it began to decline (Figure 10). The water level continued to decline for the duration of the pumping and recovery parts of the test.

The water level decline appears to be consistent with pumping at a distance from the well, where a time lag would be expected. However, this time lag (about 20 days) would also be expected in the response of the well to recovery after the test ended. Measurements were collected in this well for 28 days after the pumping ended and no sign of recovery was noted. In addition, the decline in water table elevation noted in MW19 (1.45 metres) was more than that noted in the Windmill well (about 300 metres from the pumping wells) and over 80% of the drawdown noted in monitor MW03-2B, which is located 45 metres from Well 6. The cause of the water level

increase and decline at this location is not clear, but based on the somewhat anomalous data, it is considered that the observed decline is not related to drawdown associated with the pumping test.

As mentioned above, the landfill is located downgradient of the municipal wells. Even if pumping the wells at an extended rate imposed a drawdown of one metre at the landfill resulting in an imposed gradient of 0.00033 m/m towards the wells, and assuming that the same granular aquifer material found at the Maple Ridge aquifer was present at the landfill and at all points between the wells and the landfill (hydraulic conductivity of about 0.2 cm/sec), the water at the landfill would take in excess of thirty-five years to reach the municipal water supply.
It would be considered however, entirely reasonable and appropriate to review the monitoring data from the landfill on a regular basis. The monitoring plan for the Permit to Take Water should include an annual review of the data collected at the Boyne Road landfill.

The most important potential contamination sources in the immediate area are the pits created by sand and gravel extraction located to the west and southwest of the well site. The aquifer testing has demonstrated that the closest pit is hydraulically connected to the municipal wells, and supplied water, although indirectly, to the wells during the test. It is assumed, based on the interpreted radius of influence of the municipal wells, that other pits in the area are also hydraulically connected to the water supply.

While the extraction of sand and gravel does not in itself pose a significant threat to the wells, the extraction machinery requires fuel, and presence of fuel storage and/or dispensing outlets could raise concerns about impact from potential spills or leaks. It is recommended that any fuel storage and dispensing be undertaken in a responsible manner and in a location as far away as possible from the open pits and the municipal well site. The operators of the extraction operations should be kept aware of the presence of the wells and encouraged to take an appropriate standard of care.

Other potential sources of contamination include the on-site sewage disposal system at the North Dundas District High School, a graveyard located on the Maple Ridge aquifer to the south of the school and farm operations on the aquifer to the west and southwest of the municipal wells. An air photograph showing the locations of the potential contaminant sources discussed above is included as Figure 11. No reports of groundwater contamination issues arising from these land uses have been documented.

Local farmers should be encouraged to utilize responsible farming practices, including safe storage and use of fuels, manure, pesticides and herbicides. Monitoring results indicate that current practices have resulted in good water quality.

6.4 Potential Sensitive Receptors and Impacts

No sensitive surface water receptors were located in the area. The nearest surface water bodies are the gravel pits to the west and southwest and the drainage ditch to the south. There are a number of houses and farms that obtain water from private wells in the area. The predicted imposed drawdown on groundwater levels from the combined use of Wells 5 (production) and 6 should not result in any unacceptable effects to local groundwater resources.

It is always possible that additional drawdown imposed on an aquifer, even if relatively minor in nature, can result in a decrease in supply in a marginal well. The Township may want to consider conducting a survey of groundwater users within the Maple Ridge aquifer to assess the conditions of their wells and to provide baseline information.

6.5 GUDI Study

As part of the 2005 work program for the Chesterville water supply, a *Groundwater Under the Direct Influence of Surface Water* (GUDI) study was conducted to determine if Well 6 is under the direct influence, or is potentially under the direct influence of surface water. The assessment was prepared in accordance with criteria defined in the *Terms of Reference for Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water* outlined by the MOE in October, 2001. The GUDI study is documented under separate cover.

Well No. 6 was classified as being potentially under the direct influence of surface water, based on the presence of surface water (the Monast pit) within a fifty day travel time to the well, the hydraulic response of the water in the Monast Pit to the pumping test and because the well draws water from an unconfined aquifer within 15 metres of surface. However, based on the results of the study, it was concluded that Well 6 is not under the direct influence of surface water.

6.6 Monitoring Program

It is recommended that a monitoring program be established to determine the effects of pumping, precipitation and spring recharge on the aquifer. This program should include regular water level measurements (e.g. weekly) at the existing on-site monitoring well network, and at monthly or quarterly intervals at selected local wells located within 2,000 metres of the municipal property. The program should also include annual water quality sampling at selected wells and surface water stations, and the data collected from the ongoing monitoring program at the Boyne Road Landfill site should be reviewed on an annual basis.

The data collected in the monitoring program will help confirm the effects of the water taking and depending upon the results, may justify an increase in water removal at a later date.

7.0 CONCLUSIONS AND RECOMMENDATIONS

A long-term aquifer test was conducted on the Maple Ridge aquifer near the Town of Chesterville in the Township of North Dundas in June and July 2005. During the test, an existing and a proposed municipal supply well were pumped for a period of 30 days. Water levels were recorded in the pumping wells and a monitoring network consisting of both monitoring wells and surface water stations.

The major conclusions of the study are as follows:

- The testing has indicated that the aquifer contained in the Maple Ridge glaciofluvial complex can sustain a combined pumping rate of 50 L/sec for a period of several weeks, and can sustain a rate of 40 L/sec in the long term, subject to monitoring. Monitoring data together with upgrading of Well 5 (production) may demonstrate that taking of 50 L/sec may be sustainable in the longer term, subject to data review.

- The drawdown in Well 5 (production) was excessive as compared to the general drawdown imposed in the aquifer due to pumping. It was concluded that Well 5 (production) was relatively inefficient. Video camera footage of the well indicated that the well screen was heavily encrusted. Rehabilitation of this well may permit increased groundwater extraction rates.

- The yield of Well 6 is at least 30 L/sec. Well 6 can easily provide the capacity that was lost from the system when Chesterville Well 1 was decommissioned. Based on the results of the testing, the aquifer can supply capacity beyond that currently required for the Village of Chesterville.

- The transmissivity of the overburden aquifer in the vicinity of Well 5 (production) and Well 6 was calculated to be in the range of 1,1050 m^2/day, with a specific yield of 0.05. These results are in general agreement with the aquifer parameters calculated from data collected during previous hydraulic tests.

- Drawdown data measured at the monitoring wells indicated that influence from the pumping could theoretically extend as far as 9,000 metres from the wells. However, due to a number of factors, including the relative close proximity of the monitoring wells, natural water table decline due to climactic conditions and the known physical limits of the Maple Ridge aquifer, the extent of influence is predicted to be considerably less, on the order of 2,000 metres. Some drawdown is expected within most of the Maple Ridge Aquifer.

- The water level in the nearby flooded gravel pit decreased by 1.3 metres during the test. Most of the decrease was attributed to the testing. Good microbiological quality and low values of turbidity were noted at Well 5 (production) and Well 6 throughout the 30-day pumping period. Groundwater quality at both wells was not affected by the proximity of the surface water in the pit. A GUDI study indicates that adequate natural filtration exists at this location, and surface water treatment techniques are therefore not required.

- Similar groundwater chemistry was found at both wells, and no significant changes in water quality were observed, indicating that long term aquifer usage is unlikely to cause a decrease in groundwater quality in the municipal supply or for other groundwater users in the area.

- No complaints of water quality or quantity issues were received during or after the aquifer testing program. Interference with groundwater supplies is not forecast at a sustained pumping rate of 40 L/sec or at peak rates of up to 50 L/sec.

- A significant contribution of water to the wells from the underlying till and bedrock was inferred from mass balance calculations and temperature profiles.

- A long-term monitoring program is required to further confirm the ultimate yield of the aquifer, and may justify an increase in water taking at a later date.

Recommendations related to the increased utilization of the Maple Ridge aquifer are provided as follows:

1. Well 5 (production) is relatively inefficient, and efforts to remove the blockage noted in the well screen should be undertaken. An appropriately qualified well contractor should be engaged to perform this work.
2. The rate of water taking to be applied for in the Permit to Take Water for Well 6 should be 30 L/sec for peak usage. The monthly and yearly rates on the Permit will be based on anticipated demand.
3. A monitoring program should be established to determine the effects of pumping, precipitation and spring recharge. This program should include regular water level measurements (e.g. weekly) at the existing monitoring well and surface water network, and at monthly or quarterly intervals at local wells located within 2,000 metres of the wells. The program should also include annual water quality sampling at selected wells and surface water stations, and the data collected from the ongoing monitoring program at the Boyne Road Landfill site should be reviewed on an annual basis. The data collected in the monitoring program will help confirm the effects of the water taking and depending upon the results, may justify an increase in water removal n the future.

4. The presence of the Monast Pit in close proximity to the municipal wellfield has not resulted in any water quality or quantity issues to date. The current operator has been very cooperative with the Municipality and has managed his business in a responsible manner. Provided similar practices are adhered to in future, there should not be undue risks from this operation. However, the municipality should be proactive in ensuring that they have sufficient control of the lands adjacent to the wellfield, including the Monast property, to ensure that access to the lands is restricted and the use of the land is controlled. This will help to protect the valuable groundwater resource of the Maple Ridge aquifer.

8.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of the Corporation of the Township of North Dundas. Should additional parties require reliance on this report, written authorization from Golder Associates will be required. The report, which specifically includes all tables, figures and appendices is based on data and information collected during the desktop review, subsurface investigations and groundwater monitoring conducted by Golder Associates and is based solely on the conditions of the property at the time of the field investigations, supplemented by historical information and data obtained by Golder Associates as described in this report.

The assessment of hydrogeological conditions at this site has been made using the results of water table elevation monitoring from a limited number of locations and of chemical analyses of discrete groundwater samples. The site conditions between and beyond monitoring locations have been inferred based on conditions observed at existing well locations. Subsurface conditions may vary from these locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of the subsurface conditions of a site may vary and remain undetected.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the geoscience profession currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during our investigations, our present understanding of the site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is either expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statues are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates should be requested to re-evaluate the conclusions of this report, and to provide amendments as required. The groundwater monitors installed during the course of this investigation have been left in place. These monitors are the property of the Township of North Dundas and not Golder Associates.

GOLDER ASSOCIATES LTD.
Environmental Division

Stephen Wilson, P.Geo.
Senior Hydrogeologist

B.J. Velderman, M.Sc., P.Geo.
Senior Hydrogeologist/Principal

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n:\active\2004\1120\environmental\04-1120-773 30-day pumping test chesterville well 6\reports\30-day pumping test\rpt-001 nov 05 well 6 chesterville pttw.doc

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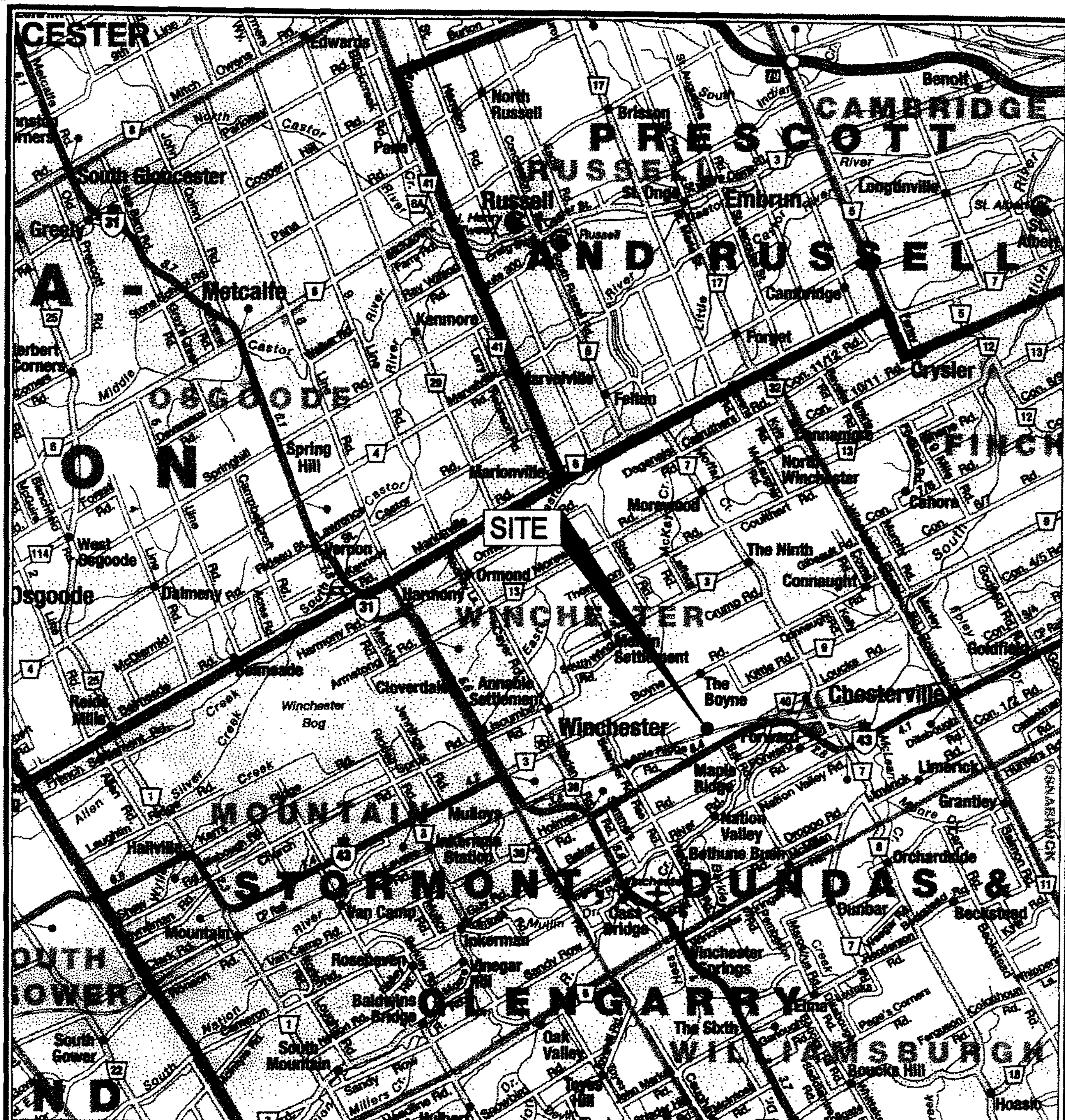

SPECIAL NOTE
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FILE No. 041120773-5000-01.dwg	CHECK S.W.		
PROJECT No. 04-1120-773 REV.	REVIEW B.J.V.	TOWNSHIP OF NORTH DUNDAS	FIGURE 1

Drawing file: 04-1120-773-5000-01.dwg Nov 11, 2005 - 2:58pm

LEGEND

- WELL No. 6 LOCATION
- EXISTING SUPPLY WELL LOCATION
- MONITORING WELL LOCATION, 2003 INVESTIGATION BY GOLDER ASSOCIATES LTD.
- TEST PIT LOCATION, 2003 INVESTIGATION BY GOLDER ASSOCIATES LTD.
- HAND AUGER HOLE LOCATION, 2003 INVESTIGATION BY GOLDER ASSOCIATES LTD.
- MONITORING WELL LOCATION BY OTHERS
- SURFACE WATER GAUGE LOCATION
- WINDMILL WELL LOCATION

Golder Associates
Ottawa, Ontario

FILE No.	041120773-5000-02.dwg
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CADD	J.M.
CHECK	S.W.
REVIEW	B.J.V.

TITLE

SITE PLAN

SPECIAL NOTE
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FIGURE 2

Drawing File: 04-1120-773-5000-02.dwg

LEGEND

- WINCHESTER WELL LOCATION
- CHESTERVILLE WELL LOCATION
- ROADWAY
- SURFACE EXPRESSION OF MAPLE RIDGE AQUIFER

SURFICIAL GEOLOGY

- TILL, PLAIN WITH LOCAL RELEIF <5m
- TILL, DRUMLINIZED
- TILL, HUMMOCKY TO ROLLING WITH LOCAL RELEIF 5 TO 10 m
- ICE CONTACT STRATIFIED DRIFT: GRAVEL & SAND
- OFFSHORE MARINE DEPOSITS: CLAY, SILTY CLAY & SILT
- OFFSHORE MARINE DEPOSITS: CLAY, SILTY CLAY & SILT (GULLIES & RAVINES)
- OFFSHORE MARINE DEPOSITS: CLAY & SILT UNDERLYING EROSIONAL TERRACES
- OFFSHORE MARINE DEPOSITS: CLAY & SILT UNDERLYING EROSIONAL TERRACES (GULLIES & RAVINES)
- DELTAIC AND ESTUARY DEPOSITS: MEDIUM TO FINE GRAINED SAND
- DELTAIC AND ESTUARY DEPOSITS: MEDIUM TO FINE GRAINED SAND (GULLIES & RAVINES)
- 5a NEARSHORE SEDIMENTS: GRAVEL, SAND & BOULDERS
- 5b NEARSHORE SEDIMENTS: FINE TO MEDIUM GRAINED SAND
- 6a ALLUVIAL DEPOSITS: SILTY SAND, SILT, SAND & CLAY
- ALLUVIAL DEPOSITS: SILTY SAND, SILT, SAND & CLAY (GULLIES & RAVINES)
- 6b ALLUVIAL DEPOSITS: MEDIUM GRAINED STRATIFIED SAND WITH SOME SILT
- ALLUVIAL DEPOSITS: MEDIUM GRAINED STRATIFIED SAND WITH SOME SILT (GULLIES & RAVINES)
- ORGANIC DEPOSITS: MUCK & PEAT
- d DUNE
- d_g DUNE (GULLIES & RAVINES)
- LANDSLIDE AREA
- LANDSLIDE AREA (GULLIES & RAVINES)
- BEDROCK: INTRUSIVE & METAMORPHIC
- BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE
- BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE (GULLIES & RAVINES)
- WATER

SPECIAL NOTE

THIS DRAWING TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT

REFERENCE

BÉLANGER, J. R., URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE D3295, 2001

Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 18

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1:90,000

PROJECT

CHESTERVILLE WATER SUPPLY

TITLE

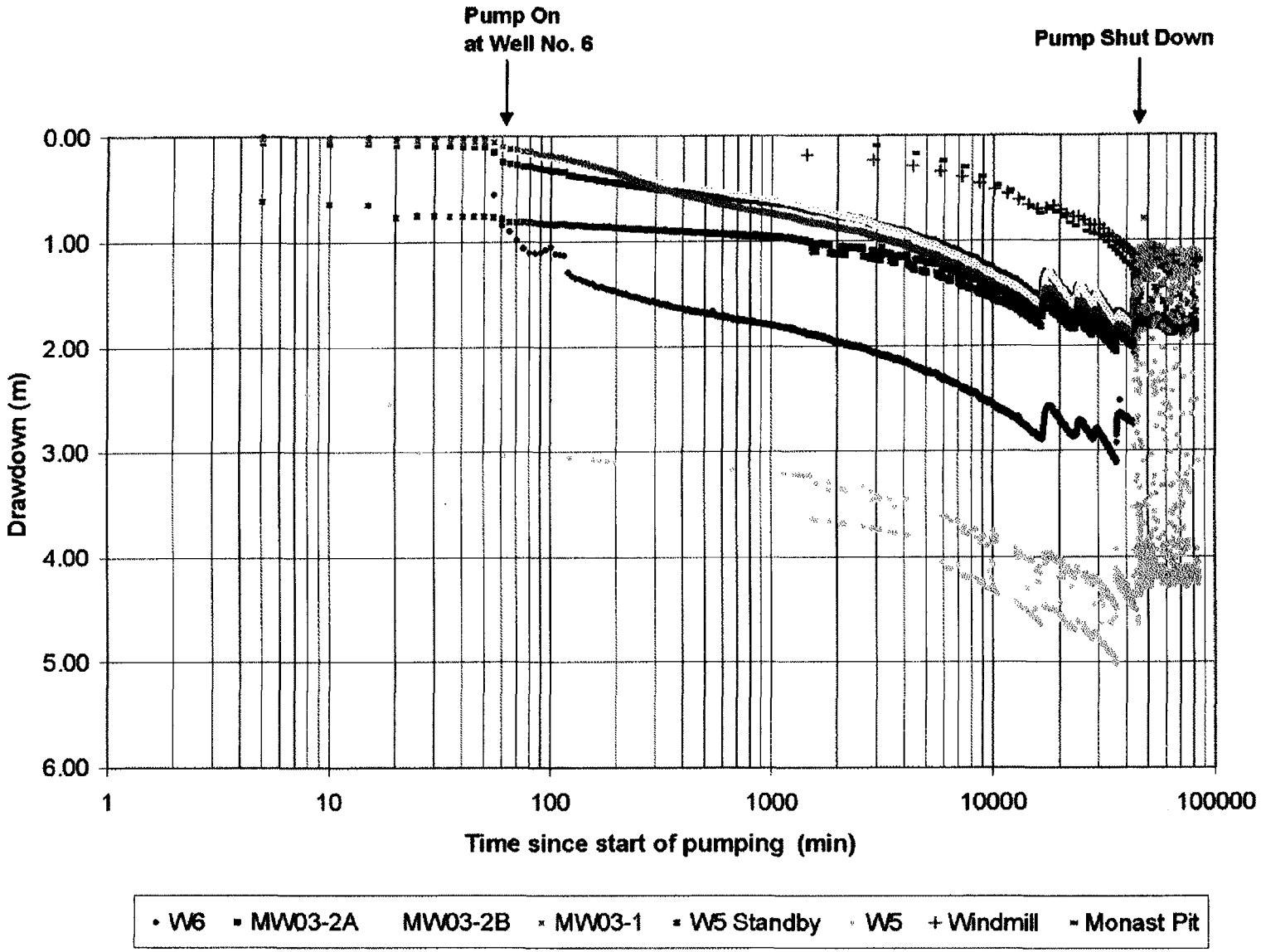
SURFICIAL GEOLOGY MAP

Golder Associates Ottawa, Ontario

PROJECT No. 04-1120-775			SCALE AS SHOWN	REV. 1
DESIGN				
GIS	SK	Nov. 2005		
CHECK	MD	Dec. 2005		
REVIEW	BJV	Dec. 2005		

FIGURE: 3

N:\Active\2004\1120\ENVIRONMENTAL\04-1120-773-90-Dey Pumping Test Chesterville Well 6\GIS\Fig3_Surficial Geology.mxd



30-DAY PUMPING TEST AND RECOVERY: DRAWDOWN PRODUCED AT PUMPING WELLS AND AT MONITORING LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 04-1120-773 FILE No. 04112073-5000-GRAPHS CADD J.M. DATE 09/22/05

FIGURE 4

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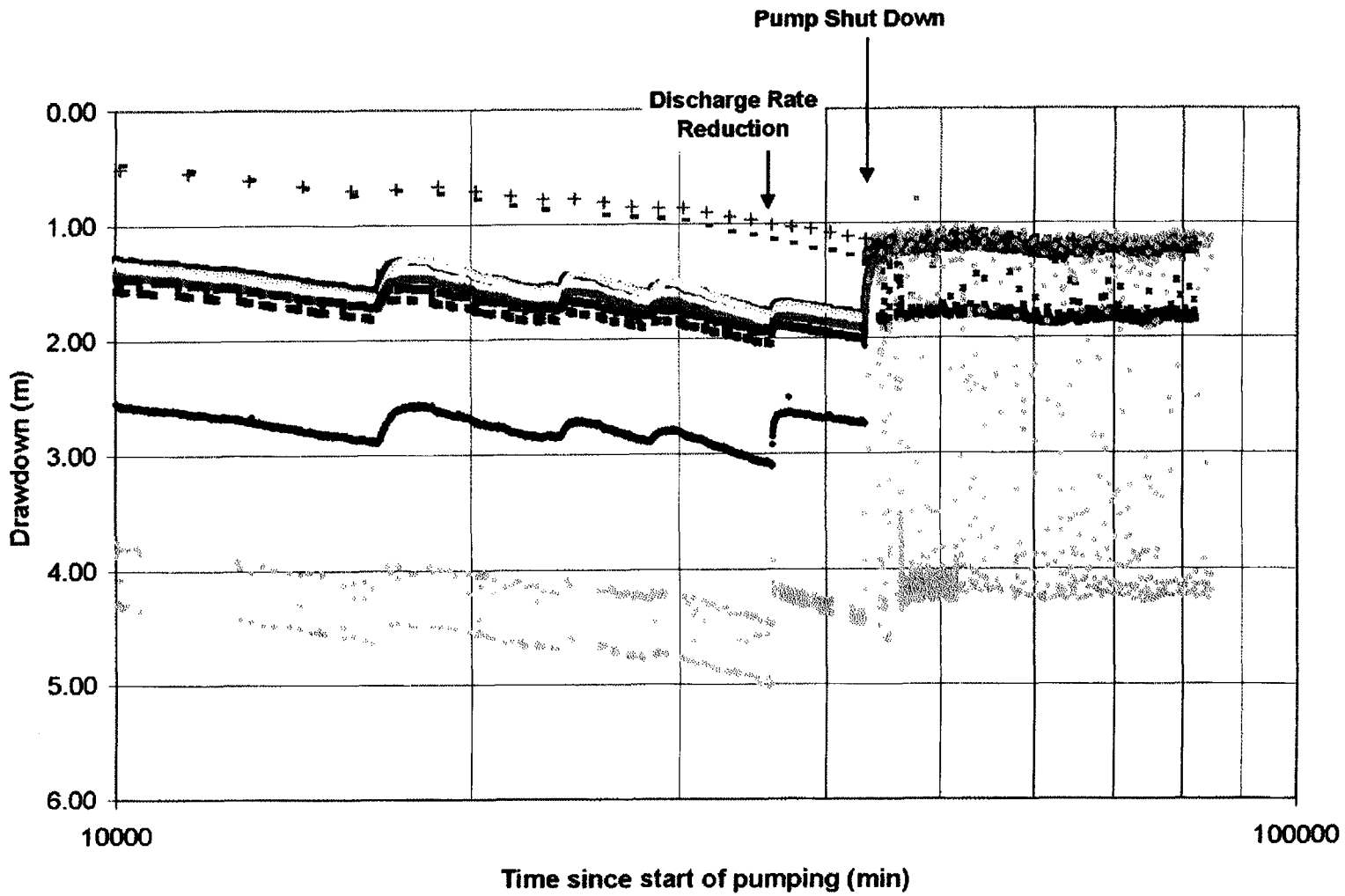

EFFECT OF PRECIPITATION AND DISCHARGE RATE REDUCTION ON DRAWDOWN AT PUMPING WELLS AND AT MONITORING LOCATIONS

FIGURE 5

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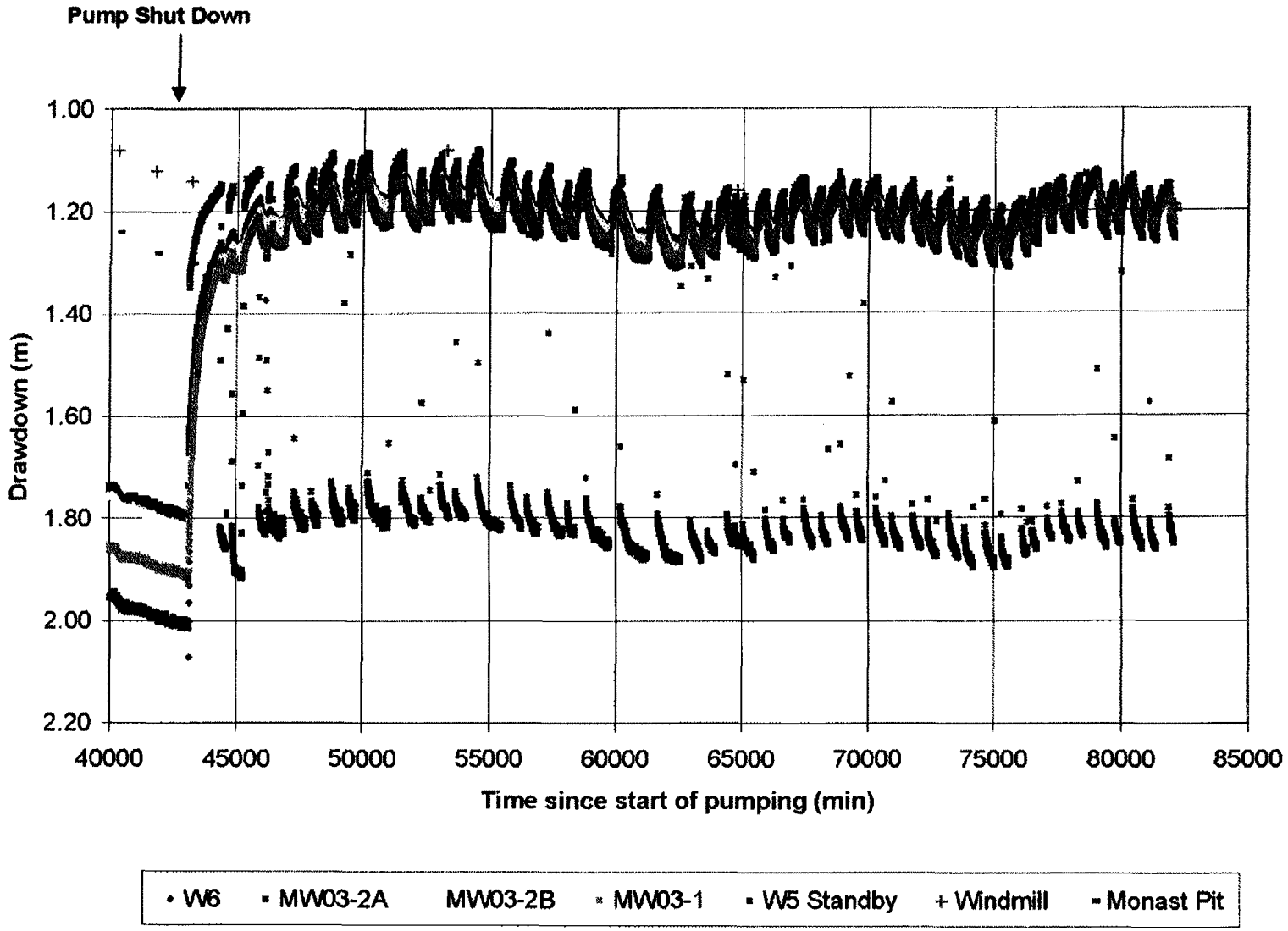

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PROJECT No. 04-1120-773 FILE No. 04112073-5000-GRAPHS CADD J.M. DATE 09/22/05

RECOVERY PHASE

FIGURE 6

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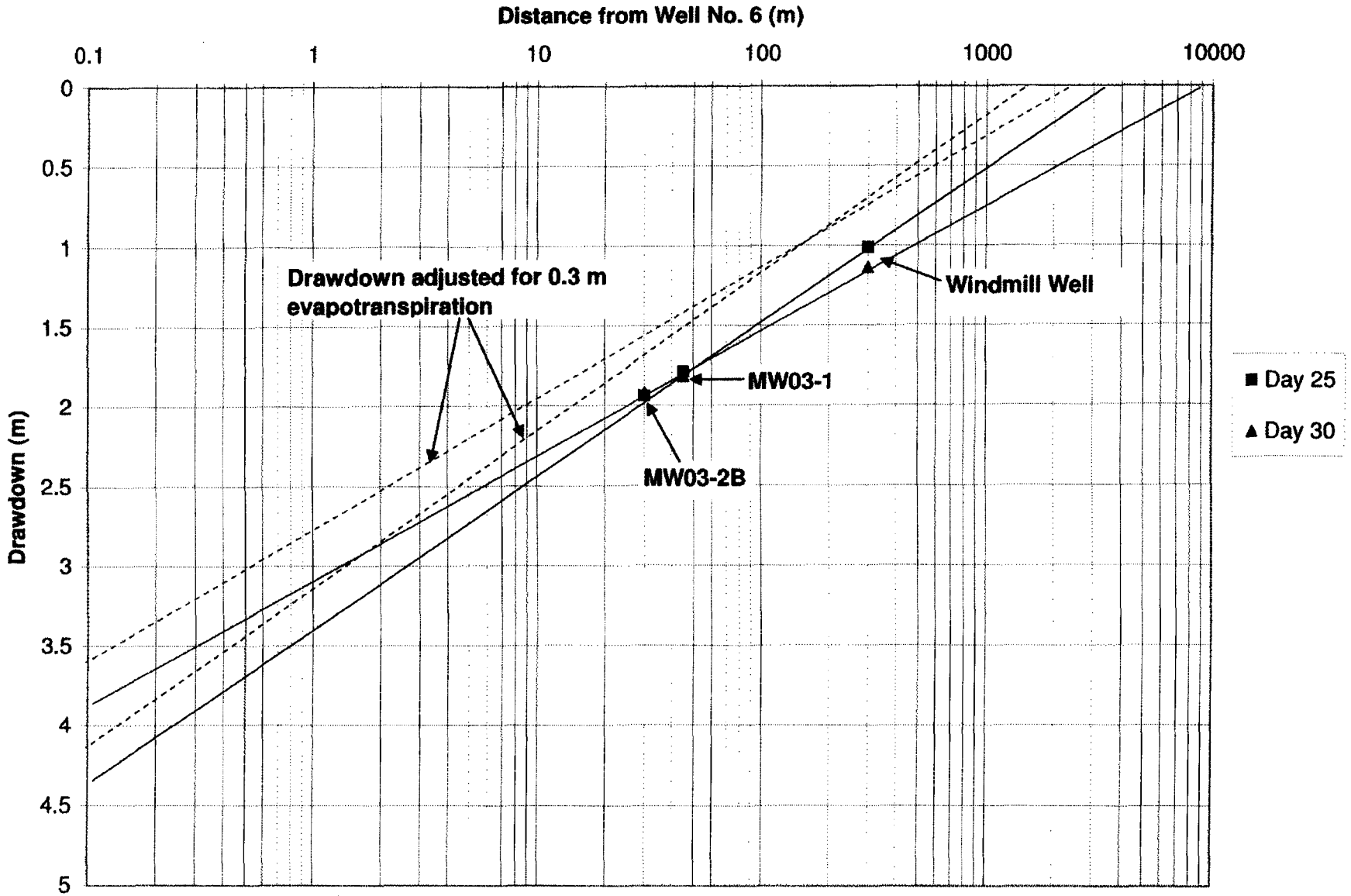

DRAWDOWN VERSUS DISTANCE GRAPH WELL 6

FIGURE 7

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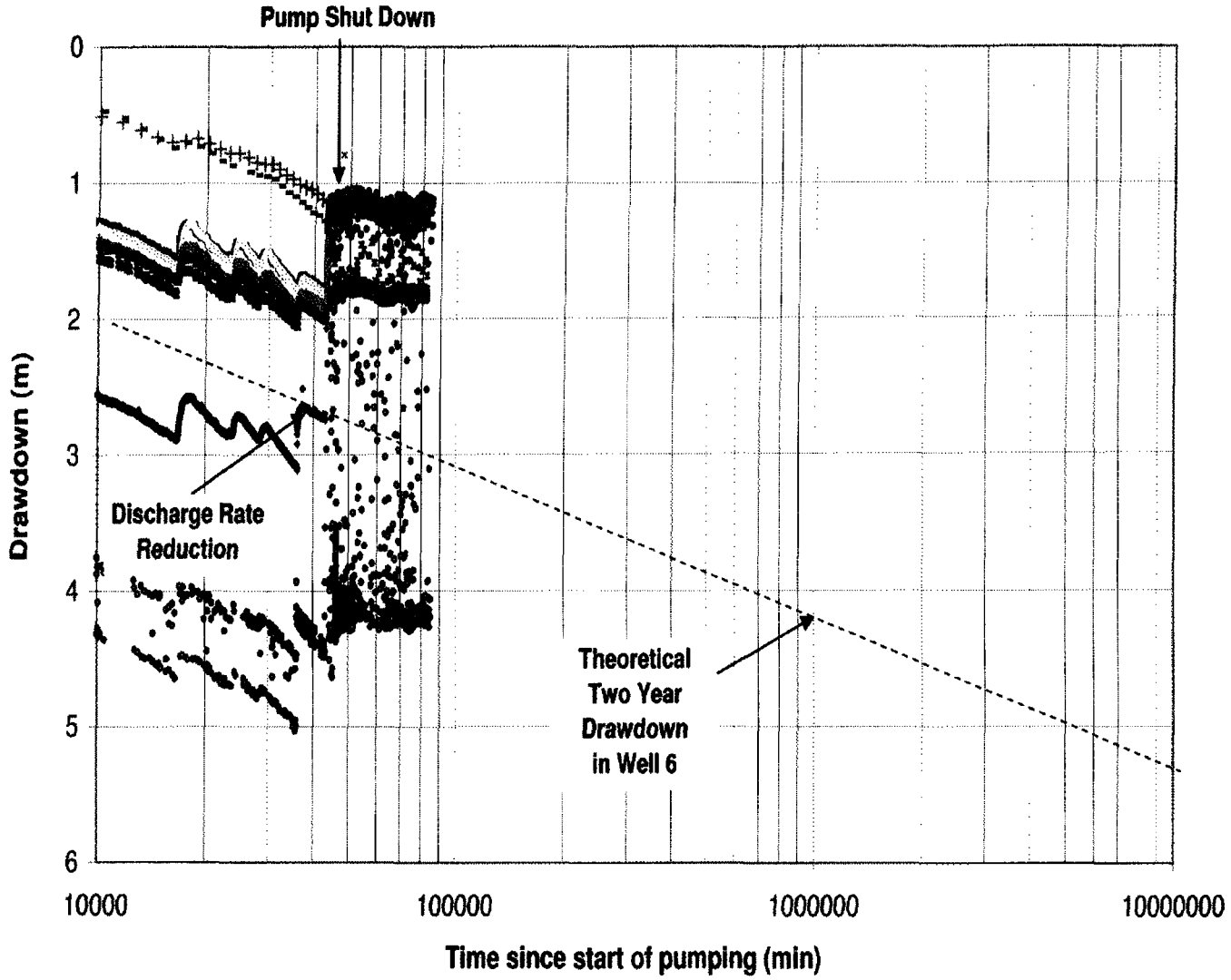

DRAWDOWN VERSUS DISTANCE FROM WELL No. 6

FIGURE 8

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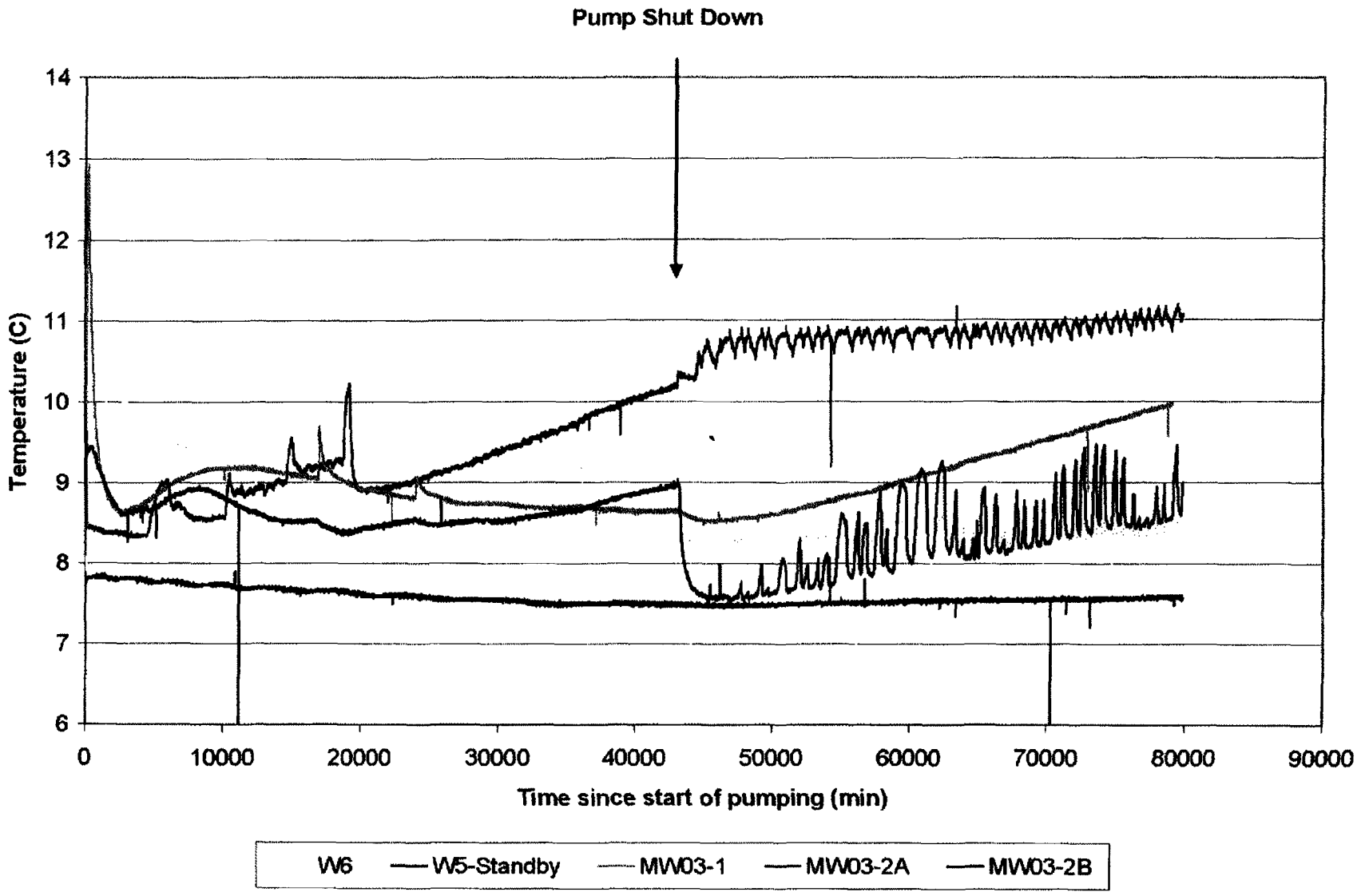

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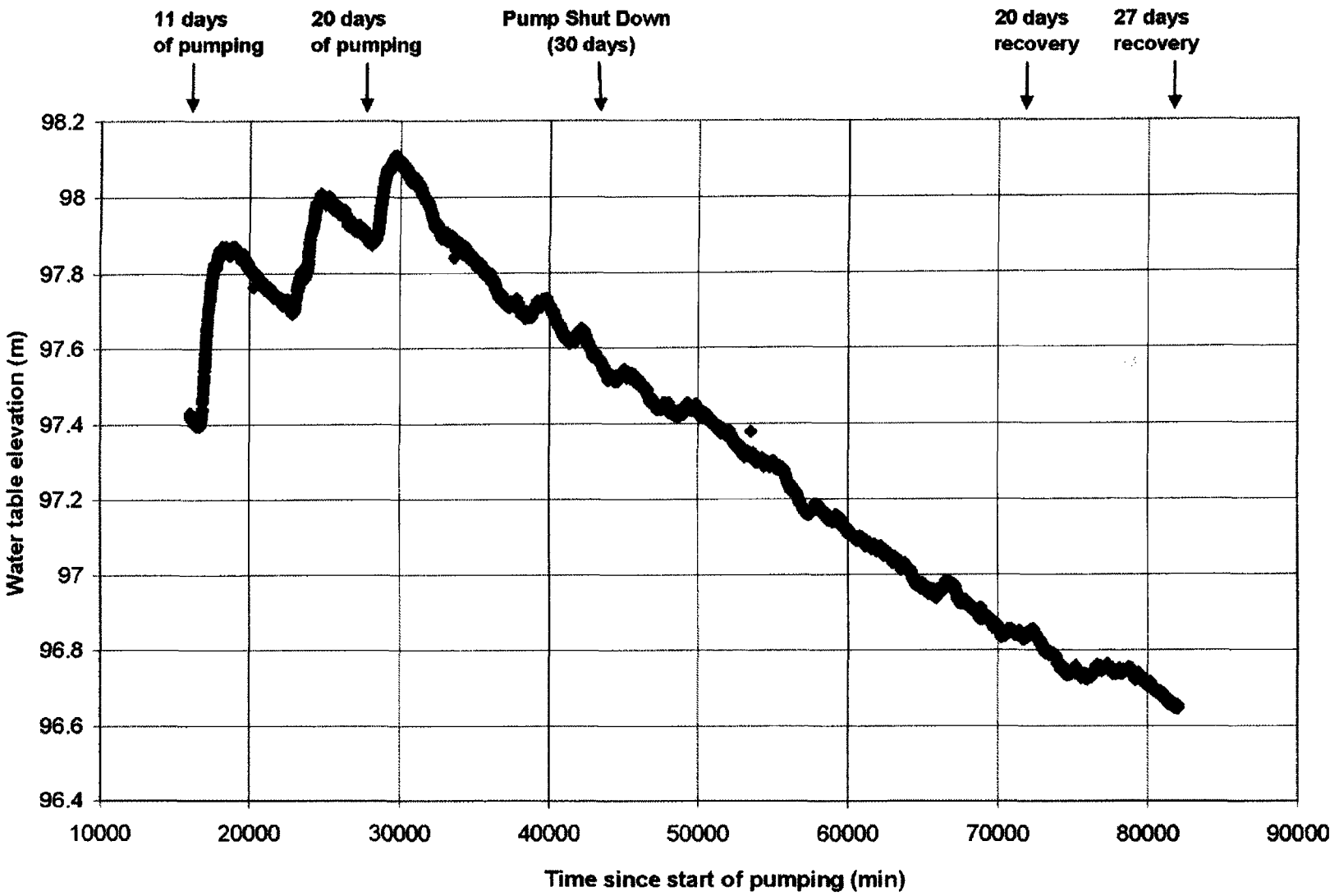
PROJECT No. 04-1120-773 FILE No. 04112073-5000-GRAPHS CADD J.M. DATE 09/22/05

30-DAY PUMPING TEST AND RECOVERY: GROUNDWATER TEMPERATURE PROFILES

FIGURE 9

Drawing file: 04-1120-773-5000-GPAPHS.dwg Nov 11, 2005 - 3:27pm



WATER TABLE ELEVATION AT MONITORING WELL MW19, BOYNE LANDFILL

FIGURE 10

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LEGEND

① BOYNE ROAD LANDFILL
② MONAST PIT
③ NORTH DUNDAS HIGH SCHOOL
④ GRAVEYARD
⑤ FARMING OPERATIONS

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT

400 0 400 800
SCALE METRES

Golder Associates
Ottawa, Ontario

FILE No. 051120773-5000-11.dwg
PROJECT No. 04-1120-773 REV.

SCALE 1:20,000
DATE Nov. 2005
DESIGN
CADD S.L.
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REVIEW

TITLE
POTENTIAL CONTAMINANT SOURCES

FIGURE **11**

Drawing file: 04-1120-773-5000-11.dwg Nov 11, 2005 - 2:52pm

APPENDIX A

WELL LOGS AND WATER WELL RECORDS

metres LOG

0

Sandy CLAY and gravel packed

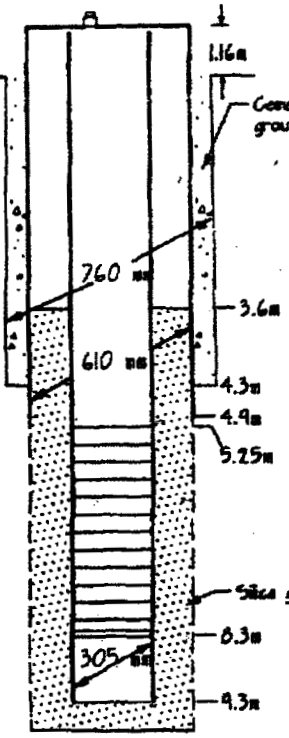
2.44

Fine to coarse GRAVEL, some sand

7.32

Fine to coarse SAND, fine to coarse gravel, some clay and boulders

9.75



WELL MATERIAL

Outer Casing: 610 mm dia. 9.5 mm Wall Thk. Mat'l Steel
Cemented from 4.3 m to 0.0 m
Inner Casing: 305 mm dia. 9.5 mm Wall Thk. Mat'l Steel
Screen: Make: 305 mm dia. Opening & Mat'l: 50 SLOT S.S. HI Q
Plug: Type: Plate Mat'l S.S. Other
Gravel: Type: Silica Size: #3 Morie Quantity: 2770 kg

AQUIFER TEST DATA

Date: September 3, 2003 By: W. Nobes
Static Level 3.21m below M.P. 1.51m A.G.L
Pumping Rate L/s : 30.3 (400 IGM)
Pumping Duration: 72 hrs. 0 min.
Pumping Level at Test End: 5.27m
Performance Plots: dd-t Dwg.
dd-r Dwg.
Step Test 103210

EQUIPPED WELL DATA

Date: By:
Rated Well Capacity L/s
Pumping Rate L/s Static Level m
Pumping Level m at hrs. min.
Pump Pressure: kPa Main Pressure kPa
Shut Off: AGH kPa W.L. m
Clear Well Depth from B.P m Air Line m

PUMP & MOTOR DATA

Pump Make: Rating: L/s @ m T.H
Head: Type: S.N.
Column: m X mm X mm X mm Shaft Mat'l
Bowl: Stage: Curve:
Suction: mm dia. m Long
Special: Zinc Sleeves Taped Oil Line
Other
Motor Make: Frame: S.N.
kW phase hz rpm Volts
Bearing No. Upper
Lower

Special Equipment

WELL REVISIONS AND REHABILITATION		
DATE	WORK DONE	BY

International Water Supply Ltd.

MONTREAL - BARRIE - SASKATOON

CLIENT: CHESTERVILLE

WELL No: WELL No. 6

DRILLED BY: Nobes/Pavey	DATE: Sep/03	DRAWN: T. Brown	
INSTALLED BY:	DATE:	DATE:	Sept 18/03

morrison beatty limited
consulting engineers and hydrogeologists
4500 dixie road, unit 12a, mississauga, ontario L4W 1V7 (416-624-8308)

Water Well Record
Production Well PW6 (5-production) 9
Chesterville, Project No. 664-881

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

STORMONT DUNDAS	CHESTERVILLE, ONTARIO	Con. 5	12
Town of Chesterville	CHESTERVILLE Ont. KOC 1HO	DATE COMPLETED 23 OJ 89	

PRODUCTION WELL

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Brown	Sand	Gravel Stones	Packed	0'	22'
Grey	Gravel	Stones sand clay	Layered	22'	30'
Multi color	Gravel	Stones , Cobbles	Loose	30'	40'

WATER RECORD

30'	☒ Fresh ☐ Salty	☐ Gas ☐ Oil	
40'	☒ Fresh ☐ Salty	☐ Gas ☐ Oil	
	☐ Fresh ☐ Salty	☐ Gas ☐ Oil	
	☐ Fresh ☐ Salty	☐ Gas ☐ Oil	

CASING & OPEN HOLE RECORD

30"	☒ Steel ☐ Concrete ☐ Plastic		0'	20'
20"	☒ Steel ☐ Concrete ☐ Plastic	.375	0'	30'
10"	☐ Steel ☐ Concrete ☒ Plastic	.302	0'	30'

SCREEN

100	10"	10'
Stainless Steel		30'

PLUGGING & SEALING RECORD

0'	21'	Cement grout
		20 sacks of High
		Early Cement

PUMPING TEST

PUMPING TEST METHOD ☒ PUMP ☐ BAILER — PUMPING RATE 300 — DURATION OF PUMPING 72

PUMPING LEVEL (below casing)	WATER LEVELS DURING				
31'	16'2"	16'1"	15'7"	15'4"	15'8"

FINAL WATER LEVEL AT END OF TEST 39' — ☐ CLEAR ☐ CLOUDY

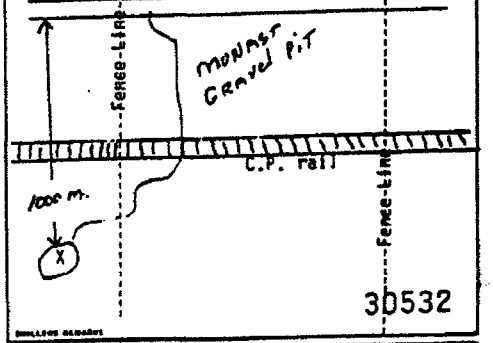
RECOMMENDED PUMP TYPE ☐ SHALLOW ☒ DEEP — RECOMMENDED PUMP SETTING 29' — RECOMMENDED PUMPING RATE 300

3' ←

FINAL STATUS OF WELL	☒ Water Supply ☐ Observation Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Quality ☐ Unfinished ☐ Other
WATER USE	☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Other ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Not Used
METHOD OF CONSTRUCTION	☒ Cable Tool ☐ Diamond ☐ Boring ☐ Driving ☐ Digging ☐ Jetting ☐ Other

LOCATION OF WELL

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



30532

CONTRACTOR

NAME OF WELL CONTRACTOR: OLYMPIC DRILLING CO. LTD. — WELL CONTRACTOR'S LICENCE NUMBER: 4006
ADDRESS: Box 9180 OTTAWA, Ontario K1G 3T9
NAME OF WELL TECHNICIAN: JODIE RENWICK — WELL TECHNICIAN'S LICENCE NUMBER: T-0460
SIGNATURE OF TECHNICIAN/CONTRACTOR: J.D. Renwick — DATE SUBMITTED: 23 01 89

CONTRACTOR'S COPY

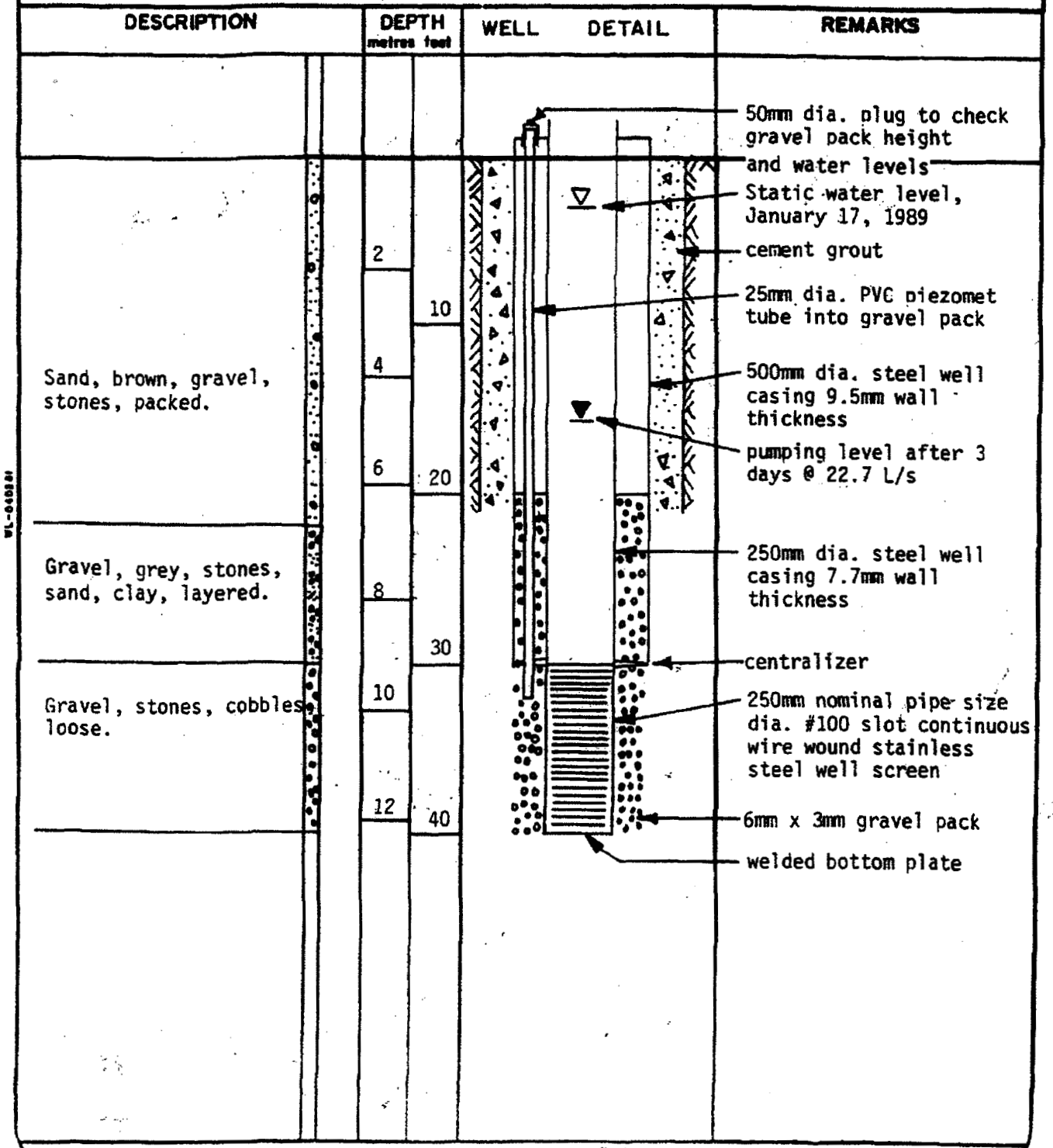
OFFICE USE ONLY

FORM NO 0506 (11/88) FORM 9

morrison beatty limited
consulting engineers and hydrogeologists
4500 dixie road, Mississauga, ontario (416) 624 - 9300

As Constructed Well Diagram
Well No. 5 (production) **10**

CLIENT Olympic Drilling Co. Ltd. FILE NO. 664-881
PROJECT Chesterville LOCATION Monast Property
GEOLOGIST/ENGINEER AWT/WDM DATE COMPLETED January 23, 1989



GS- GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

Ontario Ministry of Environment and Energy

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

County or District	Township/Borough/City/Town/Village	Con	Lot
DUNDAS	WINCHESTER	V	12

Owner's surname	First Name	Address of Well Location	Date completed (day / month / year)
TOWNSHIP OF NORTH DUNDAS		CHESTERVILLE	3 / 9 / 03

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	CLAY & GRAVEL	SANDY	PACKED	0	8
	GRAVEL	SAND	FINE TO COARSE	8	24
	SAND & GRAVEL	CLAY & BOULDERS	FINE TO COARSE	24	32

WATER RECORD

Water found at - feet	Kind of water		
	☒ 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
24	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	0.375	0	16
12	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	0.375	+5	17
12	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	0.375	27	30

SCREEN

Slot No.	Diameter	Length	Material and type	Depth at top of screen
50	12 inches	10 feet	WW SS	17 feet

PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
14	0	CEMENT GROUT.

PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
☒ Pump ☐ Bailer	400 GPM	72 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☒ Pumping ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
5.5 feet	12.3 feet	8.9 feet	9.1 feet	9.4 feet	9.5 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 pump rate
☐ Shallow ☐ Deep	feet	GPM

FINAL STATUS OF WELL

☒ Water supply ☐ Observation well ☐ Test hole ☐ Recharge well
☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering
☐ Unfinished ☐ Replacement well

WATER USE

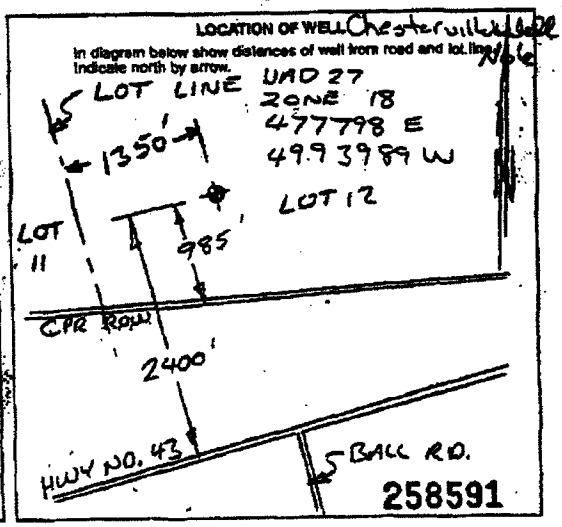
☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial
☐ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning
☐ Not use ☐ Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



Name of Well Contractor	Well Contractor's Licence No.
INTERNATIONAL WATER SUPPLY	2801

Address	
PO BOX 310 BARRIE ON L4M 4T5	

Name of Well Technician	Well Technician's Licence No.
WALTER NOGES	T0115

Signature of Technician/Contractor	Submission date (day / month / year)
	25 09 03

MINISTRY USE ONLY

0506 (05/02) Print Form 9

3 - OWNER'S COPY

FIGURE 2: RECORD OF TEST HOLE

DESIGNATION WELL NO. 5 (STANDBY)

COMPLETION DATE

PROJECT CHESTERVILLE WATER SUPPLY

PROJECT NO. 1500

DRILLING METHODS CABLE TOOL

SUPERVISOR I. MACDONALD

DRILLING CONTRACTOR OLYMPIC DRILLING

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	SAMPLING N VALUE
1		Sand: light brown, fine grained sand mixed with 20% silt and 5% rounded 5-10 mm coarse sand to fine gravel granules - granules increase in amount with depth		cement grout between 30cm and 20 cm casings			
2							
3							
4		4.6 m					
5		Sand and gravel: light brown, fine grained sand to silt matrix with subangular to angular gravel clasts up to 3 cm					
6							
7		7.3 m					
8		Silty clay: grey clay mixed with fine grained brown silt		20 cm (8")			
9		8.5 m Sand and gravel: dark grey/black, coarse grained sand mixed with 40% angular to subangular gravel up to 5 cm; water produced					
10		9.8 m		1.2 m (4') of 100 slot screen			
11		Gravel: dark grey gravel rounded to subangular up to 10 cm with a coarse sand matrix - a lot of water produced 11.0 m		2.7 m (9') of 80 slot screen			
12		Gravel: cobble to boulder gravel with a dark grey coarse sand matrix - water produced					
13		12.8 m Bedrock: 0.5 m socket					
14		13.3 m		Total of 3.9 m (13') of Johnson stainless steel wire wrap screen			

WATER AND EARTH SCIENCE ASSOCIATES LTD.

APPENDIX B

PERMIT TO TAKE WATER

Ontario

Ministry of the Environment

Ministère de l'Environnement

PERMIT TO TAKE WATER
Pumping Test
NUMBER 0045-68USZA

Pursuant to Section 34 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

The Corporation of the Township of North Dundas
PO Box 489
Winchester, Ontario, K0C 2K0
Canada

For the water taking from: Two Drilled Wells

Located at: Lot 12, Concession V
North Dundas, United Counties of Stormont, Dundas and Glengarry

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment.

(d) "District Office" means the Cornwall District Office.

(e) "Permit" means this Permit to Take Water No. 0045-68USZA including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Corporation of the Township of North Dundas.

(g) "OWRA " means the *Ontario Water Resources Act,* R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated December 6, 2004 and signed by Howard F. Smith, C.A.O., and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

2. General Conditions and Interpretation

2.1 Inspections

The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.

2.2 Other Approvals

The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act*, and the *Environmental Protection Act*, and any regulations made thereunder; or

(b) limit in any way the authority of the Director or a Provincial Officer to require certain steps be
taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 **Expiry**

This Permit expires on **December 31, 2005**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description	Source Type	Taking - Specific Purpose	Taking - Major Category	Max. Rate of Taking per Minute (litres)	Max. Number of Hrs Taken per Day	Max. Taking per Day (litres)	Max. Taking per Year (litres)	Zone Easting Northing
1.	Maple Ridge Aquifer (Communal Well No. 5)	Well Drilled	Pumping Test	Miscellaneous	1364.00	24.00	1960000.00	30.00	18 477847 4993811
2.	Maple Ridge Aquifer (Communal Well No. 6)	Well Drilled	Pumping Test	Miscellaneous	1818.00	24.00	2620000.00	30.00	18 477890 4994150
						Total Taking:	4580000.00		

4. Monitoring

4.1 Notification to Well Owners

Prior to commencement of the pumping test, the Permit Holder shall identify all wells within the area of the anticipated potential cone of influence, or within 500 metres of the test site, whichever is greater. At least 24 hours prior to beginning the pumping test, the Permit Holder shall provide written notification to the owners of the wells identified within the potential cone of influence. The notification shall include the expected date, time and duration of the pumping test, and a contact telephone number that may be used to report any interferences with water supplies.

4.2 Measuring Water Depths

To establish baseline conditions, well depths and depths to water levels for identified representative wells in the area of the water taking shall be recorded by the Permit Holder. During the pumping test, water levels in the identified wells shall be recorded. The pumping test must be of sufficient duration to accurately predict the long term impacts of the proposed water taking. Water levels in the identified wells shall continue to be monitored beyond the water taking period until at least 85% recovery is achieved.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 Restoration of Water Supply

If the Permit Holder observes, or is notified of significant interference with a local water supply, or with the natural environment, the Permit Holder shall ensure that the water taking is immediately stopped. Where the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of doing so.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written notice served upon me, the Environmental Review Tribunal and the Environmental Commissioner, **Environmental Bill of Rights**, R.S.O. 1993, Chapter 28, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, as amended provides that the Notice requiring a hearing shall state:*

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This notice must be served upon:

The Secretary
Environmental Review Tribunal
2300 Yonge Street, 12th Floor
Toronto, Ontario M4P 1E4

AND

The Environmental Commissioner
1075 Bay Street
6th Floor, Suite 605
Toronto, Ontario M5S 2W5

AND

The Director, Section 34
Ontario Water Resources Act,
RSO 1990,
Ministry of Environment
133 Dalton Ave
Kingston ON K7L 4X6
Fax: (613)548-6908

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

*This instrument is subject to Section 38 of the **Environmental Bill of Rights** that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek to appeal for 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry, you can determine when the leave to appeal period ends.*

Dated at Kingston this 14th day of Feburary, 2005.

Clyde Hammond

Clyde Hammond
Director, Section 34
Ontario Water Resources Act, R.S.O. 1990

APPENDIX C

DEPTH TO WATER TABLE AT MONITORING WELLS MW03-2A AND MW03-2B

Golder Associates

Chesterville 30-day Pumping Test - Depth to Water Table at Monitoring Wells MW03-2A and MW03-2B

Date	MW03-2A (mbgs)	MW03-2B (mbgs)	Date	MW03-2A (mbgs)	MW03-2B (mbgs)
20-Jun-05	1.31	1.26	14-Jul-05	2.76	2.77
27-Jun-05	1.32	1.35	15-Jul-05	2.82	2.83
28-Jun-05	2.01	2.00	16-Jul-05	2.88	2.90
29-Jun-05	2.14	2.15	17-Jul-05	2.84	2.87
30-Jun-05	2.27	2.31	18-Jul-05	2.85	2.87
01-Jul-05	2.37	2.41	19-Jul-05	2.94	2.95
02-Jul-05	2.42	2.49	20-Jul-05	3.00	3.02
03-Jul-05	2.53	2.59	21-Jul-05	3.05	3.08
04-Jul-05	2.61	2.67	22-Jul-05	3.10	3.14
05-Jul-05	2.67	2.73	23-Jul-05	3.02	3.05
06-Jul-05	2.73	2.80	24-Jul-05	3.03	3.08
07-Jul-05	2.80	2.87	25-Jul-05	3.07	3.11
08-Jul-05	2.86	2.92	26-Jul-05	3.10	3.15
09-Jul-05	2.69	2.77	27-Jul-05	3.13	3.17
10-Jul-05	2.65	2.66	03-Aug-05	2.51	2.49
11-Jul-05	2.74	2.76	11-Aug-05	2.57	2.57
12-Jul-05	2.83	2.86	23-Aug-05	2.57	2.56
13-Jul-05	2.87	2.91			

APPENDIX D

BACTERIOLOGICAL ANALYTICAL RESULTS AND CERTIFICATES OF ANALYSIS

Golder Associates

Chesterville 30-day Pumping Test - Bacteriological Analytical Results, Well No. 5 and Well No. 6

	W5		W6	
	Total Coliforms (ct/100 mL)	Escherichia Coli (ct/100 mL)	Total Coliforms (ct/100 mL)	Escherichia Coli (ct/100 mL)
27-Jun-05	-	-	-	-
28-Jun-05	0	0	-	-
29-Jun-05	0	0	-	-
30-Jun-05	-	-	-	-
01-Jul-05	0	0	-	-
02-Jul-05	-	-	-	-
03-Jul-05	0	0	-	-
04-Jul-05	0	0	2	0
05-Jul-05	0	0	-	-
06-Jul-05	0	0	-	-
07-Jul-05	0	0	-	-
08-Jul-05	0	0	-	-
09-Jul-05	-	-	-	-
10-Jul-05	0	0	-	-
11-Jul-05	0	0	-	-
12-Jul-05	-	-	-	-
13-Jul-05	0	0	-	-
14-Jul-05	0	0	0	0
15-Jul-05	148	0	0	0
16-Jul-05	0	0	0	0
17-Jul-05	0	0	0	0
18-Jul-05	0	0	0	0
19-Jul-05	0	0	-	-
20-Jul-05	0	0	0	0
21-Jul-05	0	0	0	0
22-Jul-05	0	0	-	-
23-Jul-05	-	-	-	-
24-Jul-05	0	0	-	-
25-Jul-05	0	0	0	0
26-Jul-05	0	0	-	-
27-Jul-05	0	0	0	0

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2512488
Date: 2005-06-30
Date Submitted: 2005-06-29
MOE DWIS UPLOAD: 2503590
Project:

P.O. Number:
Matrix: Supply Water

			LAB ID:	395256					**GUIDELINE**
			Sample Date:	2005-06-28					
			Sample ID:	Day 2 Well 5					MOE REG. 170/03
PARAMETER	**UNITS**	**MDL**		RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: CHESTERVILLE WELL SUPPLY
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: Mr. Blair Henderson

Report Number: 2512525
Date: 2005-07-04
Date Submitted: 2005-06-29
MOE DWIS UPLOAD: 2503611
Project:

P.O. Number:
Matrix: Supply Water

								GUIDELINE		
			LAB ID:	395317						
			Sample Date:	2005-06-29						
			Sample ID:	CW05-Day2 *Well 5*				MOE REG. 170/03		
PARAMETER	UNITS	MDL	RAW					TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2512687
Date: 2005-07-04
Date Submitted: 2005-07-02
MOE DWIS UPLOAD: 2503652
Project: Chesterville Wells

P.O. Number:
Matrix: Supply Water

			LAB ID:	395744	395745				GUIDELINE		
			Sample Date:	2005-07-01	2005-07-02				MOE REG. 170/03		
			Sample ID:	CW-01 Well 5	CW-001 Well 5						
PARAMETER	**UNITS**	**MDL**		RAW	RAW				**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2512766
Date: 2005-07-06
Date Submitted: 2005-07-04
MOE DWIS UPLOAD: 2503658
Project: Chesterville Wells

P.O. Number:
Matrix: *Supply Water*

	LAB ID:	396015	396016	396017			GUIDELINE		
	Sample Date:	2005-07-03	2005-07-04	2005-07-04			MOE REG. 170/03		
	Sample ID:	CW-01 Well 5	CW-02 Well 5	CW-03 Well 6					
PARAMETER	**UNITS**	**MDL**	RAW	RAW	RAW			**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0	2			MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0	0			MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2512910
Date: 2005-07-06
Date Submitted: 2005-07-05
MOE DWIS UPLOAD: 2503681
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	396311					**GUIDELINE**
			Sample Date:	2005-07-05					MOE REG. 170/03
			Sample ID:	Day 8 Well 5 Pump Test					
PARAMETER	**UNITS**	**MDL**		RAW					**TYPE** / **LIMIT** / **UNITS**
Total Coliforms	ct/100mL			0					MAC / 0 / ct/100mL
Escherichia Coli	ct/100mL			0					MAC / 0 / ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513115
Date: 2005-07-08
Date Submitted: 2005-07-06
MOE DWIS UPLOAD: 2503753
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	396811					**GUIDELINE**	
			Sample Date:	2005-07-06						
			Sample ID:	Well 5 Pumphouse Raw Water					MOE REG. 170/03	
PARAMETER	**UNITS**	**MDL**		RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513233
Date: 2005-07-11
Date Submitted: 2005-07-07
MOE DWIS UPLOAD: 2503808
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:					GUIDELINE		
			Sample Date:					MOE REG. 170/03		
			Sample ID:							
PARAMETER	UNITS	MDL	RAW					TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513323
Date: 2005-07-11
Date Submitted: 2005-07-08
MOE DWIS UPLOAD: 2503797
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	397212					**GUIDELINE**
			Sample Date:	2005-07-08					MOE REG. 170/03
			Sample ID:	Day 11 Well 5 Pumptest					
PARAMETER	**UNITS**	**MDL**		RAW					**TYPE** / **LIMIT** / **UNITS**
Total Coliforms	ct/100mL			0					MAC / 0 / ct/100mL
Escherichia Coli	ct/100mL			0					MAC / 0 / ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513478
Date: 2005-07-13
Date Submitted: 2005-07-11
MOE DWIS UPLOAD: 2503845
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	397715					**GUIDELINE**
			Sample Date:	2005-07-10					MOE REG. 170/03
			Sample ID:	Day 13 Well 5 Pumptest					
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513479
Date: 2005-07-13
Date Submitted: 2005-07-11
MOE DWIS UPLOAD: 2503846
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	397716					**GUIDELINE**
			Sample Date:	2005-07-11					MOE REG. 170/03
			Sample ID:	Day 14 Well 5 Pumptest					
PARAMETER	**UNITS**	**MDL**		RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513861
Date: 2005-07-18
Date Submitted: 2005-07-14
MOE DWIS UPLOAD: 2503972
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:					GUIDELINE		
			Sample Date:					MOE REG. 170/03		
			Sample ID:							
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: CHESTERVILLE WELL SUPPLY
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: Mr. Blair Henderson

Report Number: 2513860
Date: 2005-07-18
Date Submitted: 2005-07-14
MOE DWIS UPLOAD: 2503973
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	398621	398622				GUIDELINE		
			Sample Date:	2005-07-14	2005-07-14				MOE REG. 170/03		
			Sample ID:	Day 17 Well 5 Pumptest Raw	Well 6 Pumptest Raw						
PARAMETER	UNITS	MDL		RAW	RAW				TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513979
Date: 2005-07-18
Date Submitted: 2005-07-16
MOE DWIS UPLOAD: 2504011
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	398877	398878				GUIDELINE		
			Sample Date:	2005-07-15	2005-07-15				MOE REG. 170/03		
			Sample ID:	Well 5 Pumptest Raw July 15	Well 6 Pumptest Raw July 15						
PARAMETER	UNITS	MDL		RAW	RAW				TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			148	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2513980
Date: 2005-07-18
Date Submitted: 2005-07-16
MOE DWIS UPLOAD: 2504012
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	398879	398880				**GUIDELINE**
			Sample Date:	2005-07-16	2005-07-16				MOE REG. 170/03
			Sample ID:	Well 5 Pumptest Raw July 16	Well 6 Pumptest Raw July 16				
PARAMETER	**UNITS**	**MDL**		RAW	RAW				**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514041
Date: 2005-07-19
Date Submitted: 2005-07-18
MOE DWIS UPLOAD: 2504025
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	399017	399018				GUIDELINE		
			Sample Date:	2005-07-17	2005-07-17				MOE REG. 170/03		
			Sample ID:	Well #5 Pumptest Day 20	Well #6 Pumptest Day 20						
PARAMETER	UNITS	MDL		RAW	RAW				TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514040
Date: 2005-07-19
Date Submitted: 2005-07-18
MOE DWIS UPLOAD: 2504027
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

		LAB ID:	399015	399016				**GUIDELINE**	
		Sample Date:	2005-07-18	2005-07-18				MOE REG. 170/03	
		Sample ID:	Well #5 Pumptest Raw Water	Well #6 Pumptest Raw Water					
PARAMETER	**UNITS**	**MDL**	RAW	RAW				**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514313
Date: 2005-07-22
Date Submitted: 2005-07-20
MOE DWIS UPLOAD: 2504128
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	399543					**GUIDELINE**
			Sample Date:	2005-07-19					MOE REG. 170/03
			Sample ID:	Day 22 Well 5 Pumptest					
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514314
Date: 2005-07-22
Date Submitted: 2005-07-20
MOE DWIS UPLOAD: 2504127
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	399544	399545				GUIDELINE		
			Sample Date:	2005-07-20	2005-07-20						
			Sample ID:	Day 23 Well 5 Pumptest	Day 23 Well 6 Pumptest				MOE REG. 170/03		
PARAMETER	**UNITS**	**MDL**		RAW	RAW				**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514451
Date: 2005-07-25
Date Submitted: 2005-07-22
MOE DWIS UPLOAD: 2504153
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	399915	399916				GUIDELINE		
			Sample Date:	2005-07-21	2005-07-21				MOE REG. 170/03		
			Sample ID:	Day 24 Well 5 Pumptest	Day 24 Well 6 Pumptest						
PARAMETER	**UNITS**	**MDL**		RAW	RAW				**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514450
Date: 2005-07-25
Date Submitted: 2005-07-22
MOE DWIS UPLOAD: 2504154
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	399914				**GUIDELINE**	
			Sample Date:	2005-07-22					
			Sample ID:	Day 25 Well 5 Pumptest				MOE REG. 170/03	
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514597
Date: 2005-07-27
Date Submitted: 2005-07-25
MOE DWIS UPLOAD: 2504187
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	400239					**GUIDELINE**
			Sample Date:	2005-07-24					
			Sample ID:	Day 27 Well 5					MOE REG. 170/03
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: CHESTERVILLE WELL SUPPLY
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: Mr. Blair Henderson

Report Number: 2514596
Date: 2005-07-27
Date Submitted: 2005-07-25
MOE DWIS UPLOAD: 2504188
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	400237	400238				GUIDELINE		
			Sample Date:	2005-07-25	2005-07-25				MOE REG. 170/03		
			Sample ID:	Day 28 Well #5	Day 28 Well #6						
PARAMETER	UNITS	MDL		RAW	RAW				TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514839
Date: 2005-07-28
Date Submitted: 2005-07-27
MOE DWIS UPLOAD: 2504243
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	400794					**GUIDELINE**
			Sample Date:	2005-07-26					MOE REG. 170/03
			Sample ID:	Day 29 Well 5					
PARAMETER	**UNITS**	**MDL**	RAW					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0					MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0					MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **CHESTERVILLE WELL SUPPLY**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

Report Number: 2514840
Date: 2005-07-28
Date Submitted: 2005-07-27
MOE DWIS UPLOAD: 2504244
Project: Well #5 Pumptest

P.O. Number:
Matrix: Supply Water

			LAB ID:	400795	400796				GUIDELINE		
			Sample Date:	2005-07-27	2005-07-27				MOE REG. 170/03		
			Sample ID:	Well 5 Pumptest-July 27/05	Well 6 Pumptest Raw						
PARAMETER	UNITS	MDL		RAW	RAW				TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____

Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

APPENDIX E

TURBIDITY MEASUREMENTS

Golder Associates

Chesterville 30-day Pumping Test - Turbidity Measurements, Well No. 5 and Well No. 6

	Turbidity (NTU)	
Date	W5	W6
27-Jun-05	-	-
28-Jun-05	0.40	-
29-Jun-05	0.29	0.26
30-Jun-05	0.27	0.29
01-Jul-05	0.28	0.16
02-Jul-05	0.27	0.22
03-Jul-05	0.20	0.32
04-Jul-05	0.19	0.16
05-Jul-05	0.20	0.20
06-Jul-05	0.15	0.22
07-Jul-05	0.23	0.27
08-Jul-05	0.40	0.39
09-Jul-05	0.16	0.18
10-Jul-05	0.24	0.18
11-Jul-05	0.28	-
12-Jul-05	0.32	0.25
13-Jul-05	0.21	0.10
14-Jul-05	0.21	0.15
15-Jul-05	0.21	0.16
16-Jul-05	0.26	0.15
17-Jul-05	0.23	0.23
18-Jul-05	0.25	0.13
19-Jul-05	0.40	0.20
20-Jul-05	1.53	1.59
21-Jul-05	0.3	0.18
22-Jul-05	0.33	0.25
23-Jul-05	0.55	0.21
24-Jul-05	0.23	0.18
25-Jul-05	0.20	0.16
26-Jul-05	0.17	0.35
27-Jul-05	0.28	0.13

APPENDIX F

GENERAL CHEMISTRY ANALYTICAL RESULTS AND CERTIFICATES OF ANALYSIS

Golder Associates

Chesterville 30-day Pumping Test - General Chemistry Analytical Results, Monast Pit

	ODWS	Set 07-2005
Alkalinity as $CaCO_3$	**30-500**	142
Chloride	**250**	8
Conductivity (uS/cm)		356
Fluoride	**1.5**	<0.10
N-NO3 (Nitrate)	**10**	<0.10
pH (pH units)	**6.5-8.5**	7.99
Sulphate	**500**	40
Hardness as $CaCO_3$	**80-100**	177
Ion Balance		0.96
Calcium		43
Magnesium		17
Potassium		2
Sodium	**200**	3
Iron	**0.3**	0.1
Manganese	**0.05**	0.02

All values reported in mg/L unless otherwise noted.

Golder Associates

Chesterville 30-day Pumping Test - General Chemistry Analytical Results, Private Wells

		30-May-05			27-Jul-05
	ODWS	Stewart # 12975	Janssen # 12949	Medveduke # 12909	Janssen # 12949
Alkalinity as $CaCO_3$	30-500	245	299	182	303
Chloride	250	50	381	23	403
Conductivity (uS/cm)		729	1860	490	1800
Fluoride	1.5	0.16	0.16	<0.10	<0.10
N-NO3 (Nitrate)	10	6.9	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.73	7.71	7.92	7.58
Sulphate	500	34	58	38	53
Hardness as $CaCO_3$	80-100	322	700	242	625
Ion Balance		0.97	1.04	1.04	0.94
Calcium		101	193	54	163
Magnesium		17	53	26	53
Potassium		2	3	3	3
Sodium	200	19	107	9	113
Iron	0.3	0.02	1.07	0.45	1.64
Manganese	0.05	<0.01	0.04	0.01	0.05

All values reported in mg/L unless otherwise noted.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Golder Associates Ltd.
32 Steacie Drive
Ottawa, ON
K2K 2A9
Attention: Mr. Stephen Wilson

Report Number: 2512295
Date: 2005-06-30
Date Submitted: 2005-06-27

Project: 04-1120-773

P.O. Number:
Matrix: Water

Chain of Custody Number: 29951

			LAB ID:					GUIDELINE		
			Sample Date:							
			Sample ID:							
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	332							
Chloride	mg/L	1	13							
Conductivity	uS/cm	5	723							
Fluoride	mg/L	0.10	0.13							
N-NO3 (Nitrate)	mg/L	0.10	0.20							
pH			7.96							
Sulphate	mg/L	1	80							
Hardness as CaCO3	mg/L	1	362							
Ion Balance		0.01	0.90							
Calcium	mg/L	1	97							
Magnesium	mg/L	1	29							
Potassium	mg/L	1	1							
Sodium	mg/L	2	5							
Iron	mg/L	0.03	0.08							
Manganese	mg/L	0.01	0.03							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: OCWA Chesterville

5 Industrial Drive
Chesterville, ON
K0C 1H0

Report Number: 2518352
Date Reported: 2005-09-16
Date Submitted: 2005-09-12
Project: Chesterville Monast Pit Well #5 Pumptest

Attention: Dave

P.O. Number:
Matrix Surfacewater

Determination of Iron Bacteria in Water

Test Method: An aliquot of the sample was filtered through a 0.45 micron membrane filter. The filter was then examined microscopically for the presence of Iron Bacteria.

LAB ID	CLIENT SAMPLE ID	Date Sampled
410919	#1	2005-09-12

NEGATIVE
The microscopic examination of the filter did not reveal the presence of microorganisms belonging to the group of the budding and/or appendages bacteria also known as nuisance or iron bacteria.

Analyte	Result	Rating
Iron Bacteria	N	NONE PRESENT

APPROVAL: _____

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: OCWA Chesterville

5 Industrial Drive
Chesterville, ON
K0C 1H0

Report Number: 2518352
Date Reported: 2005-09-16
Date Submitted: 2005-09-12
Project: Chesterville Monast Pit Well #5 Pumptest

Attention: Dave

P.O. Number:
Matrix Surfacewater

Determination of Iron Bacteria in Water

Test Method: An aliquot of the sample was filtered through a 0.45 micron membrane filter. The filter was then examined microscopically for the presence of Iron Bacteria.

LAB ID	CLIENT SAMPLE ID	Date Sampled
410920	#2	2005-09-12

NEGATIVE
The microscopic examination of the filter did not reveal the presence of microorganisms belonging to the group of the budding and/or appendages bacteria also known as nuisance or iron bacteria.

Analyte	Result	Rating
Iron Bacteria	N	NONE PRESENT

APPROVAL: _____

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: OCWA Chesterville

5 Industrial Drive
Chesterville, ON
K0C 1H0

Report Number: 2518352
Date Reported: 2005-09-16
Date Submitted: 2005-09-12
Project: Chesterville Monast Pit Well #5 Pumptest

Attention: Dave

P.O. Number:
Matrix Surfacewater

Determination of Iron Bacteria in Water

Test Method: An aliquot of the sample was filtered through a 0.45 micron membrane filter. The filter was then examined microscopically for the presence of Iron Bacteria.

LAB ID	CLIENT SAMPLE ID	Date Sampled
410921	#3	2005-09-12

NEGATIVE
The microscopic examination of the filter did not reveal the presence of microorganisms belonging to the group of the budding and/or appendages bacteria also known as nuisance or iron bacteria.

Analyte	Result	Rating
Iron Bacteria	N	NONE PRESENT

APPROVAL: _____

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: OCWA Chesterville

5 Industrial Drive
Chesterville, ON
K0C 1H0

Report Number: 2518352
Date Reported: 2005-09-16
Date Submitted: 2005-09-12
Project: Chesterville Monast Pit Well #5 Pumptest

Attention: Dave

P.O. Number:
Matrix Surfacewater

Determination of Iron Bacteria in Water

Test Method: An aliquot of the sample was filtered through a 0.45 micron membrane filter. The filter was then examined microscopically for the presence of Iron Bacteria.

LAB ID	CLIENT SAMPLE ID	Date Sampled
410922	#4	2005-09-12

NEGATIVE
The microscopic examination of the filter did not reveal the presence of microorganisms belonging to the group of the budding and/or appendages bacteria also known as nuisance or iron bacteria.

Analyte	Result	Rating
Iron Bacteria	N	NONE PRESENT

APPROVAL: _____

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Golder Associates Ltd.
32 Steacie Drive
Ottawa, ON
K2K 2A9
Attention: Mr. Stephen Wilson

Report Number: 2513134
Date: 2005-07-12
Date Submitted: 2005-07-06

Project: 04-1120-773

P.O. Number:
Matrix: Groundwater

Chain of Custody Number: 29836

			LAB ID:	396849	396850				GUIDELINE		
			Sample Date:	2005-07-06	2005-07-06						
			Sample ID:	Well 5	Well 6						
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		198	251						
Chloride	mg/L	1		19	22						
Conductivity	uS/cm	5		521	625						
Fluoride	mg/L	0.10		0.14	0.14						
N-NO3 (Nitrate)	mg/L	0.10		<0.10	<0.10						
pH				8.13	8.03						
Sulphate	mg/L	1		72	71						
Hardness as CaCO3	mg/L	1		237	312						
Ion Balance		0.01		0.90	0.90						
Calcium	mg/L	1		64	82						
Magnesium	mg/L	1		20	26						
Potassium	mg/L	1		3	1						
Sodium	mg/L	2		11	4						
Iron	mg/L	0.03		0.11	0.06						
Manganese	mg/L	0.01		0.02	0.01						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

12/07 2005 15:38 FAX 613 727 0776 ACCUTEST LABS

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: CHESTERVILLE WELL SUPPLY
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: Mr. Blair Henderson

Report Number: 2513862
Date: 2005-07-19
Date Submitted: 2005-07-14

Project: Quarterly Chemicals

P.O. Number:
Matrix: Supply Water

	LAB ID:	398624					GUIDELINE		
	Sample Date:	2005-07-14					MOE REG. 170/03		
	Sample ID:	Chesterville Well #6Raw-G.Chem							
PARAMETER	UNITS	MDL	RAW				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	242				OG	500	mg/L
Chloride	mg/L	1	25				AO	250	mg/L
Conductivity	uS/cm	5	628						mg/L
Fluoride	mg/L	0.10	0.14				MAC	1.5	mg/L
N-NO3 (Nitrate)	mg/L	0.10	<0.10				MAC	10.0	mg/L
pH			8.17				AO	6.5-8.5	
Sulphate	mg/L	1	73				AO	500	mg/L
Hardness as CaCO3	mg/L	1	329				OG	100	mg/L
Ion Balance		0.01	0.98						mg/L
Calcium	mg/L	1	89						mg/L
Magnesium	mg/L	1	26						mg/L
Potassium	mg/L	1	1						mg/L
Sodium	mg/L	2	7				AO	20	mg/L
Iron	mg/L	0.03	0.05				AO	0.3	mg/L
Manganese	mg/L	0.01	<0.01				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Peter Haulena
Analytical Services Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: *Golder Associates Ltd.*
32 Steacie Drive
Ottawa, ON
K2K 2A9
Attention: Mr. Stephen Wilson

Report Number: 2514315
Date: 2005-07-27
Date Submitted: 2005-07-20

Project: 04-1120-773

P.O. Number:

Chain of Custody Number: 25502

Matrix: Groundwater

			LAB ID:	399546	399547				GUIDELINE		
			Sample Date:	2005-07-20	2005-07-20						
			Sample ID:	W5-Winchester	W6-Winchester						
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		189	244						
Chloride	mg/L	1		22	24						
Conductivity	uS/cm	5		488	827						
Fluoride	mg/L	0.10		<0.10	<0.10						
N-NO3 (Nitrate)	mg/L	0.10		<0.10	<0.10						
pH				7.66	7.79						
Sulphate	mg/L	1		50	78						
Hardness as CaCO3	mg/L	1		232	322						
Ion Balance		0.01		0.96	0.94						
Calcium	mg/L	1		80	86						
Magnesium	mg/L	1		20	26						
Potassium	mg/L	1		2	1						
Sodium	mg/L	2		12	7						
Iron	mg/L	0.03		0.11	0.07						
Manganese	mg/L	0.01		0.02	0.01						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: Ewa McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Golder Associates
32 Steacie Dr.
Ottawa, Ont.

Attention: Mr. Stephen Wilson

Report Number: 2514852
Date: 2005-08-04
Date Submitted: 2005-07-27

Project:

P.O. Number:

Chain of Custody Number: 26376

Matrix: Groundwater

			LAB ID:	400810	400811	400812			GUIDELINE		
			Sample Date:	2005-07-27	2005-07-27	2005-07-27					
			Sample ID:	W5-Chesterville	W6-Chesterville	Janssen - #42949					
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		190	243	303					
Chloride	mg/L	1		23	23	403					
Conductivity	uS/cm	5		493	634	1800					
Fluoride	mg/L	0.10		0.11	<0.10	<0.10					
N-NO3 (Nitrate)	mg/L	0.10		<0.10	<0.10	<0.10					
pH				7.82	7.79	7.58					
Sulphate	mg/L	1		50	79	53					
Hardness as CaCO3	mg/L	1		231	307	825					
Ion Balance		0.01		0.94	0.90	0.94					
Calcium	mg/L	1		61	80	183					
Magnesium	mg/L	1		19	26	53					
Potassium	mg/L	1		2	1	3					
Sodium	mg/L	2		11	7	113					
Iron	mg/L	0.03		0.11	0.08	1.84					
Manganese	mg/L	0.01		0.01	<0.01	0.05					

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Golder Associates
32 Steacie Drive
Kanata, Ont.
K2K 2A9
Attention: Steven Wilson

Report Number: 2509748
Date: 2005-06-10
Date Submitted: 2005-05-30

Project: 021-2859

P.O. Number:

Chain of Custody Number: 28200

Matrix: Groundwater

	LAB ID:	388463	388464	388465			GUIDELINE		
	Sample Date:	2005-05-30	2005-05-30	2005-05-30					
	Sample ID:	D Stewart	E Janssen	Medveduke					
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	245	299	162				
Chloride	mg/L	1	50	381	23				
Conductivity	uS/cm	5	729	1860	490				
Fluoride	mg/L	0.10	0.16	0.16	0.26				
N-NO3 (Nitrate)	mg/L	0.10	6.90	<0.10	<0.10				
pH			7.73	7.71	7.92				
Sulphate	mg/L	1	34	58	38				
Hardness as CaCO3	mg/L	1	322	700	242				
Ion Balance		0.01	0.97	1.04	1.04				
Calcium	mg/L	1	101	193	54				
Magnesium	mg/L	1	17	53	26				
Potassium	mg/L	1	2	3	3				
Sodium	mg/L	2	19	107	9				
Iron	mg/L	0.01	0.02	1.07	0.45				
Manganese	mg/L	0.01	<0.01	0.04	0.01				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Evelyn McRae
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

10/06 2005 14:50 FAX 613 727 5222 ACCUTEST LABS ► Golder Kanata 005/011

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **OCWA Chesterville**
5 Industrial Drive
Chesterville, ON
K0C 1H0

Attention: **Mr. Blair Henderson**

INVOICE: CHESTERVILLE WELL SUPPLY

Report Number: 2518185
Date: 2005-09-16
Date Submitted: 2005-09-09

Project: Monast Pit Well #5 Pumptest

P.O. Number:
Matrix: Water

								GUIDELINE		
LAB ID:			410388							
Sample Date:			2005-09-07							
Sample ID:			Monast Pit Raw Sample #3							
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Alkalinity as CaCO3	mg/L	5	142							
Chloride	mg/L	1	8							
Conductivity	uS/cm	5	356							
Fluoride	mg/L	0.10	<0.10							
N-NO3 (Nitrate)	mg/L	0.10	<0.10							
pH			7.99							
Sulphate	mg/L	1	40							
Hardness as CaCO3	mg/L	1	177							
Ion Balance		0.01	0.96							
Calcium	mg/L	1	43							
Magnesium	mg/L	1	17							
Potassium	mg/L	1	2							
Sodium	mg/L	2	3							
Iron	mg/L	0.03	0.10							
Manganese	mg/L	0.01	0.02							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Ewan McRobbie
Inorganic Lab Supervisor

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **OCWA Chesterville**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Mr. Blair Henderson**

INVOICE: CHESTERVILLE WELL SUPPLY

Report Number: 2518170
Date: 2005-09-12
Date Submitted: 2005-09-09

Project: Monast Pit Well #5 Pumptest

P.O. Number:
Matrix: Water

								GUIDELINE		
		LAB ID:	410307	410308						
		Sample Date:	2005-09-07	2005-09-07						
		Sample ID:	Monast Pit Raw Sample #1	Monast Pit Raw Sample #2						
PARAMETER	**UNITS**	**MDL**						**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		67	33					100	ct/100mL
Escherichia Coli	ct/100mL		5	2					100	ct/100mL
Heterotrophic Plate Count	ct/1mL		>500	>500					1000	ct/1mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Tim McCooeye
QC Manager

Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **OCWA Chesterville**
5 Industrial Drive
Chesterville, ON
K0C 1H0
Attention: **Dave**

Report Number: 2518352
Date: 2005-09-16
Date Submitted: 2005-09-12

Project: Chesterville Monast Pit
Well #5 Pumptest

P.O. Number:
Matrix: Surfacewater

			LAB ID:	410919	410920	410921	410922		GUIDELINE		
			Sample Date:	2005-09-12	2005-09-12	2005-09-12	2005-09-12				
			Sample ID:	#1	#2	#3	#4				
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Faecal Coliforms	ct/100mL			1	3	0	4				
Faecal Streptococcus	ct/100mL			11	4	16	6				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL: _____
Krista Quantrill
Microbiology Analyst

Results relate only to the parameters tested on the samples submitted for analysis.