Appendix A

Field Investigations

April 2017

CAMBRIDGE EAST IUS WATER SUPPLY CLASS ENVIRONMENTAL ASSESSMENT

Appendix A
Field Investigations

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REPORT

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Golder Associates

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1.0 INTRODUCTION

The Regional Municipality of Waterloo (the Region) is undertaking a municipal Class Environmental Assessment (EA) to identify the preferred alternative for optimizing municipal groundwater supply taking in Cambridge East. This EA is a component of a larger project; the Integrated Urban System Groundwater Supply Optimization and Expansion Project (IUS Project) that was initiated in 2005 and directed to develop additional supplies in select areas across the Region. The Cambridge East EA Study Area, as shown on Figure 1, includes the Pinebush, Clemens Mill and Shade's Mills well fields. It is approximately bounded on the west by Franklin Boulevard and extends east of Townline Road to include portions of the Townships of Puslinch and North Dumfries. It is approximately bounded on the north by Highway 401 and extends to Clyde Road in the south.

The EA is focused on assessing options for optimizing the Region's municipal well supplies to meet existing treatment capacity at the Pinebush, Turnbull (Clemens Mill) and Shade's Mills Water Treatment Plants (WTPs). Golder Associates Ltd. (Golder) in association with Triton Engineering Ltd. (Triton) were retained by the Region to carry out the EA. S.S. Papadopulos & Associates Inc. (SSPA) and Matrix Solutions Inc. (Matrix) were retained by the Region to complete groundwater modelling to support the hydrogeological assessment for the EA.

As part of the studies supporting the Class EA, Golder Associates (Golder) undertook a comprehensive field program to characterize the hydrogeological conditions in the vicinity of the Cambridge East Study Area. This technical appendix (Appendix A) of the Hydrogeological and Natural Environment Report for the project provides the factual results of this field program. These results were previously reported in a series of draft reports, technical memoranda and presentations and have been compiled here to provide a single comprehensive summary of the methodology and results of the Cambridge East IUS Project field program.

In addition to the field program carried out under the IUS Project, during the course of the EA a number of additional well field optimization investigations were carried out as part of other Region projects in the Pinebush, Clemens Mill and Shade's Mills well fields. These investigations were completed at existing wells sites that supply the Cambridge East EA Water Treatment Plants and are also summarized in this report.

1.1 Overview of the IUS Project Field Investigations

The field program for IUS Project Task B at the Cambridge East Study Area included:

- An extensive test drilling program to assess hydrogeological conditions to the base of the bedrock aquifer including:
  - Drilling, installing and step testing twelve (12) 152 mm (6-inch) diameter test wells;
  - Drilling, installing and step testing five 305 mm (12-inch) diameter test production wells at the five most favourable test well sites; and
  - Monitoring well drilling and installation at 20 sites (72 piezometers) completed in the bedrock and overburden at locations up to about 1 km from the test wells.
- Geophysical logging and flow profiling of boreholes that were completed as test wells and monitoring wells;
- The development of comprehensive monitoring programs in support of a long-term pumping test including: shallow water table piezometers located in environmentally sensitive areas and cold water streams, private

wells, multi-level monitoring well nests, staff gauges in lakes and ponds, stream flow measuring stations and ecological monitoring transects;

- A 28-day long-term pumping test with a staggered start of pumping from three test production wells;
- Three additional constant rate pumping tests, ranging from 3 to 6 days in duration, at other test wells and test production wells;
- Sampling for water quality;
- Communication with the public and public meetings focused on the field testing program; and
- Comprehensive analysis of all test data to assess long-term aquifer yields and potential effects on nearby sensitive environmental features and groundwater users. The analysis is supported by numerical groundwater modelling completed by SSPA and Matrix (2016) (Appendix D).

1.2 Phases of the Field Investigations

The IUS Project field investigations for the Cambridge East EA were carried out between 2005 and 2009 and are summarized in Tables A1-A through A1-C.

Additional well field optimization investigations were carried out at some of the existing well sites as part of other Region projects between 2009 and 2016 and these are summarized in Table A1-D.

For reporting purposes these investigations are described below.

Phase I (2005/2006) – Pinebush, Clemens Mill and Shade's Mills IUS Project Testing

The initial program for the Cambridge East investigations was focused in the Pinebush, Clemens Mill and Shade's Mills Well Fields. The program included installation and step testing of six test wells (two for Pinebush, three for Clemens Mill and one for Shade's Mills), drilling and step testing of three test production wells (CMPW2-06, PBPW1-06 and CMPW1-06), installation of 10 monitoring well nests, conversion of two test wells into bedrock monitoring nests and a 28-day pumping test of the three test production wells. The 28-day pumping test was completed with a staged start of pumping from the three test production wells (CMPW2-06, PBPW1-06 and CMPW1-06) at rates of 37.5 L/s, 39.1 L/s and 37.5 L/s, respectively.

Due to the modest result obtained at the Shade's Mills test well (SMTW1-05), additional testing in Shade's Mills was proposed for Phase II to further investigate groundwater supply potential in that area. Also, investigations further west of Puslinch Lake were explored to expand options for the Pinebush well field.

Phase II (2007/2008) – Additional Pinebush and Shade's Mills IUS Project Testing

Based on the results of the Phase I testing, the second phase of the Cambridge East investigations was initiated in 2007. During this phase, additional testing was undertaken in the Clemens Mill and Shade's Mills Well Fields. In total, three test wells were drilled and step-tested in Shade's Mills. Two of these test wells were converted into bedrock monitoring well nests (SMTW2-07 and SMTW3-07). The Shade's Mills bedrock monitoring nests were sampled for water quality and an analysis was done to investigate groundwater sulphate concentrations. An overburden monitoring nest was installed and a 3-day pumping test was conducted at the third Phase II Shade's Mills test well (SMTW4-08). Subsequently the third test well was converted to a bedrock monitoring

well nest. In Pinebush, a third test well (PBTW3-07) was installed and step-tested. Following this test, a test production well (PBPW2-08) was drilled, step tested and then a 3-day constant rate test was conducted.

Phase II did not identify any suitable sources in the Shade's Mill well field, so additional testing further east in the Town of Clyde was proposed for Phase III investigations.

Phase III (2008/2009) – North Dumfries IUS Project Testing

In 2008, a third phase of investigations was initiated in the vicinity of Clyde in the Township of North Dumfries. Initially two test wells (NDTW1-08 and NDTW2-08) were drilled and step-tested. Following these tests, a test production well (NDPW1-08) was drilled at the most favourable location and the remaining test well was converted into a monitoring well nest. At two additional sites, monitoring well nests (including piezometers in the bedrock and overburden) were installed and three additional shallow overburden monitoring well nests were installed. In 2009, two constant rate pumping tests were conducted at the test production well. The first was a 2-day test on the open bedrock borehole and the second was a 7-day test on the borehole with a packer installed to isolate the Gasport Formation.

Additional Well Field Optimization Investigations (2009 – 2016)

Additional testing was completed in the Pinebush, Clemens Mill and Shade's Mills Well Fields as part of other Region projects. In the Pinebush Well Field, following testing at four pilot test wells, three additional test wells were installed. The Pinebush test wells included two wells in the deep bedrock (P10A close to P10 and PBTW1-10 near the Pinebush Water Treatment Plant) and one in the deep overburden/shallow bedrock (P10B near P10). Several monitoring well nests were installed close to P10 (Burnside, 2010, 2011; Stantec, 2013a). A steel liner was also installed in well P17 in 2011. In 2012, Well P11 was overdrilled to remove the casing and a new casing was installed to a deeper depth (44 m) below ground. A 15-day constant rate test of the three test wells and P17 was conducted (Stantec, 2013a). In 2014, a steel liner was installed in P9, a new well (P15A) was installed as an eventual replacement for well P15 and a constant rate pumping test was conducted at P9 and P15A (Stantec, 2015).

In the Clemens Mill Well Field, G16 was deepened and a steel liner installed (Lotowater, 2011). Well rehabilitation was performed on G17 and a steel liner was also installed in G6. In the Shade's Mills Well Field, a test production well (G40) and new monitoring well nest were installed in the vicinity of G38 and G39. A 6-day constant rate pumping test was conducted at G40, G38 and G39 (Stantec, 2013b). These investigations are summarized in this report and the reader is to refer to the above mentioned references for additional details.

2.0 PHASE I INVESTIGATIONS (2005/2006) PINEBUSH, CLEMENS MILL AND SHADE'S MILLS WELL FIELDS

2.1 Well Drilling and Construction

The details regarding the field methodology used in the well drilling and testing, and the test well, test production well and monitoring well schematics are provided in Attachment A1. The locations of wells drilled as part of the IUS investigations are shown on Figure A1.

2.1.1 Test Wells and Test Production Wells

In Phase I, under the Region contracts Q2005-1008 and Q2005-1012, five 152 mm (6-inch) diameter test wells were constructed by Davidson Well Drilling Ltd., under the supervision of Golder personnel. These test wells included: SMTW1-05, PBTW1-05, CMTW1-05, CMTW2-05 and CMTW3-05. Drilling of the first five test wells took place between August 9, 2005 and November 15, 2005. These test wells were drilled using a Gardner Denver mud rotary drilling rig. A sixth 152 mm (6-inch) diameter test well (PBTW2-06) was drilled under the Region of Waterloo contract Q2006-014 by Gerrits Well Drilling Inc. using a Foremost DR-12 air rotary drill rig. Test well construction details are provided in Table A2.

Three of the test well sites were chosen for installation of adjacent 305 mm (12-inch) diameter test production wells based on the results of the test well drilling and step testing. Details regarding the step testing are provided in Section 2.3. Details regarding the site selection process are provided in the main report text for the Hydrogeology and Natural Environment Report.

Under the Region contract Q2006-015, the three test production wells (CMPW1-06, CMPW2-06 and PBPW1-06) were drilled by Gerrits Well Drilling Inc., under the supervision of Golder personnel, using a Foremost DR-12 air rotary drill rig. Drilling commenced on May 8, 2006 at the CMPW1-06 well site and finished on July 14, 2006 with the completion of test production well PBPW1-06. Test production well construction details are provided in Table A2.

2.1.2 Monitoring Wells

Five monitoring well nests were constructed by Gerrits Well Drilling Inc. under the supervision of Golder personnel during the period of May 15, 2006 to July 24, 2006. The monitoring wells were drilled with an air rotary drilling rig. Four of the monitoring well nests (CMOW1-06, CMOW2-06, PBOW1-06 and PBOW2-06) consisted of three bedrock piezometers and three overburden piezometers to monitor the overburden and bedrock aquifer units. Three of these wells were located east of Townline Road in Puslinch (CMOW2-06, PBOW1-06 and PBOW2-06) and one was located in Cambridge East (CMOW1-06). The fifth monitoring well nest (CMOW3-06) was drilled as a bedrock monitoring well nest adjacent to an existing overburden monitoring well nest (OW4-92). Well construction details for the monitoring nests are provided in Table A3.

Two of the test wells (CMTW3-05 and SMTW1-05) were converted into bedrock monitoring well nests. Nests of two or three shallow overburden monitoring wells (less than 15 m depth) were installed to improve understanding of the shallow groundwater flow system adjacent to Puslinch Lake (well nests PLOW1-06 and PLOW2-06) and adjacent to Hilborn Pond (well nest HPOW1-06). The shallow overburden monitoring wells were installed by Strata Soil Sampling Inc. using a direct push continuous core drilling rig.

2.1.3 Borehole Testing

At each drilling location, overburden samples were taken for grain-size analyses and bedrock drill cuttings were collected. Details of the field methodologies used are provided in Attachment A1. The air rotary cuttings obtained during drilling provided limited information on geologic materials, although the condition of the rock mass where weathered was apparent from inspection of drill cuttings. Mud rotary cuttings obtained during drilling through the overburden provided limited information on overburden geologic materials. The results from the grain-size analyses and photos of the rock chips are included in Attachment A2.

Geophysical logging was carried out by Golder geophysicists in the test wells, test production wells and bedrock monitoring wells. The geophysical logs completed included gamma, conductivity and optical televiewer. Caliper logging was performed at wells CMTW2-05 and PBTW1-05. The geophysical logs (natural gamma, conductivity and optical televiewer) were used to aid in interpretation of borehole stratigraphy. The natural gamma log response was useful for distinguishing the stratigraphic contacts in cases where there was a contrast in clay content in the overburden or shale content in the bedrock. The methodology used for the borehole logging is provided in Attachment A1.

The results of the test well, test production well and monitoring well drilling and testing are provided in the borehole records in Attachment A2. The natural gamma and inductive conductivity geophysical log data is presented beside the stratigraphy in the borehole log records. The borehole records were completed prior to Ontario Geological Survey (OGS) publication of the preliminary revised Silurian Bedrock Stratigraphy (Brunton, 2008) and therefore follow the earlier bedrock stratigraphic nomenclature. Photographs of the test well bedrock drill cuttings, and the grain size analysis results used to confirm overburden lithologies, are also included in Attachment A2. Driller's water well records are also included in Attachment A2.

The interpretation of the bedrock geology at the drilling locations, following the revised nomenclature (Brunton, 2008, 2009; Brunton and Britnell, 2011), is presented in Table A4. The bedrock geology interpretation is based on the drill cuttings, the natural gamma log response, the optical televiewer log data and an examination of borehole records for existing wells in the Cambridge East area. The bedrock geology interpretations were developed in consultation with Frank Brunton of the OGS.

2.2 Permits to Take Water

Step testing of the six test wells (CMPW1-05, CMPW2-05, CMPW2-05, PBPW1-05, PBPW2-06 and SMTW1-05) during Phase I of the field work was conducted under the Category II Permit to Take Water (PTTW) number 6223-6ERJQG. This permit was issued on September 8, 2005 and expired on July 30, 2006. A Category III PTTW number 5514-683QNG, was issued on July 27, 2006 to allow step testing and the 28-day aquifer testing of the three test production wells, CMPW1-06, CMPW2-06 and PBPW1-06. An addendum to this application was submitted on July 20, 2006 to provide additional information regarding the testing program. The amended PTTW number 0458-6TDH4X was issued on September 7, 2006 in order to correct a clerical error by the Ontario Ministry of the Environment and Climate Change (MOECC). These permits are included in Attachment A3.

2.3 Step Testing

Step-drawdown tests of 8-hour duration were conducted at each of the six test wells and each of three test production wells that were drilled during Phase I Investigations. A summary of the dates and pumping rates of the step tests completed is presented in Table A5. Step testing of the first five of the test wells (PBTW1-05, CMTW1-05, CMTW2-05, CMTW3-05 and SMTW1-05) was completed during the period of September 8, 2005 and November 5, 2005 by Davidson Well Drilling Ltd. Step testing of the sixth test well (PBTW2-06) and the first three test production wells (PBPW1-06, CMPW1-06 and CMPW2-06) was completed between June 7 and August 16, 2006 by Gerrits Well Drilling Inc. The fourth step was not completed for test production well CMPW1-06 since the pump broke suction at the fourth step pumping rate.

2.3.1 Monitoring Program

Water levels in nearby private wells were monitored with dataloggers to assess water level changes during step testing. Two private wells, as listed by the Region's Water Resources Analysis System (WRAS+) database unique well identifiers (9203306 and 9202055) were monitored near PBTW1-05, two wells (9200728 and 1000545) near CMTW1-05, and one well (ID# DW08) near CMTW2-05. Following the above step testing, letters were sent to these well owners providing the results of the monitoring of their wells.

Flow profile logging was performed by personnel from Lotowater Ltd. during step testing of the three test production wells (PBPW1-06, CMPW1-06 and CMPW2-06). Flow profiling methods are outlined in Attachment A1. The flow profiles are included in Attachment A2.

2.3.2 Discharge Conveyance

Water from the test was conveyed away from the wellhead area by temporary piping, and discharged to nearby storm sewers or suitable surface water features. Discharge of water from the step testing was coordinated with City of Cambridge operations staff. Flow dissipation measures were used, as necessary, to avoid erosion. Given the short duration of the step tests and the depth of the aquifers tested, recirculation of pumped water back to the aquifer was not an issue for the step testing. Discharge locations for the long term 28-day test are described in Section 2.5.2 and shown on Figure A3.

2.3.3 Water Quality Sampling

Water samples were collected from the six test wells at the end of the step pumping tests. Key parameters that were analyzed included chloride, sodium, sulphate, hardness, iron and manganese. Water quality results are included in Attachment A8.

2.3.4 Observed Response

The drawdown at the end of each step, and the specific capacity calculated at the end of each step test, are presented in Table A6. Hydrographs, which allow a comparison of the drawdowns during the step testing for the test wells and test production wells, are shown on Figures A4 and A5, respectively. Graphs for each of the step tests showing drawdown vs. log time at each step are included in Attachment A4. The key results of the step testing at the test wells are as follows:

- At the end of the last step, water levels in some of the test wells (PBTW1-05, PBTW2-06, CMTW1-05, CMTW2-05, CMTW3-05 and SMTW1-05) were still slightly declining. Steady-state had not been reached;
- PBTW1-05 and PBTW2-06 showed the least drawdown (less than 2 m) and highest specific capacity at the maximum step pumping rate of 1,309 m^3/day (15.1 L/s);
- CMTW2-05 also showed relatively minor drawdown and high specific capacity at the maximum step pumping rate; and
- SMTW1-05 showed the greatest drawdown (9.6 to 11.1 m) and lowest specific capacity at the maximum step pumping rate of 1,309 m^3/day (15.1 L/s).

Test production well sites were selected at PBTW2-06, CMTW1-05 and CMTW2-05 based on the results of the test well program as further described in the main text of the Hydrogeology and Natural Environment Report.

The following key results are noted for the step testing of the test production wells:

- At the end of the last step, water levels in the test production wells were still slightly declining. Steady-state had not been reached;
- The test production wells CMPW2-06 and PBPW1-06 showed the least amount of drawdown (less than 6.5 m) and the highest specific capacity (12 L/s/m) at the maximum step pumping rate of 6,540 m^3/day (75.7 L/s); and
- CMPW1-06 (Portuguese Club) pump broke suction when pumping was increased to the last step rate (75.7 L/s) and had a lower specific capacity of 3 L/s/m.

2.4 Private Well Inventory

Prior to the long-term 28-day pumping test, a private well inventory was conducted during July and August of 2006. The inventory was completed within a 1 km radius of each of the three test production wells (CMPW1-06, CMPW2-06 and PBPW1-06). The private wells are plotted on Figures A5.1 and A5.2 in Attachment A5. The results of the well inventory are presented in Tables A5.1 and A5.2 in Attachment A5.

2.5 28-Day Pumping Test (PBPW1-06, CMPW1-06 and CMPW2-06)

A long-term (28-day) pumping test was completed with a staged start of pumping from the first three test production wells (PBPW1-06, CMPW1-06 and CMPW1-06). The schedule of the pumping test is outlined below and in Table A7.

Date	Pumping Test Details
Sept 5, 2006	Start up of CMPW2-06 at 12 noon at a constant rate of 3,240 m^3/day (37.5 L/s).
Sept 13, 2006	Start up of PBPW1-06 at 1:30 pm at a constant rate of 3,378 m^3/day (39.1 L/s).
Sept 19, 2006	Start up of CMPW1-06 at 12:45 pm at a constant rate of 3,240 m^3/day (37.5 L/s).
Oct 2, 2006	Shutdown of CMPW1-06, CMPW2-06 and PBPW1-06 at 12 noon.

2.5.1 Monitoring Program

The monitoring program included wells, shallow piezometers, surface water stations and ecological monitoring stations. The locations of the monitoring stations are shown in Figure A2. Table A8 lists the locations monitored and the methods used to monitor these sites.

Water levels were monitored in six test and test production wells, 65 piezometers in 19 monitoring well nests, 16 private wells, six stream piezometers, and three surface water gauges. In total 60 electronic dataloggers were deployed measuring water levels at five minute intervals. Manual water level measurements were taken on a daily or weekly basis. Surface water levels were monitored using staff gauges in Puslinch Lake, Little Lake and Hilborn Pond, as well as in three private ponds. The monitoring included shallow groundwater levels in stream piezometers and stream levels at four locations in Cedarbrook Creek. Portuguese Swamp water levels were monitored in shallow piezometers CMOW1D-92 and CMOW2D-92.

Eight ecological monitoring stations were set up to monitor vegetation in environmentally sensitive areas throughout the pumping test. The sites were selected to include nearby representative environmentally sensitive features including Portuguese Swamp, Cedarbrook Creek and McCormick Bog. The monitoring also included

areas of bog, marsh and wetland type communities at distances of 2 to 5 km from the pumping wells, considered as representative background monitoring sites. Monitoring began in advance of the testing (July 24, 2006) with an inventory of the plant species at each of these locations. Shallow piezometers were installed at these sites to monitor changes in water levels. During the pumping test, each site was visited weekly, photos were taken, changes to the vegetation were observed and water levels in the shallow piezometers were measured. This work was conducted by Golder biologists.

2.5.2 Discharge Conveyance

In order to avoid the possibility for recirculation of discharge water back to the aquifer, measures were taken to convey the discharge water from the long-term pumping test out of the recharge area for the wells. Figure A3 shows the discharge conveyance from the three wells. Discharge during testing was arranged in coordination with operations staff from the City of Cambridge.

Water pumped from CMPW2-06 was discharged into the storm sewer inlet on Cedarbrook Crt. This water was channelled through the storm sewer, which passes under Cedarbrook Crt. and discharges into the Hilborn storm water management pond. Hilborn Pond outlets into Cedarbrook Creek, which flows into Mill Creek. Water pumped from CMPW1-06 was conveyed through temporary piping to the storm sewer inlet at Townline Road and Saginaw Parkway. This storm sewer discharges into Cedarbrook Creek upstream from Hilborn Pond. Approval for the discharge to the storm water pond was given by the City of Cambridge.

Discussions were held with the Grand River Conservation Authority (GRCA) and the Ministry of Natural Resources (MNR) regarding the combined discharge from two test production wells (CMPW1-06 and CMPW2-06) to Hilborn Pond that overflows into Cedarbrook Creek. The planned monitoring of groundwater levels at in-stream piezometers was augmented as follows:

- The start of the test was delayed for five days because of a then pending significant storm event. This storm event was not as intense in the Cambridge East area as expected and pumping commenced on September 5, 2006;
- At the request of GRCA, an electro fishing survey was conducted on September 1, 2006, immediately prior to the beginning of the test. The presence of cold water fish species was confirmed during this survey. (documentation of the fish survey is contained in Attachment A6);
- Inspections of the creek and pond were conducted during start up and daily for the first three days with less frequent inspections thereafter; inspections were conducted by an experienced team including aquatic scientists, surface water engineers and hydrogeologists;
- Creek water samples were collected daily at two locations and inspected visually for clarity with laboratory analysis of total suspended solids (TSS). These two locations were at the discharge from Hilborn Pond and at the culvert passing under Avenue Road;
- Daily water temperature measurements were made at four locations along this creek and a continuous record of creek water temperatures was obtained immediately below the pond outlet and downstream near the confluence with Mill Creek;
- Measurements of creek flow were collected daily at a location downstream of Avenue Road near the confluence with Mill Creek. (See Figure A6.52 in Attachment A6) Groundwater levels were also measured

daily at in-stream piezometers to confirm that discharge (upward) gradients were maintained. Groundwater levels were also measured daily at the shallow nested piezometer located immediately adjacent to the outlet of Hilborn Pond;

- The outlet from Hilborn Pond was temporarily modified to prevent clogging from floating weed and consequent rise in pond water levels; and
- For the first 14 days, only the CMPW2-06 was discharged into Hilborn Pond. Given the stable condition of the creek as observed during this period, pumping from CMPW1-06 was initiated with the combined discharge reporting through Hilborn Pond. Again daily inspections of the condition of the creek were conducted for the next three days as well as the continuation of daily TSS, temperature and flow monitoring. (See Figure A6.52 in Attachment A6). Particular attention was paid to reaches of the creek with a greater potential for bank undercutting or erosion of the stream bed. Creek conditions remained stable with respect to the potential for erosion or scouring and so the combined discharge was maintained for a further 13 days, with pumping terminated on October 2, 2007. In the event that unstable conditions were observed or suspected, pumping from the CMPW2-06 would have been terminated.

Discussions were held with the City of Cambridge to evaluate the feasibility of discharging pumped water from PBPW1-06 to the sanitary sewer. The capacity of the sanitary sewer system was reviewed by MTE consultants who determined that an additional pump was needed at the Burnett Avenue pumping station. This report is included in Attachment A6. A temporary pump was installed in the pumping station to handle the addition of groundwater to the sanitary sewer system.

Water pumped from PBPW1-06 was initially discharged, beginning on September 13, 2006 into a local storm water pond, while the connections and pump modifications for discharge to the sanitary sewer were completed. After three days, discharge water was directed through temporary piping into the sanitary sewer system approximately 300 m south of the test production well. The flow of water to the sanitary pumping station was inspected by both City staff and Golder when well water was first discharged to the sanitary sewer on September 15, 2006. The performance of the sewer system and the additional pump were as expected in that sump water levels were maintained within desirable levels. Discharge to the sanitary sewer was continued for 19 days to the end of the test on October 2, 2006.

2.5.3 Water Quality Sampling

As shown in Table A10, water samples were collected from each of the three test production wells (CMPW1-06, CMPW2-06 and PBPW1-06) during the pumping test. For the duration of the testing period, water samples were collected from each of the three wells three times per week. Field measurements were taken of temperature, pH, and electrical conductivity. Samples were submitted to the Region's Water Services Laboratory for water quality analysis for ODWS (Ontario Drinking Water Standard) parameters to determine local water quality at each site. At the end of the test, additional samples were collected and submitted to the University of Waterloo Isotope Lab for analysis of stable isotopes (deuterium and oxygen-18), tritium and sulphur-34. For organic chemistry and radionuclides analysis, samples were collected on Sept 29, 2006 and submitted to the Region's Water Services Laboratory. Water quality results are discussed in Section 2.7.

2.5.4 Observed Responses

Figure A6 shows a hydrograph of the three production wells: CMPW1-06, CMPW2-06 and PBPW2-06, along with the pumping rates and daily precipitation as recorded at the GRCA's Shade's Mills station. Figures A7 and A8 present the drawdown observed in the Gasport Formation and lower overburden, respectively, in plan view. Table A8 presents the drawdown for all monitoring wells at the end of the 28-day pumping test. Key hydrographs from this test are shown on Figures A9 through A18. Composite plots showing observed drawdown from pumping at CMPW1-06, CMPW2-06 and PBPW1-06 versus (time/radius)^2 are presented on Figures A6.45 through A6.47 in Attachment A6. Hydrographs of all monitoring wells are also included in Attachment A6 (Figures A6.1 through A6.15).

Test Production Well Drawdowns

The drawdowns in the test production wells during the 28-day pumping test are shown on Figure A6. The following key observations are noted regarding the drawdowns observed in the test production wells:

- In each of these wells, most of the drawdown occurred within the first 24 hours after pumping began; after which time these water levels approached a steady-state condition;
- Following shut down of the pumping test, water levels in the pumping wells recovered above the initial static levels within 48 hours;
- The least drawdown at the end of the test was observed in PBPW1-06 (2.5 m), with more drawdown observed at CMPW2-06 (5.4 m) and the greatest drawdown observed in CMPW1-06 (10.4 m);
- There was little interference (<0.5 m) observed in PBPW1-06 from pumping at the other two test production wells; conversely, there was also little interference (<1 m) observed at the CMPW1-06 and CMPW2-06 from pumping at PBPW1-06;
- Interference between CMPW1-06 and CMPW2-06 was about 2 m for each of these wells; and
- The water levels in wells CMPW2-06 and CMPW1-06 showed minor influences from nearby municipal pumping at wells G16, G17 and G18. These municipal wells were cycling in unison. Fluctuations of up to approximately 0.5 m occurred in these two test production wells as the existing municipal wells cycled off and on. The cycling of these wells did not influence well PBPW1-06, located further to the north. Comparison plots showing the municipal pumping from existing wells in relation to water levels in the test production wells are presented on Figure A6.44 in Attachment A6. The municipal supply wells of the Pinebush well field typically do not cycle in the same manner as for the Clemens Mill wells and interference from these wells was not observed in water levels at the test production wells.

Overview of Water Level Responses

The drawdowns at the end of the test are plotted for all bedrock wells monitored (Figure A7) and for all overburden monitoring wells monitored (Figure A8). The drawdown values for wells with monitored intervals in the deep bedrock (Gasport Formation) are highlighted and contoured on Figure A7. On Figure A8, the drawdown values for wells with monitored intervals in the lower overburden are highlighted and contoured.

- Drawdowns observed in the bedrock at the end of the test are summarized as follows:

- Observed drawdowns at the end of the test were greatest in the Gasport Formation, with values ranging from 1.2 m (at CMTW3A-05) to 4.4 m (at CMOW1A-06);
- Observed drawdowns in the Gasport Formation were greatest in the vicinity of the CMPW1-06 and CMPW2-06. Drawdowns were relatively lower in the Gasport Formation in monitoring wells east of PBPW1-06 near Puslinch Lake (CMOW5A-94 and PBOW2A-06);
- The observed drawdowns were largely confined to the lower bedrock Gasport Formation in the southern part of the Study Area near Mill Creek with little (<0.4 m) to no drawdowns observed in wells in the Guelph Formation (CMOW2B/C-06 and SMTW1B/C-05). The observed drawdowns were also largely confined to the lower bedrock Gasport Formation in the central part of the Study Area, with observed drawdown ranging from 0.6 m to 1.6 m in the Guelph Formation;
- In the area to the east of PBPW1-06, approaching Puslinch Lake, drawdowns were more evenly distributed between the Gasport and Guelph Formations, with drawdown values of 1.4 m to 2.0 m observed in the Guelph Formation in wells PBOW2B/C-06 and CMOW5C/D-94, respectively;
- Drawdowns were observed in the bedrock at wells located up to about 1 km from the test production wells; and
- Wells located at distances greater than 1 km from the test production wells and completed in the bedrock included TW9-78, at distance of approximately 1.5 km, and TW10-78 at a distance of approximately 5 km. Water levels in these two wells did not show any responses to pumping from the three test production wells in Cambridge East.
- Drawdowns observed in the overburden at the end of the test are summarized as follows:
- Drawdowns of more than 0.1 m were observed in overburden wells at distances of up to about 1.3 km from the test production wells;
- The observed lower overburden responses were greatest in wells located northeast of PBPW1-06, with end-of-test drawdown values of 1.2 m to 1.3 m observed in wells PBOW2D-06 and CMOW5E-94, located at distances of about 500 m and 550 m, respectively, from the test production wells;
- In the vicinity of the Portuguese Swamp and CMPW2-06, drawdowns in the lower overburden ranged from 0.2 m to 0.9 m;
- On the southwest shore of Puslinch Lake and at McCormick's Point on Puslinch Lake, drawdowns in the lower overburden were approximately 0.4 m in wells PLOW1A-06, PLOW2A-06 and C2; and
- Water level responses to pumping were not observed in the lower overburden at the following locations: Puslinch Township Concession 1 area located 4 to 5 km to the east of Townline Road (wells 9203311 and MW1D); on the northeast shore of Puslinch Lake (well 6710783); in the Shade's Mills reservoir area (well SM3B-93) and in the western area of Portuguese Swamp (well CMOW1B-92).

The responses at private wells, shallow overburden wells and the water table are described below.

Responses in Private Wells

During the pumping test there were no interruptions to private well water supplies.

The following are the key observations regarding private well water level responses:

- Water level declines observed in nearby deeper private wells completed in the bedrock or lower overburden were generally less than about 1.5 m during the testing. An example of the responses of a private well (ID#9203306) completed in the upper bedrock is shown on Figure A12. This well is located on Townline Road at a distance of about 500 m from PBPW2-06. This hydrograph shows regular fluctuations of up to 4 m that occurred as a result of regular cycling of this well for domestic water supplies. The effect of test well pumping is observed to be about 0.8 m when pumping began at PBPW2-06, with a total drawdown of about 1.4 m recorded at the end of testing. Drawdown from the pumping test did not impact operation of any private wells. Water levels in this well, and in all private wells monitored, recovered to above pre-pumping test levels within less than 48 hours; and
- Water levels in shallow private wells increased during testing in response to seasonal rains. An example of the responses of a private well that was largely influenced by seasonal rains is shown on Figure A13 (well 6710783), located on Lake Road on the north side of Puslinch Lake.

Responses of Shallow Water Table

The following are the key observations regarding the shallow water table responses during the testing:

- The shallow water table, ponds and lake levels all rose during the testing period in response to seasonal rains;
- For example, in the Mill Creek area adjacent to Avenue Road, the water level response hydrographs during testing are shown for the bedrock, overburden and shallow water table on Figures A14 and A15. In this area, drawdown was limited to the lower Gasport Formation while water levels in the overlying Guelph Formation (SMTW1BC-05) did not respond to pumping. Therefore, the shallow water table hydrograph (well 9203305) was representative of the background influence of the seasonal rains on the water table during the testing period and was not influenced by the pumping test;
- In the Portuguese Swamp area, shallow water table water levels were found to increase during the testing in response to rainfall events as illustrated on Figure A16 (CMOW1CD-92);
- During the pumping test, upward vertical hydraulic gradients, as measured in shallow piezometers and stream level stations, were maintained in Cedarbrook Creek; this in spite of the higher creek water levels resulting from the discharge of pumped water from two test wells into Hilborn Pond and Cedarbrook Creek; and
- Wetland shallow water levels increased at all ecological monitoring stations and vegetation changes reflected only seasonal variability, as observed at background monitoring sites.

Responses in Puslinch Lake Area

The responses during pumping in the Puslinch Lake area are illustrated on the hydrographs shown on Figures A17 and A18. Figure A17 shows the responses in the shallow piezometer nest PLOW1-06 in relation to the Puslinch Lake level, nearby overburden well C2 and monitoring well PBOW2F-06. Piezometer PLOW1B-06 (<5 m deep) showed responses similar to the Puslinch Lake level and typical of shallow wells in sandy materials influenced by seasonal rains. The responses in PLOW1B-06 were similar to the shallow water table well responses of well 9203305, shown on Figure A18 that was not influenced by pumping.

Figure A18 also includes the responses in a shallow water table at well PTOW1 (<5m deep) and a private water well (6710783), both located to the northeast of Puslinch Lake. Water levels in these wells also rose during the testing period in response to rainfall events.

The data from the wells monitored adjacent to Puslinch Lake showed that downward vertical hydraulic gradients were present between the lake level and the underlying lower overburden sand and gravel aquifer materials in these locations. These downward gradients were present before the test pumping program began and continued through the testing period. For the shallow wells that showed a response to pumping, the magnitude of the downward vertical gradient increased during the testing period.

2.5.5 Aquifer Parameter Estimates

The bedrock transmissivity and storativity estimates were interpreted from the pumping test data using a Cooper Jacob solution. Figures A6.45 through A6.47 in Attachment A6 show composite drawdown versus (time/radius^2) plots for each of the test production wells (CMPW1-06, CMPW2-06 and PBPW1-06). These figures present the observed drawdown normalized with respect to the distance from the pumping well.

The Effective Transmissivity (T) can be estimated by applying an effective Cooper Jacob method to the observed drawdown as follows:

$$T = \left(\frac{2.303}{4\pi}\right) \times \left(\frac{Q}{\Delta S}\right)$$

Where: Q = pumping rate (m^3/day)

ΔS = slope of the observed drawdown hydrograph per log cycle

The bedrock transmissivity and storativity estimates based on analysis of data from the long-term pumping test are presented in Table A9. The following summarizes the interpreted aquifer hydraulic parameters for the 28-day (CMPW1-06, CMPW2-06 and PBPW1-06) pumping test:

- Estimated transmissivity values in the vicinity of the test production wells varied in a relatively narrow range, averaging 688 m^2/day at PBPW1-06, 534 m^2/day at CMPW1-06 and 653 m^2/day at CMPW2-06; and
- Storativity values estimated from observation well data in the Gasport Formation, range from 2 x 10^{-5} to 8 x 10^{-6} m/m.

Step tests were also analysed using Aqtesolv to estimate transmissivity and hydraulic conductivity values based on aquifer thicknesses. The Aqtesolv results are included in Attachment A4. Hydraulic parameter estimates based on interpretation of the step tests are included in Table A9.

2.6 Public Communication

During the drilling of monitoring wells at sites in Puslinch Township, a number of local residents became concerned as to the extent and purpose of the program. Local residents organized a meeting to which the Region was invited to explain the program and hear local concerns first hand. This meeting was held at the Clifford Evans Training Centre in Puslinch on July 6, 2006 and attended by about 100 residents (Attachment A7 includes the list of attendees). Representatives from the Region presented on overview of the IUS water supply program and the background to municipal groundwater pumping in the Cambridge East area. They noted that the objective of the program was to restore groundwater pumping rates to levels required to meet the available

capacity at the existing treatment plants. Representatives from Golder presented details of the program including the rationale for the monitoring well nests that were then being installed in Puslinch, the monitoring program that included extensive monitoring of water levels in private wells and environmentally sensitive areas (ESAs) and the planned 28-day pumping test of the three test production wells located in Cambridge East.

The key technical and procedural concerns expressed were as follows (in no order of priority):

- The Township should have input on the selection of private water wells for inclusion in the monitoring plan that should be expanded to include locations at distances of more than 1 km from the test pumping wells;
- Contingency plans for possible disruption to well water supplies should be augmented and communicated; including a clear protocol for an emergency response contact and for the timely provision of water;
- Since the discharge of pumped water within the watershed could compromise monitoring of the elevation of the water table at environmentally sensitive areas and shallow water wells, the pumped water should be discharged to flow outside the watershed. In addition, discharge from the Portuguese Club test well (CMPW1-06) to the storm sewer on Townline Road had the potential to cause flooding locally on the east side of the road;
- The testing program might impact water levels in Puslinch Lake, environmentally sensitive areas, wetlands, Mill Creek and constructed ponds;
- Regular updates of water level monitoring data obtained during the pumping test should be provided to private well owners during the testing;
- Water level monitoring data from private wells obtained during the pumping test should be provided to the private well owners after completion of the testing;
- The overview of the testing program should be documented and made available to local residents who could not attend the residents meeting; and
- A follow-up meeting should be held to present the results of the testing program.

The following activities were completed to address these concerns:

- Two site visits were conducted with the Township's hydrogeologist, Mr. Stan Denhoed, (July 28 and August 17, 2006) to select additional locations for inclusion in the monitoring program; including private wells, existing monitoring wells, a location adjacent to Hilborn Pond and two locations immediately adjacent to Puslinch Lake were identified for the installation of shallow monitoring well nests. Discussions addressed the following: private wells preferred for the installation of data loggers; installation of staff gauges at private ponds, and Puslinch and Little Lakes; private wells that potentially would be most at risk during the pumping test; provision of emergency water supplies; locations for the discharge of pumped water and provision of regular updates of the water level monitoring data during testing; and
- A detailed contingency plan was developed. The Region's emergency call centre number was provided to all residences served with a private water well located within 1 km of the test pumping wells. A water supply contractor was retained to provide water on an emergency basis to any residents whose well water supply was disrupted during the test. Also, five nearby residences with shallow (<10m deep) water wells were visited and offered the installation of a temporary water storage tank to facilitate the timely provision of

an emergency water supply if requested. Only two residents felt this measure was warranted. No calls were received at the emergency call centre in relation to the pumping test program.

- The plan for the discharge of pumped water was modified as follows:
  - For CMPW2-06, discharge water was piped to the storm sewer at Saginaw Parkway that in turn reported to Hilborn Pond, with overflow to Cedarbrook Creek, a tributary of Mill Creek;
  - For PBPW1-06, discharge water was directed to the sanitary sewer system;
  - For CMPW1-06, discharge water was directed to Hilborn Pond as per the original plan;
  - The monitoring program for Cedarbrook Creek was enhanced to ensure that the combined discharge from two test wells did not compromise fish habitat;
  - The program included considerable monitoring in the vicinity of environmentally sensitive areas including at eight wetland transects for monitoring of water levels and vegetation stress. The program was expanded to include additional private wells, additional monitoring wells nests installed at three key locations, staff gauges installed in private ponds and extensive use of data loggers to collect water level measurements; and
  - A Question and Answer handout was prepared and provided to the Township Office for local distribution. This handout contained responses to a number of concerns expressed at the residents meeting including an overview of the revised monitoring program, the process for addressing water supply disruptions and advising of the provision of water level monitoring data from representative locations during the testing program. A copy of this Question and Answer document is provided in Attachment A7.

The testing program was conducted beginning September 5, 2006 and pumping was stopped on October 2, 2006.

No calls were received at the Region's emergency call centre in relation to this pumping test program.

- During the 28-day pumping test, information updates, including the status of the pumping wells and water level measurements from representative monitoring locations presented graphically were compiled and forwarded to the Township office via email at the end of each week. These measurements were collected manually on a daily basis, rather than recovering and re-setting data loggers for each weekly update. At the completion of the testing program, including a period of time for the recovery of water levels following the cessation of pumping, a letter containing the results of the water level monitoring were sent to the owner of each of the private wells monitored;
- Complaints were received from residents on Cedarbrook Court (at CMPW1-06) regarding the noise levels from the generator required to operate the test pump. A 12 foot high wall of plywood sheeting was erected around the exterior of the generator housing. This had the effect of reducing noise levels and no further complaints were received. In advance of pumping at the PBPW1-06, a similar 12 foot high wall was erected around the generator housing. No complaints were received regarding noise levels at this location; and
- One complaint was received from a resident on Townline Road whose well was reported to contain fuel or sewage like odours. Golder was advised that this condition was first noted long before the testing program.

A site visit indicated a very poor condition of the well head. The well owner was advised to have a well driller inspect the well with the view to reconstructing this well. The reported condition was not related to the well testing program.

Following completion of the testing program, including monitoring as water levels recovered, along with subsequent analyses of test data, a follow up meeting was held with residents of Puslinch to present the results. This meeting was held on January 29, 2007 at the Clifford Evans Training Centre and attended by about 50 residents (see Attachment A7 for list of attendees). The monitoring results were presented on a number of graphs from representative monitoring locations across the Study Area.

2.7 Water Quality Results

Table A11 provides the inorganic and physical water quality results from samples taken from each of the test production wells toward the end of the 28-day pumping test on September 29, 2006. Table A12 provides the results of the isotopic analyses. Detailed tables of all water quality data from the 28-day pumping test are provided in Tables A8.2 (Inorganic Water Quality), A8.5 (Organic Water Quality) and A8.6 (isotopes and radionuclides) of Attachment A8.

2.7.1 Inorganic Groundwater Chemistry

A summary of water quality results from the general (inorganic) water quality analyses for each of the test wells are presented in Table A11. This included one sample collected from each of the first five step tests, 23 samples collected from the three test production wells during the 28-day pumping test and two samples collected from bedrock wells in Puslinch; one flowing domestic well (6699 Concession 1) and a flowing monitoring well, TW10-78.

The chemistry of groundwater obtained during pumping of the test wells was dominated by the presence of calcium and bicarbonate ions consistent with this carbonate (dolomite) bedrock aquifer. Calcium concentrations ranged from 80 mg/L to a high of 235 mg/L with values typically less than 120 mg/L, alkalinity concentrations (expressed as $CaCO_3$) ranged from 219 to 265 mg/L and hardness from 310 to 791 mg/L. Sulphate was present in concentrations ranging from a low of 23 mg/L to as much as 492 mg/L. This range likely reflects the irregular distribution of gypsum and or anhydrite (sulphate minerals) within the bedrock aquifer. It is to be noted that the sulphate concentrations reported for CMPW2-06 on September 8, 2006 (10.8 mg/L) appear anomalously low and are not considered as representative.

Distinct differences were observed in major ion chemistry between the wells tested. In the Pinebush area (PBTW1-05 -1 sample; and PBPW1-06 – 7 samples) calcium concentrations ranged from 84 mg/L at PBTW1-05 to values that declined from 105 to 94 mg/L over the 7 samples obtained during pumping at PBPW1-06. Similarly, hardness concentrations declined over the 28-day pumping test from 404 to 364 mg/L while alkalinity values typically ranged between 240 and 250 mg/L.

For the wells tested in the Clemens Mill well field area (CMTW1-05, CMTW2-05 and CMTW3-05, (one sample from each), CMPW1-06 – 5 samples, and CMPW2-06 – 11 samples) calcium concentrations ranged from 83 to 155 mg/L. During the 28-day pumping test, calcium concentrations at CMPW1-06 were consistently in the 83 to 90 mg/L range while higher concentrations were observed at CMPW2-06; in the 110 to 124 mg/L range.

At the Shade's Mills site (SMTW1-05 – 1 sample) higher concentrations of calcium (235 mg/L) and hardness (791 mg/L) were observed.

Sulphate concentrations also varied across the Study Area with much higher concentrations of 492 mg/L reported at SMTW1-05. This is consistent with sulphate data reported from earlier studies conducted in the Shade's Mills area (Lotowater 1993b). For the other two well field areas, lower sulphate concentrations were reported with values typically in the range of 85 to 90 mg/L at CMPW1-06 and 188 to 229 mg/L at CMPW2-06. The lowest sulphate concentrations were reported for the one sample obtained from CMTW3-05.

Chloride concentrations were low with values generally less than 10 mg/L with slightly higher values at PBTW1-06, varying between 12 and 17 mg/L and no obvious trends over time evident. As noted by Lotowater (1994), where elevated chloride concentrations are observed, these are typically highest in the shallow overburden and decrease markedly with depth. Elevated chloride concentrations likely originate from local road salting practices. The lowest chloride concentrations of 4.5 mg/L were reported at CMTW3-05, which also reported the lowest sulphate concentrations of 28.1 mg/L. Concentrations of nitrate were also low with all values reported at <0.10 mg/L for samples collected in Cambridge East. Higher nitrate values, although not above the ODWS value of 10 mg/L, were reported for the two wells in Puslinch (6699 Concession #1 and TW10-78), with 0.53 and 3.33 mg/L, respectively. It should also be noted that the two wells in Puslinch contain much lower sulphate concentrations than those sampled in Cambridge East, with values of 29.1 and 24.2 mg/L reported at Concession #1 and TW10-78, respectively.

Iron and manganese were present at elevated concentrations. Iron concentrations in excess of the ODWS were recorded at PBTW1-05 (0.552 mg/L) and varied from 0.21 to 0.27 mg/L at PBPW1-06 during the 28-day pumping test. In the Clemens Mill area, reported concentrations of iron ranged from less than 0.1 mg/L at CMTW3-05 (which also had the lowest chloride and sulphate values) to typically about 0.10 to 0.13 mg/L at CMPW1-06, to higher values ranging between 0.18 to 0.27 mg/L at CMPW2-06. Manganese concentrations were typically below 0.01 mg/L although higher values were reported from the samples collected during step testing at CMTW3-05, PBTW1-05 and SMTW1-05, with values ranging from 0.015 to a maximum of 0.048 mg/L.

These water quality results were compared to the ODWS. With respect to hardness concentrations, all reported values exceeded the operational guidelines (OG) value of 80-100 mg/L; a common occurrence in the dolomite bedrock aquifers in this area of Southern Ontario. One sample for iron, collected at PBTW1-05 (0.55 mg/L), also exceeded the ODWS Aesthetic Objective (AO) of 0.3 mg/L. Canadian Drinking Water Guidelines (CDWG) for manganese are currently being updated, including a new health based MAC of 0.1 mg/L and a new AO of 0.02 mg/L, which is higher than the current ODWS AO of 0.05 mg/L. While there were not any exceedances in manganese in the test production wells, there were a number of AO manganese exceedances in other wells sampled compared to the updated standards. These wells included: CMTW3-05, PBTW1-05 and TW10-78. A number of monitoring wells in Shade's Mills, with concentrations of manganese ranging from 0.10 to 0.25 mg/L, also exceeded the health-based MAC. All other inorganic parameters met the ODWS, although some reported results approached their ODWS values as follows: a sulphate concentration of 492 mg/L and aluminium concentration of 0.092 mg/L, both reported from the step test at SMTW1-05. Data developed from the long-term pumping test are expected to be more representative of water quality conditions in the bedrock aquifer in Cambridge East, as compared to the sample results obtained during step testing.

2.7.2 Isotope Results

Analysis of the isotopic composition was conducted to assess the possible age and origin of groundwater in the bedrock aquifer in Cambridge East. Samples of pumped groundwater were collected at the three test production wells and two flowing artesian wells in Puslinch (a domestic well on Concession 1 and monitoring well TW10-

78). These samples were analysed for oxygen-18 (^{18}O), deuterium (^{2}H), tritium (^{3}H) and sulphur-34 (^{34}S) isotopes at the University of Waterloo. Results from these analyses are presented in Table A12.

The presence of tritium in the test production wells, with concentrations ranging between <0.8 to 5.7 TU, indicate at least a component of 'modern' groundwater recharged after 1952. It is likely that this water reflects a mix of older water and younger water (Fritz and Clark, 1997). The sampled wells in Puslinch contained higher tritium concentrations of 13.1 and 14.5 TU respectively at 6699 Concession 1 and TW10-78. Groundwater recharge to these wells is likely modern with ages between <5 and 10 years old (Fritz and Clark, 1997), but could have been recharged as far back as the early 1970s.

The stable isotope values from the test production wells in Cambridge East and the two wells in Puslinch have been plotted (Figure A19) on the Local Meteoric Water Line (LMWL) as determined by Fritz, et al (1987), based on work completed in Simcoe, Ontario. The Cambridge East values for delta deuterium (v) and delta oxygen-18 ($\delta^{18}O$) lie close to the LMWL indicating that the isotopic signature reflects that of precipitation. The isotopic signatures for CMPW2-06 and TW10-78 are slightly enriched (less negative) (i.e., they lie slightly to the right of the LMWL); this could indicate that the recharge water for these wells has undergone some evaporation in the unsaturated zone prior to reaching the water table. The stable isotopic signatures for the test production wells are within the range of isotopic values found in local groundwater as reported by Stotler (2003).

With respect to the sulphur-34 isotopic values for the three test production wells, sampled groundwater has a similar range of $\delta^{34}S$ signatures (24.6 to 29.1‰). These isotopic signatures are typical for sulphates with a marine origin, consistent with the formation of the bedrock aquifer in a marine environment. The sulphur would mostly likely originate from the dissolution of sulphate from gypsum and anhydrite (sulphate minerals in the carbonate), but could also be from minor sulphate nodules and laminations on bedding planes (Clark and Fritz, 1997).

For the results from the wells in Puslinch, TW10-78 and 6699 Concession #1, the $\delta^{34}S$ values were more depleted, ranging from 2.7 to 3.3‰. These $\delta^{34}S$ values match typical sulphate signatures of atmospheric deposition. The source of sulphate in the groundwater in these wells likely originates from precipitation.

The isotopic data suggest the bedrock water in Cambridge East is mixed and includes a component of relatively young water likely recharged from precipitation since 1952. The sulphur is sourced from the dissolution of gypsum, reflecting a marine origin for these rocks. Elevated sulphate concentrations are expected to persist with long-term pumping in the area. The sampled water in Puslinch indicated a slightly different origin that in part reflects that these wells do not extend completely through the Guelph-Gasport Formation (as do the test wells in Cambridge) and that they are free flowing (albeit at very low rates) rather than being actively pumped. Groundwater sampled from these wells reflects recent recharge from precipitation with perhaps a longer residence time in the unsaturated zone to account for the isotopically lighter signature evident from the $\delta^{2}H$ and $\delta^{18}O$ results.

2.7.3 Organic Groundwater Chemistry

The results from the Organic Water Chemistry Analyses are shown in Table A8.5 of Attachment A8. These results were all below the method detection limits (MDL) reported by the Region's Water Services Laboratory, with the exception of total xylenes, as discussed further below. All reported parameters were below the Maximum Acceptable Concentrations (MAC) and the Interim Maximum Acceptable Concentrations (IMAC) as outlined in the ODWS.

Low levels of xylene (total) were detected in all three test production wells, ranging from 0.005 to 0.022 mg/L. These concentrations were below the current aesthetic objective (AO) of 0.3 mg/L for total xylenes. However, in 2014, Health Canada set a heath-based CDWG for xylenes at 0.09 mg/L and an AO of 0.02 mg/L, which will be adopted into the ODWS in 2017. The concentration of 0.022 mg/L of total xylenes at CMPW1-06 will exceed the new ODWS AO. While the origin of this xylene is not known, it could be an artifact of well construction and this occurrence is not thought to reflect a local land use or water quality concern. However, these wells should be re-sampled to establish that xylenes do not represent a concern for a future municipal groundwater supply.

The MDLs for two compounds, 2,4-Dichlorophenol and 2,3,4,6-Tetrachlorophenol in the PBPW1-06, CMPW1-06, CMPW2-06 and PBPW2-08 samples, as reported by the Region's Water Services Laboratory, were higher than the objectives set out in the ODWS. The Region reported an MDL for 2,4-Dichlorophenol of 0.005 mg/L, a value that exceeded the AO of 0.0003 mg/L for this parameter and for 2,3,4,6-Tetrachlorophenol, the reported MDL of 0.001 mg/L was equal to the AO value for this parameter. This does not indicate that these compounds are necessarily present is this water; however, these parameters should be re-analyzed in the future using appropriate detection limits.

Some parameters included in the ODWS Table 2 were not reported by the Region's Water Services Laboratory; these included NDMA, NTA, antimony, bromate and arsenic. Prior to bringing new wells online, these wells should be re-sampled and analyzed for the full ODWS suite, confirming the MDLs meet the ODWS. Based on discussions with the Region, it is also recommended that these wells be analyzed for 1,4 Dioxane, a compound that has been detected in municipal wells elsewhere in the Region.

2.7.4 Radionuclides

The analyses for the radionuclides are reported on Table A12 and indicate all values at less than reported detection limits.

3.0 PHASE II INVESTIGATIONS (2007/2008) PINEBUSH AND SHADE'S MILLS WELL FIELDS

After completion of the Phase I Investigations, further exploration in the Pinebush Well Field, at sites located further away from Puslinch Lake, lead to the site selection of PBTW3-07 for installation of a test well. Following drilling and step testing results, a test production well (PBPW2-08) was drilled and installed adjacent to PBTW3-07. A step test followed by a 3-day constant rate pumping test was conducted at PBPW2-08.

In an attempt to find more productive sites in the Shade's Mills Well Field, two locations (SMTW2-07 and SMTW3-07) were chosen for additional test wells. Following unfavourable step test results at these two sites and high concentrations of sulphate, these test wells were converted into bedrock monitoring nests. A site further to the east was selected to install a new test well, SMTW4-08. A 3-day constant rate pumping test was run on this well.

3.1 Well Drilling and Construction

3.1.1 Test Wells and Test Production Well

In Phase II, additional test wells (SMTW2-07, SMTW3-07, SMTW4-08 and PBTW3-07) were drilled by Gerrits Well Drilling Incorporated under the Region contract Q2007-029. Wells SMTW2-07 and SMTW3-07 were drilled

between August 14 and 23, 2007. Well PBTW3-07 was drilled between December 18 and 20, 2007. Well SMTW4-08 was drilled between February 13 and 18, 2008. Test production well PBPW2-08 was drilled and installed adjacent to PBTW3-07 in April, 2008. Each of these wells were drilled using a Foremost DR-12 air rotary drill rig. Borehole logs for these wells are provided in Attachment A2. Well construction details are provided in Table A2.

3.1.2 Borehole Testing

At each of the drilling locations, overburden samples were taken for grain-size analyses and bedrock drill cuttings were collected. Details of the methodologies used are provided in Attachment A1. The air rotary cuttings obtained during drilling provided limited information on geologic materials although the condition of the rock mass, where weathered, was apparent from inspection of drill cuttings. Mud rotary cuttings obtained during drilling through the overburden provided limited information on overburden geologic materials. Results from the grain-size analyses and photos of the rock chips are included in Attachment A2.

Geophysical logging was carried out by Golder geophysicists in the test wells, test production wells and bedrock monitoring wells. Downhole natural gamma and conductivity logs were completed at all of the wells. Optical televiewer logs were completed at SMTW2-07, SMTW3-07, SMTW4-07 and PBTW3-07. The geophysical logs (natural gamma, conductivity and optical televiewer) were used to aid in interpretation of borehole stratigraphy. The natural gamma log response was useful for distinguishing the stratigraphic contacts in cases where there was a contrast in clay content in the overburden or shale content in the bedrock. The methodology used for the borehole logging is provided in Attachment A1.

The borehole records were completed prior to OGS publication of the preliminary revised Silurian Bedrock Stratigraphy (Brunton, 2008) and therefore, follow the earlier bedrock stratigraphic nomenclature. The results of the test well, test production well and monitoring well drilling are provided in the borehole log records in Attachment A2. The natural gamma and inductive conductivity geophysical log data are presented beside the stratigraphy in the borehole log records. Photographs of the test well bedrock drill cuttings and the grain size analysis results used to confirm overburden lithologies are also included in Attachment A2.

The interpretation of the bedrock geology at the drilling locations, following the revised nomenclature (Brunton, 2008, 2009; Brunton and Britnell, 2011), is presented in Table A4. The bedrock geology interpretation is based on the drill cuttings, the natural gamma log response, the optical televiewer log data and an examination of borehole records for existing wells in the Cambridge East area. The bedrock geology interpretations were developed in consultation with Frank Brunton of the OGS.

3.1.3 Monitoring Wells

Following step testing, on October 10 to 14, 2007 the two test wells SMTW2-07 and SMTW3-07 were converted into bedrock monitoring nests by Gerrits Well Drilling Inc. In addition, the existing well SM3A-93, was converted into a bedrock monitoring nest with three piezometers. Prior to the conversion, this well was an open hole in the bedrock from the bottom of the casing at approximately 24 m to a depth of 137.5 m bgs. Concurrent to drilling of test well SMTW4-08, one overburden monitoring nest, SMOW1ABC-08 was drilled and installed (February 12 to 14, 2008) by All-Terrain Drilling Ltd. to the south of SMTW4-08. Construction details for the monitoring well nests are provided in Table A3. Borehole logs for these wells are included in Attachment A2.

3.2 Permits to Take Water

A Category II permit application was submitted on June 25, 2007 for the step testing of the test wells SMTW2-07, SMTW3-07 and PBTW3-07 and the test production well PBPW2-08. The permit, PTTW No. 8518-76HNTQ, was issued to the Region of Waterloo on September 17, 2007. This permit expired on December 31, 2007 before PBTW3-07 could be tested and prior to drilling PBPW2-08. On January 9, 2008 a second Category II permit application was submitted for the step testing of PBTW3-07, PBPW2-08 and SMTW4-08 and the constant rate (3-day) testing of PBPW2-08 and SMTW4-08. The permit, PTTW No. 3311-7AYQF9, was issued to the Region of Waterloo on January 22, 2008. Copies of these PTTWs are found in Attachment A3.

3.3 Step Testing

Step-drawdown tests of 8-hour duration were conducted at the four test wells and one test production well during this phase of the investigation. A summary of the step tests completed is presented in Table A5. Wells SMTW2-07 and SMTW3-07 were step tested on September 18 and September 20, 2007, respectively. Step testing for the next group of wells (SMTW4-08, PBTW3-07 and PBPW2-08) took place between February 6, 2008 and April 30, 2008.

An additional fifth step was conducted at PBTW3-07 at a rate of 2,160 m^3/day (25 L/s). The test production well, PBPW2-08, was tested in four steps each of 2 hours duration with rates of approximately 1,637, 2,455, 3,273 and 5,237 m^3/day (18.9, 28.4, 37.9 and 60.6 L/s).

3.3.1 Monitoring Program

Monitoring of private wells was also done for the following step tests: PBTW3-07 (9202055 and 9203308); SMTW4-08 (6504527, 9203305, 6500644 and 6505664).

Flow profiling logging was conducted by Lotowater personnel during step testing at the following test wells: SMTW2-07, SMTW3-07 and PBTW3-07. The flow profiling at SMTW4-08 was conducted during the constant rate pumping test. The methodology used for flow profile logging is outlined in Attachment A1. The flow profiles are included in Attachment A2.

3.3.2 Discharge Conveyance

Water from the tests was conveyed away from the wellhead area by temporary piping, and discharged to nearby suitable surface water features (Figure A3). Flow dissipation measures were used, as necessary, to avoid erosion. Given the short duration of the step tests and the depth of the aquifers tested, recirculation of pumped water back to the aquifer was not an issue for the step testing.

3.3.3 Water Quality Sampling

As outlined in Table A10, water samples were taken from each of the test wells (SMTW2-07, SMTW3-07 and PBTW3-07) during step testing and submitted to the Region's laboratory for analysis of general chemistry including major cations and anions. The test well SMTW4-08 and test production well PBPW2-08 were not sampled during the step testing but were sampled during the longer term testing. Results from the water quality analyses are presented in Attachment A8.

3.3.4 Observed Responses

The drawdown and the specific capacity calculated at the end of each step, are presented in Table A6. Hydrographs, which also present a comparison of the drawdowns during the step testing for the test wells and test production wells, are shown in Figures A4 and A5. Graphs for each of the step tests showing drawdown vs. log time at each step are also presented on Figures A4.1, A4.2 and A4.4 in Attachment A4. The key results of the step testing at the test wells are summarized as follows:

- At the end of each step in test wells SMTW2-07 and SMTW3-07 water levels continued to decline. At the end of each step in wells SMTW4-08, PBTW3-07 and PBPW2-08 water levels were declining slightly but were approaching steady-state levels;
- Compared to the other test wells, SMTW2-07 and PBTW3-07 showed the greatest drawdown (9.6 to 11.1 m) and lowest specific capacities (1.5 L/s per metre drawdown and 1.4 L/s per meter drawdown, respectively) at the maximum step rate of 1,309 m^3/day (15.1 L/s);
- Compared to the other test wells, SMTW4-08 showed the least drawdown (3.0 m) and the highest specific capacity during the fourth step (5.1 L/s per metre drawdown); and
- Compared to the other Pinebush test production well (PBPW1-06), PBPW2-08 showed a greater drawdown (14.3 m) and a lower specific capacity (4.2 L/s per metre drawdown).

3.4 Additional Water Quality Sampling

In October and November, 2007 additional water quality samples were collected from the piezometer nests installed in the following wells: SMTW1ABC-05, SMTW2ABC-07, SMTW3ABC-07, SM3ABC-07 and CMOW2ABC-06. These samples were submitted to the Region's laboratory for key parameters including chloride, sodium, sulphate, hardness, iron and manganese. This sampling was conducted to better understand any trends in the distribution of sulphate in zones of the bedrock aquifer.

The water quality results from this sampling are presented in Table A8.4 and Figure A8.1 in Attachment A8.

3.5 Private Well Inventory

A private well inventory was completed prior to the 28-day pumping test during the Phase I investigations. No additional private well inventory was completed during the Phase II investigations.

3.6 SMTW4-08 (3-Day) Pumping Test

Following recovery from the step test, a 3-day constant rate pumping test was conducted at well SMTW4-08 from March 3 to March 6, 2008. The schedule of the pumping test is outlined in Table A7 and below:

Date	Pumping Test Details
March 3, 2008	Start up of SMTW4-08 at 11:05 am at a constant rate of 1,964 m^3/day (22.7 L/s).
March 6, 2008	Shutdown of SMTW4-08 at 11:05 am.

3.6.1 Monitoring Program

Water levels were monitored manually and/or with dataloggers in the pumping well and observation wells within a 3.6 km radius of SMTW4-08. Monitoring sites included two test wells, two active municipal production wells

(G38 and G39), 19 monitoring sites with 45 piezometers and six private wells (along Avenue Road and Clyde Road). In total 55 electronic dataloggers were deployed during this test (Table A8). The dataloggers in two of the private wells failed during the testing period.

3.6.2 Discharge Conveyance

For the step test and constant rate test at SMTW4-08, water was conveyed away from the wellhead area by temporary piping, and discharged into Mill Creek (Figure A3). Flow dissipation measures were used, as necessary, to avoid erosion. The overburden monitoring wells, SMOW1ABC-08, were monitored to ensure that the recirculation of pumped water back into the aquifer was not an issue at this site.

3.6.3 Water Quality Sampling

During the pumping test, three water quality samples were taken from SMTW4-08 and submitted to the Region's laboratory for analysis of general chemistry and major cations and anions. Results from these analyses are included in Table A8.1 in Attachment 8.

3.6.4 Observed Response

A hydrograph showing the responses of SMTW4-08 during the 3-day test, and other key hydrographs are included on Figure A20. Figure A21 presents the drawdown observed in the Gasport Formation in plan view. Table A8 shows the amounts of drawdown in each monitoring well. Hydrographs from this test are provided on Figures A6.16 through A6.21. Drawdown versus log time plots of key wells are included on Figure A6.42 in Attachment A6.

Test Production Well Drawdown

- The drawdown at the end of 72 hours of pumping at a rate of 1,964 m^3/day (22.8 L/s) in SMTW4-08 was 5.7 m;
- The specific capacity estimated at the end of the test was 3.9 L/s/m;
- At the end of the test, the remaining available drawdown (depth of water above the bottom of the casing) was approximately 18.4 m, which is 75% of the total initial available drawdown of 24.4 m;
- The most rapid drawdown occurred during the first 12 hours of pumping; by the end of the test, water levels in SMTW4-08 had stabilized;
- Recovery to higher than initial static conditions in SMTW4-08 occurred within 24 hours of shutting off the pump; and
- There was a slight interference in SMTW4-08 due to the cyclic use of Municipal Production Wells G16, G17 and G18.

Overview of Water Level Responses

- During this pumping test, similar to the 28-day pumping test, interference from the cyclic pumping of G16, G17 and G18 was observed in the following wells screened in the Gasport Formation: CMOW1A-06, CMOW2A-06, PBOW1A-06 and SMTW1A-06. The lines for these wells on the hydrographs and the drawdown versus log time plots are smoother, as water levels in these wells were measured at a 1 hour frequency as compared to a 5 minute frequency in SMTW4-08;

- The zone of influence in the deep Gasport Formation extended to less than 1.5 km in the southwest (no drawdown was observed at SMTW2A-08); to greater than 2.7 km to the north (0.8 m drawdown was observed at PBOW1A-08; no drawdown was observed at PBOW2A-06 – 3.6 km); to slightly greater than 1.1 km to the west (0.3 m drawdown observed at SM3A-07). There were no observation wells monitored to the east or south of SMTW4-08 during this pumping test;
- The zone of influence in the Guelph Formation was much smaller than that in the Gasport Formation. No drawdown was observed at CMOW1C-06, at 1 km distance to the north, or at SMTW1C-05 at 0.6 km to the west, however, 0.3 m of drawdown was observed at SMTW3C-07 to the southwest;
- At nearby wells in the overburden, a small amount of drawdown was observed. At SMOW1A-08, 0.27 m of drawdown occurred and in the shallower SMOW1B-08, 0.12 m of drawdown occurred;
- During the testing period, the shallow water table (SMOW1C-08) increased due to a rainfall event; and
- No interference was observed at any of the private wells monitored.

3.6.5 Aquifer Parameter Estimates

The bedrock transmissivity and storativity estimates were interpreted from the pumping test data using a Cooper Jacob solution. Figure A6.49 in Attachment A6 shows a composite drawdown versus (time/radius^2) plot for SMTW4-08. This figure presents the observed drawdown normalized with respect to the distance from the pumping well.

The Effective Transmissivity (T) can be estimated by applying an effective Cooper Jacob method to the observed drawdown as outlined in Section 2.5.5. The following summarizes the interpreted aquifer hydraulic parameters for the SMTW4-08 (3-day) pumping test:

- All of the observation wells plotted on this figure that are screened in the Gasport Formation had a similar drawdown slopes. SMOW1A-08, a deep overburden well, had a different slope although there is a connection to the Gasport Formation at this location. A delay in response was observed at SMTW3AB-07 and an even greater delay in response was observed at SM3A-07;
- Based on the drawdown slopes, the transmissivity in the vicinity of SMTW4-08 was estimated to be approximately 275 m^2/day; and
- The storativity, based on drawdown slopes through SMTW1A-05, CMOW1A-06 and CMOW2A-06 was estimated to be 7 x 10^{-5} m/m. Higher storativity values are observed at SMTW2A-07 and SM3A-07.

3.7 PBPW2-08 (3-Day) Pumping Test

A 3-Day constant rate test was conducted at the Can-Amera Parkway test production well (PBPW2-08) as outlined in Table A7 and below:

Date	Pumping Test Details
May 5, 2008	Start up of PBPW2-08 at 11:20 am at a constant rate of 3,273 m^3/day (37.9 L/s).
May 8, 2008	Shutdown of PBPW2-08 at 11:20 am.

3.7.1 Monitoring Program

Water levels were monitored prior to, during and after the testing period with electronic dataloggers in PBPW2-08 as well as two other test production wells, two test wells, 15 monitoring sites (including 43 piezometers) and two private wells within a 2.7 km radius of PBPW2-08. The Portuguese Swamp water level was monitored and the shallow water table was monitored during testing at the OW1D-92 site. Two private wells located along Townline Road were monitored; these wells had been monitored previously during the 28-day pumping test in Phase I.

3.7.2 Discharge Conveyance

Discharge water during the pumping test was conveyed via flexible tubing to the storm water pond approximately 100 m west of the site (Figure A3).

3.7.3 Water Quality Sampling

Three water quality samples were taken during the testing period and submitted to the Region's laboratory for analysis of general chemistry, major cations and anions and organic parameters. Results from these analyses are included in Tables A8.3 (inorganics) and A8.5 (organics) in Attachment 8.

3.7.4 Observed Responses

Hydrographs of key monitoring wells from this test are shown on Figure A22. Figure A23 presents the drawdown observed in the Gasport Formation in plan view. Table A8 shows the amounts of drawdown in the observation wells. A complete set of hydrographs from monitoring wells measured during this test are included in Attachment A6 (Figures A6.22 through A6.27) and drawdown versus log time plots of PWPW2-08 and key observation wells during the PBPW2-08 test are presented on Figure A6.42 of Attachment A6.

Test Production Well Drawdown

- The drawdown at the end of 72 hours at a pumping rate of 3,378 m^3/day (37.9 L/s) in PBPW2-08 was 8.7 m;
- The specific capacity estimated at the end of the test was 4.4 L/s/m;
- At the end of the test, the remaining available drawdown (depth of water above the bottom of the casing) was approximately 14.2 m, which is 70% of the total initial available drawdown of 19.9 m;
- The majority of the drawdown occurred within the first 12 hours of pumping. By the end of the 3-day test the water level continued to decline slightly. Water levels had not yet stabilized; and
- Recovery to pre-static conditions in PBPW2-08 occurred within 72 hours of shutting off the pump.

Overview of Water Level Responses

- As observed in the Drawdown Versus Log Time plots (Figure A6.42), the slopes of drawdown were similar for PBPW2-08, PBTW3-07 and CMTW3A-05;
- Drawdown in the Gasport Formation was observed as far east as PBOW2A-06 (0.5 m at 1.5 km); no drawdown was observed at PBOW1A-06 (1.8 km). South of PBPW2-08 a drawdown of 1.23 m was seen at CMTW3A-05 (0.7 km) and no drawdown was observed at CMOW1A-06 (1.4 km). 0.5 km north of the test

production well at OW1A-92 (screened through both the Guelph and Gasport Formations), a drawdown of 1.93 m was observed. There were no monitors to the north or to the west of the test production well;

- It is noted that in the deep Gasport monitor at PBOW1A-06 there was no response to testing at PBPW2-08, whereas both the shallow bedrock (Guelph) monitor (PBOW1C-06) and the shallow overburden monitor (PBOW1F-06) responded to the aquifer test with 0.12 m of observed drawdown;
- The zone of influence in the Guelph Formation was less than that in the Gasport Formation. To the south, a drawdown of 0.34 m was observed at CMTW3C-05 and to the east a drawdown of 0.12 was observed in PBOW1C-06;
- An overburden response to pumping was observed as far east as PLOW1A-06 (2.1 km) with a drawdown of 0.09 m. No overburden responses were observed in the monitors to the north and south of PBPW2-08; and
- No drawdown was observed in the Portuguese Swamp water table and shallow groundwater level at OW1D-92 and OW2C-92.

3.7.5 Aquifer Parameter Estimates

The bedrock transmissivity and storativity estimates were interpreted from the pumping test data using a Cooper Jacob solution. Figure A6.48 in Attachment A6, shows a composite drawdown versus (time/radius^2) plot for PBPW2-08. This figure presents the observed drawdown normalized with respect to the distance from the pumping well.

The Effective Transmissivity (T) can be estimated by applying an effective Cooper Jacob method to the observed drawdown, as outlined in Section 2.5.5. The following summarizes the interpreted aquifer hydraulic parameters for the PBPW2-08 (3-day) pumping test:

- The drawdown slopes of the PBTW3-07 and PBTW2-08 were similar; the slopes of all other monitors on this plot were shallower;
- Based on the drawdown slopes through PBTW3-07 and PBPW2-08, the transmissivity in the vicinity of PBPW2-08 was estimated to be 333 m^2/day; and
- The storativity, based on the drawdown slope through PBTW3-08, was 1 x 10^{-4} m/m. Lower storativity values were estimated at all other monitoring wells on Figure A6.48 in Attachment A6.

3.8 Public Communication

Prior to drilling test wells SMTW2-07, SMTW3-07, SMTW4-08 and PBTW3-07 and test production well PBPW2-08, residents within a 500 m radius of the drilling sites were provided with a notice to advise them about the upcoming drilling. Prior to step testing and constant rate testing, private well owners were also provided with notices to advise them about the upcoming aquifer testing. These notices provided information about the testing program as well as contact information for the Region and Golder.

The private well owners whose wells were monitored during the SMTW4-08 and PBTW2-08 constant rate tests were provided with a letter and a hydrograph of their well's response during testing.

3.9 Water Quality Results

Results from the general (inorganic) water quality analyses for the test wells (PBTW1-07, SMTW2-07, SMTW3-07, and SMTW4-08) are included in Table A8.1, from test production well PBPW1-08 in Table A8.2 and from the additional Shade's Mills sampling event in Table A8.4. The key parameters analyzed included chloride, sodium, sulphate, hardness, iron and manganese.

At PBTW2-07 and PBPW2-08, with the exception of hardness all parameters analyzed were below the ODWS. The concentrations of hardness (329 to 346 mg/L) were slightly lower than those measured at PBPW1-06 during 2006 testing. Concentrations of all other major cations and anions were slightly lower than those observed at PBPW1-06, with concentrations of iron ranging from 0.034 to 0.055 mg/L, chloride ranging from 2.0 to 9.2 mg/L, and sulphate ranging from 58.2 to 72.8 mg/L. All organic parameters analyzed at PBPW2-08 were below the laboratory method detection limits (Table A8.5).

Relative to the other Cambridge East well fields, concentrations of sulfate and hardness were significantly higher in the Shade's Mills well field at SMTW2-07 and SMTW3-07, SMTW4-08 and the bedrock well nests SMTW1ABC-05, SMTW2ABC-07, SMTW3ABC-07 and SM3ABC-07, largely exceeded the ODWS. Concentrations of hardness ranged from 316 mg/L in SMTW1C-05 (Guelph formation) to 1,900 mg/L at SMTW2-07. Concentrations of sulphate ranged from 33.8 mg/L at SMTW1C-05 to as high as 1,530 mg/L at SMTW2-07. The distribution of sulphate during testing in Shade's Mills is shown on Figure A8.1 in Attachment A8. Elevated concentrations of sulphate were observed in many of the bedrock wells that screened either the Guelph or the Gasport formations. It is noted that high concentrations of hardness and sulphate were also observed in the intermediate bedrock monitor at CMOW2B-06, to the north of the Shade's Mills well field, with concentrations of 1,260 mg/L and 1,060 mg/L, respectively.

The range of concentrations of chloride in the Shade's Mills wells was 1.0 to 31.1 mg/L, which was similar to other test wells in East Cambridge. Sodium concentrations ranged from 1.6 to 46.3 mg/L. Concentrations of iron and manganese in water from the Shade's Mills test wells were low, with a range of values of 0.084 to 0.132 mg/L and 0.005 to 0.015 mg/L, respectively. Concentrations of iron in the groundwater exceeded the ODWS for the following wells: SMTW1C-05 and SMTW2C-07 (upper Guelph Formation), SMTW3A-07 (Gasport Formation) and SM3ABC-07 (Guelph and Gasport Formations). Concentrations of manganese in the groundwater exceeded the AO for the following wells: SMTW3A-07, SMTW2C-07, and CMOW2C-06. Concentrations of manganese in the SM3ABC-07 well nest also exceeded the updated MAC. Aluminium concentrations in the water sampled from the SM3ABC-07 well nest exceeded the ODWS, with values ranging from 0.68 to 9.35 mg/L. No analyses for organic parameters were conducted for any of the Shade's Mills test wells.

4.0 PHASE III INVESTIGATIONS (2008/2009) TOWNSHIP OF NORTH DUMFRIES

Further to the east in North Dumfries, two locations in Clyde Park were selected for the installation of the final test wells. Considering the results of the step test, the location of NDTW2-08 was selected as the most favourable location for the final test production well (Figure A1).

4.1 Well Drilling and Construction

4.1.1 Test Wells and Test Production Well

During Phase III, the two test wells (NDTW1-08 and NDTW2-08) were drilled by Gerrits Well Drilling Inc., under the Region Contract Q2008-021. These wells were drilled simultaneously with two drill rigs (Foremost DR-24) between October 1 and 8, 2008. The final test production well NDPW1-08 was also drilled by Gerrits under the same contract. It was drilled between December 20 and 28, 2008. Table A2 presents a summary of the drilling and well construction for the test wells drilled.

Borehole log records are found in Attachment A2. Geophysical logging was performed at NDTW1-08 and NDTW2-08, as described in Attachment A1.

4.1.2 Monitoring Wells

Under the Region contract Q2008-021, two monitoring well nests were constructed by Gerrits Well Drilling Inc. and three shallow overburden well nests were installed by CMT Engineering in North Dumfries between October 28 and November 19, 2008. The two monitoring well nests (NDOW1-08 and NDOW2-08) were drilled using an air rotary rig and consisted of three bedrock piezometers and two overburden piezometers to monitor the active groundwater flow system. In addition, test well NDTW1-08 was also converted into a bedrock monitoring nest. The three shallow overburden well nests (NDOW3AB-08, NDOW4AB-08 and NDOW5-08) were drilled by CMT Engineering using a Geo Probe direct push rig.

The drilling and well construction for the monitoring wells is summarized in Table A3 and the locations of these monitoring wells are shown on Figure A2. Borehole log records are found in Attachment A2.

4.1.3 Borehole Testing

At all of the drilling locations overburden samples were taken for grain-size analyses and bedrock drill cuttings were collected. Details of the field methodologies used are provided in Attachment A1. The air rotary cuttings obtained during drilling provided limited information on geologic materials although the condition of the rock mass, where weathered, was apparent from inspection of drill cuttings. Mud rotary cuttings obtained during drilling through the overburden provided limited information on overburden geologic materials. Results from the grain-size analyses and photos of the rock chips are included in Attachment A2.

Geophysical logging was carried out by Golder geophysicists in NDTW1-08 and NDTW2-08. Downhole natural gamma, conductivity logs and optical televiewer logs were completed. The geophysical logs (natural gamma, conductivity and optical televiewer) were used to aid in interpretation of borehole stratigraphy. The natural gamma log response was useful for distinguishing the stratigraphic contacts in cases where there was a contrast in clay content in the overburden or shale content in the bedrock. The methodology used for the borehole logging is provided in Attachment A1.

The borehole records were completed prior to OGS publication of the preliminary revised Silurian Bedrock Stratigraphy (Brunton, 2008) and therefore, follow the earlier bedrock stratigraphic nomenclature. The results of the test well, test production well and monitoring well drilling are provided in the borehole log records in Attachment A2. The natural gamma and inductive conductivity geophysical log data are presented beside the stratigraphy in the borehole log records. Photographs of the test well bedrock drill cuttings and the grain size analysis results used to confirm overburden lithologies are also included in Attachment A2.

The interpretation of the bedrock geology at the drilling locations, following the revised nomenclature (Brunton, 2008, 2009; Brunton and Britnell, 2011), is presented in Table A4. The bedrock geology interpretation is based on the drill cuttings, the natural gamma log response, the optical televiewer log data and an examination of borehole records for existing wells in the Cambridge East area. The bedrock geology interpretations were developed in consultation with Frank Brunton of the OGS.

4.2 Permits to Take Water

The following summarizes the PTTWs obtained for the testing:

- A Category II Permit (PTTW No. 3808-7K9PSS) for step testing the Clyde Park test wells (NDTW1-08 and NDTW2-08) was issued on October 9, 2008;
- A Category II permit application was submitted on November 13, 2008 for the step testing and long-term constant rate testing of the Clyde Park test production well NDPW1-08. The permit (PTTW NO 280-7MCMMT) was issued on December 15, 2008 and expired on February 28, 2009. Due to issues with the generator and discharge conveyance, the constant-rate pumping test was cut short from a planned 7 days to 2 days. A new Category II permit application was submitted on July 17, 2009 for step-testing and long-term testing of NDPW1-08. PTTW No 5351-7VBNWA was issued on August 27, 2009; and
- Access agreements were secured from each property owner and copies along with relevant correspondence were included with the PTTW applications.

Copies of PTTWs issued by the MOECC are provided in Attachment A3.

4.3 Step Testing

The North Dumfries Test wells (NDTW1-08 and NDTW2-08) were step tested in October 2008. They were tested in four steps each of 2 hours duration with rates of approximately 327, 655, 982 and 1,309 m^3/day (3.8, 7.6, 11.4, and 15.1 L/s). Flow profiling was conducted during step testing at these two test wells.

The test production well NDPW1-08 was step tested twice, once over the entire open borehole, and once with a packer set to sleeve off the Guelph and Eramosa Formations. These tests took place on January 13, 2009 and September 23, 2009. Each step-drawdown test was 8-hours long and is summarized in Table A5. During the January 2009 test at NDPW1-08, the fourth step was at a rate of 6,396 m^3/day (74 L/s). The constant rate test was initiated immediately following the fourth step. During the September, 2009 test at NDPW1-08, the fourth step was at a rate of 6,049 m^3/day (70 L/s).

4.3.1 Monitoring Program

Flow profile logging was performed by personnel from Gerrits Well Drilling during step testing at NDTW1-08 and NDTW2-08. Flow profiling techniques are outlined in Attachment A1. The flow profiles are included in Attachment A2. During both step tests at NDPW1-08, data loggers were installed in five private wells to monitor water level responses to pumping.

4.3.2 Discharge Conveyance

Water from the test was conveyed away from the wellhead area by temporary piping, and discharged to the nearby drainage ditch. Flow dissipation measures were used, as necessary, to avoid erosion. Given the short

duration of the step tests and the depth of the aquifers tested, recirculation of pumped water back to the aquifer was not an issue for the step testing.

4.3.3 Water Quality Sampling

As outlined in Table A10, water samples were taken at the end of each step test from NDTW1-08 and NDTW2-08 and submitted to the Region's laboratory for analysis of general chemistry including major cations and anions. Results from the water quality analyses are presented in Table A8.1 of Attachment A8. The test production well NDPW1-08 was not sampled during step testing but was sampled during both of the constant rate tests.

4.3.4 Observed Responses

The drawdown at the end of each step and the specific capacity estimated at the end of each step test are presented in Table A6. Hydrographs, which also present comparison of the drawdowns during the step testing for the test wells and test production wells, are shown on Figures A4 and A5. Graphs for each of the step tests showing drawdown versus log time at each step are also presented on Figure A4.5 in Attachment A4. The key results of the step testing at the test wells are as follows:

- At the end of each step in the test wells NDTW1-08 and NDTW2-08, and in both step tests at NDPW1-08, water levels continued to decline slightly;
- Test well NDTW2-08 showed less drawdown (2.4 m) compared to NDTW1-08, with 3.4 m of drawdown. NDTW2-08 had a higher specific capacity of 6.4 L/s per metre of drawdown compared to a specific capacity of 4.5 L/s/m in NDTW1-08; and
- The Clyde Park test production well (NDPW1-08) had a specific capacity of 9.5 L/s/m at the end of the January test and a lower specific capacity of 6.4 L/s/m at the end of the September test when the well was sleeved to draw only water from the Gasport Formation.

4.4 Private Well Inventory

Prior to conducting aquifer testing at the North Dumfries test wells, a private well inventory was conducted during the month of September, 2008. This inventory was completed within a 1 km radius of the Clyde Park test production well (NDPW1-08). The private wells are plotted on Figure A2. The results of the well inventory are presented in Table A5.3 of Attachment A5. The wells found in the inventory were matched with the well records from the WRAS+ database where possible.

4.5 NDPW1-08 (2-Day) Pumping Test

The first of two constant rate pumping tests at NDPW1-08 took place from January 13 to January 15, 2009. Details are outlined below and in Table A7.

Date	Pumping Test Details
January 13, 2009	Start of step testing of NDPW1-08 at 7:45 am. Each step lasted for 2 hours at the following rates: 3,273, 4,366, 5,453, 6,396 m^3/day (37.9, 50.5, 63.1, 74.0 L/s)
January 13, 2009	Start of constant rate test of NDPW1-08 at 3:45 pm at a rate of 6,394 m^3/day (74.0 L/s), immediately following the step-testing.
January 15, 2009	Shutdown of NDPW1-08 at 12:45 pm. The test was ended early due to generator failure and ice jams restricting flow of water through culverts.

The constant rate test began immediately following the Step Test at a rate of 6,394 m^3/day (74 L/s). The static water level was flowing prior to the pumping test and was assumed to be 1.0 m above ground surface.

4.5.1 Monitoring Program

Water levels were monitored with electronic dataloggers in the test production well, two test wells, 13 monitoring locations (including 39 piezometers), and five private wells. In total 46 electronic dataloggers were deployed during this pumping test. In addition, 3 ponds were monitored manually using staff gauges.

4.5.2 Discharge Conveyance

Discharge water during the pumping test was conveyed over 1 km west of NDPW1-08 to a wetland on the Cambridge Golf Club Property (Figure A3). This test was shut down early due to a generator failure and ice jams restricting flow through culverts.

4.5.3 Water Quality Sampling

One water quality sample was taken during the testing period on January 14, 2009. This sample was submitted to Maxxam's laboratory for analysis of general chemistry including major cations and anions.

4.5.4 Observed Responses

Figure A24 includes hydrographs of NDPW1-08 and other key monitoring wells, along with the pumping rates and daily precipitation as recorded at Waterloo Regional Airport Climate Station. Figure A25 presents the drawdown observed in the Gasport Formation in plan view. Table A8 presents the drawdown for all monitoring wells at the end of the 2-day pumping test. Hydrographs of all monitoring wells are included in Attachment A6 (Figures A6.28 through A6.33).

Figure A6.50 in Attachment A6 is a composite plot showing observed recovery from pumping at NDPW1-08 versus $(time/radius)^2$.

Test Production Well Drawdown

- The drawdown at the end of the 2-Day Test in NDPW1-08 was approximately 11.2 m; the specific capacity at the end of this test was 6.6 L/s/m;
- The majority of the drawdown occurred within the first 12 hours of pumping. By the end of the 2-Day test the water level continued to decline slightly. Water levels had not yet stabilized; and
- Recovery to pre-static conditions in PBPW2-08 occurred within 48 hours of shutting off the pump.

Overview of Water Level Responses

- Drawdown in the Gasport of 2.9 m was observed as far northwest as PBOW1A-06 (3.5 km). A drawdown of 3.9 m was observed at SMTW1A-05, 3.7 km southwest of NDPW1-08;
- The zone of influence in the Guelph Formation is much smaller than that in the Gasport Formation. Immediately to the east, a drawdown of 2.38 m was observed at NDTW1C-08 (0.2 km). No drawdown was observed 0.6 km to the northeast at NDOW1C-08. To the southwest, a drawdown of 1.35 m was observed at NDOW2C-08;

- Prior to, during and after the testing, a seasonal trend of decline in shallow overburden water levels was observed. A drawdown due to testing of 0.6 m was observed in the deep overburden at NDOW2D-08 (0.6 km southwest); and
- Interference was observed at two of the four private wells monitored with drawdowns of between 1.2 and 1.7 m for wells with IDs 6506418 and 9202389; this drawdown did not impact operation of these wells

4.5.5 Aquifer Parameter Estimates

The bedrock transmissivity and storativity estimates were interpreted from the pumping test data using a Cooper Jacob solution. Figure A6.50 in Attachment A6 shows the composite recovery versus (time/radius^2) plot for the open hole test production well (NDPW1-08). This figure presents the observed drawdown normalized with respect to the distance from the pumping well. Aquifer Hydraulic Parameter estimates are also summarized in Table A9.

The Effective Transmissivity (T) can be estimated by applying an effective Cooper Jacob method to the observed drawdown as outlined in Section 2.5.5. The following summarizes the interpreted aquifer hydraulic parameters for the NDPW1-08 (2-Day) pumping test, when the test production well was open over both the Guelph and Gasport formations:

- The transmissivity around NDPW1-08 over the entire bedrock formation was estimated to be 434 m^2/day; and
- The S/S' value is greater than one, indicating that recovery occurs faster than it would if all the water that came in to replenish the drawdown cone was supplied by storage. There are several processes which could provide water in addition to storage; the effects of pumping propagate to a lateral source of water, or upward to a shallower source of water, or laterally to a region of much higher transmissivity, or vertically to a water table aquifer.

4.6 NDPW1-08 (6-Day) Pumping Test

Details regarding the second pumping test at NDPW1-08 are outlined below and in Table A7.

Date	Pumping Test Details
September 15, 2009	Installation of a packer to a depth of 66 m below ground surface at NDPW1-08 and NDTW2-08.
September 23, 2009	Start of step testing of NDPW1-08 at 8:55 am. Each step lasted for 2 hours at the following rates: 3,273, 4,366, 5,453, 6,049 m^3/day (37.9, 50.5, 63.1, 70.0 L/s)
September 24, 2009	Start of constant rate test of NDPW1-08 at 11:15 am at a rate of 4,321 m^3/day (50.0 L/s).
September 30, 2009	Shutdown of NDPW1-08 at 1:30 pm.
October 1, 2009	Deflation and removal of packers at NDPW1-08 and NDTW2-08.

On September 15, 2009, prior to conducting this pumping test, packers were installed in the open boreholes at NDPW1-08 and the neighbouring NDTW2-08 from ground surface to the top of the Gasport Formation, to a depth of approximately 66 m below ground surface. These wells were sleeved off to reduce potential interference with nearby neighbouring private wells. The second constant rate pumping test took place between

September 24 and 30 2009, this time at a lower rate of 4,321 m^3/day (50 L/s). The packers were removed from NDPW1-08 and NDTW2-08 following the test on October 1, 2009.

4.6.1 Monitoring Program

In addition to the same monitoring network that was used in January, additional monitoring well nests were included and monitoring locations were set up at the discharge site, along the flow path of the discharge along the culverts and ditches along Clyde Road and in the wetland areas to the south of Clyde Road. During this test, water levels were monitored in the test production well, two test wells, 18 monitoring locations (including 48 piezometers), five private wells and two staff gauges. In total 52 electronic dataloggers were deployed during this pumping test.

4.6.2 Discharge Conveyance

Discharge water during the pumping test, was conveyed over 1 km west of NDPW1-08 to a wetland on the Cambridge Golf Club Property (Figure A3). Prior to this test, the Region of Waterloo Public Works Department dug out the ditches long Clyde Road, replaced a culvert and built a berm along the southern edge of the Cambridge Golf Club property to prevent any potential issues with flooding due to discharged water.

4.6.3 Observed Responses

Figure A26 provides hydrographs of NDPW1-08 and other key monitoring wells along with the pumping rates, dates of packer installation and daily precipitation as recorded at Waterloo Regional Airport Climate Station. Figure A27 presents the drawdown observed in the Gasport Formation in plan view. Table A8 presents the drawdown for all monitoring wells at the end of the 6-day pumping test. Figure A6.51 in Attachment A6 is a composite plot showing observed recovery from pumping at NDPW1-08 versus (time/$radius^2$). Hydrographs of all monitoring wells are also included in Attachment A6 (Figures A6.34 through A6.39).

Test Production Well Drawdown

- During the 6-day pumping test, the maximum drawdown at NDPW1-08 at a rate of 4,321 m^3/day (50 L/s) (occurring after 2 days into the pumping test) was 9.02 m. The specific capacity estimated during the maximum drawdown was 5.5 L/s/m; and
- After two days of pumping, slightly rising water levels were observed in the test production well, and many of the observation wells in the monitoring network.

Overview of Water Level Responses

- The installation of the packers in NDPW1-08 and NDTW2-08 resulted in decreases in water levels from about 0.6 to 1.0 m in NDTW1B-08, NDTW1C-08 and in two private wells (IDs 6506418 and 9202389);
- The zone of influence in the Gasport Formation was slightly smaller as compared to the 2-day pumping test. A maximum drawdown of 2.7 m was observed to the north at PBOW1A-06 (3.5 km). A drawdown of 2.5 m was observed to the southwest at SMTW1A-05 (3.7 km);
- Compared to the 2-day pumping test conducted without a packer, the zone of influence in the Guelph Formation was much smaller. Immediately to the east, a drawdown of 0.07 m was observed at NDTW1C-08 (0.2 km). No drawdown was observed at CMOW2C-06 (2.6 km to the north). To the southwest, a drawdown of 0.95 m was observed at NDOW2C-08;

- In the deep overburden a drawdown of 0.37 m was observed at NDOW2D-06; and
- Water level declines were observed at two of the four private wells monitored, with drawdowns of approximately 0.09 m for wells with IDs 6506418 and 9202389. The impact from the pumping test on these wells was minimal as the cyclic operation of these wells for domestic water supply resulted in drawdowns of 1 to 2 m.

4.6.4 Aquifer Parameter Estimates

The bedrock transmissivity and storativity estimates were interpreted from the pumping test data using a Cooper Jacob solution. Figure A6.51 in Attachment A6 shows the composite drawdown versus (time/radius^2) plot for the sleeved test production well (NDPW1-08). This figure presents the observed drawdown normalized with respect to the distance from the pumping well.

The Effective Transmissivity (T) can be estimated by applying an effective Cooper Jacob method to the observed drawdown, as outlined in Section 2.5.5. The following summarizes the interpreted aquifer hydraulic parameters for the NDPW1-08 (6-day) pumping test when the well was sleeved to isolate the Gasport Formation from the Guelph Formation.

- The transmissivity of the Gasport Formation at NDPW1-08 was estimated to be 305 m^2/day; and
- The storativity, based on the drawdown slope between NDOW1A-08 and NDOW2A-08 was estimated to be 5 x 10^{-5} m/m.

4.7 Public Communication

Prior to drilling and testing of wells in North Dumfries, a public meeting was held on September 11, 2008. The meeting was held at Clyde Park to inform residents of the testing program and answer questions. A copy of the community sign in sheet and log of community concerns is included in Attachment A7.

4.8 Water Quality Results

Similar to the other Cambridge East well fields, concentrations of hardness at the North Dumfries test wells exceeded the ODWS, with concentrations ranging from 523 to 755 mg/L, concentrations of all other major ions met ODWS standards. The water chemistry in North Dumfries was dominated by the presence of bicarbonate ions, with alkalinity ranging from 222 mg/L to 276 mg/L. Calcium concentrations ranged from 126 to 203 mg/L, whereas sulphate concentrations ranged from 250 to 465 mg/L. This range likely reflects the irregular distribution of gypsum and or anhydrite (sulphate minerals) within the bedrock aquifer. In general, water quality in North Dumfries tended toward a sulphate-bicarbonate type, but not as strongly as the wells located in the Shade's Mills well field.

Chloride concentrations in the North Dumfries test wells ranged from 23 to 29 mg/L, within the higher end of the ranges of concentrations observed in other Cambridge East wells. All concentrations of nitrite and nitrate were lower than the method detection limits of the laboratory. Concentrations of iron (0.06 to 0.54 mg/L) and manganese (0.004 to 0.009 mg/L) were generally within the ranges observed at other Cambridge East municipal bedrock wells.

5.0 ADDITIONAL WELL FIELD OPTIMIZATION INVESTIGATIONS

5.1 Pinebush Well Field – Construction and Testing of Test Wells P10A, P10B, PBTW1-10 and Production Well P17

In 2010, the Region completed the construction of test production wells P10A (Burnside, 2011) and PBTW1-10 (Burnside, 2010) in the deep bedrock aquifer at the sites of existing Production Well P10 and the Pinebush Water Treatment Plant, respectively. Well P10A is a 300 mm diameter well with an open hole through the Gasport Formation from 58 to 122 m below grade, whereas PBTW1-10 is a 203 mm diameter well with an open hole through the Guelph to Gasport Formations from 50 to 107 m below grade. Based on the results of the 2010 borehole testing program, an additional drilling and testing program was completed in the vicinity of wells P10 and P11/P17 which led to the installation of test production well P10B, a 324 mm diameter well with a gravel pack straddling the overburden/bedrock (Guelph Formation) interface close to P10. Pilot hole testing in the vicinity of wells P11/P17 indicated insufficient capacity within the overburden/upper bedrock aquifer. Alternatively, well P11 was overdrilled and a new 254 mm well casing installed deeper into the bedrock to a depth of 44.0 mbgs to prevent sand production. A steel well liner was installed in Production Well P17 from 3.1 m below grade to 48.2 m below grade to increase the available drawdown in this well (Stantec, 2013a).

In 2011, a 15-day constant rate pumping test at wells P10A, P10B, PBTW1-10 and P17 was conducted to evaluate sustainable aquifer yield, potential well interference and well field optimization (Stantec, 2013a). The 15-day test included a staggered start to allow for impacts to be assessed at each pumping location. The total combined pumping rate was as high as about 156 L/s. Pumping rates at nearby production wells in the Pinebush, Clemens Mill and Hespeler well fields were maintained at constant rates during testing. Based on analysis of the stages of the constant rate pumping test results, the transmissivity and storativity values at each of the test locations were estimated as follows:

Test Well	Transmissivity (m^3/day)	Storativity (m/m)	Formation Screened	Solution Used in Analysis
P17	130	$3 E^{-05}$	Gasport	Theis confined
PBTW1-10	320	$3 E^{-06}$	Guelph to Gasport	Theis confined
P10A and PBTW1-10	370	$1 E^{-06}$	Guelph to Gasport	Theis confined
P10A	140 to 220	$1 E^{-04}$ to $2 E^{-04}$	Gasport	Cooper-Jacob
P10B	440 to 520	$2 E^{-03}$ to $1 E^{-04}$	Overburden and Guelph	Theis confined

Water quality from P10B and PBTW1-10 met all health-related ODWS criteria. Water quality in the deeper bedrock wells (P17, P10A and PBTW1-10) had low chloride and sodium concentrations whereas P10B had higher concentrations, likely due to the effects of nearby road salting (Stantec, 2013a). Elevated concentrations of iron (0.6 to 1.2 mg/L) and turbidity (6 to 13 NTU) at P10A and P10B, exceeded the Aesthetic Objectives of the ODWS. Concentrations of hardness exceeded the Operational Guidelines of the ODWS in all of the wells, as did concentrations of organic nitrogen at P10B and PBTW1-10 and total dissolved solids (TDS) at P10B. Stantec (2012) classified PBTW1-10 and P10B as GUDI with Effective Filtration (GUDI-EF) while testing by Burnside (2011) classified P10A as groundwater. A final GUDI evaluation for P17 was not completed as part of the investigation due to potential interference from the temporary packer installed at P11 during the test. The long-term sustainable yield (Stantec, 2013a) of P17 is 26 L/s (2,246 m^3/day), the Gasport Formation in the

vicinity of P10A and PBTW1-10 is approximately 70 L/s (6,048 m^3/day) and the overburden/Guelph Formation at P10B is estimated at 30 L/s (2,592 m^3/day).

5.2 Clemens Mill Well Field – G16 Investigations

In March and April, 2011, Production Well G16 was deepened to a depth of about 126.5 m below grade and a liner was installed in this well to a depth of about 58 m below grade. These changes resulted in an increased well performance at G16 with an increase in specific capacity to 4.4 L/s/m (380 m^3/day/m) (Lotowater, 2011).

5.3 Shade's Mills Well Field – Construction and Testing of SM-PW1-11

In 2011 and 2012, test drilling was conducted within the deep overburden and shallow bedrock in the vicinity of Production Wells G38 and G39 and a test production well, SM-PW1-11 (later renamed G40), was constructed and tested. Wells G38 and G39 were rehabilitated and a 6-day constant rate pumping test was conducted at SM-PW1-11, G38 and G39 to evaluate the capacity of the new well and recommend an optimized pumping scenario for the three wells. A GUDI assessment of the new well was also completed (Stantec, 2013b).

Similar to wells G38 and G39, SM-PW1-11 was installed in the overburden with a 60 slot screen stainless steel well screen from 33.6 m to 40.5 m below grade in sand and gravel outwash deposits, the main producing Shade's Mills aquifer. The well was naturally developed. Following performance testing of SM-PW1-11 and rehabilitation and performance testing of G38 and G39, a 6-day constant rate pumping test was conducted, with a staggered start of G38, G39 and SM-PW1-11 at a combined rate of approximately 85 L/s (7,344 m^3/day).

Based on analysis of the results of the constant rate pumping test, using the Hantush (1964) Solution for a leaky confined aquifer, the transmissivity of the aquifer was estimated to be about 780 m^2/day with a storativity of 0.003 m/m and a leakage parameter of 0.0006 day^{-1}. This transmissivity and leakage parameter were lower than that estimated during historical testing of G38 and G39 at 1,300 m^2/day and 0.006 day^{-1}, respectively (Golder, 1995). Stantec concluded that the decrease in transmissivity in the aquifer was due to the accumulation of sediment in the Shade's Mills Reservoir and subsequent decrease in leakage (i.e., recharge to the aquifer system) (Stantec, 2013b). No effects were observed in any adjacent surface water features including the Shade's Mills Reservoir or Mill Creek during the 6-day pumping test.

Water quality from the test production well SM-PW1-11 met all health-related ODWS criteria, with exceedances for the following non-health related parameters: hardness, manganese, organic nitrogen and colour. Similar to G38 and G39, SM-PW1-11 was classified as a GUDI well with Effective Filtration (GUDI-EF) (Stantec, 2013b).

6.0 REFERENCES

Bajc, A.F. and Shirota, J., 2007. Three-dimensional mapping of surficial deposits in the Regional Municipality of Waterloo, Southwestern Ontario; report in Ontario Geological Survey, Groundwater Resources Study 3, 42p.

Brunton and Brintnell, 2011. Final Update of Early Silurian Stratigraphy of the Niagara Escarpment and Correlation with Subsurface Units Across Southwestern Ontario and the Great Lakes Basin, Ontario Geological Survey, Open File Report 6270, p. 30-1 to 30-11.

Brunton, F., 2009. Update of revisions to the early Silurian stratigraphy of the Niagara Escarpment: Integration of sequence stratigraphy, sedimentology and hydrogeology to delineate hydrogeologic units, In *Summary of Field Work and Other Activities 2009*, Ontario Geological Survey, Open File Report 6240, pp. 25-1 to 25-20.

Brunton, F., 2008. Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p. 31-1 to 31-18.

R.J. Burnside and Associates Limited (Burnside), 2011. Production Well P10A, Construction and Testing Report. Prepared for the Regional Municipality of Waterloo. February 2011.

R.J. Burnside & Associates Limited (Burnside), 2010a. Production Well G5A: Construction and Testing Report – Regional Municipality of Waterloo. September 2010.

R.J. Burnside and Associates Limited (Burnside), 2010b. Municipal Well P10 Optimization Project, Test Well PB-TW-10 Construction and Diagnostics. Prepared for the Regional Municipality of Waterloo. November 2010.

Clark, I and P. Fritz, 1997. Environmental Isotopes in Hydrogeology. Lewis Publishers, New York.

Fritz, P., Drimmie, R.J., Frape, S.K. and O. O'Shea, 1987. The isotopic composition of precipitation and groundwater in Canada. *In:* Isotope Techniques in Water Resources Development. IAEA Symposium 299, March 1987, Vienna: 539-550.

Golder Associates Ltd. (Golder), 2011. Tier 3 Water Budget and Local Area Risk Assessment: Cambridge East Well Field Characterization. Report to the Regional Municipality of Waterloo, Project 08-1112-020, Revised November 2011.

Golder Associates Ltd. (Golder), 1991. Cambridge Groundwater Study. Report to the Regional Municipality of Waterloo, Project 891-1582, April 1991.

Johnson, M., D. Armstrong, B. Sanford, P. Telford and M. Rutka, 1992. Paleozoic and Mesozoic geology of Ontario. *In* Geology of Ontario. Edited by P.C. Thurston, H. R. Williams, R.H. Sutcliffe and G.M. Stout. Ontario Geological Survey, Special Volume 4: 907-1008.

Karrow, P.F., 1987. Surficial quaternary geology of the Cambridge Study Area. Technical Report, Ontario Geological Survey.

Lotowater Ltd. (Lotowater), 2011. Well G16 Liner Installation and Rehabilitation. Lotowater Technical Services, Inc., June 2011.

Lotowater Ltd. (Lotowater), 1997. Study of the Hydrogeology of the Cambridge Area. Report prepared for the Regional Municipality of Waterloo, Project 066-044, May 1997.

Lotowater Ltd. (Lotowater), 1993a. Clemens Mill Aquifer Study Program, Cambridge, Ontario. Report prepared for The Regional Municipality of Waterloo, Project 066-024, March 1993.

Lotowater Ltd. (Lotowater) 1993b. Shade's Mills Groundwater Study, Cambridge Ontario. Report prepared for The Regional Municipality of Waterloo, 1993.

Ontario Geological Survey (OGS), 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 128 – Revised.

S.S. Papadopulos and Associates, Inc. and Matrix Solutions Inc. (Papadopulos and Matrix), 2016. Cambridge East IUS Water Supply Class EA: Groundwater Modelling. Final Report. Report submitted to the Regional Municipality of Waterloo. Dated January 5, 2016.

Stantec Consulting Ltd. (Stantec), 2013a. Pinebush Road Well Field Construction and Testing of Test Wells P10A, P10B, TW1 10 and Production Well P17. Prepared for the Regional Municipality of Waterloo.

Stantec Consulting Ltd. (Stantec), 2013b. Shade's Mill Well Field Construction and Testing of Test Production Well SM-PW1-11. Final Report. Prepared for the Regional Municipality of Waterloo.

Stotler, R., 2003. Change in Geochemistry, Isotope Composition, and Residence Time within the Waterloo Moraine Aquifer Complex. M.Sc. Thesis, University of Waterloo.

Report Signature Page

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TABLES

Summary of Field Investigations - Phase I (2005/2006)

Date	Well Field	Drilling and Aquifer Testing Details	Region of Waterloo Contract Number	Sub-Contractor
Aug 9-30, 2005	Pinebush, Clemens Mills & Shades Mills	Drilling and installation of 152 mm diameter test wells SMTW1-05, PBTW1-05 and CMTW1-05	Q2005-1008	Davidson Well Drilling Ltd.
Sep 13-19, 2005	Pinebush, Clemens Mills & Shades Mills	Step testing of CMTW1-05, PBTW1-05 and SMTW1-05		
Nov 1-15, 2005	Clemens Mills	Drilling and installation of 152 mm diameter test wells CMTW2-05 and CMTW3-05	Q2005-1012	Davidson Well Drilling Ltd.
Nov 17-21, 2005	Clemens Mills	Step testing of CMTW2-05 and CMTW3-05		
May 26-31, 2006	Pinebush	Drilling and installation of 152 mm test well PBTW2-06	Q2006-014	Gerrits Well Drilling Inc.
June 7, 2006	Pinebush	Step testing of PBTW2-06		
June 28 to July 14, 2006	Clemens Mills and Shades Mills	Conversion of CMTW3-05 and SMTW1-05 to bedrock monitoring nests		
May 15 to July 5, 2006	Pinebush and Clemens Mills	Drilling and installation of 4 monitoring well nests with 3 bedrock and 3 overburden monitors in each nest (CMOW1-06, CMOW2-06, PBOW1-06 and PBOW2-06) and drilling and installation of bedrock monitoring nest at CMOW3-06		
May 8 to July 14, 2006	Pinebush and Clemens Mills	Drilling and Installation of three 305 mm test production wells, PBPW1-06, CMPW1-06 and CMPW2-06	Q2006-015	Gerrits Well Drilling Inc.
June 7 to Aug 16, 2006	Pinebush and Clemens Mills	Step testing of PBPW1-06, CMPW2-06 and CMPW2-06		
Aug 17-21, 2006	Pinebush and Clemens Mills	Installation of 3 shallow monitoring well nests, PLOW1-06, PLOW2-06 and HPOW1-06	N/A	Strata Soils
Sep 5 to Oct 2, 2006	Pinebush and Clemens Mills	28-day pumping test of CMPW1-06, CMPW2-06 and PBPW1-06	Q2006-015	Gerrits Well Drilling Inc.

Summary of Field Investigations - Phase II (2007/2008)

Date	Well Field	Drilling and Aquifer Testing Details	Region of Waterloo Contract Number	Sub-Contractor
Aug 14-23, 2007	Shades Mills	Drilling and installation of 152 mm diameter test wells SMTW2-07 and SMTW3-07	Q2007-029	Gerrits Well Drilling Inc.
Sep 6-11, 2007	Shades Mills	Conversion of SM3A-93 into bedrock monitoring nest SM3ABC-07		
Sep 18-20, 2007	Shades Mills	Step testing of SMTW2-07 and SMTW3-07		
Oct 10-14, 2007	Shades Mills	Conversion of SMTW2-07 and SMTW3-07 into bedrock monitoring nests		
Dec 18-20, 2007	Pinebush	Drilling and installation of 152 mm diameter test well PBTW3-07		
Feb 6-7, 2008	Pinebush	Step testing of PBTW3-07		
Feb 13-19, 2008	Shades Mills	Drilling and installation of 152 mm diameter test well SMTW4-08		
Feb 12-14, 2008	Shades Mills	Installation of overburden Monitoring nest SMOW1ABC-08		All-Terrain Drilling Ltd.
Mar 2, 2008	Shades Mills	Step testing of SMTW4-08		Gerrits Well Drilling Inc.
Mar 3-6, 2008	Shades Mills	3-day pumping test at SMTW4-08		
Mar 12 to Apr 18, 2008	Pinebush	Drilling and installation of test production well PBPW2-08		
Apr 30, 2008	Pinebush	Step testing of PBPW2-08		
May 5-8, 2008	Pinebush	3-day pumping test at PBPW2-08		
May 14-15, 2008	Shades Mills	Conversion of SMTW4-08 into bedrock monitoring nest		

Summary of Field Investigations - Phase III (2008/2009)

Date	Well Field	Drilling and Aquifer Testing Details	Region of Waterloo Contract Number	Sub-Contractor
Oct 1-8, 2008	Town of Clyde	Drilling and installation of 152 mm diameter test wells NDTW1-08 and NDTW2-08	Q2008-021	Gerrits Well Drilling Inc.
Oct 16-20, 2008	Town of Clyde	Step Testing of NDTW1-08 and NDTW2-08		
Dec 2-17, 2008	Town of Clyde	Conversion of NDTW1-08 into monitoring well nest		
Dec 20-28, 2008	Town of Clyde	Drilling of 503 mm test production well NDPW1-08		
Oct 28 to Dec 22, 2008	Town of Clyde	Drilling and installation of NDOW1-08 and NDOW2-08 (3 bedrock and 2 overburden monitors)		
Oct 28 to Nov 19, 2008	Town of Clyde	Drilling and installation of overburden monitoring nests NDOW3-08, NDOW4-08 and NDOW5-08		CMT Engineering
Jan 13-15, 2009	Town of Clyde	Step testing and 2-Day pumping test of NDPW1-08		Gerrits Well Drilling Inc.
Sep 23-30, 2009	Town of Clyde	Step testing and 7-Day test of packered NDPW1-08		

Table A1-D
Summary of Additional Field Investigations (2009/2016)

Date	Well Field	Drilling and Aquifer Testing Details	Contractor
April, 2009	Pinebush	New production well G5A drilled beside G5, cased through the upper bedrock (Reformatory Quarry Fm) and open in deeper water producing zones (Goat Island and Gasport Fms).	Davidson Drilling
June, 2009	Pinebush	A 225 mm diameter steel liner installed and cemented into place in G5 to a depth of 22.3 m below ground surface.	
June 2009 and Dec 2009	Pinebush	Step testing and pre and post acid injection at G5A.	Lotowater
Feb 25 - Mar 3, 2010	Pinebush	6-Day pumping test conducted at G5A	
Oct. 2009	Pinebush	Drilling and Installation of test well P10-TW1-09	Well Initiatives
Dec. 2009	Pinebush	Drilling and Installation of test well P10-TW2-09	Davidson Drilling
Jan - April 2010	Pinebush	Conversion of P10-TW2-09 into P10A, a 300 mm test production well and conversion of P10-TW1-09 into a multi-level well.	
Apr. 2010	Pinebush	P10 reconstructed, sealing of low water production zone at the bottom of the well with bentonite and capped with cement	
Apr. 2010	Pinebush	Drilling and construction of overburden monitoring wells P10-TW1D-10 and P10-TW1E-10.	Pro Core Drilling
May 6-13, 2010	Pinebush	Step testing and 6-Day pumping test at P10A	Lotowater
July - Aug 2010	Pinebush	Drilling of 203 mm test production well PBTW1-10	Davidson Drilling
Feb - Mar 2011	Pinebush	Drilling of pilot test holes PB-TW1-11 and PB-TW3-11 near P10 and PB-TW2-11 and PB-TW4-11 near P11/P17.	Gerrits Well Drilling Inc.
Apr 29 - May 25, 2011	Pinebush	Drilling and installation of Test Well P10B at P10 site	
July, 2011	Pinebush	Conversion of PB-TW4-11 into a deep overburden monitoring well (PBOW1A-11) and drilling and installation of a shallow overburden monitoring well (PBOW1B-11)	
Mar - Apr, 2012	Pinebush	Overdrilling and removal of P11 well casing, installation of new 250 mm casing to 44 m	
June 2-10, 2011	Pinebush	Installation of a 254 mm ID steel well liner to a depth of 48.2 m BGS in P17.	Well Initiatives
Oct 4-19, 2011	Pinebush	15-day pumping test conducted at P17, PBTW1-10, P10A and P10B.	
Jan. 2013	Pinebush	Drilling of two test wells PB-TW1-13 and PB-TW2-13	Gerrits Well Drilling Inc.
Apr - May 2013	Pinebush	Drilling and construction of well P15A by overdrilling PB-TW2-13	
May. 2013	Pinebush	Conversion of PB-TW1-13 into a mutli-level monitoring well nest	
May, 2014	Pinebush	In P9, a 200 mm diameter stainless steel liner was installed to a depth of 54.3 m below ground surface. The liner was installed to address concerns of cascading water from shallow bedrock water producing features.	Lotowater

Table A1-D
Summary of Additional Field Investigations (2009/2016)

Date	Well Field	Drilling and Aquifer Testing Details	Contractor
May - June 2014	Pinebush	Performance and constant rate testing at P9 and P15A to confirm capacity and optimum pumping configuration of these two wells. P15A is expected to replace P15 when brought online.	Gerrits Well Drilling Inc.
March, 2011	Shades Mills	Drilling and installation of pilot test hole SM-TW1-11.	Gerrits Well Drilling Inc.
Jun - August, 2011	Shades Mills	Overdrilling and conversion of SM-TW1-11 into a 305 mm, naturally developed Test Production Well, later to become G40. Well step tested.	
Jan 31 - Feb 7, 2012	Shades Mills	6-day pumping test conducted at G40, G38 and G39.	
Jan. 2012	Shades Mills	Rehabilitation of wells G38 and G39	Well Initiatives
Aug, 2010	Clemens Mills	Well inspection and testing at G18. Variable rate pumping test indicated well performing at close to as constructed capacity.	Lotowater
Mar - Apr 2011	Clemens Mills	G16 deepened to a depth of 126.5 m bgs and a liner was installed to a depth of 58 m bgs. Lowering of the pump in the well resulted in an increased well specific capacity to 4.4 L/s/m.	Hopper/Lotowater
2013 / 2014	Clemens Mills	Well rehabilitation of G17 only returned 15% of the well's specific capacity of about 5 L/s/m.	Lotowater
August, 2014	Clemens Mills	A liner was installed in G6 to a depth of 44.3 m to increase the available drawdown in this well. The well was rehabilitated following liner installation.	Lotowater
Dec. 2015	Clemens Mills	Performance testing on G18 indicated similar to as-constructed.	Lotowater

Table A2
Construction Details for Test Wells and Test Production Wells

Well_ID	OBJ_NUM	Easting	Northing	Ground Surface Elevation (masl)	Location	Drilling Completion Date	Casing Depth[1] (mbgs)	Casing Diameter (mm)	Top of Rock (mbgs)	Bottom of Hole (mbgs)	Geophysical Logs Completed[2]	Static Water Level[3] (mbgs)
Phase I												
SMTW1-05[4]	9202047	558520.3	4803672.6	292.80	Shades Mill Conservation Area	12-Aug-05	21.34	152.4	19.50	120.40	yes	5.55
PBTW1-05	9202046	558317.2	4806856.7	314.60	Off roundabout at CanAmerica Parkway	22-Aug-05	42.67	152.4	39.90	130.61	yes	11.82
CMTW1-05	9202045	558402.6	4805356.3	307.20	Portuguese Club of Cambridge	30-Aug-05	31.69	152.4	29.26	130.15	yes	6.91
CMTW2-05	9202048	558964.4	4804452.2	301.80	Cedarbrook Crescent	07-Nov-05	34.10	152.4	32.61	122.80	yes	2.10
CMTW3-05[4]	9202049	557559.9	4805180.6	313.60	Burnett Avenue	15-Nov-05	41.40	152.4	36.50	140.40	yes	13.14
CMPW1-06	9202640	558400.0	4805353.2	306.90	Portuguese Club of Cambridge	19-May-06	30.78	304.8	28.96	121.31	yes	7.26
PBTW2-06	9202646	558219.6	4806227.2	318.30	Witmer Park	31-May-06	41.00	152.4	39.10	138.68	yes	15.09
CMPW2-06	9202641	558967.2	4804450.6	301.60	Cedarbrook Crescent	07-Jun-06	34.14	304.8	32.61	120.40	yes	2.23
PBPW1-06	9202645	558217.2	4806229.1	318.20	Witmer Park	14-Jul-06	42.67	304.8	38.90	138.68	yes	15.26
Phase II												
SMTW2-07[4]	9203419	557668.7	4802637.6	288.60	Shades Mill Conservation Area	14-Aug-07	16.80	152.4	14.17	124.21	yes	5.20
SMTW3-07[4]	9203420	558417.6	4802866.6	290.29	640 Clyde Rd	23-Aug-07	22.86	152.4	17.98	118.41	yes	3.47
PBTW3-07	9203557	557466.3	4805907.7	308.59	Can-Amera Parkway	21-Dec-07	29.26	152.4	27.43	133.20	yes	6.93
SMTW4-08[4]	9203543	559023.0	4803334.5	301.62	Shades Mill Conservation Area	19-Feb-08	28.04	152.4	24.99	127.86	yes	3.63
PBPW2-08	9203558	557478.2	4805910.8	308.85	Can-Amera Parkway	20-Mar-08	29.26	304.8	26.82	128.02	no	6.40
Phase III												
NDTW1-08[4]	9203611	562366.8	4804125.2	300.95	Clyde Park	01-Oct-08	23.77	152.4	21.95	144.60	yes	0.27
NDTW2-08	9203612	562219.7	4800075.7	300.55	Clyde Park	08-Oct-08	22.90	152.4	21.95	115.52	yes	0.04
NDPW1-08	9203615	562219.2	4804072.2	300.49	Clyde Park	15-Jan-09	24.68	304.8	21.95	106.68	no	-0.38

Notes:

1) All casings were grouted into top of rock using positive displacement techniques.
2) Geophysical logs completed include: optical televiewer, gamma and conductivity.
   a) Caliper logs were completed for wells CMTW2-05 and PBTW1-05.
   b) Flow profile logging was completed at the Test Production Wells and at Test wells PBTW3-07, SMTW2-07, SMTW3-07 and SMTW4-08.
3) Static water levels as measured immediately prior to step testing.
4) Test Wells CMTW3-05, SMTW1-05, SMTW2-07, SMTW3-07 and NDTW1-08 were completed as bedrock monitoring well nests.

Table A3
Construction Details for Monitoring Wells

Well_ID	OBJ_NUM	Easting	Northing	Location	Date Installed	Hole Depth (mbgs)	Screen ID	Piezometer Screen Lengths (mbgs)	Sand Pack (mbgs)	Geophysical Logs Completed
Phase I										
CMOW1ABC-06	9202637	558725.7	4805314.2	Portuguese Club	16-May-06	126.8	A	102.1 - 120.4	98.5 - 125.0	Yes
							B	48.8 - 57.9	46.6 - 61.3	
							C	36.6 - 39.6	33.2 - 41.1	
CMOW1D-06	9202664	558724.0	4805313.1	Portuguese Club	16-May-06	33.1	D	30.2 - 33.1	29.1 - 33.5	
CMOW1E-06	9202665	558723.0	4805312.4	Portuguese Club	15-May-06	17.1	E	14.0 - 17.1	12.5 - 17.1	
CMOW1F-06	9202666	558724.8	4805313.7	Portuguese Club	15-May-06	7.6	F	4.6 - 7.6	3.6 - 7.6	
CMOW2ABC-06	9202638	559589.2	4804173.7	6514 Gore Road	23-Jun-06	121.0	A	91.4 - 111.6	89.0 - 111.9	Yes
							B	45.0 - 58.2	44.8 - 58.5	
							C	30.5 - 35.4	27.8 - 35.4	
CMOW2D-06	9202667	559589.8	4804173.5	6514 Gore Road	13-Jun-06	28.3	D	27.4 - 29.0	25.9 - 29.0	
CMOW2E-06	9202668	559588.2	4804174.2	6514 Gore Road	13-Jun-06	16.8	E	13.7 - 16.8	12.2 - 16.8	
CMOW2F-06	9202669	559590.5	4804173.0	6514 Gore Road	13-Jun-06	7.6	F	4.6 - 7.6	3.6- 7.6	
CMTW3ABC-05	9202049	557560.0	4805132.0	Burnett Avenue	06-Jul-06	143.3	A	106.7 - 125.0	103.6 - 128.0	Yes
							B	64.0 - 70.1	61.0- 73.2	
							C	38.4 - 46.0	38.4 - 46.0	
SMTW1ABC-05	9202047	558520.3	4803672.6	Shades Mill Conservation Area	12-Jul-06	120.4	A	83.2 - 101.5	80.2 - 104.5	Yes
							B	47.9 - 57.0	44.8 - 60.0	
							C	21.3 - 24.4	18.3 - 27.4	
PBOW1ABC-06	9202643	559285.9	4806058.2	6522 Concession 1	26-Jun-06	126.5	A	91.4 - 109.1	90.8 - 112.2	Yes
							B	48.2 - 54.3	46.6 - 55.8	
							C	35.4 - 41.5	33.4 - 41.5	
PBOW1D-06	9202670	559284.4	4806058.2	6522 Concession 1	26-Jun-06	35.5	D	32.0 - 35.5	31.1 - 35.5	
PBOW1E-06	9202671	559283.1	4806058.4	6522 Concession 1	26-Jun-06	22.9	E	19.0 - 22.9	19.8 - 22.9	
PBOW1F-06	9202672	559281.8	4806058.7	6522 Concession 1	26-Jun-06	11.3	F	8.2 - 11.3	7.6 - 11.4	

Construction Details for Monitoring Wells

Well_ID	OBJ_NUM	Easting	Northing	Location	Date Installed	Hole Depth (mbgs)	Screen ID	Piezometer Screen Lengths (mbgs)	Sand Pack (mbgs)	Geophysical Logs Completed
Phase I Continued										
PBOW2ABC-06	9202673	558534.8	4806923.5	Tln. Rd Roundabout	24-Jul-06	128.9	A	91.4 - 109.8	88.4 - 112.8	Yes
							B	48.9 - 55.0	48.9 - 55.0	
							C	33.5 - 44.4	33.5 - 44.4	
PBOW2D-06	9202674	558535.9	4806925.7	Tln. Rd. Roundabout	24-Jul-06	35.6	D	33.2 - 36.3	31.7 - 36.3	
PBOW2E-06	9202675	558536.3	4806926.8	Tln. Rd Roundabout	24-Jul-06	28.0	E	25.0 - 28.0	21.9 - 28.0	
PBOW2F-06	9202676	558534.4	4806922.1	Tln. Rd Roundabout	24-Jul-06	17.1	F	14.0 - 17.1	12.5 - 17.1	
CMOW3ABC-06	9202639	558916.3	4804866.4	Saginaw and Townline Road	03-Aug-06	123.1	A	77.7 - 108.2	74.2 - 111.3	Yes
							B	50.3 - 56.1	47.2 - 56.4	
							C	36.6 - 39.6	33.5 - 42.4	
PLOW1A-06	9202647	559402.9	4806775.2	Puslinch Lake Area	18-Aug-06	13.4	A	9.1 - 10.7	4.9 - 13.4	No
PLOW1B-06	9202647	559403.1	4806774.7	Puslinch Lake Area	18-Aug-06	5.3	B	3.8 - 5.3	2.7 - 5.5	
PLOW2A-06	9202648	559066.4	4806671.4	Puslinch Lake Area	21-Aug-06	12.2	C	10.5 - 12.0	1.5 - 12.2	No
PLOW2B-06	9202648	559066.9	4806671.8	Puslinch Lake Area	21-Aug-06	8.2	A	6.7 - 8.2	1.2 - 8.2	
PLOW2C-06	9202648	559066.0	4806671.9	Puslinch Lake Area	21-Aug-06	3.4	B	1.5 - 3.1	0.9 - 3.4	
HPOW1A-06	9202642	558786.2	4804394.6	Hilborn Pond Area	22-Aug-06	7.3	A	5.8- 7.3	3.1 - 7.3	No
HPOW1B-06	9202642	558785.7	4804394.3	Hilborn Pond Area	22-Aug-06	5.9	B	2.1 - 3.7	2.1 - 3.7	
Phase II										
SMTW2ABC-07	9203419	557668.7	4802637.6	Shades Mill Conservation Area	14-Aug-07	124.2	A	94.5 - 109.7	91.1 - 112.6	Yes
							B	45.7 - 62.5	43.9 - 64.0	
							C	21.3-24.4	15.0 - 30.5	
SMTW3ABC-07	9203420	558417.6	4802866.6	Shades Mill Conservation Area	23-Aug-07	118.4	A	76.2 - 88.4	73.3 - 91.4	Yes
							B	48.8 - 57.9	45.7 - 59.3	
							C	24.4 - 27.4	21.3 - 30.5	
SMOW1A-08	9203540	558969.6	4803478.9	Shades Mill Conservation Area	14-Feb-08	20.0	A	16.92 - 19.96	16.2 - 20.0	Yes
SMOW1B-08	9203541	558971.1	4803478.2			12.0	B	9.0 - 12.0	8.5 - 12.2	
SMOW1C-08	9203542	558970.9	4803479.8			5.8	C	4.3 - 5.8	3.1 - 5.8	
SMTW4ABC-08	9203543	559026.0	4803334.5	Shades Mill Conservation Area	18-Feb-08	127.9	A	94.5 - 109.7	91.4 - 112.8	Yes
							B	50.3 - 62.5	48.8 - 64.0	
							C	30.5 - 33.5	24.4 - 35.1	

Construction Details for Monitoring Wells

Well_ID	OBJ_NUM	Easting	Northing	Location	Date Installed	Hole Depth (mbgs)	Screen ID	Piezometer Screen Lengths (mbgs)	Sand Pack (mbgs)	Geophysical Logs Completed
Phase III										
NDOW1ABC-08	9203616	562254.3	4804735.6	SW Corner of Village and Gore Rd.	10-Dec-08	114.3	A	83.2 - 101.5	77.4 - 103.2	Yes
							B	39.6 - 48.8	38.0 - 83.2	
							C	28.7 - 31.7	24.4 - 32.3	
NDOW1D-08	9203617	562255.3	4804733.2	SW Corner of Village and Gore Rd.	28-Oct-08	23.8	D	14.0 - 17.1	12.5 - 17.1	
NDOW1E-08	9203618	562255.4	4804731.3	SW Corner of Village and Gore Rd.	17-Nov-08	8.5	E	5.2 - 8.2	5.2 - 8.5	
NDOW2ABC-08	9203619	561220.1	4803775.5	Cambridge Golf Course	22-Dec-08	116.4	A	86.9 - 105.2	82.3-108.2	Yes
							B	50.3 - 57.9	48.0 - 60.1	
							C	33.8 - 39.3	29.9 - 41.0	
NDOW2D-08	9203620	561223.0	4803779.2	Cambridge Golf Course	19-Nov-08	31.4	D	28.0 - 31.1	27.7 - 31.4	
NDOW2E-08	9203633	561221.2	4803778.3	Cambridge Golf Course	10-Nov-08	11.0	E	3.1 - 4.8	3.7 - 4.8	
NDOW3A-08	9203634	562046.3	4803928.6	In Field West of Clyde Park	17-Nov-08	9.8	A	7.9 - 9.5	7.6 - 9.5	No
NDOW3B-08	9203635	562045.3	4803930.2		17-Nov-08	2.4	B	0.9 - 2.4	0.8 - 2.4	
NDOW4A-08	9203636	562601.2	4803605.8	Southeast side of Clyde and Village, near fence gate	17-Nov-08	8.5	A	5.2 - 6.7	4.6 - 6.7	No
NDOW4B-08	9203637	562601.3	4803607.7		17-Nov-08	2.4	B	0.9 - 2.4	0.8 - 2.4	
NDOW5A-08	9203638	563380.0	4805018.4	South side of Gore Rd, east of Sideroad 10	18-Nov-08	3.1	A	1.5 - 3.1	1.2 - 3.1	No
NDTW1ABC-08	9203611	562366.8	4804125.2	Northeast End of Clyde Park	04-Dec-08	114.6	A	79.2 - 97.5	77.1 - 99.9	Yes
							B	44.1 - 51.8	42.0 - 53.3	
							C	25.9 - 28.9	22.5 - 30.5	
NDTW1D-08	9203613	562367.6	4804123.2		16-Dec-08	17.7	D	14.6 - 17.7	14.0 - 17.7	
NDTW1E-08	9203614	562369.4	4804123.6		17-Dec-08	8.5	E	5.5 - 8.5	4.9 - 8.5	

Note:

1) Geophysical logs completed include optical televiewer, gamma and conductivity

Table A4
Drilling Results - Bedrock Formation Picks

Borehole	Elevation	Overburden					Guelph Formation					Eramosa Formation - Reformatory Quarry Member					Eramosa Formation - Vinemount Member				
	(masl)	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**
CMOW1-06	305.9	0	32.4	305.9	273.5	**32.4**	32.4	61.3	273.5	244.6	**28.9**	61.3	70.5	244.6	235.4	**9.2**	70.5	74.1	235.4	231.8	**3.6**
CMOW2-06	300.7	0	28.7	300.7	272.0	**28.7**	28.7	61.1	272.0	239.6	**32.5**	61.1	66.7	239.6	234.0	**5.6**	66.7	72.2	234.0	228.4	**5.6**
CMOW3-06	302.4	0	34.1	302.4	268.3	**34.1**	34.1	55.7	268.3	246.7	**21.6**	55.7	60.4	246.7	242.0	**4.7**	60.4	64.1	242.0	238.3	**3.7**
CMTW1-05	307.1	0	29.3	307.1	277.9	**29.3**	29.3	68.6	277.9	238.5	**39.4**	--	--	--	--	--	--	--	--	--	--
CMTW2-05	301.8	0	32.6	301.8	269.2	**32.6**	32.6	59.8	269.2	242.0	**27.2**	59.8	62.8	242.0	239.0	**3.0**	62.8	68.8	239.0	233.0	**6.0**
CMTW3-05	313.6	0	36.5	313.6	277.1	**36.5**	36.5	80.8	277.1	232.8	**44.3**	--	--	--	--	--	--	--	--	--	--
NDTW2-08	300.6	0	21.5	300.6	279.1	**21.5**	21.5	40.6	279.1	260.0	**19.1**	40.6	59.1	260.0	241.5	**18.5**	59.1	66.6	241.5	234.0	**7.5**
PBOW1-06	308.2	0	34.6	308.2	273.6	**34.6**	34.6	54.2	273.6	254.0	**19.6**	54.2	61.2	254.0	247.0	**7.0**	61.2	62.2	247.0	246.0	**1.0**
PBOW2-06	310.7	0	35.5	310.7	275.2	**35.5**	35.5	53.5	275.2	257.2	**18.0**	53.5	58.6	257.2	252.1	**5.1**	--	--	--	--	--
PBTW1-05	314.6	0	39.9	314.6	274.7	**39.9**	39.9	56.5	274.7	258.1	**16.6**	--	--	--	--	--	--	--	--	--	--
PBTW2-06	318.3	0	39.1	318.3	279.2	**39.1**	39.1	47.2	279.2	271.1	**8.1**	--	--	--	--	--	--	--	--	--	--
PBTW3-07	308.9	0	27.2	308.9	281.6	**27.2**	27.2	36.3	281.6	272.6	**9.1**	36.3	42.0	272.6	266.9	**5.7**	--	--	--	--	--
SMTW2-07	288.6	0	14.2	288.6	274.5	**14.2**	14.2	55.0	274.5	233.6	**40.8**	--	--	--	--	--	--	--	--	--	--
SMTW3-07	290.9	0	18.0	290.9	272.9	**18.0**	18.0	58.0	272.9	232.9	**40.0**	58.0	63.0	232.9	227.9	**5.0**	63.0	65.0	227.9	225.9	**2.0**
SMTW4-08	302.9	0	25.0	302.9	277.9	**25.0**	25.0	62.5	277.9	240.4	**37.5**	64.3	68.6	240.4	234.3	**6.1**	68.6	76.2	234.3	226.7	**7.6**

Borehole	Elevation	Goat Island Formation					Gasport Formation					Rochester Formation					Cabot Head Formation				
	(masl)	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)	From (masl)	To (masl)	**Thickness (m)**	From (mgbs)	To (mbgs)[1]	From (masl)	To (masl)[1]	**Thickness (m)**
CMOW1-06	305.9	74.1	79.5	231.8	226.4	**5.4**	79.5	122.5	226.4	183.4	**43.0**	122.5	126.8	183.4	179.1	**4.3**	126.8	126.8	179.1	179.1	**N/A**
CMOW2-06	300.7	72.2	77.5	228.4	223.2	**5.3**	77.5	117.5	223.2	183.2	**40.0**	117.5	119.8	183.2	180.9	**2.3**	119.8	121.2	180.9	179.5	**N/A**
CMOW3-06	302.4	64.1	67.5	238.3	234.9	**3.4**	67.5	116.5	234.9	185.9	**49.0**	116.5	121.6	185.9	180.8	**5.1**	121.6	123.1	180.8	179.3	**N/A**
CMTW1-05	307.1	68.6	70.6	238.5	236.5	**2.0**	70.6	125.0	236.5	182.1	**54.4**	125.0	130.1	182.1	177.0	**5.1**	130.1	131.1	177.0	176.0	**N/A**
CMTW2-05	301.8	68.8	71.8	233.0	230.0	**3.0**	71.8	119.9	230.0	181.9	**48.1**	119.9	122.8	181.9	179.0	**2.9**	122.8	122.8	179.0	179.0	**N/A**
CMTW3-05	313.6	80.8	86.9	232.8	226.7	**6.1**	86.9	134.0	226.7	179.6	**47.1**	134.0	138.4	179.6	175.2	**4.4**	138.4	140.5	175.2	173.1	**N/A**
NDTW2-08	300.6	66.6	72.6	234.0	228.0	**6.0**	72.6	108.6	228.0	192.0	**36.0**	108.6	112.1	192.0	188.5	**3.5**	112.1	115.5	188.5	185.1	**N/A**
PBOW1-06	308.2	62.2	67.2	246.0	241.0	**5.0**	67.2	121.5	241.0	186.7	**54.3**	121.5	125.6	186.7	182.6	**4.1**	125.6	126.5	182.6	181.7	**N/A**
PBOW2-06	310.7	58.6	63.8	252.1	246.9	**5.2**	63.8	123.5	246.9	187.2	**59.7**	123.5	127.4	187.2	183.3	**3.9**	127.4	128.9	183.3	181.8	**N/A**
PBTW1-05	314.6	56.5	64.8	258.1	249.8	**8.3**	64.8	125.5	249.8	189.1	**60.8**	125.5	129.5	189.1	185.0	**4.0**	129.5	130.6	185.0	184.0	**N/A**
PBTW2-06	318.3	47.2	57.0	271.1	261.3	**9.8**	57.0	135.0	261.3	183.3	**78.0**	135.0	138.7	183.3	179.6	**3.7**	138.7	138.7	179.6	179.6	**N/A**
PBTW3-07	308.9	42.0	50.0	266.9	258.9	**8.0**	50.0	128.0	258.9	180.9	**78.0**	128.0	132.0	180.9	176.9	**4.0**	132.0	133.2	176.9	175.7	**N/A**
SMTW2-07	288.6	55.0	59.5	233.6	229.2	**4.4**	59.5	118.9	229.2	169.8	**59.4**	118.9	124.0	169.8	164.6	**5.1**	124.0	124.2	164.6	164.4	**N/A**
SMTW3-07	290.9	65.0	75.0	225.9	215.9	**10.0**	75.0	112.5	215.9	178.4	**37.5**	112.5	117.0	178.4	173.9	**4.5**	117.0	118.4	173.9	172.5	**N/A**
SMTW4-08	302.9	76.2	78.5	226.7	224.4	**2.3**	78.5	123.4	224.4	179.5	**44.9**	123.4	127.9	179.5	175.1	**4.5**	127.9	127.9	175.1	175.0	**N/A**

NOTE:

1) Bottom depth of the Cabot Head Formation is based on the borehole depth.

Table A5
Summary of Step Pumping Tests

Well_ID	OBJ_NUM	Date Tested	Pumping Rates (m^3/day)	Pumping Rates (L/s)	Duration	Static Level[1] (mbgs)	Phase
Test Wells							
CMTW1-05	9202045	13-Sep-05	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	6.91	I
SMTW1-05	9202047	8-Sep-05	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	5.55	I
PBTW1-05	9202046	15-Sep-05	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	11.82	I
CMTW2-05	9202048	18-Nov-05	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	2.10	I
CMTW3-05	9202049	21-Nov-05	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	13.14	I
PBTW2-06	9202646	7-Jun-06	327, 655, 982, 1,257	3.8, 7.6, 11.4, 14.5	8 hours	15.09	I
SMTW2-07	9203419	18-Sep-07	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	5.20	II
SMTW3-07	9203420	20-Sep-07	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	3.47	II
PBTW3-07	9203557	6-Feb-08	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	6.93	II
PBTW3-07	9203557	7-Feb-08	2,160	25	2 hours	6.86	II
SMTW4-07	9203543	29-Feb-08	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	3.83	II
NDTW2-08	9203612	16-Oct-08	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	0.04	III
NDTW1-08	9203611	20-Oct-08	327, 655, 982, 1,309	3.8, 7.6, 11.4, 15.1	8 hours	0.27	III
Test Production Wells							
PBPW1-06	9202645	10-Aug-06	3,273, 4,366, 5,453, 6,540	37.9, 50.5, 63.1, 75.7	8 hours	15.26	I
CMPW1-06	9202640	14-Aug-06	3,273, 4,366, 5,453	37.9, 50.5, 63.1	6 hours[2]	7.26	I
CMPW2-06	9202641	16-Aug-06	3,273, 4,366, 5,453, 6,540	37.9, 50.5, 63.1, 75.7	8 hours	2.23	I
PBPW2-08	9203558	30-Apr-08	1,637, 2,455, 3,273, 5,237	18.9, 28.4, 37.9, 60.6	8 hours	6.40	II
NDPW1-08	9203615	13-Jan-09	3,273, 4,366, 5,453, 6,396	37.9, 50.5, 63.1, 74.0	51 hours[3]	-1.00 [4]	III
NDPW1-08	9203615	23-Sep-09	3,273, 4,366, 5,453, 6,048	37.9, 50.5, 63.1, 70.0	8 hours	-0.38	III

Notes:

1) Static water levels as measured immediately prior to step testing for each well. For NDTW1-08, the value was measured prior to NDTW2-08 step test.
2) CMPW1-06 broke suction prior to the fourth step.
3) For the January 2009 test at NDPW1-08, the constant rate pumping test initiated immediately at end of fourth step at rate of 977 IGM (70.0 L/s).
4) NDPW1-08 was free flowing at the start of January 2009 test. Static level was estimated at 1 m above ground surface.

Table A6
Step Pumping Test Results

Test Wells								
Well_ID	Static Water[1] Level (mbgs)	Step 1 (3.8 L/s or 327 m^3/day) Drawdown (m)	Step 2 (7.6 L/s or 655 m^3/day) Drawdown (m)	Step 3 (11.4 L/s or 982 m^3/day) Drawdown (m)	Step 4 (15.1 L/s or 1,309 m^3/day) Drawdown (m)	Step 5 (25.0 L/s or 2,160 m^3/day) Drawdown (m)	Specific Capacity (L/s/m) (at end of test)	Phase
CMTW1-05	6.91	0.85	1.77	3.02	4.43		3.4	I
CMTW2-05	2.1	0.43	0.85	1.56	2.44		6.2	I
CMTW3-05	13.14	1.14	2.24	3.83	5.5		2.7	I
PBTW1-05	11.82	0.25	0.43	0.77	1.16		13	I
PBTW2-06[3]	15.09	0.31	0.99	1.24	1.69		8.6	I
SMTW1-05	5.55	2.15	4.52	7.31	9.63		1.6	I
PBTW3-07	6.93	2	4.15	7.04	10.21		1.5	II
PBTW3-07	6.86					17.11	1.5	II
SMTW2-07	3.47	2.34	4.96	8.04	11.06		1.4	II
SMTW3-07	5.2	0.94	2.22	3.87	5.73		2.6	II
SMTW4-08	3.83	0.51	1.33	1.98	2.99		5.1	II
NDTW1-08	0.272	0.5	1.23	2.2	3.37		4.5	III
NDTW2-08	0.04	0.42	0.99	1.6	2.37		6.4	III

Test Production Wells							
Well_ID	Static Water[1] Level (mbgs)	Step 1 (37.9 L/s or 3,273 m^3/day) Drawdown (m)	Step 2 (50.5 L/s or 4,366 m^3/day) Drawdown (m)	Step 3 (63.1 L/s or 5,435 m^3/day) Drawdown (m)	Step 4 (75.7 L/s or 6,540 m^3/day) Drawdown (m)	Specific Capacity (L/s/m) (at end of test)	Phase
CMPW1-06	7.26	9	13.4	18.62	See note 4	3.4	I
CMPW2-06	2.23	2.53	3.42	4.68	6.22	12.2	I
PBPW1-06	15.26	1.87	3.21	4.51	6.03	12.6	I
PBPW2-08 [5]	6.04	3.4	6.4	8.29	14.36	4.2	II
NDPW1-08	-1.00 [6]	2.62	3.94	6.42	7.76 [7]	9.5	III
NDPW1-08	-0.38	4.52	6.84	9.19	10.97 [8]	6.4	III

NOTES:

1) Static Water Levels measured immediately prior to step pumping test for each well.
2) Static water level value for NDTW1-08 was measured before NDTW2-08 step test.
3) The Step 4 pumping rate for PBTW2-06 was 1,256 m^3/day (14.5 L/s).
4) CMPW1-06 broke suction at the fourth step.
5) Step rates for PBPW2-08 were as follows: Step 1 - 1,635 m^3/day (18.9 L/s); Step 2 - 2,455 m^3/day (28.4 L/s); Step 3 - 3,633 m^3/day (37.9 L/s); and Step 4 - 5,237 m3/day (60.6 L/s).
6) NDPW1-08 was free flowing at start of the test. Static water level was estimated.
7) The Step 4 pumping rate for NDPW1-08 was 6,396 m^3/day (74.0 L/s) in January 2009.
8) The Step 4 pumping rate for NDPW1-08 was 6,049 m3/day (70.0 L/s) in September 2009.

Table A7
Summary of Constant Rate Pumping Tests

Well_ID	OBJ_NUM	Pumping Test Description	Pumping Start Date/Time	Pumping End Date/Time	Duration	Pumping Rate (m^3/day)	Pumping Rate (L/s)	Phase
CMPW2-06 [1]	9202641	28-Day Cambridge East Pumping Test	05-Sep-06 12:00	02-Oct-06 12:00	28 Days	3,240	37.5	I
PBPW1-06 [1]	9202645	28-Day Cambridge East Pumping Test	13-Sep-06 13:30	02-Oct-06 12:00	28 Days	3,378	39.1	I
CMPW1-06 [1]	9202640	28-Day Cambridge East Pumping Test	19-Sep-06 12:45	02-Oct-06 12:00	28 Days	3,240	37.5	I
SMTW4-08	9203543	3-Day Shades Mill Pumping Test	03-Mar-08 11:05	06-Mar-08 11:05	3 Days	1,964	22.7	II
PBPW2-08	9203558	3-Day Can-Amera Pumping Test	05-May-08 11:20	08-May-08 11:20	3 Days	3,273	37.9	II
NDPW1-08 [2,3]	9203615	2-Day Clyde Park Pumping Test	13-Jan-09 15:45	15-Jan-09 12:45	2 Days	6,394	74.0	III
NDPW1-08 [4]	9203615	6-Day Clyde Park Pumping Test	24-Sep-09 11:15	30-Sep-09 13:30	6 Days	4,321	50.0	III

Notes:

1) CMPW2-06, PBPW1-06 and CMPW1-06 were pumped together during the 28-day Constant Rate Test. Start times were staggered and all the wells stopped at the same time.
2) The January NDPW1-08 Test started immediately following the fourth step in the Step Pumping Test.
3) The January NDPW1-08 Test was ended early due to a generator failure and ice jams restricting flow of discharge water through culverts.
4) Prior to the September Test, a packer was installed in NDPW1-08 at the top of the Gasport Formation to isolate pumping to the deeper zone.

Drawdown During Constant Rate Pumping Tests

Well_ID / Location	OBJ_NUM	PHASE I		PHASE II				PHASE III			
		Cambridge East (CMPW1-06, CMPW2-06 and PBPW1-06) 28-Day Test		Shades Mill (SMTW4-08) 3-Day Test		Can-Amera (PBPW2-08) 3-Day Test		North Dumfries (NDPW1-08) 2-Day Test		North Dumfries (NDPW1-08) 6-Day Test	
		Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test
Test Wells and Test Production Wells											
CMPW1-06	9202640	E	11.10								
CMPW2-06	9202641	E	5.38			E	NR	E	3.15	E	2.31
CMTW1-05	9202045	E	6.71								
CMTW2-05	9202048	E	5.11								
PBPW1-06	9202645	E	3.50			E	0.57				
PBTW1-05	9202046	E	1.94	E	NR	E	0.56				
PBTW2-06	9202646	E	2.47								
PBTW3-07	9203557					E	4.13				
PBPW2-08	9203558					E	8.71				
SMTW4-08	9203543			E	5.73						
NDPW1-08	9203615							E	10.00	M, E	7.84
NDTW2-08	9203612							E	5.80	M, E	4.40
Monitoring Well Nests											
CMOW1A-92 [1]	1000383	E	NR	E	NR	E	1.93				
CMOW1B-92 [1]	1000382	E	NR	E	NR	E	NR				
CMOW1C-92 [1]	1000382	E	NR	E	NR	E	NR				
CMOW1D-92 [1]	9200050	E	NR	E	NR	E	NR				
CMOW1A-06 [2]	9202637	E	4.44	E	0.84	E	NR	E	2.89	E	1.54
CMOW1B-06	9202637	E	1.41								
CMOW1C-06	9202637	M [4]	0.90 [4]								
CMOW1D-06	9202664	E	1.06								
CMOW1E-06	9202665	M, E	0.62								
CMOW1F-06 [2]	9202666	M	NR	E	NR	E	NR	E	NR	E	NR
CMOW2A-92 [1]	1000386	E	0.95			E	NR				
CMOW2B-92 [1]	1000384	E	0.22								
CMOW2C-92 [1]	1000384	M	NR			E	NR				
CMOW2D-92 [1]	9200056	M	NR								
CMOW2A-06 [2]	9202638	M	4.01	E	1.64	E	NR	E	4.39	E	2.91
CMOW2B-06	9202638	E	0.37								
CMOW2C-06 [2]	9202638	E	0.17	E	NR	E	NR	E	NR	E	NR
CMOW2D-06	9202667	E	0.24								
CMOW2E-06	9202668	E	0.24								
CMOW2F-06 [2]	9202669	E	NR	E	NR	E	NR	E	NR	E	NR
CMOW3A-06	9202639	E	4.26								
CMOW3B-06	9202639	E	1.34								
CMOW3C-06	9202639	E	0.65								
CMOW5A-94	9200572	M	2.26								
CMOW5B-94 [1]	9200572	E	2.23	E	NR	E	0.57				
CMOW5C-94	9200572	M	1.96								
CMOW5D-94	9200572	M	1.86								
CMOW5E-94	9200572	M	1.31								
CMOW5F-94 [1]	9200572	E	0.53	E	NR	E	NR				
CMTW3A-05	9202049	M	1.23			E	1.23			E	NR
CMTW3B-05	9202049	M	1.04								
CMTW3C-05	9202049	E	NR			E	0.34			E	NR
G38	1000018			E	NR						
G39	1000019			E	NR						
G8TW	6500605			E	NR						
HPOW1A-06	9202642	E	0.23								
HPOW1B-06	9202642	M	NR								
MW1-D	1000370	E	NR							M	NR
MW1-I	1000370	E	NR							M	NR
MW1-S	1000370	E	NR							M	NR
MW09-T3-01-2	N/A									E	1.00 [3]
NDTW1A-08 [2]	9203611							E	5.52	E	4.12
NDTW1B-08	9203611							E	4.71	E	0.21
NDTW1C-08 [2]	9203611							E	2.38	E	0.12
NDTW1D-08	9203613							E	NR	E	NR
NDTW1E-08 [2]	9203614							E	NR	E	NR
NDOW1A-08	9203616							E	5.10	E	3.65
NDOW1B-08	9203616							E	0.87	E	NR
NDOW1C-08	9203616							E	NR	E	NR
NDOW1D-08	9203617							E	NR	E	NR
NDOW1E-08	9203618							E	NR	E	NR
NDOW2A-08	9203619							E [5]	-	E	3.45
NDOW2B-08	9203619							E	1.84	E	1.23
NDOW2C-08	9203619							E	1.35	E	0.74
NDOW2D-08	9203620							E	0.56	E	0.30
NDOW2E-08	9203633							E	NR	E	NR
NDOW3A-08	9203634							E	NR	E	NR
NDOW3B-08	9203635							E	NR	E	NR

Drawdown During Constant Rate Pumping Tests

Well_ID / Location	OBJ_NUM	PHASE I		PHASE II				PHASE III			
		Cambridge East (CMPW1-06, CMPW2-06 and PBPW1-06) 28-Day Test		Shades Mill (SMTW4-08) 3-Day Test		Can-Amera (PBPW2-08) 3-Day Test		North Dumfries (NDPW1-08) 2-Day Test		North Dumfries (NDPW1-08) 6-Day Test	
		Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test
NDOW4A-08	9203636							E	NR	E	NR
NDOW4B-08	9203637							E	NR	E	NR
NDOW5-08	9203638							E	NR	E	NR
OW102A-90	9070062			E	NR						
OW102C-90	9070062			E	NR						
OW3A-92 [1]	1000388			E	NR						
OW3A-94 [1]	1000322			E	NR						
OW4A-92 [1]	1000389	E	0.66	E	NR	E	NR				
OW4B-92 [1]	1000390	E	0.59	E	NR	E	NR				
OW4C-92 [1]	1000390	M	0.55								
PBOW1A-06	9202643	E	3.22	E	0.81	E	NR	E	2.94	E	1.37
PBOW1B-06	9202643	E	0.74								
PBOW1C-06	9202643	E	0.55	E	NR	E	0.12	E	NR	E	NR
PBOW1D-06	9202670	E	0.53								
PBOW1E-06	9202671	E	0.54								
PBOW1F-06	9202672	E	0.50	E	NR	E	0.12	E	NR	E	NR
PBOW2A-06	9202673	E	2.29	E	NR	E	0.51	E	0.29	E	NR
PBOW2B-06	9202673	E	1.82								
PBOW2C-06	9202673	E	1.44	E	NR	E	0.35	E	0.21	E	NR
PBOW2D-06	9202674	E	1.18								
PBOW2E-06	9202675	E	0.94								
PBOW2F-06	9202676	E	0.88	E	NR	E	0.25	E	0.14	E	NR
PLOW1A-06 [2]	9202647	E	0.36	E	NR	E	0.09	E	NR	E	NR
PLOW1B-06 [2]	9202647	E	NR			E	NR	E	NR	E	NR
PLOW2A-06	9202648	M	0.45	E	NR	E	0.12	E	NR	E	NR
PLOW2B-06	9202648	M	NR			E	NR	E	NR	E	NR
PLOW2C-06	9202648	E	NR			E	NR	E	NR		
PTOW1	9203312	E	NR								
SM1A-93	9200467			E	NR						
SM1B-93	9200467			E	NR						
SM2A-93	9200466			E	NR						
SM3A-93 [1,6]	9200458	M	1.33								
SM3B-93*	9200458	M	NR								
SM3A-07 [1]	9203421			E	0.34	E	NR				
SM3B-07 [1]	9203421			E	NR	E	NR				
SM3C-07 [1]	9203421			E	NR	E	NR				
SMOW1A-08	9203540			E	0.27	E	NR				
SMOW1B-08	9203541			E	0.12	E	NR				
SMOW1C-08	9203542			E	NR	E	NR				
SMTW1A-05 [2]	9202047	E	3.72	E	1.72	E	NR	E	3.93	E	1.84
SMTW1B-05	9202047	M, E	NR	E	0.30	E	NR	E	NR	E	NR
SMTW1C-05 [2]	9202047	M, E	NR	E	NR	E	NR	E	NR	E	NR
SMTW2A-07	9203419			E	NR	E	NR				
SMTW2B-07	9203419			E	NR	E	NR				
SMTW2C-07	9203419			E	NR	E	NR				
SMTW3A-07	9203420			E	0.61	E	NR				
SMTW3B-07	9203420			E	0.64	E	NR				
SMTW3C-07	9203420			E	0.20	E	NR				
TW1-58	9201413			E	NR						
TW10-78	6706772	M	NR							M	NR
TW9-78	1000369	M	NR							M	NR
Private Wells											
388 Avenue Rd	6505664			E	NR						
855 Avenue Rd	9203305	M	NR	E	NR						
859 Avenue Rd	6504527	M	NR	E	NR						
640 Clyde Rd	6500647			E	NR						
810 Clyde Rd	6500644										
1629 Clyde Rd	1001132							M	NR	E	NR
6494 Concession 1	9203302	M	0.70								
6505 Concession 1	9203304	M	0.72								
6508 Concession 1	9203300	E	NR								
6525 Concession 1	9203303	M	0.47								
6699 Concession 1	9203311	M	NR								
6518 Gore Rd	-									E	NR
6522 Gore Rd	9203307	M	0.20								
44 Lake Rd	6710783	M	NR								
32 Lakeside Dr (C2)	1000936	M	0.40								
2 Langford Dr.	6506418							E	1.24	E	0.07
16 Langford Dr.	6506243							E	NR		
485 Townline Rd	6708333	E	0.55								
870 Townline Rd	9200728	M	0.42								
870 Townline Rd (OW57-95)	1000545	M	0.70								
1493 Townline Rd	9203308	E	NR			E	NR				

Drawdown During Constant Rate Pumping Tests

Well_ID / Location	OBJ_NUM	PHASE I		PHASE II				PHASE III			
		Cambridge East (CMPW1-06, CMPW2-06 and PBPW1-06) 28-Day Test		Shades Mill (SMTW4-08) 3-Day Test		Can-Amera (PBPW2-08) 3-Day Test		North Dumfries (NDPW1-08) 2-Day Test		North Dumfries (NDPW1-08) 6-Day Test	
		Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test	Monitoring	Drawdown at End of Test
1639 Townline Rd	9202055	E	1.41			E	0.41				
1873 Townline Rd	9203306	E	1.26								
1275 Village Rd.	6810757							E	NR	E	NR
1310 Village Rd.	9202389							E	1.70	E	0.12
Surface Water											
H10-03 (Stream Piezo)	9201488	M	NR								
H3-03 (Stream Piezo)	9201409	M	NR								
H7-06 (Stream Piezo)	9201410	M	NR								
HILBORN POND-06	9202663	M	NR								
HX-06 (Stream Piezo)	9203313	E	NR								
LITTLE LAKE GAUGE	-	M	NR								
ND MP1 (Shallow Piezo)	-									E	NR
ND MP2 (Shallow Piezo)	-									E	NR
ND MP3 (Shallow Piezo)	-									E	NR
ND MP4 (Shallow Piezo)	-									M	NR
ND MP5 (Shallow Piezo)	-									M	NR
ND MP6 (Shallow Piezo)	-									M	NR
ND MP7 (Shallow Piezo)										M	NR
NICKEL LAKE GAUGE (SG1)	-									M	NR
PUSLINCH LAKE GAUGE (LWL-06)	9202660	E	NR								
MP4 (Shallow Piezo)	-	M	NR								
MP9 (Shallow Piezo)	-	M	NR								
WATERLOO PROPANE LAKE GAUGE (SG2)	-									M	NR
Rain Gauge, Flow and TSS[7] Monitoring											
HILBORN RAIN GAUGE	-	M									
FM3-92 (flow station)	9201286	M	NR								
Hilborn Pond Discharge (TSS)	-	M	NR								
Cedarbrook Creek (At Avenue Road) (TSS)	-	M	NR								
Environmentally Sensitive Areas											
E1: Off of Roundabout	-	M	NR								
E2: Portuguese Swamp	-	M	NR								
E3: Stonebrook Road	-	M	NR								
E4: Cedarbrook Court	-	M	NR								
E5: Tln. Rd and Conc. 1	-	M	NR								
E6: McCormick Bog	-	M	NR								
E7: Ball Tract	-	M	NR								
E8: Puslinch Tract	-	M	NR								

NOTES:

M = Manual water level monitoring.

E = Electronic datalogger water level monitoring.

NR = No clear response to pumping.

1) Water levels in these wells were also monitored as part of the Region's Groundwater Monitoring Program.

2) As of July 2010, these wells have been incorporated into the Region's Groundwater Monitoring Program.

3) Interference at MW09-T3-01-2 during North Dumfries test due to South Guelph pumping test at GSTW1-08. Drawdown estimated based on recovery.

4) Drawdown at CMOW1-06 during the 28-day test, based on a manual measurement several days prior to end of test.

5) Well flowing prior to and after testing. Electronic data available when water level below Top of Casing.

6) In 2007 Well SM3A-93 was converted into the multi-level monitoring nest SM3ABC-07.

7) TSS = Total Suspended Solids monitoring

Table A9
Bedrock Aquifer Hydraulic Parameter Estimates

Well Field	Location	Pumping Well ID	OBJ_NUM Pumping Well	Observation Well	Test Date	T (m^2/day)	b (m)	K (m/s)	S	Data Source	Solution	Phase
Pinebush	Townline Roundabout	PBTW1-05	9202046	PBTW1-05	15-Sep-05	646	86	8.7E-05	N/A	Step Test	Theis (Step Test)	I
	Witmer Park	PBTW2-06	9202646	PBTW2-06	7-Jun-06	1173	96	1.4E-04	N/A	Step Test	Theis (Step Test)	I
	Witmer Park	PBPW1-06	9202645	PBPW1-06	16-Aug-06	688	98	8.1E-05	N/A	Step Test	Theis (Step Test)	I
	Witmer Park	PBPW1-06	9202645	Composite	1-Sep-06	688	98	8.1E-05	2E-05	28-Day Pumping Test	Cooper-Jacob	I
	Can-Amera Parkway	PBTW3-07	9203558	PBTW3-07	6-Feb-08	98	101	1.1E-05	N/A	Step Test	Theis (Step Test)	II
	Can-Amera Parkway	PBPW2-08	9203558	PBPW2-08	30-Apr-08	282	101	3.2E-05	N/A	Step Test	Theis (Step Test)	II
	Can-Amera Parkway	PBPW2-08	9203558	PBTW3-08 and PBPW2-08	5-May-08	333	101	3.8E-05	N/A	3-Day Pumping Test	Cooper-Jacob	II
Clemens Mills	Portuguese Club	CMTW1-05	9202045	CMTW1-05	13-Sep-05	535	97	6.4E-05	N/A	Step Test	Theis (Step Test)	I
	Portuguese Club	CMPW1-06	9202640	CMPW1-06	14-Aug-06	940	91	1.2E-04	N/A	Step Test	Theis (Step Test)	I
	Portuguese Club	CMPW1-06	9202640	Composite	1-Sep-06	534	91	6.8E-05	8E-06	28-Day Pumping Test	Cooper-Jacob	I
	Cedarbrook Crt.	CMTW2-05	9202048	CMTW2-05	Nov-05	645	87	8.6E-05	N/A	Step Test	Theis (Step Test)	I
	Cedarbrook Crt.	CMPW2-06	9202641	CMPW2-06	16-Aug-06	905	86	1.2E-04	N/A	Step Test	Theis (Step Test)	I
	Cedarbrook Crt.	CMPW2-06	9202641	Composite	1-Sep-06	653	86	8.8E-05	2E-05	28-Day Pumping Test	Cooper-Jacob	I
	Burnett Ave.	CMTW3-05	9202049	CMTW3-05	23-Nov-05	178	98	2.1E-05	N/A	Step Test	Theis (Step Test)	I
Shades Mill	Shades Mill Conservation Area	SMTW1-05	9202047	SMTW1-05	19-Sep-05	110	161	7.9E-06	N/A	Step Test	Theis (Step Test)	I
		SMTW2-07	9203419	SMTW2-07	18-Sep-07	78	105	8.6E-06	N/A	Step Test	Theis (Step Test)	II
		SMTW3-07	9203420	SMTW3-07	20-Sep-07	85	92	1.1E-05	N/A	Step Test	Theis (Step Test)	II
		SMTW4-08	9203543	SMTW4-08	29-Feb-09	333	102	3.8E-05	N/A	Step Test	Theis (Step Test)	II
		SMTW4-08	9203543	Composite	1-Mar-08	277	102	3.1E-05	7E-05	3-Day Pumping Test	Cooper-Jacob	II
	North Dumfries - Clyde Park	NDTW1-08	9203611	NDTW1-08	20-Oct-08	450	82.5	6.3E-05	N/A	Step Test	Theis (Step Test)	III
		NDTW2-08	9203612	NDTW2-08	16-Oct-08	443	87.8	5.8E-05	N/A	Step Test	Theis (Step Test)	III
		NDPW1-08	9203615	NDPW1-08	13-Jan-09	730	82.5	1.0E-04	N/A	Step Test	Theis (Step Test)	III
		NDPW1-08	9203615	Composite	13-Jan-09	434	82.5	6.1E-05	N/A	2-Day Pumping Test	Theis Recovery	III
		NDPW1-08	9203615	NDPW1-08	23-Sep-09	510	41	1.4E-04	N/A	Step Test	Theis (Step Test)	III
		NDPW1-08	9203615	Composite	24-Sep-09	305	41	8.6E-05	5E-05	6-Day Pumping Test	Cooper-Jacob	III

Water Quality Sampling and Analysis

Well_ID	Dates Sampled	Analytes	Number of Times Sampled
Phase I			
CMTW1-05	13-Sep-05	ODWS Parameters	1
PBTW1-05	15-Sep-05	ODWS Parameters	1
SMTW1-05	19-Sep-05	ODWS Parameters	1
CMTW2-05	18-Nov-05	ODWS Parameters	1
CMTW3-05	23-Nov-05	ODWS Parameters	1
CMPW1-06	20-Sep-06 to 29-Sep-06	ODWS Parameters	5
	28-Sep-06	Isotopes	1
	29-Sep-06	Radionuclides	1
CMPW2-06	6-Sep-06 to 29-Sep-06	ODWS Parameters	11
	28-Sep-06	Isotopes	1
	29-Sep-06	Radionuclides	1
PBPW1-06	15-Sep-06 to 29-Sep-06	ODWS Parameters	7
	28-Sep-06	Isotopes	1
	29-Sep-06	Radionuclides	1
6699 Concession 1	28-Sep-06	ODWS Parameters	1
	28-Sep-06	Isotopes	1
	29-Sep-06	Radionuclides	1
TW10-78	28-Sep-06	ODWS Parameters	1
	28-Sep-06	Isotopes	1
	29-Sep-06	Radionuclides	1
Discharge from Hilborn Pond	5-Sep-06 to 25-Sep-06	TSS	25
Cedarbrook Creek (At Avenue Rd)	5-Sep-06 to 25-Sep-06	TSS	25
Phase II			
PBTW3-07	07-Feb-07	ODWS Parameters	1
SMTW2-07	18-Sep-07	ODWS Parameters	1
SMTW3-07	20-Sep-07	ODWS Parameters	1
SMTW2A-07	30-Oct-07	ODWS Parameters	1
SMTW2B-07	30-Oct-07	ODWS Parameters	1
SMTW2C-07	30-Oct-07	ODWS Parameters	1
SMTW3A-07	30-Oct-07	ODWS Parameters	1
SMTW3B-07	30-Oct-07	ODWS Parameters	1
SMTW3C-07	30-Oct-07	ODWS Parameters	1
SM3A-07	31-Oct-07	ODWS Parameters	1
SM3B-07	31-Oct-07	ODWS Parameters	1
SM3C-07	31-Oct-07	ODWS Parameters	1
CMOW2A-06	01-Nov-07	ODWS Parameters	1
CMOW2B-06	01-Nov-07	ODWS Parameters	1
CMOW2C-06	01-Nov-07	ODWS Parameters	1
SMTW1A-07	02-Nov-07	ODWS Parameters	1
SMTW1B-07	02-Nov-07	ODWS Parameters	1
SMTW1C-07	02-Nov-07	ODWS Parameters	1
SMTW4-08	03-Mar-08 to 05-Mar-08	ODWS Parameters	3
PBPW2-08	05-May-08 to 08-May-08	ODWS Parameters	3
Phase III			
NDTW1-08	16-Oct-08	ODWS Parameters	1
NDTW2-08	23-Nov-08	ODWS Parameters	1
NDPW1-08	14-Jan-09; 24-Sept-09 to 30-Sept-09	ODWS Parameters	4

Table A11
Inorganic Water Chemistry Results

Sampling Location			CMTW1-05	PBTW1-05	SMTW1-05	CMTW3-05	CMTW2-05	CMPW1-06[5]	CMPW2-06[5]	PBPW1-06[5]
Sampling Date			13-Sep-05	15-Sep-05	19-Sep-05	20-Oct-08	18-Nov-05	29-Sep-06	29-Sep-06	29-Sep-06
Inorganic parameters	ODWS[1]		Phase I							
	MAC[2]	AO/OG[3]								
Alkalinity as $CaCO_3$ (mg/L)		30-500	219	254	226	228	225	232	232	227
Aluminium (mg/L)		0.1	<0.005	0.005	0.092	0.011	<0.005	<0.010	<0.010	< 0.010
Calcium (mg/L)			88.5	83.9	235	203	155	118	87	133
Chloride (mg/L)		250	8.38	12.2	11.8	28.8	11.5	8.82	13.5	23.2
Dissolved Organic Carbon (mg/L)		5	0.6	1.7	0.9	0.8	<0.5	0.8	0.7	1.7
Hardness (mg/L)		80-100	343	310	791	755	602	473	351	537
Iron (mg/L)		0.3	0.044	0.552	0.227	0.129	0.049	0.192	0.121	0.06
Magnesium (mg/L)			29.7	24.5	49.5	60.3	52.3	43.4	32.4	49.8
Manganese (mg/L)		0.05	0.002	0.038	0.015	0.008	0.005	0.006	0.002	0.004
Nitrate-N (mg/L)	10		<0.10	<0.10	<0.10	< 0.10	<0.10	<0.10	<0.10	< 0.10
Nitrite-N (mg/L)	1		<0.010	<0.010	<0.010	< 0.015	<0.010	<0.015	<0.015	< 0.015
pH (pH Units)[4]		6.5-8.5	7.57*	7.45*	7.43*	6.99*	7.03*	7.62*	7.29*	6.90*
Potassium (mg/L)			1.11	0.88	1.02	1.82	1.48	1.24	1.2	1.56
Sodium (mg/L)		200	7.39	5.23	11.4	18.8	9.34	8.4	9.8	14.7
Sulphate (mg/L)		500	80.9	23.7	492	465	358	208	90.1	250

NOTES:

1) ODWS - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2006
2) MAC - Maximum Acceptable Concentration
3) AO/OG - Aesthetic Objective and/or Operational Guideline
4) * pH estimated due to exceeded holding time
5) Test Production Wells (CMPW1-06, CMPW2-06 and PBTW1-06) values are from samples collected at the end of the 28-day Pumping Test
6) Test Well SMTW4-08 values are from samples collected at the end of the 3-day Pumping Test.

- indicates parameter exceeds AO/OG

Table A11
Inorganic Water Chemistry Results

Sampling Location			SMTW2-07	SMTW3-07	PBTW3-07	SMTW4-08[6]	NDTW1-08	NDTW2-08	NDPW1-08	NDPW1-08
Sampling Date			18-Sep-07	20-Sep-07	07-Feb-08	05-Mar-08	16-Oct-08	23-Nov-05	14-Jan-09	30-Sep-09
Inorganic parameters	ODWS[1]		Phase II				Phase III			
	MAC[2]	AO/OG[3]								
Alkalinity as $CaCO_3$ (mg/L)		30-500	206	206	235	215	225	265	250	223
Aluminium (mg/L)		0.1	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.006	<0.010	<0.010
Calcium (mg/L)			598	504	85.1	263	149	80.9	94.1	141
Chloride (mg/L)		250	31.1	18.6	2.01	19.3	23.6	4.49	15.5	24.5
Dissolved Organic Carbon (mg/L)		5	1.1	< 0.5	0.6	0.5	0.6	1.1	0.9	0.9
Hardness (mg/L)		80-100	1900	1630	329	980	574	318	364	558
Iron (mg/L)		0.3	0.132	0.12	0.034	0.084	0.097	0.089	0.244	0.073
Magnesium (mg/L)			97.7	89.4	28.4	78.4	49.1	28.1	31.3	50.1
Manganese (mg/L)		0.05	0.015	0.012	0.003	0.005	0.004	0.048	0.005	0.004
Nitrate-N (mg/L)	10		< 0.10	< 0.10	<0.10	< 0.10	< 0.10	<0.10	<0.10	<0.10
Nitrite-N (mg/L)	1		< 0.015	< 0.015	<0.015	< 0.015	< 0.015	<0.010	<0.015	<0.015
pH (pH Units)[4]		6.5-8.5	7.35*	7.29*	7.24*	7.26*	7.16*	8.15*	7.22*	7.54*
Potassium (mg/L)			2.05	1.75	0.88	1.63	1.62	0.85	1.16	1.64
Sodium (mg/L)		200	26.5	20.3	4.6	16.5	14.8	3.53	9.5	13.4
Sulphate (mg/L)		500	1530	1300	72.8	734	281	28.1	89.4	278

NOTES:

1) ODWS - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2006
2) MAC - Maximum Acceptable Concentration
3) AO/OG - Aesthetic Objective and/or Operational Guideline
4) * pH estimated due to exceeded holding time
5) Test Production Wells (CMPW1-06, CMPW2-06 and PBTW1-06) values are from samples collected at the end of the 28-day Pumping Test
6) Test Well SMTW4-08 values are from samples collected at the end of the 3-day Pumping Test.

- indicates parameter exceeds AO/OG

Isotope and Radionuclide Results

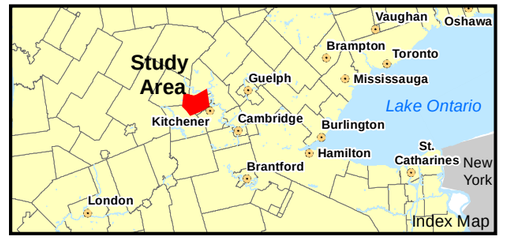
Sampling Location	CMPW1-06	CMPW2-06	PBPW1-06	6699 CONCESSION 1 (9203311)	TW10-78
Sampling Date	28-Sep-06	28-Sep-06	28-Sep-06	28-Sep-06	28-Sep-06
Isotope analysis					
$\delta^{18}O$ (oxygen-18)	-9.87	-10.03	-10.2	-10.13	-9.34
$\delta^{2}H$ (deuterium)	-69.34	-69.3	-68.72	-68.21	-66.76
^{3}H (tritium) (TU)	1.3 +/- 0.4	<0.8 +/- 0.4	5.7 +/- 0.6	13.1 +/- 1.0	14.5 +/- 1.1
$\delta^{34}S$ (sulphur-34)	26.61	29.08	24.56	2.71	3.26
Radionuclides					
Gross Alpha (Bq/l)	<0.1	<0.1	<0.1	<0.1	<0.1
Gross Beta (Bq/l)	<0.1	<0.1	<0.1	<0.1	<0.1
Tritium (Bq/l)	<1000	<1000	<1000	<1000	<1000

FIGURES



LEGEND

- IUS Project Monitoring Well
- Municipal Supply Well
- Test Well/Test Production Well
- IUS Project Test Well
- Treatment Plant
- Railway
- Watercourse
- Waterbody
- GRCA Provincially Significant Wetlands
- ESAs
- Municipality



REFERENCE

Base Data - MNRF LIO obtained 2016
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GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5 2
Kilometres

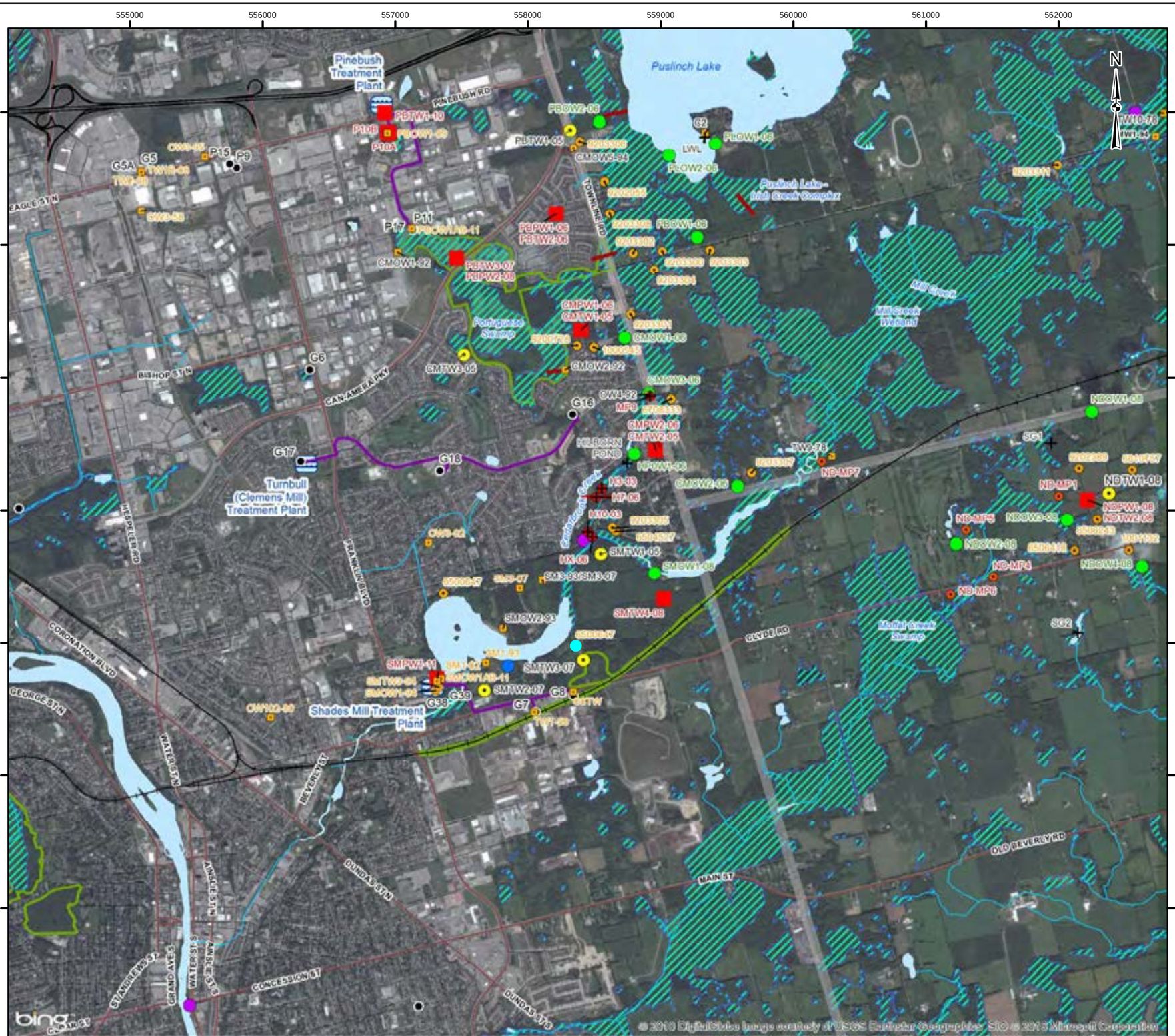
PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE
IUS PROJECT DRILLING LOCATIONS

Golder Associates
Mississauga, Ontario

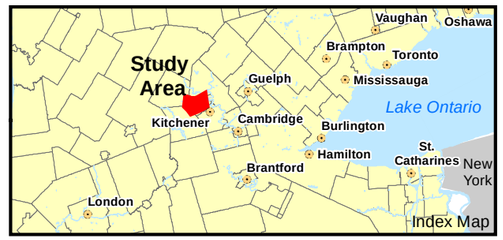
PROJECT NO. 05-1112-010		SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005	FIGURE: A1
GIS	PR	30 Jun. 2016	
CHECK	JLH	30 Jun. 2016	
REVIEW	JAP	30 Jun. 2016	

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\FigA1_IUS_Project_Drilling_Locations.mxd



LEGEND

- IUS Project Monitoring Well
- Municipal Supply Well
- Test Well/Test Production Well
- IUS Project Test Well
- Monitoring Well (not including IUS project wells)
- Monitored Private Well
- Mini-Piezometer
- Surface Water Level Station
- Rain Gauge Station
- Stream Flow Station
- Treatment Plant
- Railway
- Existing Raw Watermain Route
- Ecological Monitoring Station
- Watercourse
- Waterbody
- GRCA Provincially Significant Wetlands
- ESAs
- Municipalities



REFERENCE

Base Data - MNRF LIO obtained 2016
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GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5 2
Kilometres

PROJECT

CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE

MONITORING LOCATIONS

Golder Associates
Mississauga, Ontario

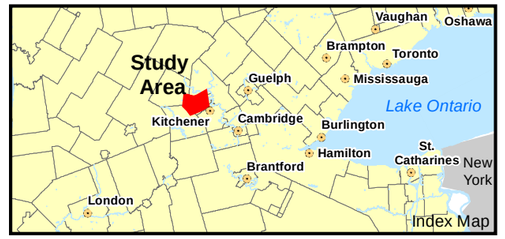
PROJECT NO. 05-1112-010			SCALE 1:30,000		REV. 1
DESIGN	CGG	10 Mar. 2005	FIGURE: A2		
GIS	PR	30 Jun. 2016			
CHECK	JLH	30 Jun. 2016			
REVIEW	JAP	30 Jun. 2016			

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\CambridgeVCambride_East_Class_EA_2016\FigA2_Test_Well_and_Monitoring_Locations.mxd



LEGEND

- IUS Project Monitoring Well
- Municipal Supply Well
- Test Well/Test Production Well
- IUS Project Test Well
- Treatment Plant
- Discharge Conveyance
- Railway
- Watercourse
- Waterbody
- GRCA Provincially Significant Wetlands
- ESAs
- Municipality



REFERENCE

Base Data - MNRF LIO obtained 2016
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Datum: NAD 83 Projection: UTM Zone 17N

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Kilometres

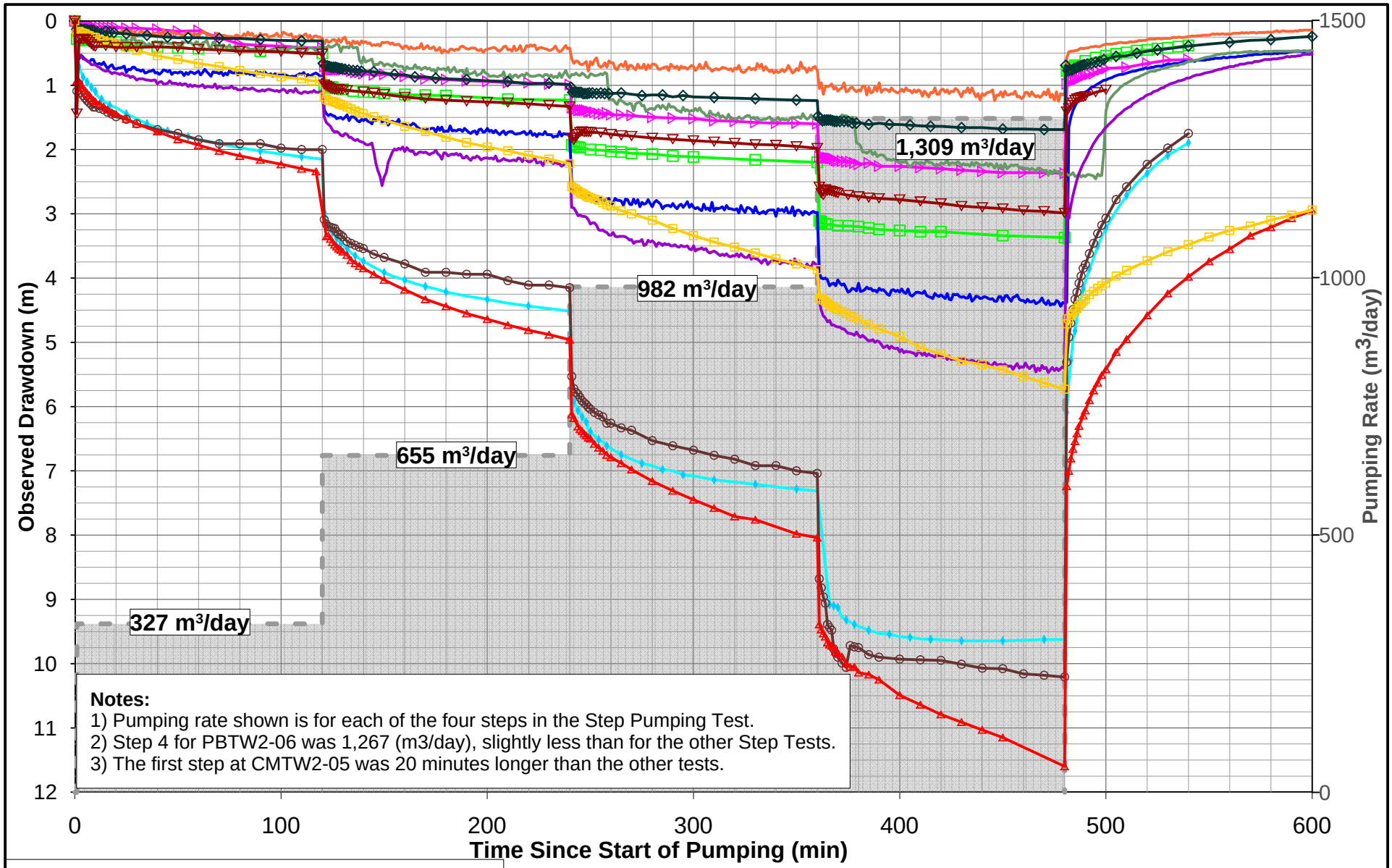
PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE
DISCHARGE CONVEYANCE

Golder Associates
Mississauga, Ontario

PROJECT NO. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005	FIGURE: A3	
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\CambridgeCambride_East_Class_EA_2016\FigA1_New_Site_Instrumentation.mxd

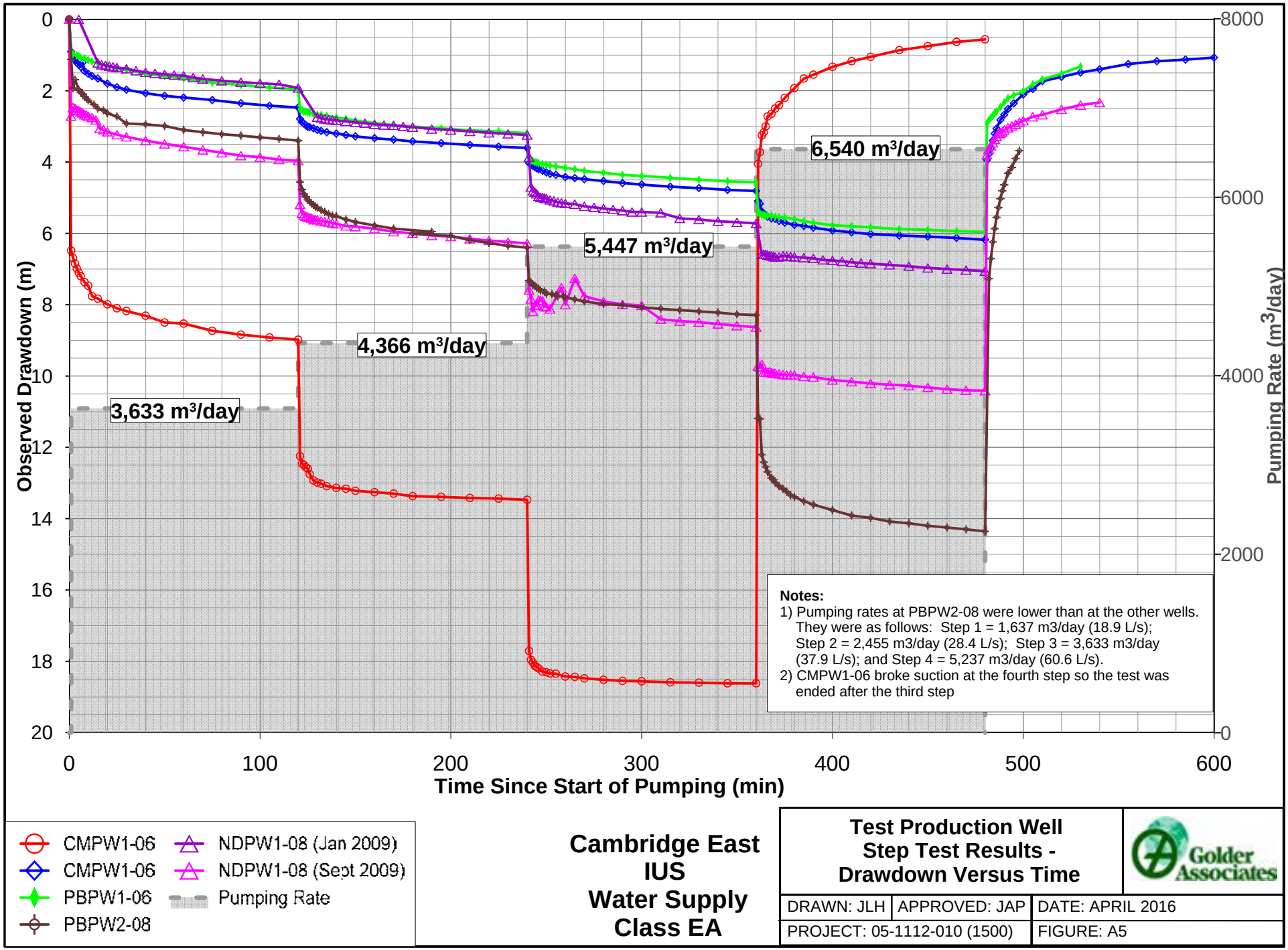


Cambridge East IUS Water Supply Class EA

Test Well Step Test Results Drawdown Versus Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4

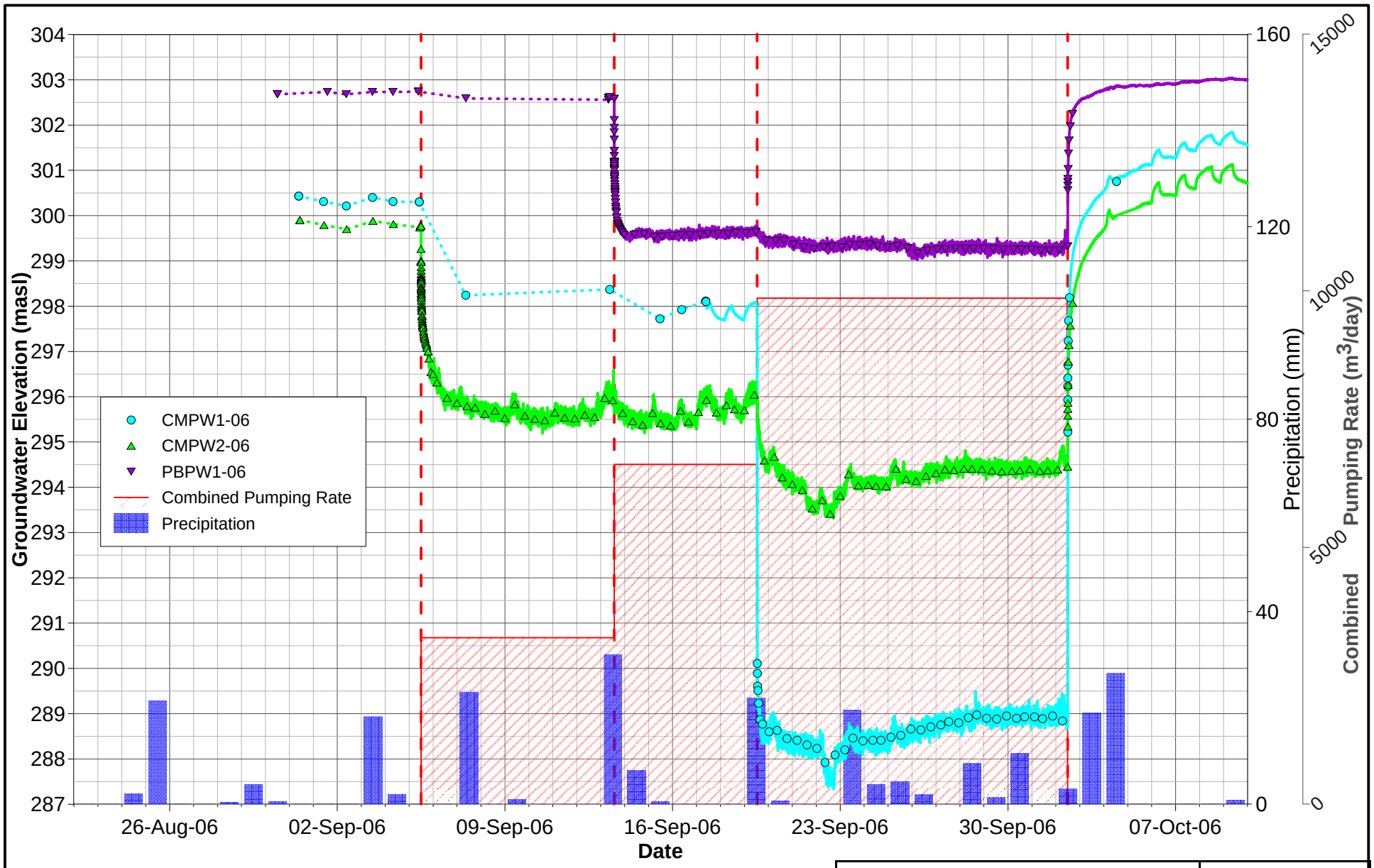


Cambridge East IUS Water Supply Class EA

Test Production Well Step Test Results - Drawdown Versus Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A5



Notes:

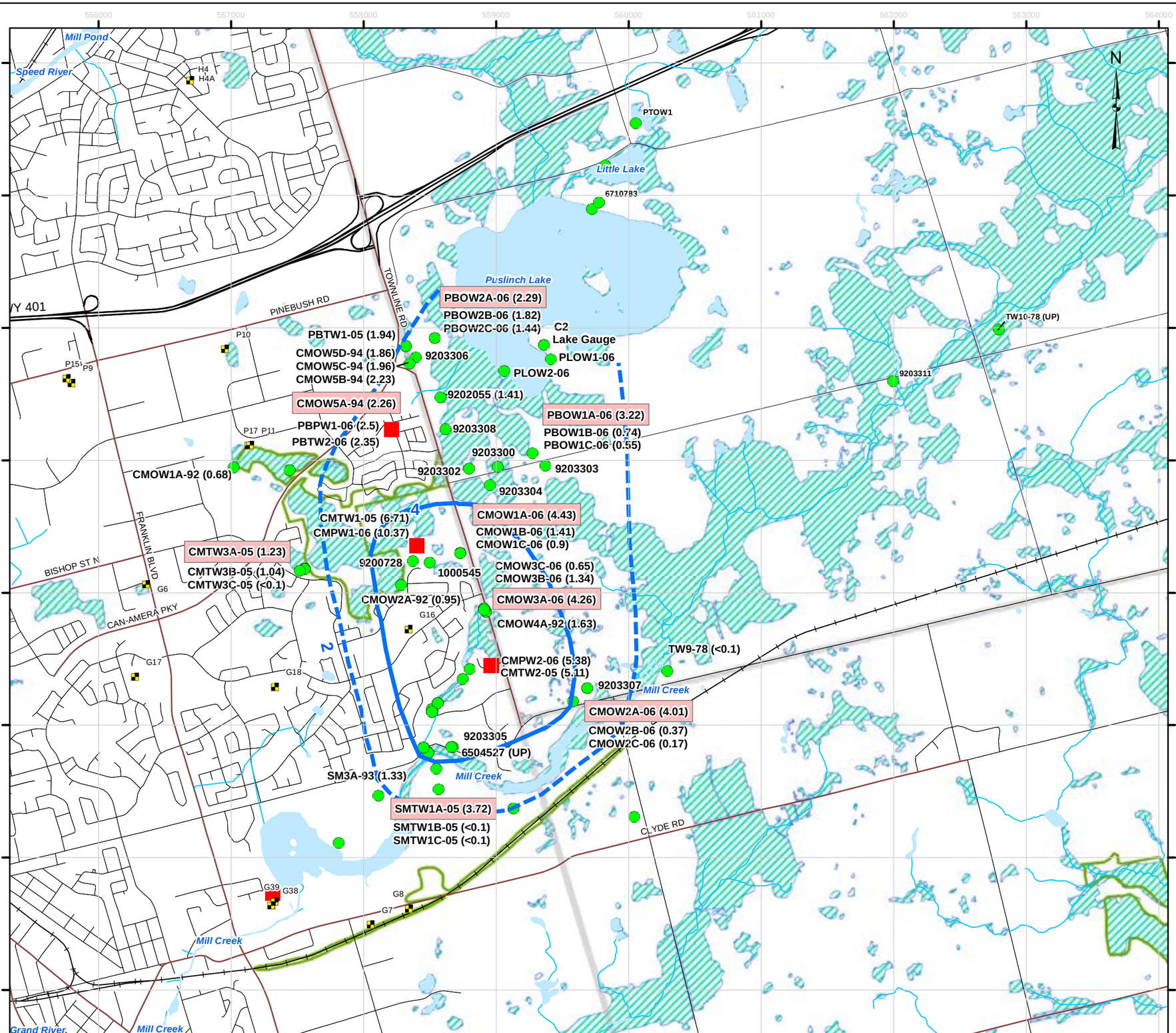
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test
Test Production Wells
Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6



LEGEND

- Municipal Supply Wells
- Monitored Wells
- Test Production Wells
- Principal Highway
- Major Roads
- Local Roads
- Railway
- Gasport Formation Bedrock Drawdown contour line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Gasport Formation Monitored Interval



REFERENCE

Base Data - MNRF LIO obtained 2016
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GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

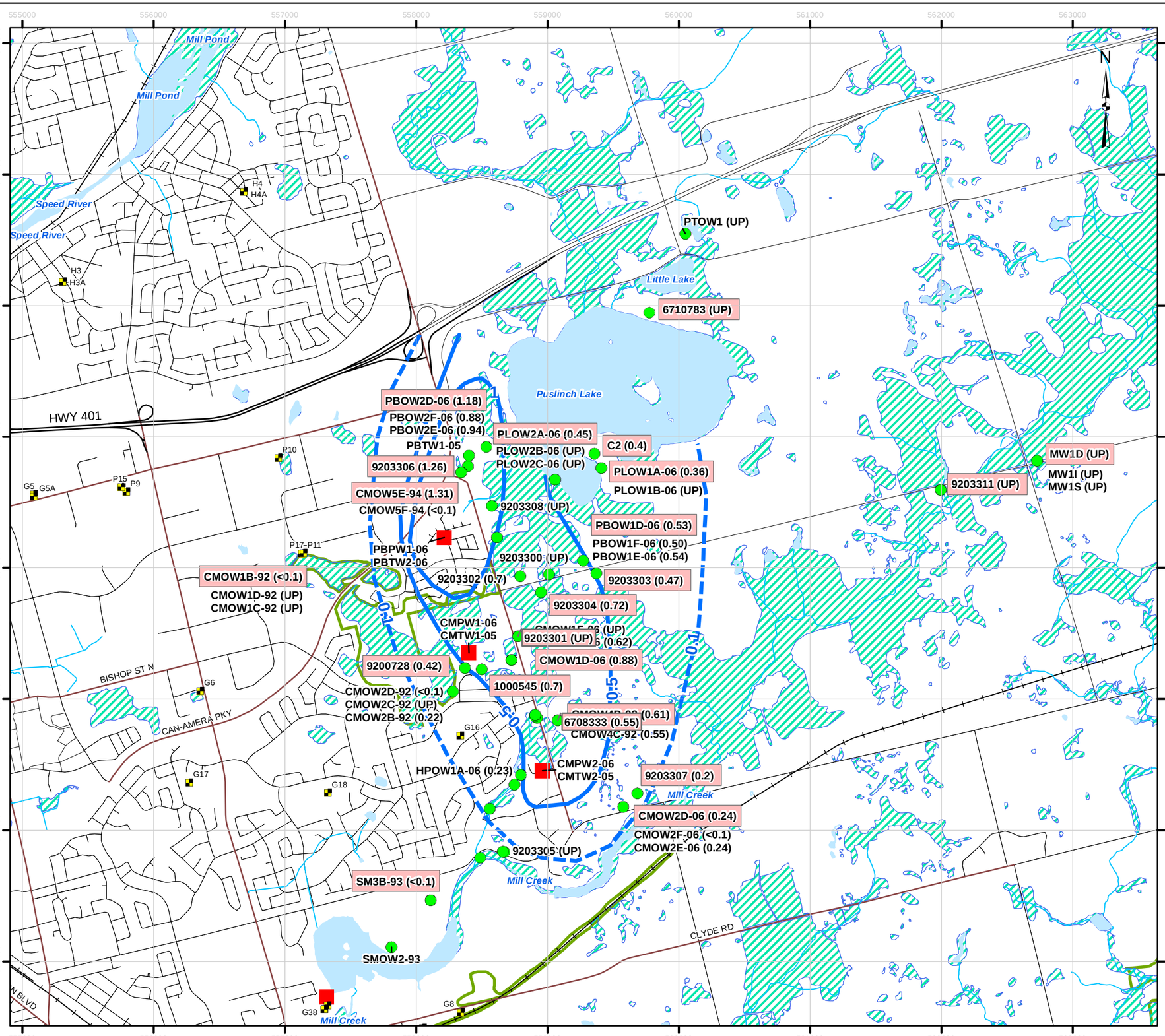
PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE
PHASE I 28-DAY PUMPING TEST (CMPW1-06, CMPW2-06 AND PBPW1-06), BEDROCK RESPONSE – GASPORT FORMATION

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005	**FIGURE: A7**	
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

G:\Projects\2005\05-1112-010_IUS_Groundwater_WaterlooGIS\MXDs\Draft\CambridgeCambride_East_Class_EA_2016\FigA7_PhaseI_28_Day_PumpingTest_GasportFormation.mxd



LEGEND

- Municipal Supply Wells
- Test Production Wells
- Monitored Wells
- Principal Highway
- Major Roads
- Local Roads
- Railway
- Lower Overburden Drawdown Contour Line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Lower overburden monitored interval



REFERENCE

Base Data - MNRF LIO obtained 2016
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GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

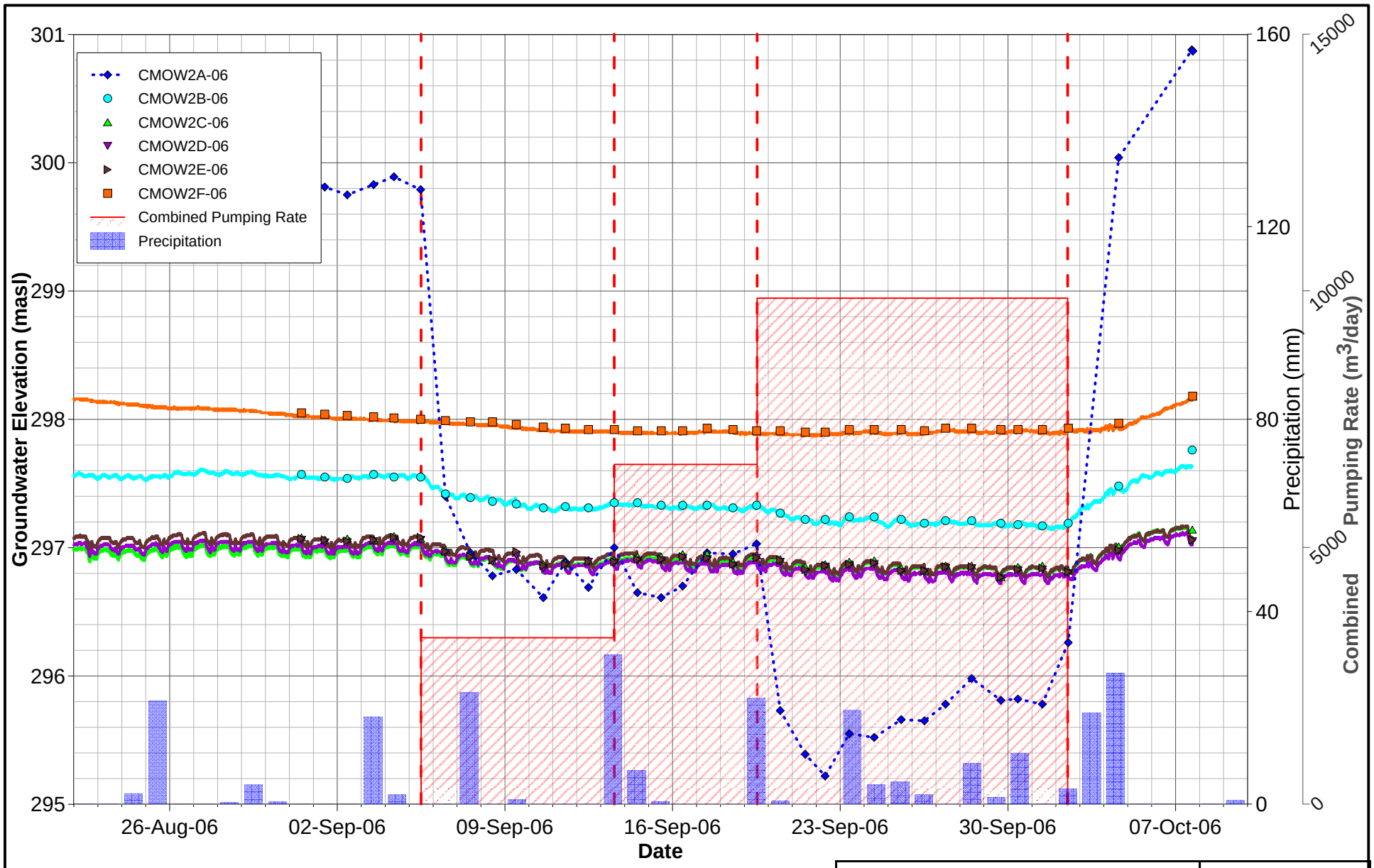
PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE
PHASE I 28-DAY PUMPING TEST
(CMPW1-06, CMPW2-06 AND PBPW1-06)
LOWER OVERBURDEN RESPONSE

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005	FIGURE: A8	
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\Figure8_PhaseI_28_Day_PumpingTest_OverburdenResponse.mxd



Notes:

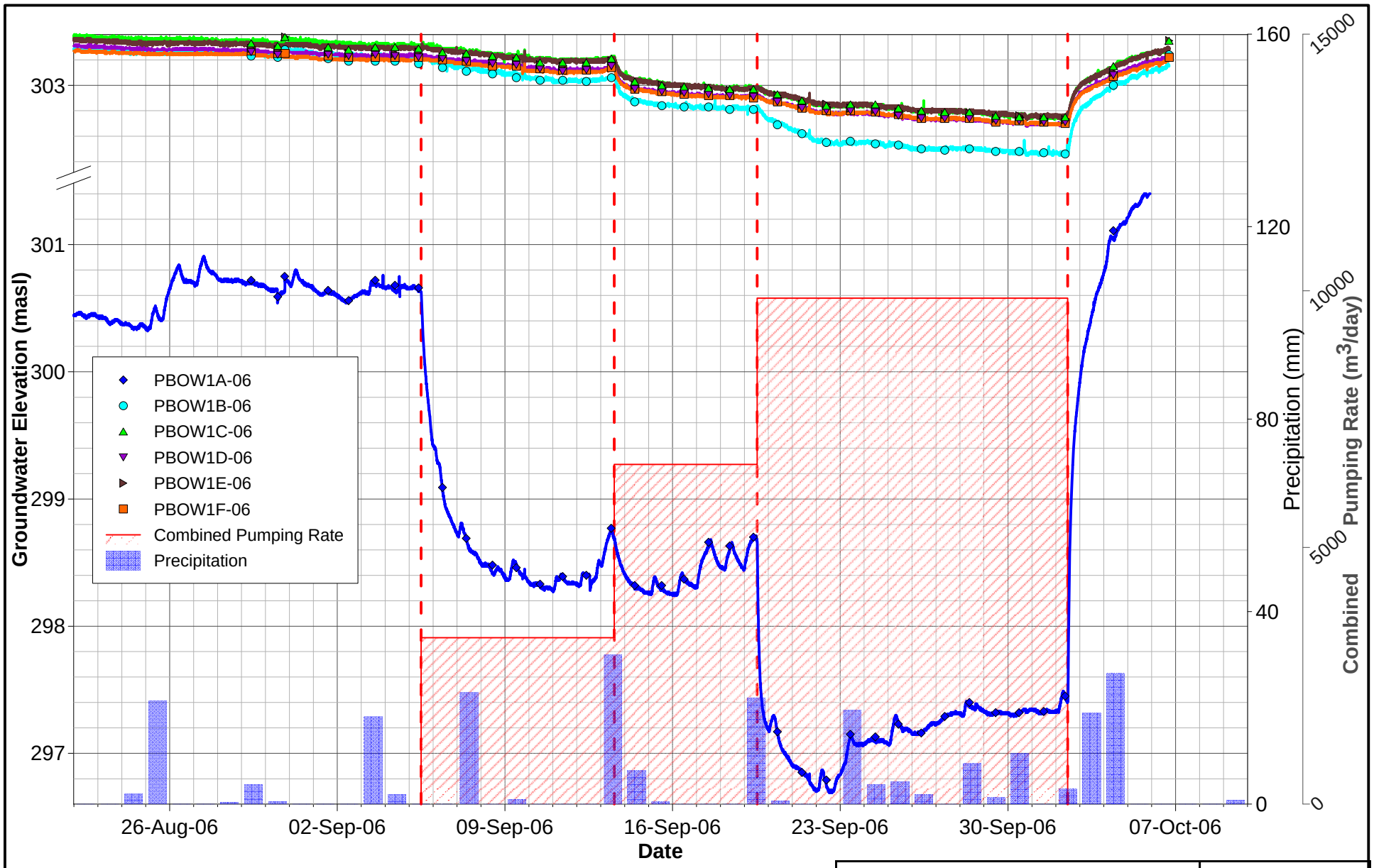
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test CMOW2-06 Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A9



Notes:

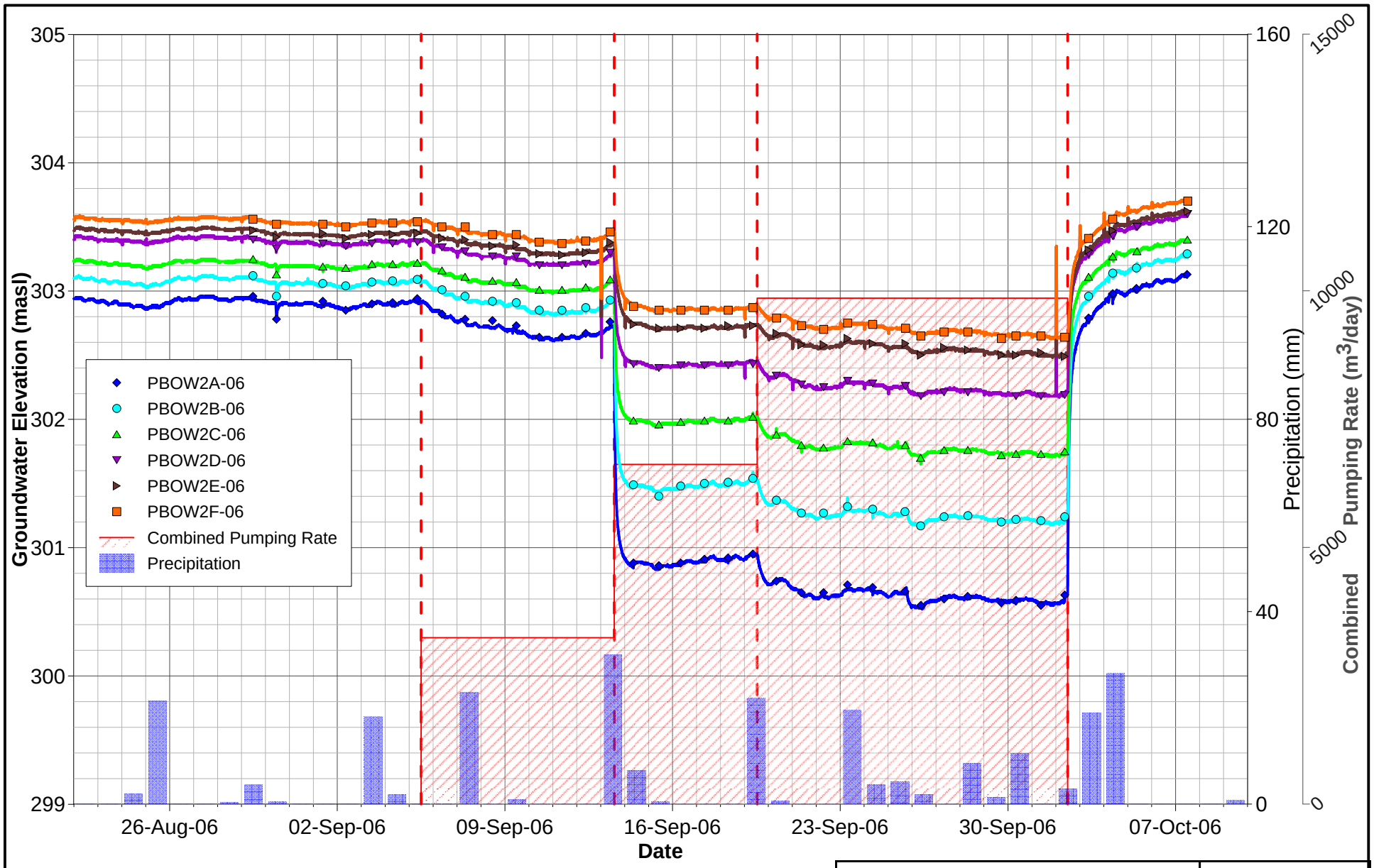
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test PBOW1-06 Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A10



Notes:

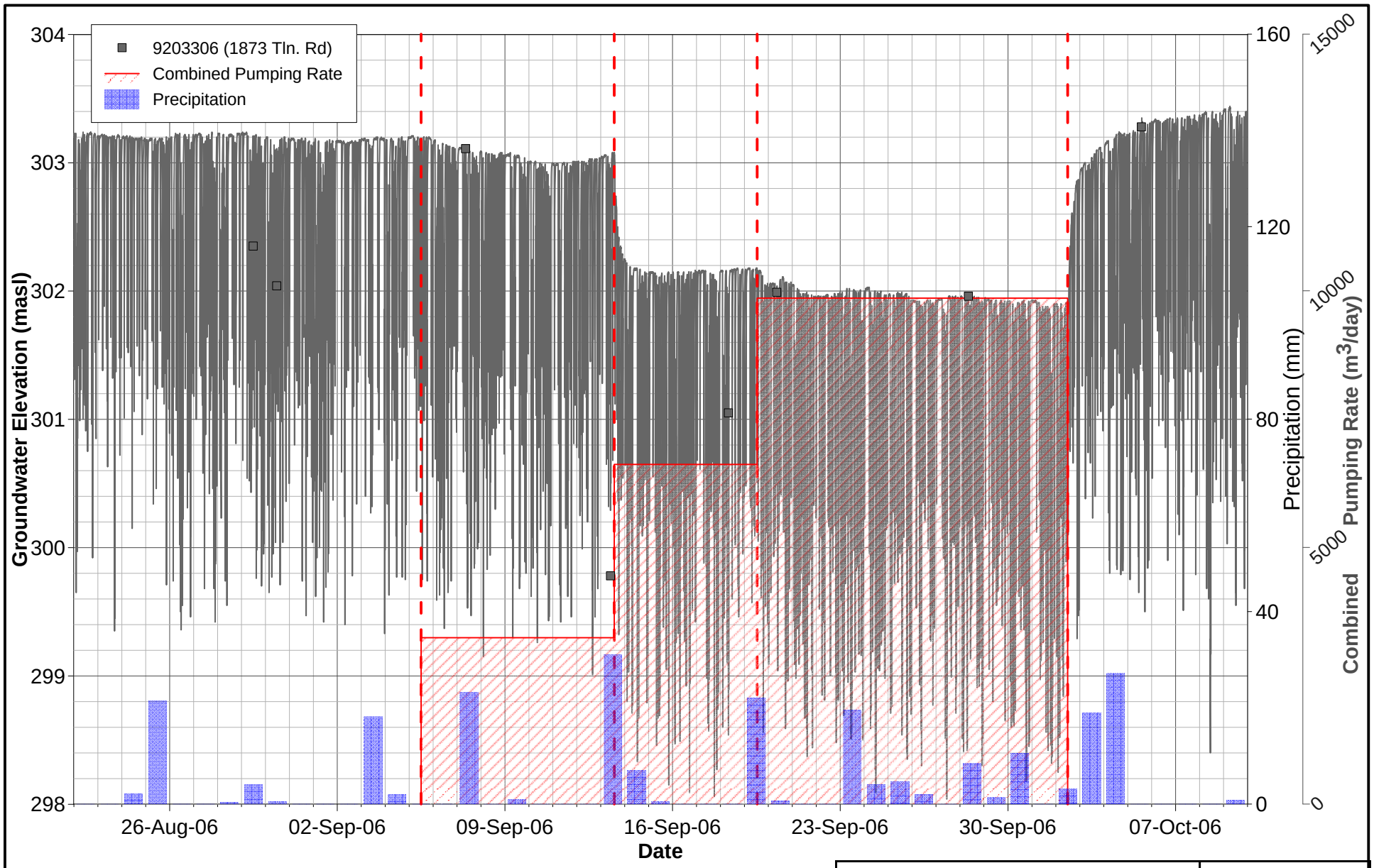
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test PBOW2-06 Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A11



Notes:

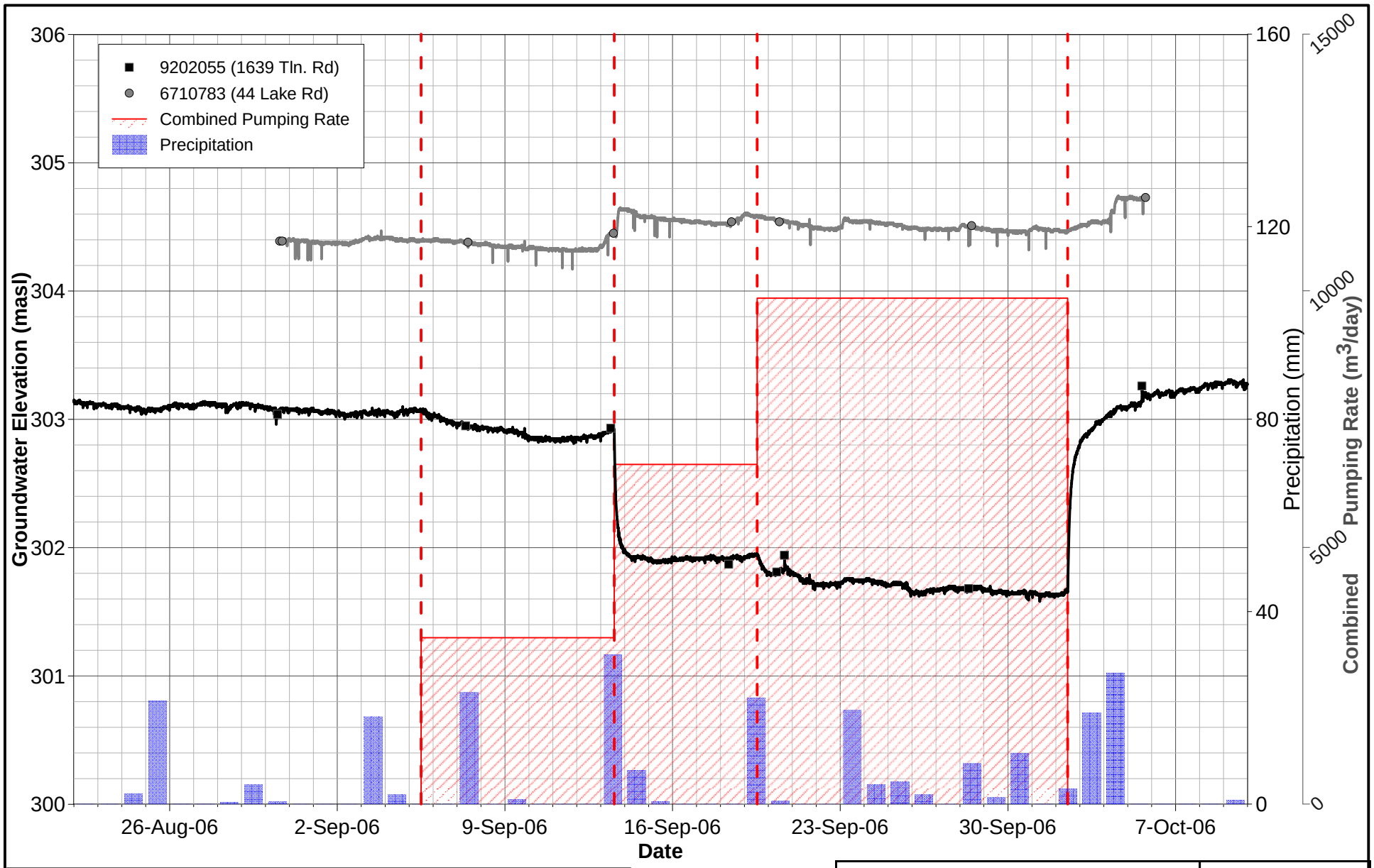
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test Private Well Example A Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A12



Notes:

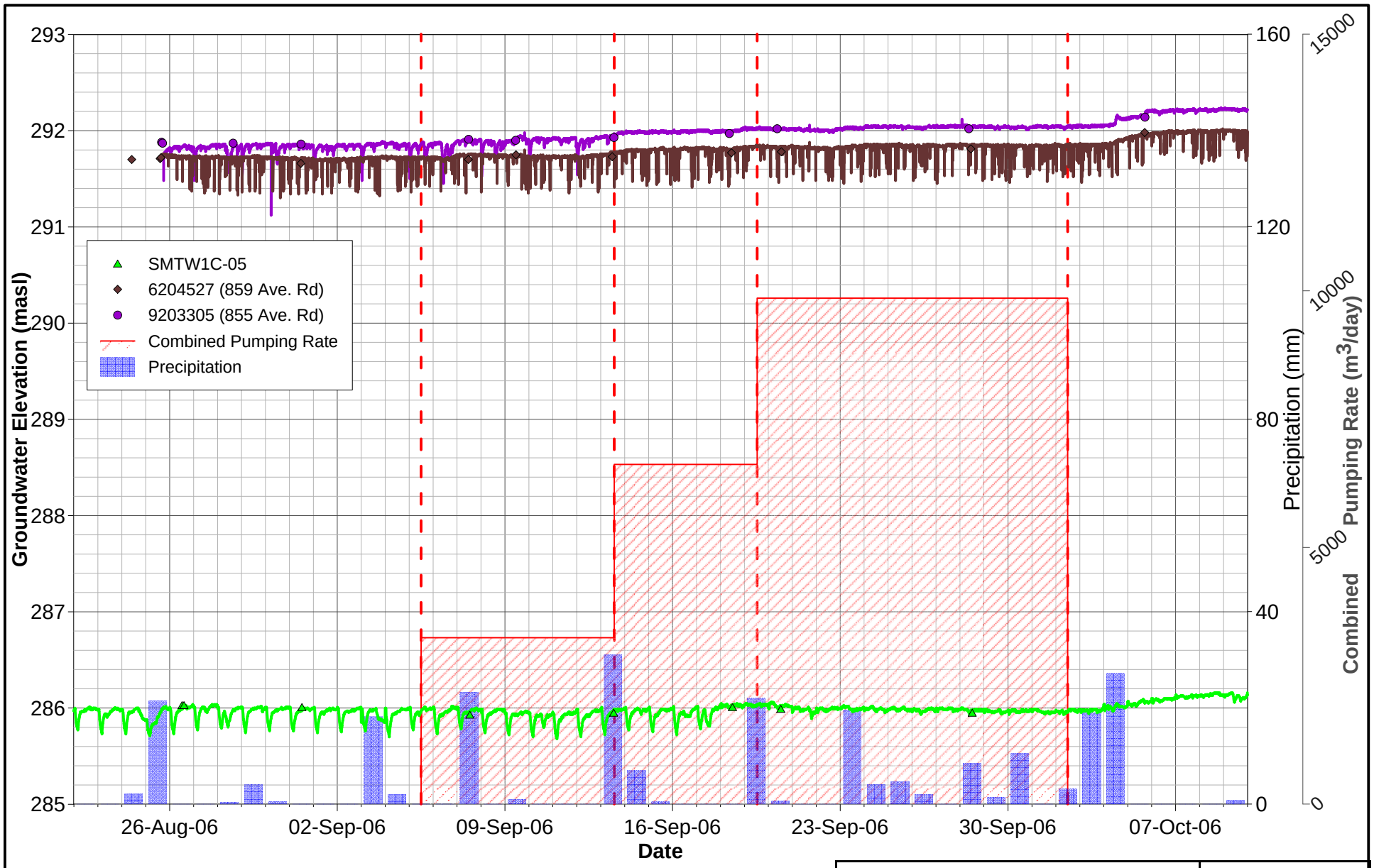
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test
Private Well Example B
Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A13



Notes:

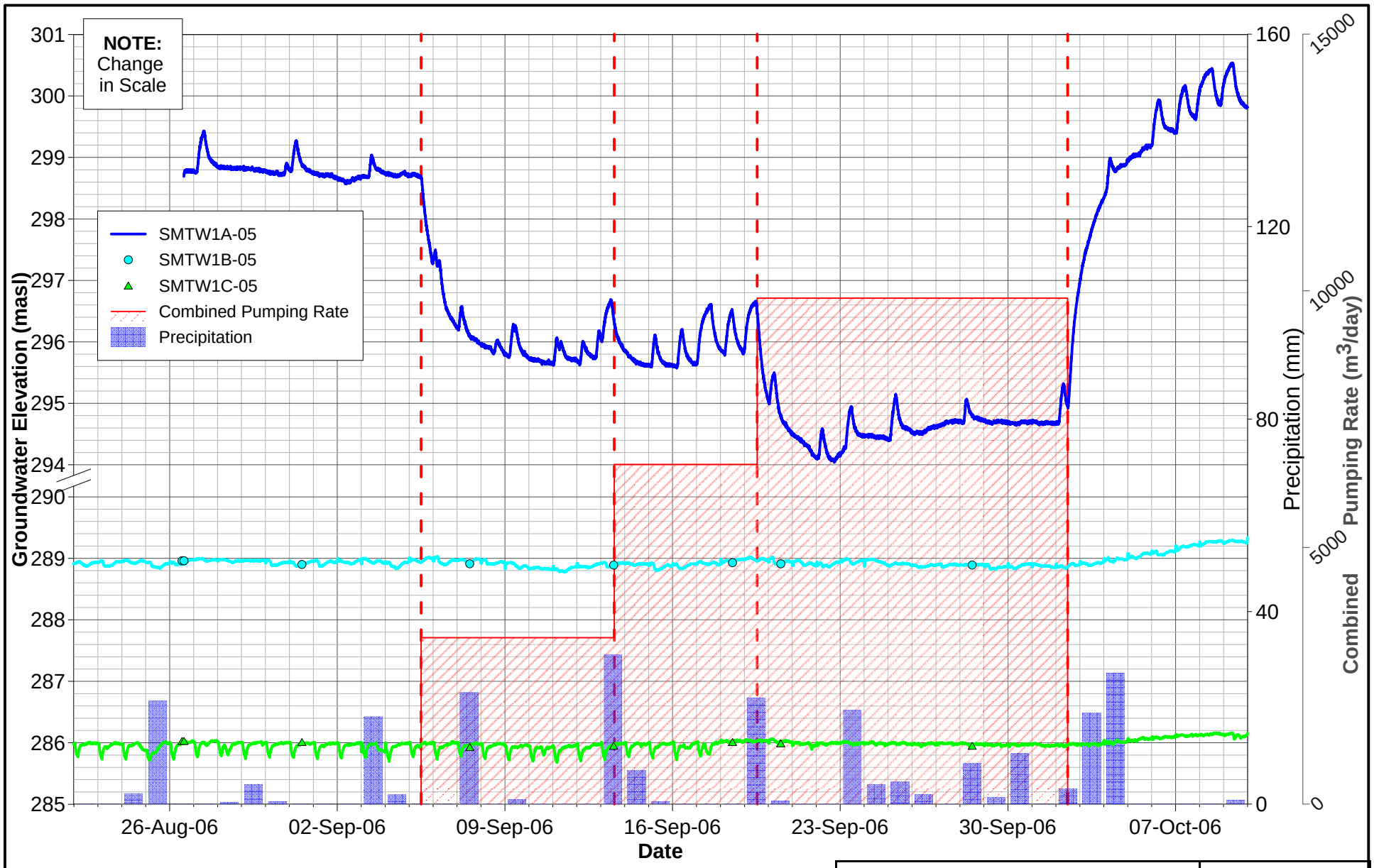
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test Mill Creek Area Wells A Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A14



Notes:

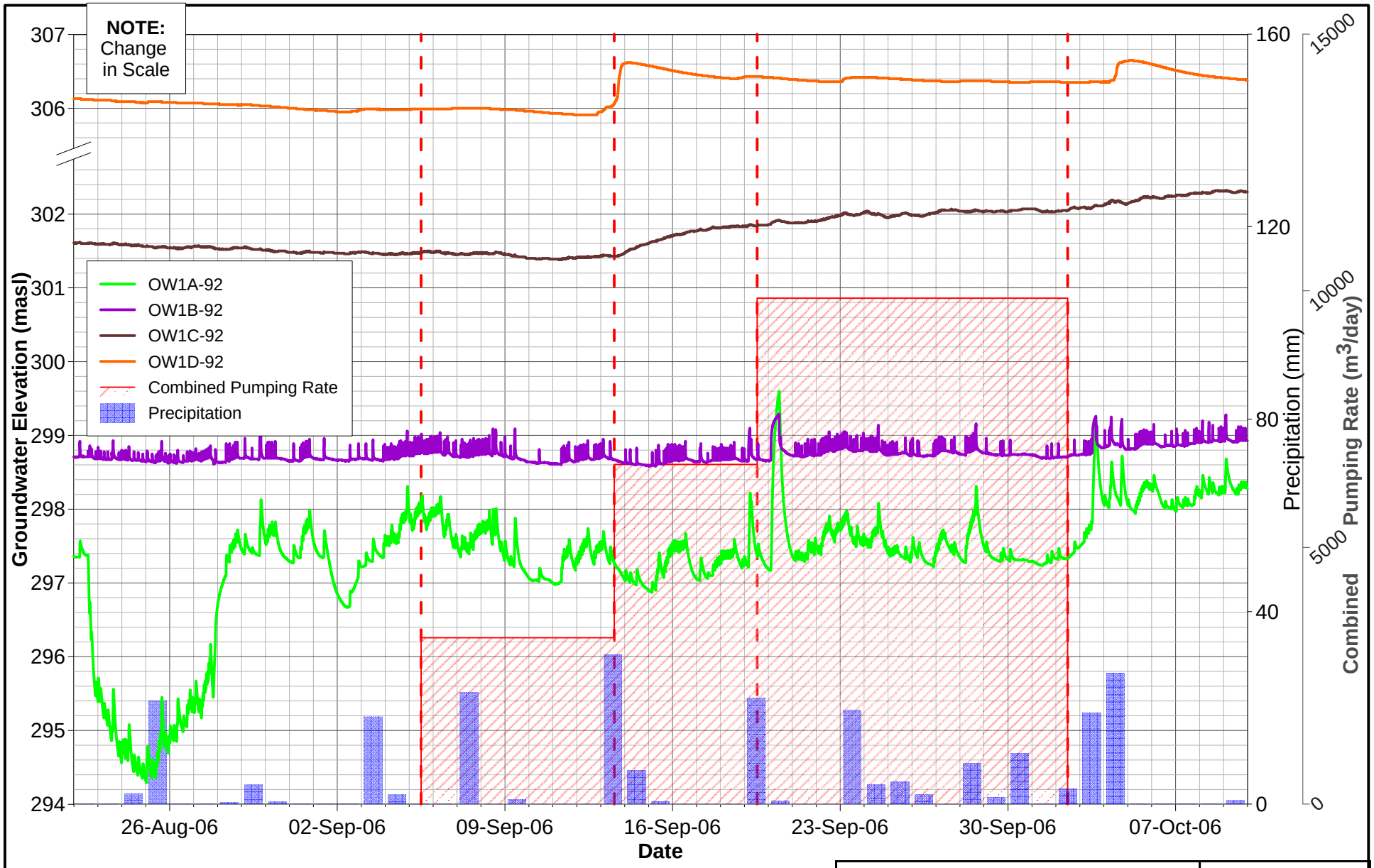
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test
Mill Creek Area Wells B
Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A15



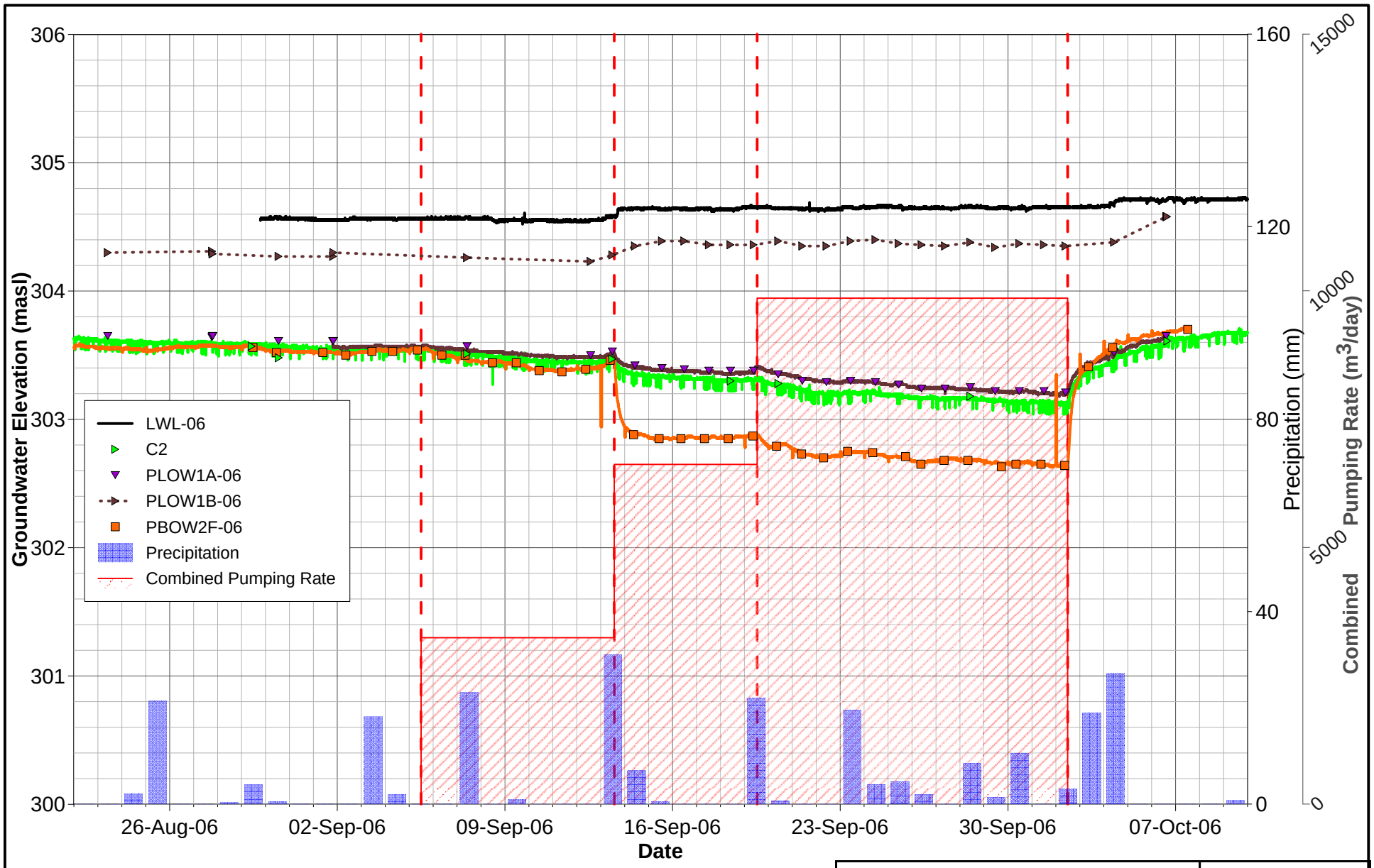
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test Portuguese Bog Area Wells Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A16



Notes:

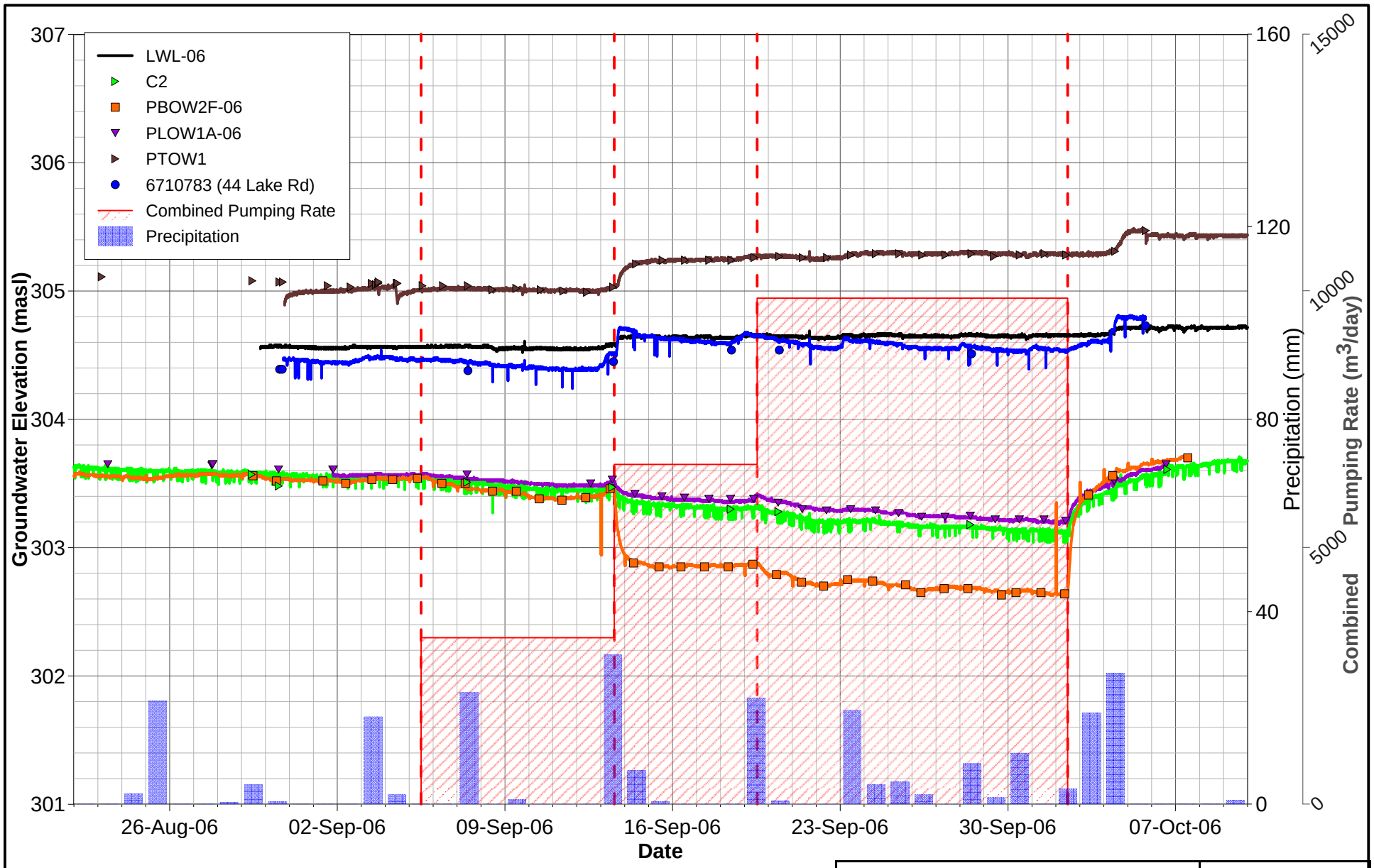
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test Puslinch Lake Area Wells A Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A17



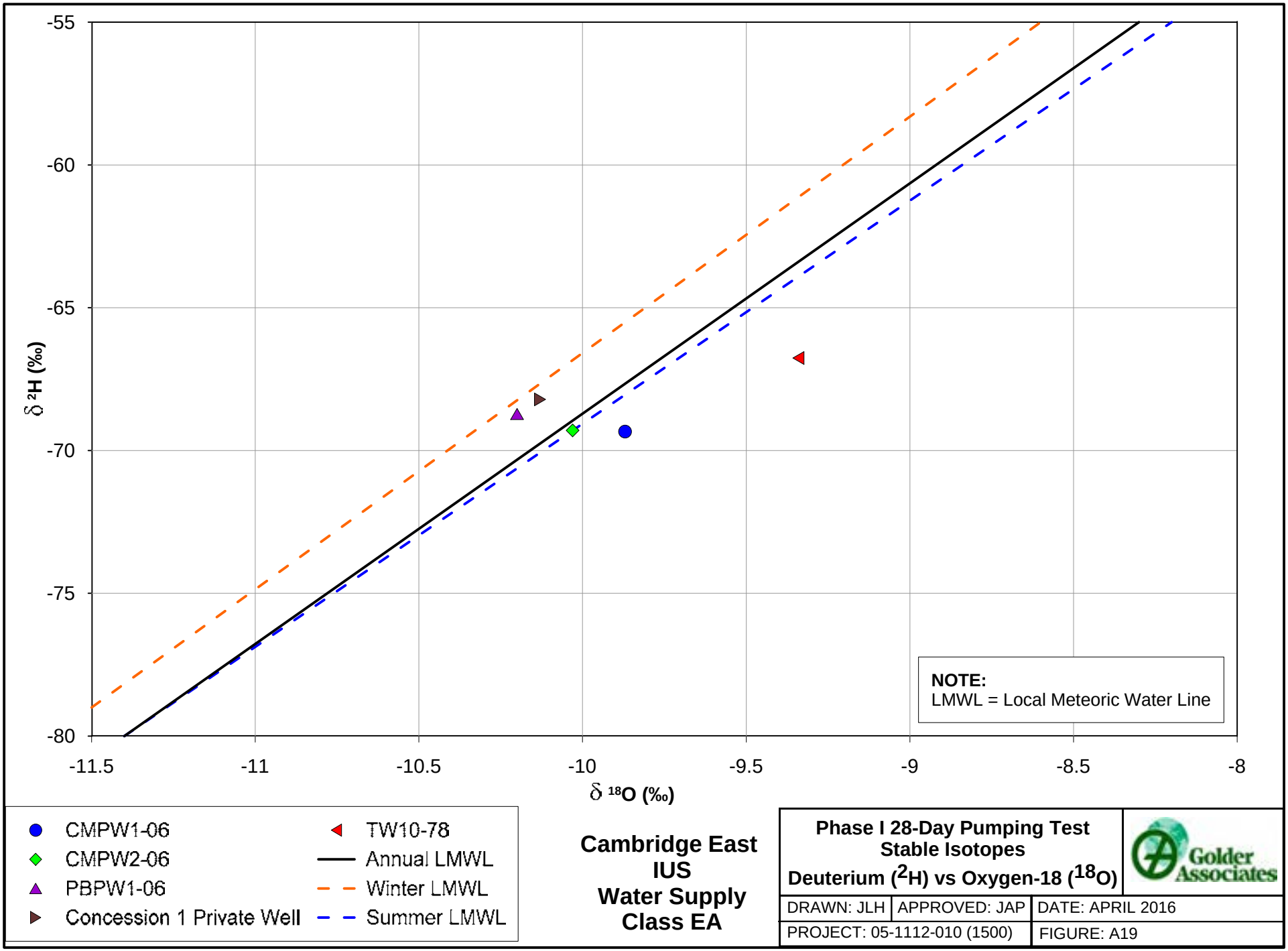
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m^3/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m^3/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m^3/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test Puslinch Lake Area Wells B Hydrographs

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A18

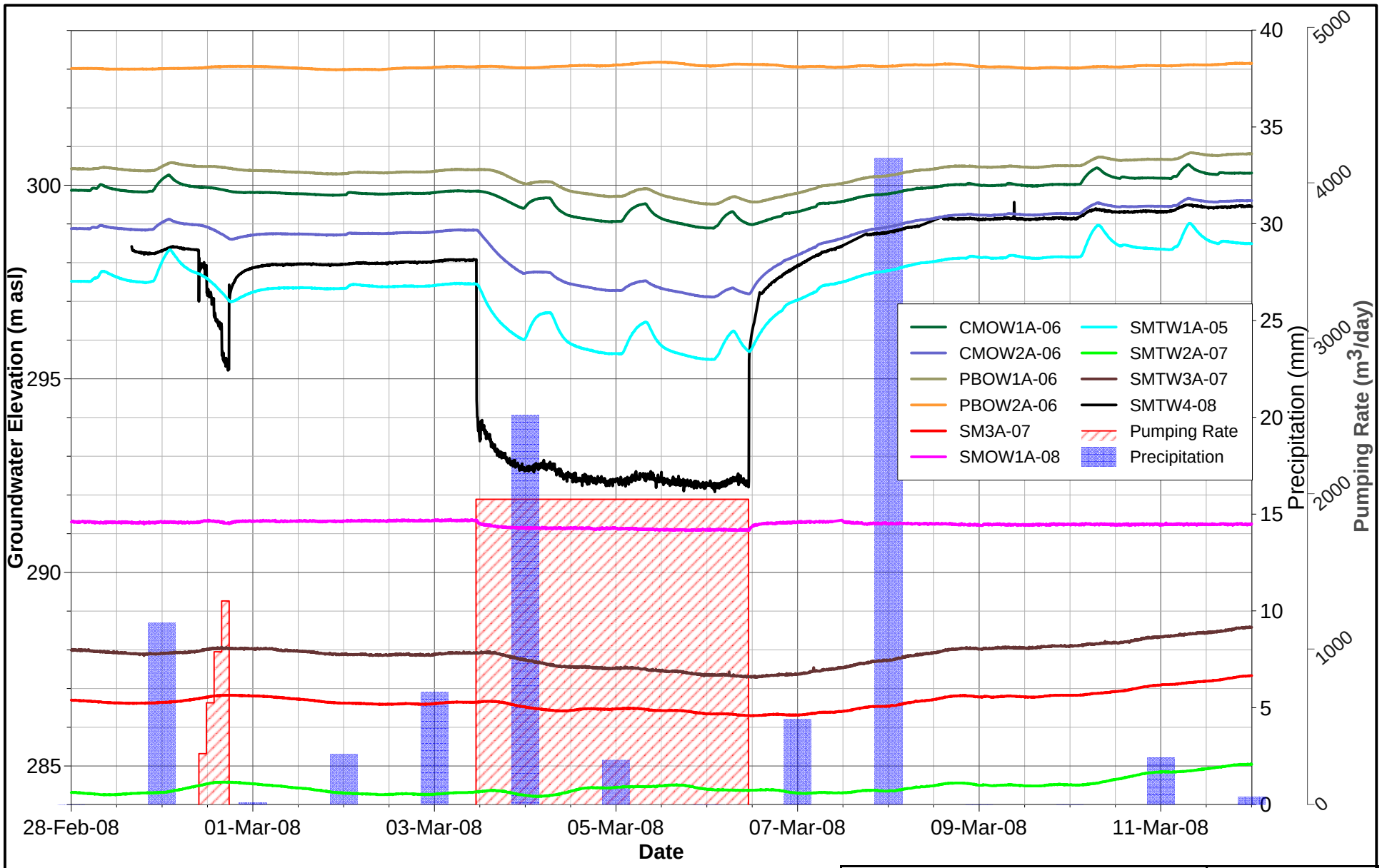


Cambridge East IUS Water Supply Class EA

Phase I 28-Day Pumping Test
Stable Isotopes
Deuterium (^{2}H) vs Oxygen-18 (^{18}O)

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A19



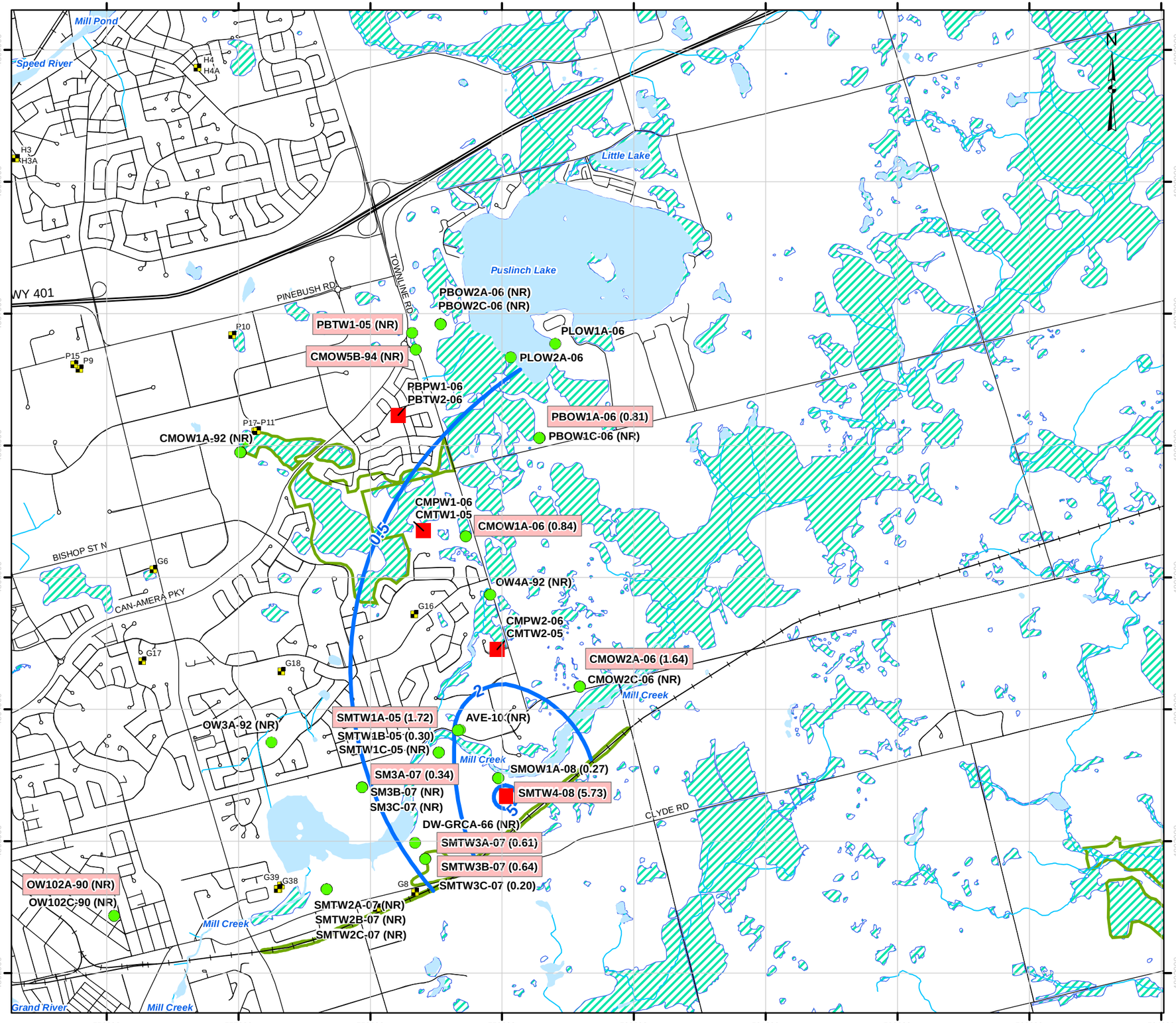
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m^3/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Cambridge East IUS Water Supply Class EA

Phase II SMTW4-08 (3-Day) Pumping Test Groundwater Elevation Monitoring

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A20



LEGEND

- Monitoring Wells
- Municipal Supply Wells
- Test Production Wells
- Principal Highway
- Major Roads
- Local Roads
- Railway
- Gasport Formation Bedrock Drawdown contour line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Gasport Formation Monitored Interval
3. (NR) - indicates no response



REFERENCE

Base Data - MNRF LIO obtained 2016
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GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

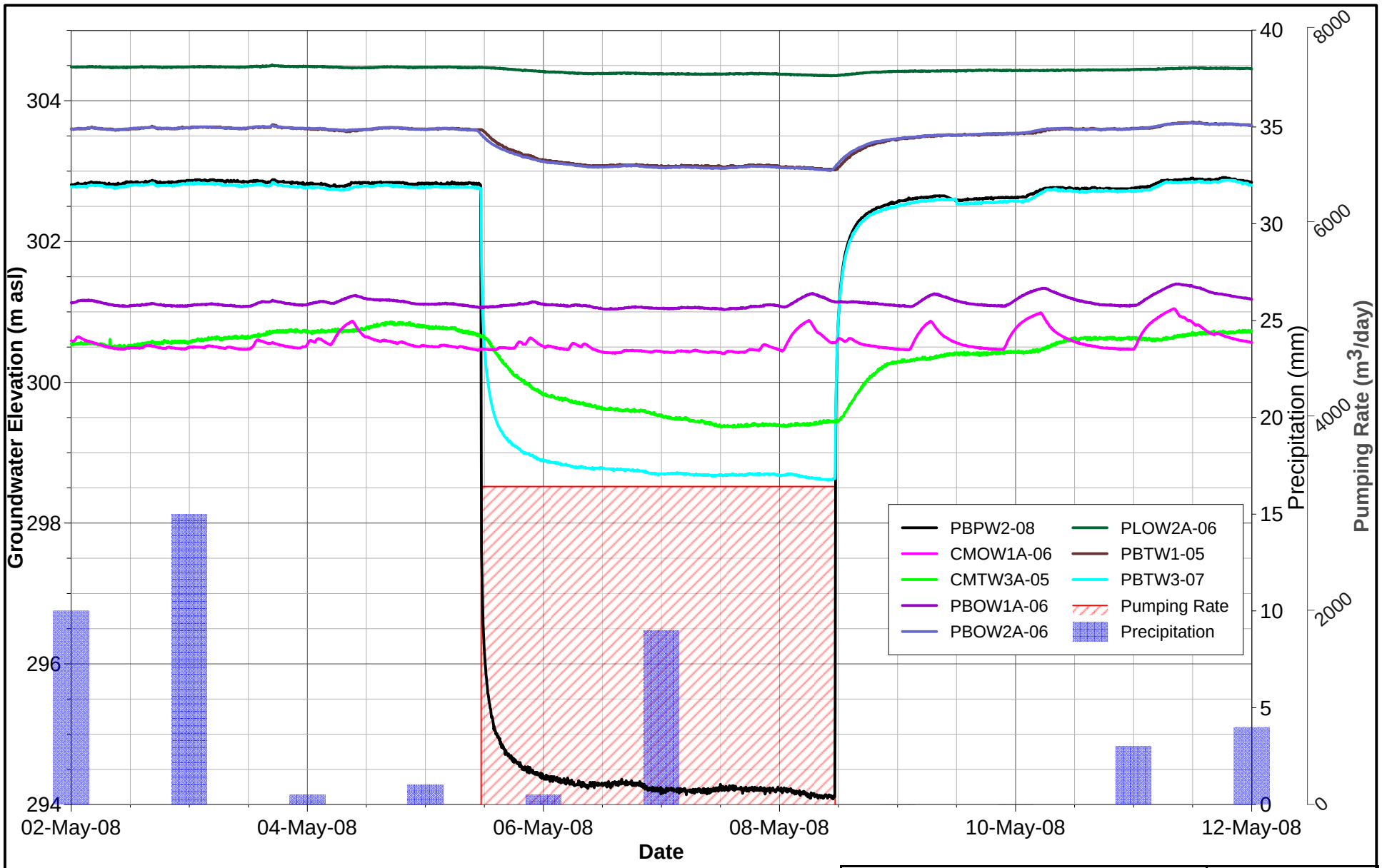
TITLE
PHASE II SMTW4-08 3-DAY PUMPING TEST, BEDROCK RESPONSE – GASPORT FORMATION

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005		
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

FIGURE: A21

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\FigureA21_PhaseII_SMTW4_08_GasportFormation.mxd



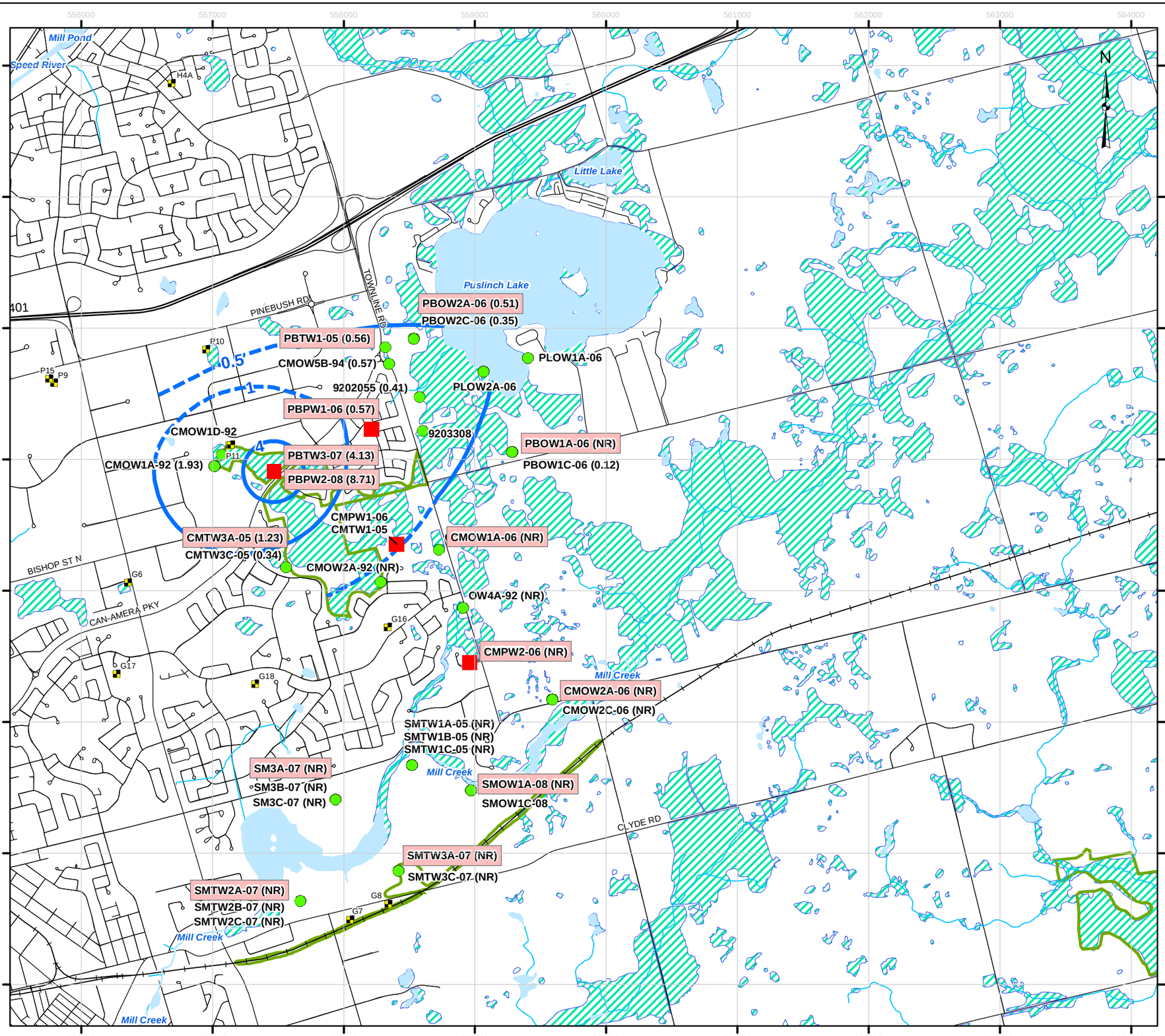
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m^3/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Cambridge East IUS Water Supply Class EA

Phase II PBPW2-08 (3-Day) Pumping Test Groundwater Elevation Monitoring

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A22



LEGEND

- Monitoring Wells
- Municipal Supply Wells
- Test Production Wells
- Principal Highway
- Major Roads
- Local Roads
- Railway
- Gasport Formation Bedrock Drawdown contour line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Gasport Formation Monitored Interval
3. (NR) - indicates no response



REFERENCE

Base Data - MNRF LIO obtained 2016
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Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

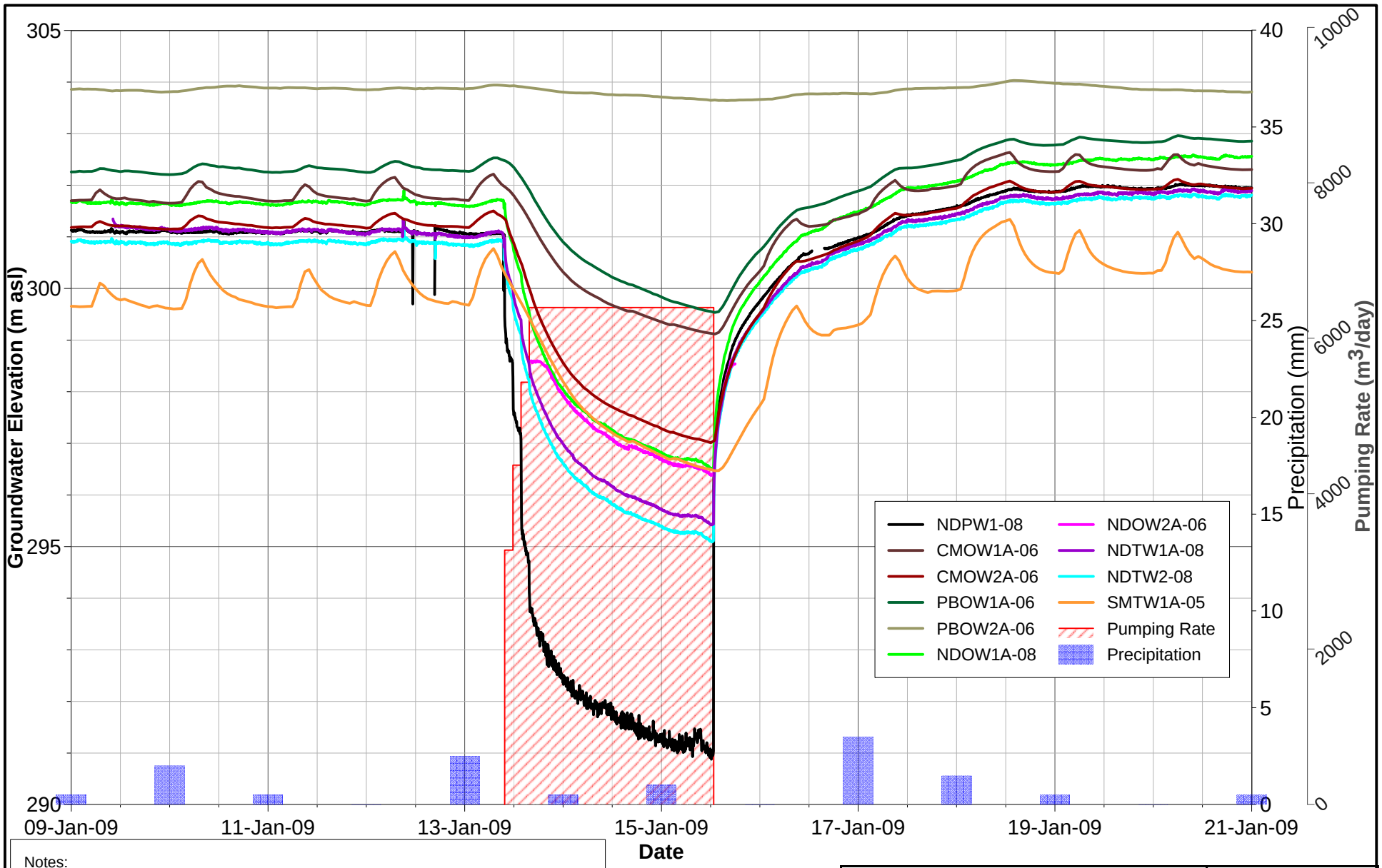
TITLE
PHASE II PBPW2-08 3-DAY PUMPING TEST, BEDROCK RESPONSE – GASPORT FORMATION

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005		
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

FIGURE: A23

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\FigureA23_PhaseII_PBPW2_08_GasportFormation.mxd



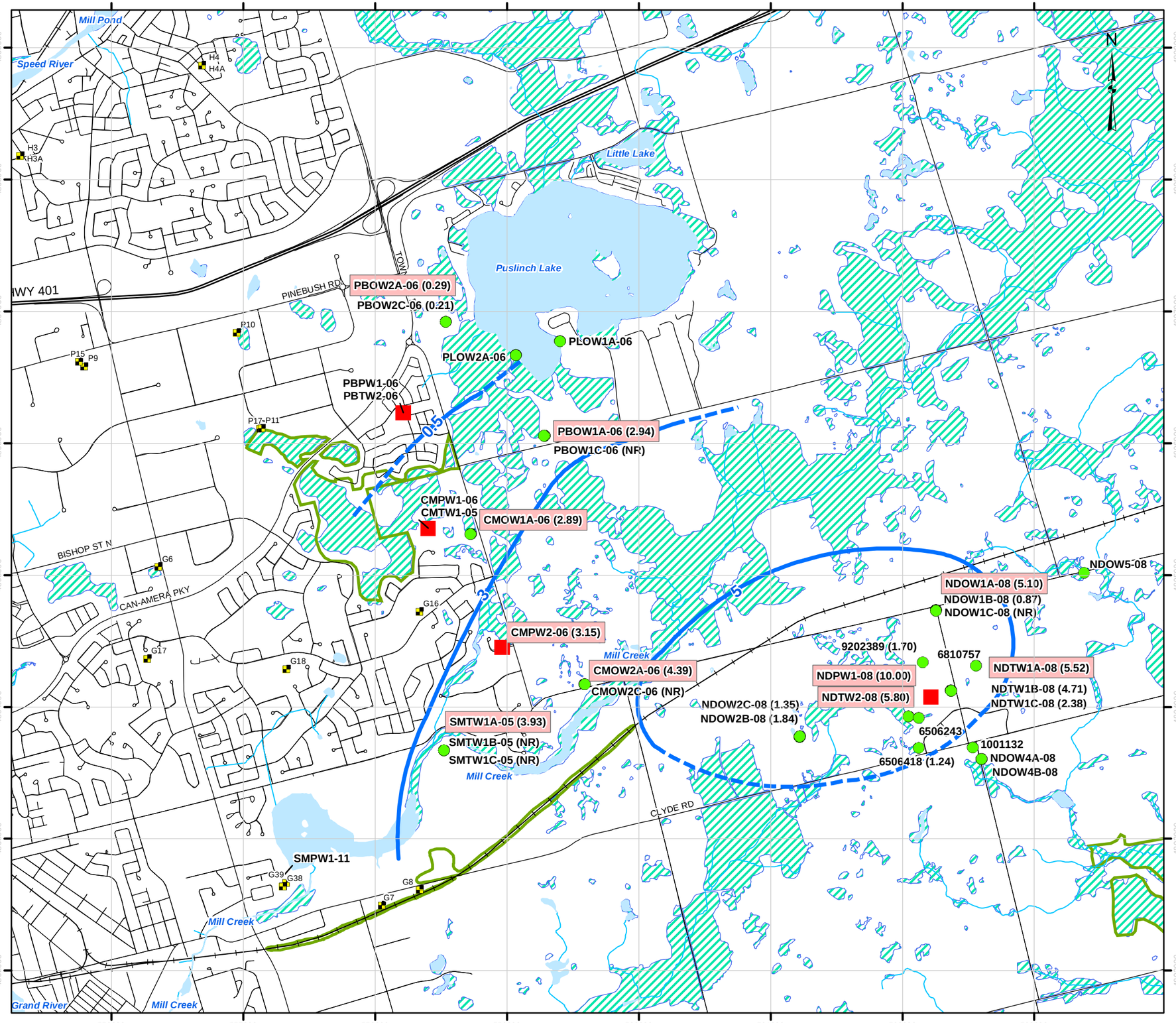
Notes:
1) The 2-day constant rate test at NDPW1-08 took place between Jan 13-15, 2009 immediately following step testing at a rate of 6,396 m^3/day (74.0 L/s).
2) Testing took place on the open borehole.
3) Testing ended early due to generator failure and ice jams restricting flow of water through culverts.
4) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Cambridge East IUS Water Supply Class EA

Phase III NDPW1-08 (2-Day) Pumping Test Groundwater Elevation Monitoring

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A24



LEGEND

- Monitoring Wells
- Municipal Supply Wells
- Test Production Wells
- Principal Highway
- Major Roads
- Railway
- Gasport Formation Bedrock Drawdown contour line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Gasport Formation Monitored Interval
3. (NR) - indicates no response



REFERENCE

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Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

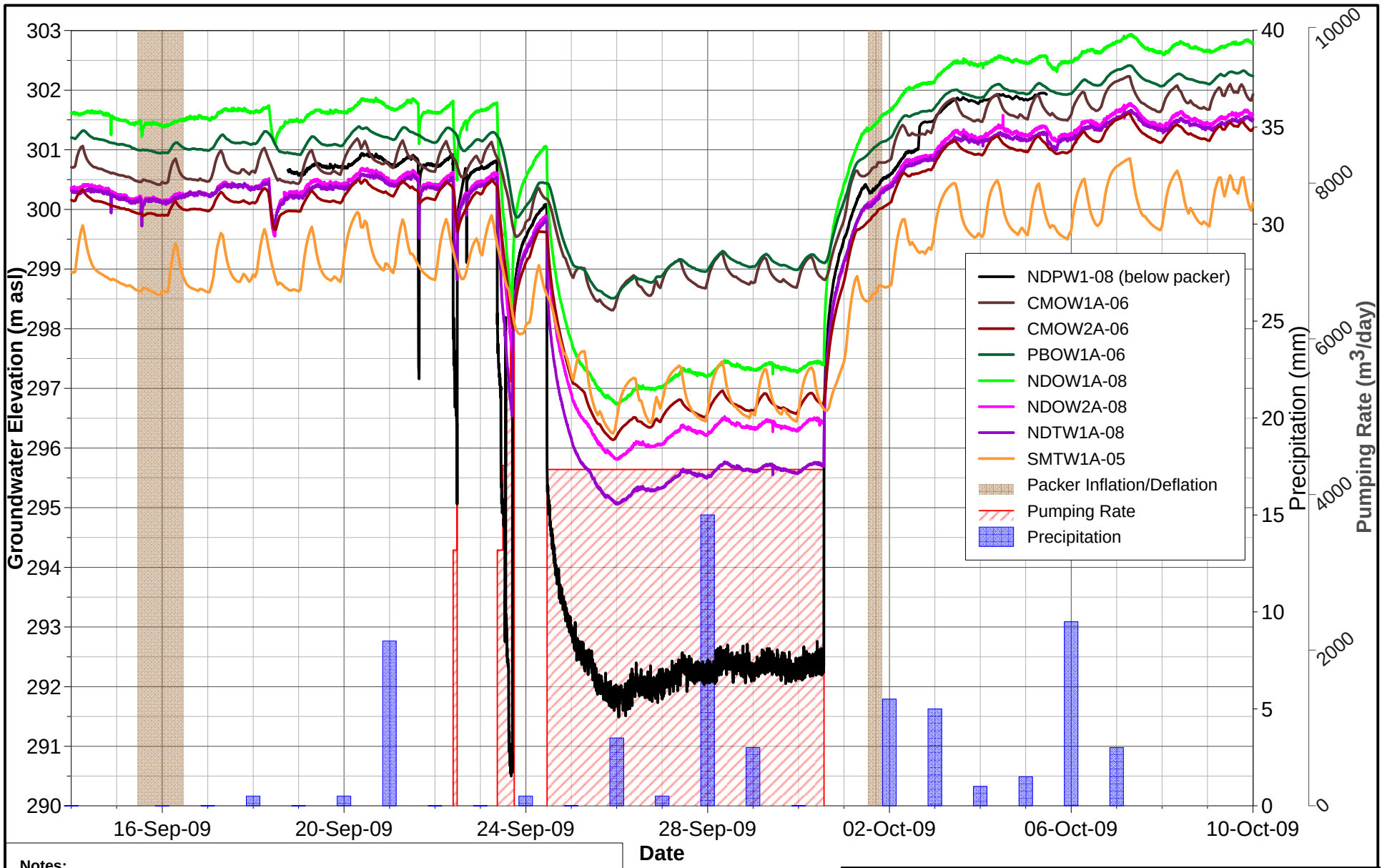
TITLE
PHASE III NDPW1-08 2-DAY PUMPING TEST, BEDROCK RESPONSE – GASPORT FORMATION

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005		
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

FIGURE: A25

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\FigureA25_PhaseII_NDPW1_08_GasportFormation.mxd



Notes:

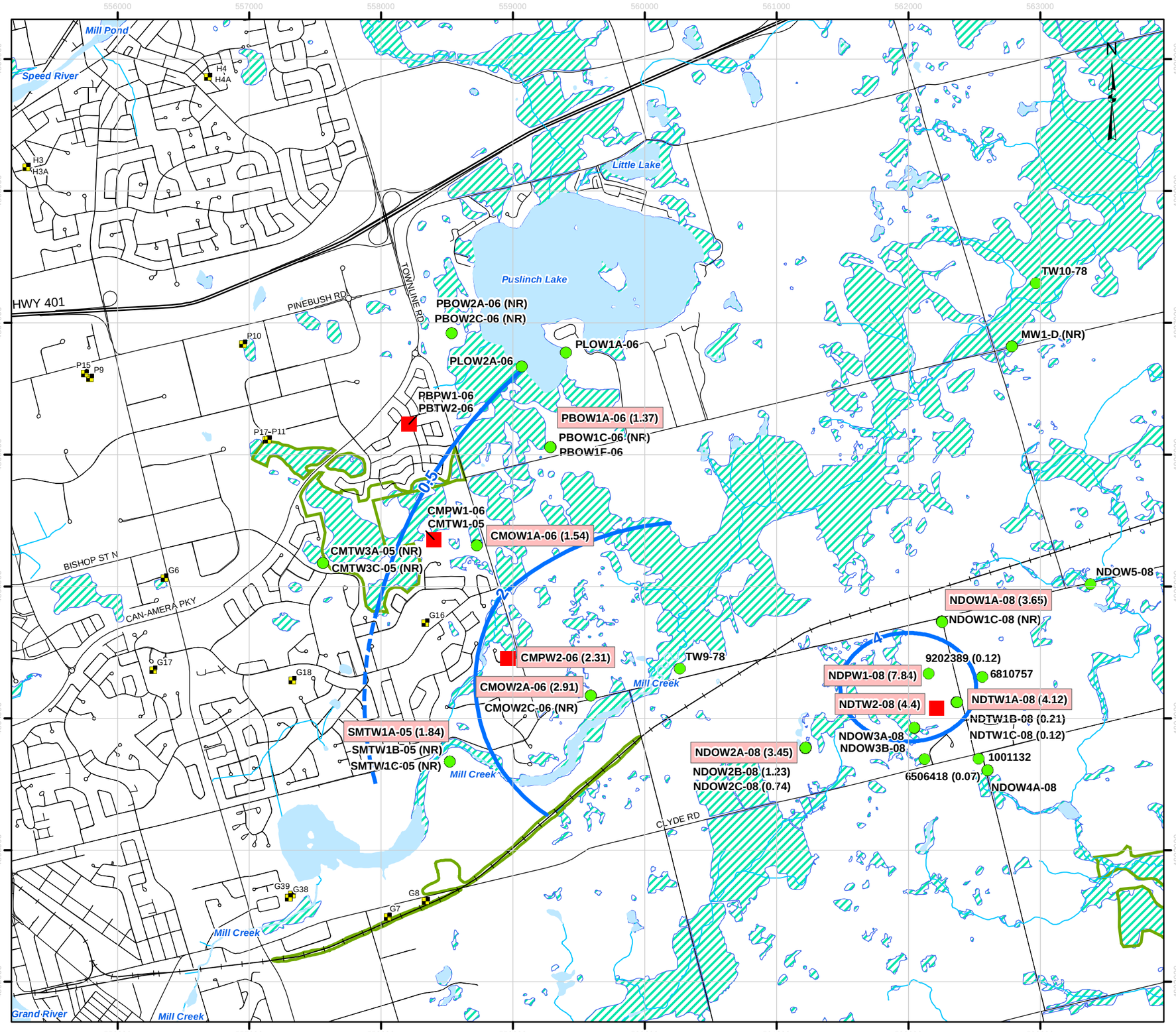
1) The 6-day constant rate test at NDPW1-08 took place between Sept 24-30, 2009. at a rate of 4,321 m^3/day (50.0 L/s).
2) A packer was installed in NDPW1-08 and NDTW2-08 on Sept 15, 2009, to isolate the Gasport Formation from the Guelph Formation. During the test, NDPW1-08 was pumped below the packer.
3) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Cambridge East IUS Water Supply Class EA

Phase III NDPW1-08 (6-Day) Pumping Test Groundwater Elevation Monitoring

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A26



LEGEND

- Monitoring Wells
- Municipal Supply Wells
- Test Production Wells
- Principal Highway
- Major Roads
- Local Roads
- Railway
- Gasport Formation Bedrock Drawdown contour line (m)
- Watercourse
- Waterbody
- ESAs
- GRCA Provincially Significant Wetlands

NOTE:
1. PBOW1-06E (0.54) - Drawdown (m) at end of pumping test
2. (UP)- indicates increase in water level at this location
3. Gasport Formation Monitored Interval
3. (NR) - indicates no response



REFERENCE

Base Data - MNRF LIO obtained 2016
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Datum: NAD 83 Projection: UTM Zone 17N

0.5 0 0.5 1 1.5
Kilometres

PROJECT
CAMBRIDGE EAST IUS WATER SUPPLY CLASS EA

TITLE
PHASE III NDPW1-08 6-DAY PUMPING TEST, BEDROCK RESPONSE – GASPORT FORMATION

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:30,000	REV. 1
DESIGN	CGG	10 Mar. 2005		
GIS	PR	30 Jun. 2016		
CHECK	JLH	30 Jun. 2016		
REVIEW	JAP	30 Jun. 2016		

FIGURE: A27

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambride_East_Class_EA_2016\FigureA27_PhaseIII_NDPW1_08_GasportFormation.mxd

ATTACHMENT A1

Field Methodology

1.0 INTRODUCTION....2

2.0 WELL DRILLING AND CONSTRUCTION....2

2.1 Drilling and Well Installation....2

2.1.1 Borehole Testing....3

FIGURES

Figure A1.1 Typical Test Well Schematic
Figure A1.2 Typical Test Production Well Schematic
Figure A1.3 Typical Bedrock Monitoring Well Nest Schematic
Figure A1.4 Typical Overburden Monitoring Well Nest Schematic
Figure A1.5 Typical Bedrock-Overburden Monitoring Well Nest Schematic – North Dumfries Monitors

1.0 INTRODUCTION

As part of the Integrated Urban System Groundwater Supply Optimization and Expansion Project (IUS Project), the Regional Municipality of Waterloo (the Region) is undertaking a municipal Class Environmental Assessment (EA) to identify the preferred alternative for developing additional municipal groundwater supply in Cambridge East. As part of the field studies supporting the Class EA, Golder Associates (Golder) undertook a field program to characterize the hydrogeological conditions in the vicinity of the Cambridge East Study Area. This Attachment (A1) of Appendix A of the Detailed Hydrogeological and Natural Environment Report (DHNR) provides details on the field methodologies used during this field program.

2.0 WELL DRILLING AND CONSTRUCTION

2.1 Drilling and Well Installation

Figure A1.1 shows the test well design. Drilling of the 152 mm (6-inch) diameter test wells typically consisted of:

- Drilling and installing a 254 mm (10-inch) temporary surface casing to 6 m depth;
- Drilling a 230 mm (9-inch) diameter borehole through the overburden and up to 3 m into competent bedrock;
- Drilling and installing a 152 mm (6-inch) steel casing through the overburden and up to 3 m into competent bedrock;
- Introduction of a cement-bentonite grout mixture into the well casing via tremmie pipe to seal the borehole annulus to surface using positive placement techniques;
- Advancement of a 152 mm (6-inch) diameter borehole through the Guelph and Gasport Formations, with the borehole terminated about 1 to 3 m into the underlying Cabot Head shale at depths of 120 m to 140 m below ground; and
- Collection of drilling cutting samples every 1.5 m of depth when possible. Photos of drill cuttings are presented in Attachment A2.

Figure A1.2 shows a schematic of a test production well. Drilling of the 305 mm (12-inch) diameter test production wells typically consisted of:

- Drilling and installing a 483 mm (19-inch) temporary surface casing to 6 m depth;
- Drilling and installing a 305 mm (12-inch) diameter steel casing through the overburden and up to 3 m into competent bedrock;
- Advancement of a 305 mm (12-inch) diameter borehole through the Guelph and Gasport Formations, with the borehole terminated about 1 to 3 m into the underlying Cabot Head shale at depths of 120 m to 140 m below ground; and
- Collection of drilling cutting samples every 1.5 m of depth when possible. Photos of drill cuttings are presented in Attachment A2.

Figures A1.3 through A1.5 present the designs of monitoring well nests installed in the bedrock and in the overburden for this project. Installation of the bedrock monitoring well nests typically consisted of:

- Installation of three 32 mm (1.25-inch) diameter PVC piezometers in existing 152 mm (6-inch) diameter bedrock test well open boreholes with steel casing set into competent bedrock. Design of screen intervals

and lengths were based on drilling records and borehole geophysical testing. In general, well screens were set in the deep bedrock (Gasport formation), the intermediate bedrock and shallow bedrock (Guelph formation);

- Sand pack was extended 1.5 m below and above the screened sections. Bentonite pellets, introduced via tremmie pipe, sealed the borehole between the screened intervals in the bedrock using positive placement techniques; and
- Bentonite grout was introduced in the open borehole and inside the 152 mm steel casing to surface above shallowest bedrock piezometer;

Installation of the overburden monitoring well nests typically consisted of up to three monitoring wells at a distance of about 1 m in the deep intermediate and shallow overburden as follows:

- Each borehole was drilled using a 108 mm (4.25-inch) hollow stem auger. Overburden samples were obtained at 1.5 m intervals using a split spoon sampler in the deepest monitoring well drilled at each nested well site;
- A 51 mm (1.25-inch) PVC 10-slot PVC well screen was installed at each location and completed with schedule 40 PVC pipe; and
- Sand pack was extended at least 0.5 m below the well screen and 1.5 m above the top of the screen. 1.5 m of bentonite pellets (hole plug) were placed above the sand pack and bentonite grout was used to backfill the remaining annual space to within 1 m of ground surface. Installations were completed with a concrete collar and an above ground lockable protective steel casing for each well.

2.1.1 Borehole Testing

All boreholes were logged and the field and soil and rock samples were collected at 1.5 m intervals. Selected overburden samples were selected for grain-size analyses following the standard test method for Sieve Analysis of fine and coarse Aggregates, ASTM C136. In the bedrock, rock chips were collected and photographed. Grain-sized analyses and rock chip photos are included in Attachment A2.

Following drilling, geophysical logging was carried out by Golder geophysicists in the test wells, test production wells and bedrock monitoring wells. Geophysical probes were run on a wireline through the open portion of the borehole to measure different properties of the bedrock and water column. The geophysical logging included the following suites: stratigraphy (natural gamma and apparent conductivity) and structural properties (optical televiewer logging). A description of the borehole logging methods is described below.

Natural Gamma

The natural gamma log records the average natural gamma activity of the formation, and can be related to variations in lithology. For example, rock with higher clay content, such as shales, have higher natural gamma activity than limestones. Natural gamma logs were generally recorded twice in each borehole for QA/QC purposes and were smoothed using a 3-point moving average (boxcar) filter prior to display.

Apparent Conductivity

This borehole probe records the apparent conductivity of the rock mass surrounding the borehole using the inductive electromagnetic technique. The probe provides a radial bulk measurement of the material 0.1 m to 1.0 m from the borehole wall over a distance of 1.0 m. The measurement is unaffected by conductive borehole fluid or the presence of plastic casing. The conductivity logs were acquired at a 5 cm sampling interval at a logging speed of 3 m/min, and the gamma logs were acquired at a 2 cm sampling interval at a logging speed of 1.5 m/min. Logs were acquired on both down and up runs, and repeatability between runs was achieved. This log is generally used in conjunction with the natural gamma log to identify variations in lithology/stratigraphy. Apparent conductivity

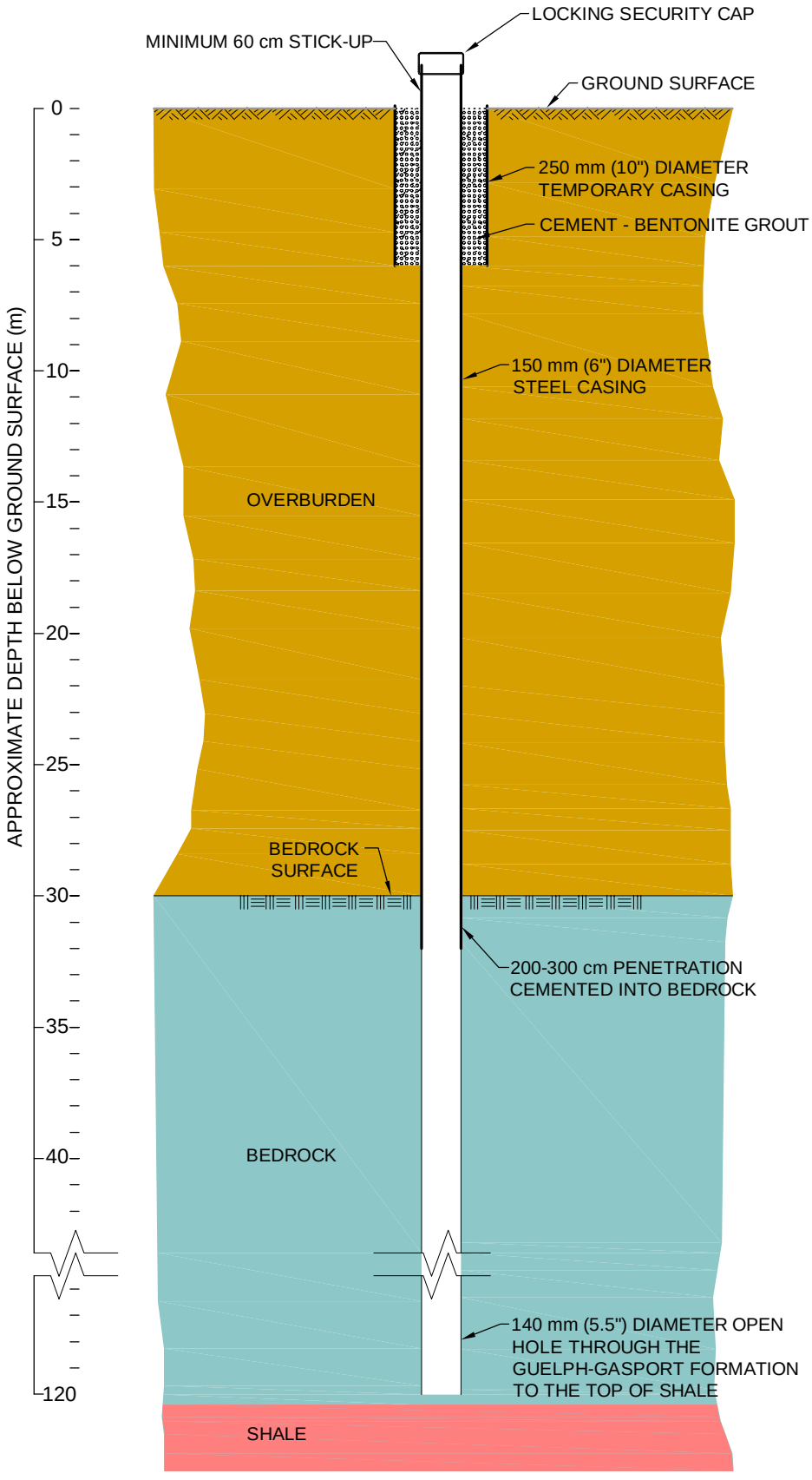
logs were generally recorded twice in each borehole for QA/QC purposes. The natural gamma and inductive conductivity log data are presented alongside the stratigraphy on the borehole log records (Attachment A2).

Optical Televiewer

The optical televiewer generates a scanned image of the inside of the borehole wall with detail for resolving fractures as narrow as 0.1 mm and with a radial resolution of 1 degree. The recorded data is “oriented” with either a 3-component fluxgate magnetometer system for vertical boreholes in a nonmagnetic host or a 3-component tilt meter system for inclined holes. The recorded data can be post processed to orient to north or to high side within the borehole. Applications for this tool include inspecting casings for defects, characterization of fractures in either air or water-filled boreholes and, in combination with traditional core logging, can be used for mineralogy and foliation studies. The optical televiewer logs are interpreted to map the orientation and extent of fractures within a borehole.

Flow Profiling

Flow profile logging was performed on test wells and test production wells during step testing. This logging was conducted by personnel from Lotowater Ltd. A spinner tool was lowered into the well in advance of the test pump installation and was used to identify the primary zones of water production below the pump setting. The spinner tool is lowered to the bottom of the borehole where typically no groundwater inflows were encountered. The tool is then raised progressively to record the velocity of water moving up the borehole in response to test pumping. While the tool records actual water velocity, it is the relative velocity that provides the indication of the relative contribution from each of the water producing zones encountered within the borehole. The water velocity is seen to increase sharply where discrete fractures are contributing additional water, while a continuous increase over a broader vertical interval indicates a steady contribution of water over the same interval. Estimates of the actual quantities of groundwater production at each inflow zone can be made by relating the flow profile to the pumping rate of the well. The flow profiles are included in Attachment A2.



Golder Associates
Mississauga, Ontario, Canada

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PROJECT No.	05-1112-010 (1500)
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CHECK	JLH
REVIEW	JAP

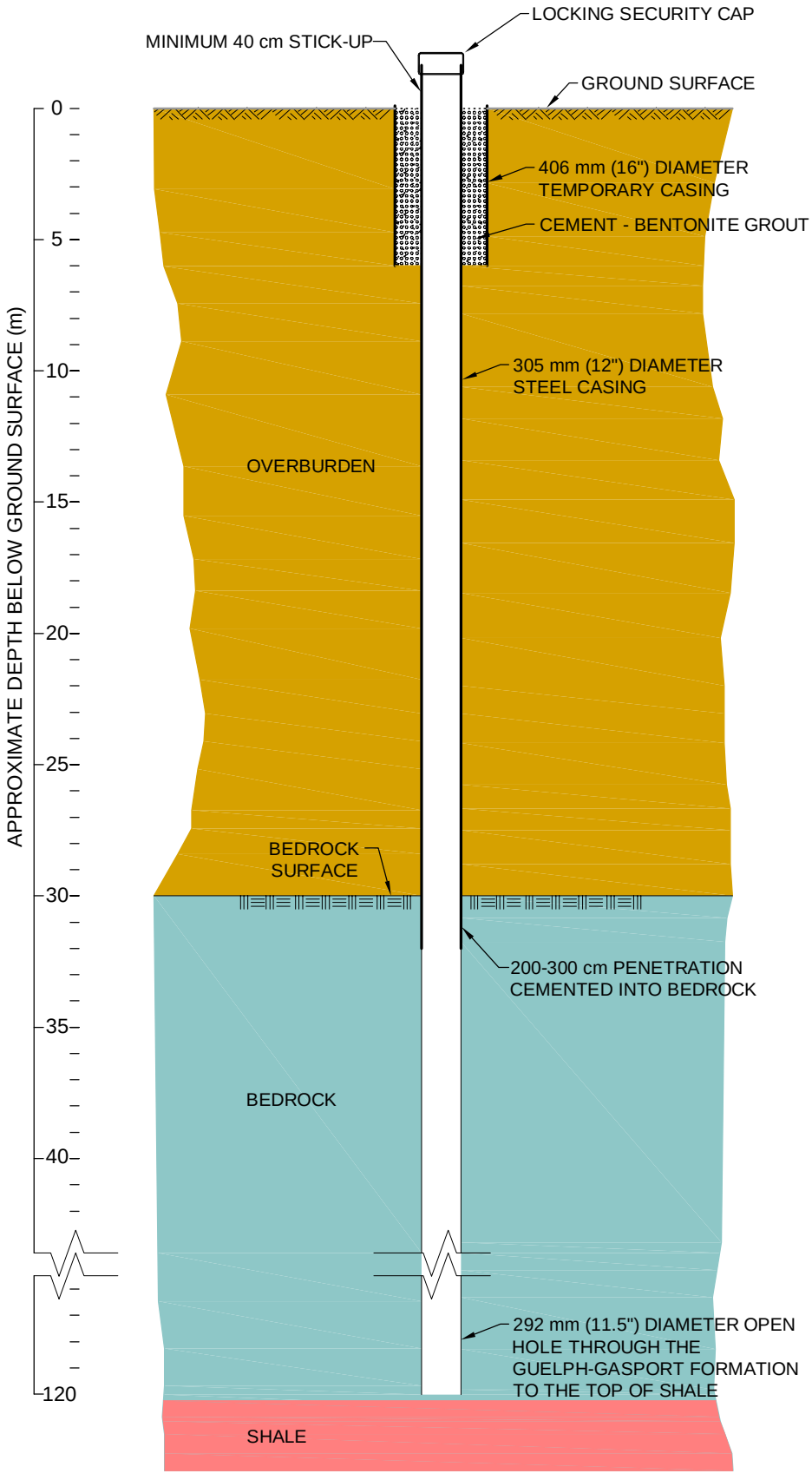
TITLE

TYPICAL TEST WELL SCHEMATIC

REGION OF WATERLOO

FIGURE
A1.1

PLOT DATE: September 17, 2012
FILENAME: T:\Projects\2005\05-1112-010 (RMOW, Waterloo)\-LA- Class Environmental Assessment\051112010LAA11.dwg



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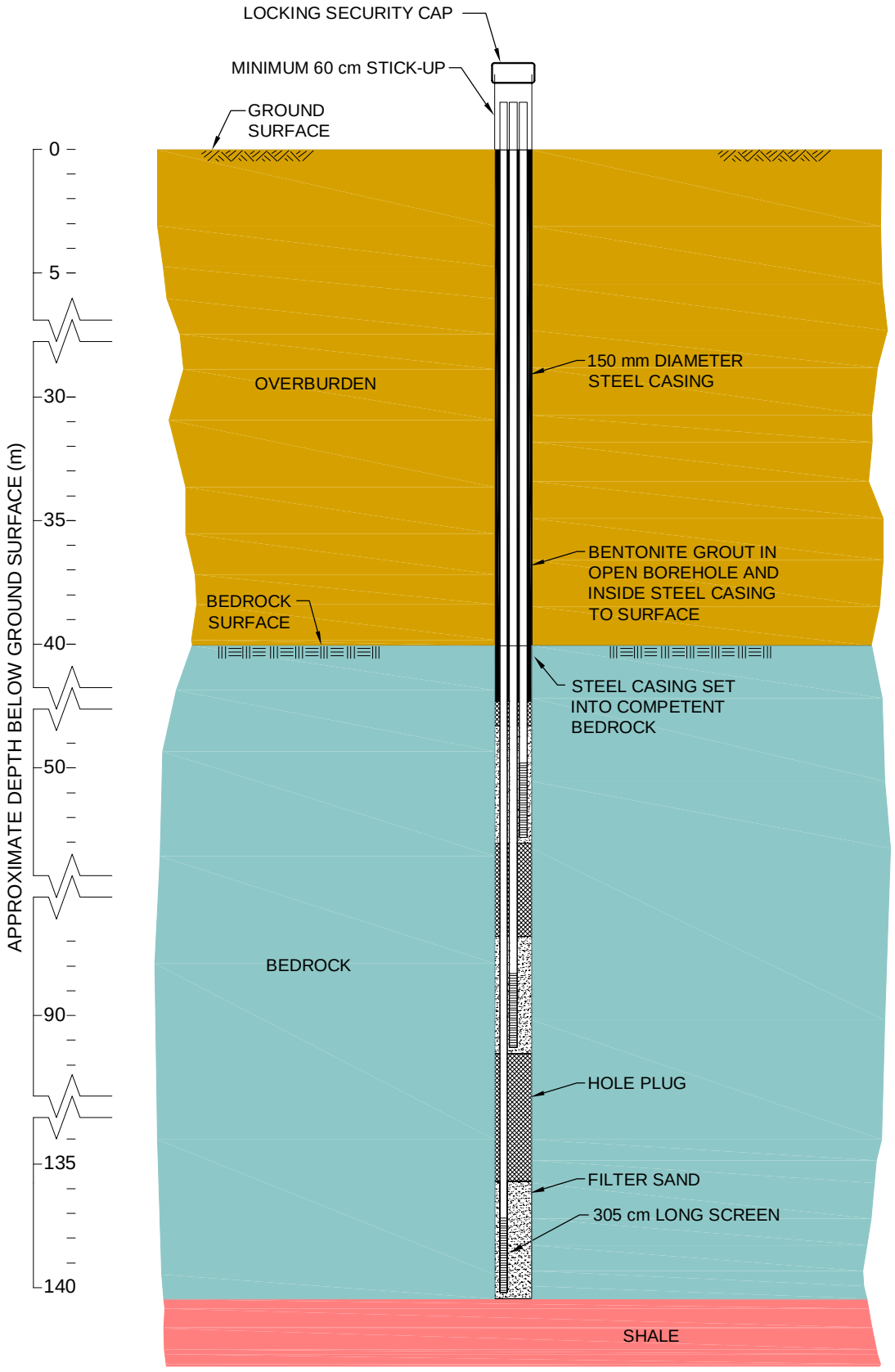
TITLE

TYPICAL TEST PRODUCTION WELL SCHEMATIC

REGION OF WATERLOO

FIGURE **A1.2**

PLOT DATE: September 17, 2012
FILENAME: T:\Projects\2005\05-1112-010 (RMOW, Waterloo)\-LA- Class Environmental Assessment\051112010LAA12.dwg



Golder Associates
Mississauga, Ontario, Canada

SCALE	AS SHOWN
DATE	Sep. 17, 2012
DESIGN	GWS
CAD	KD
CHECK	GWS
REVIEW	JMP

TITLE

TYPICAL BEDROCK MONITORING WELL NEST SCHEMATIC

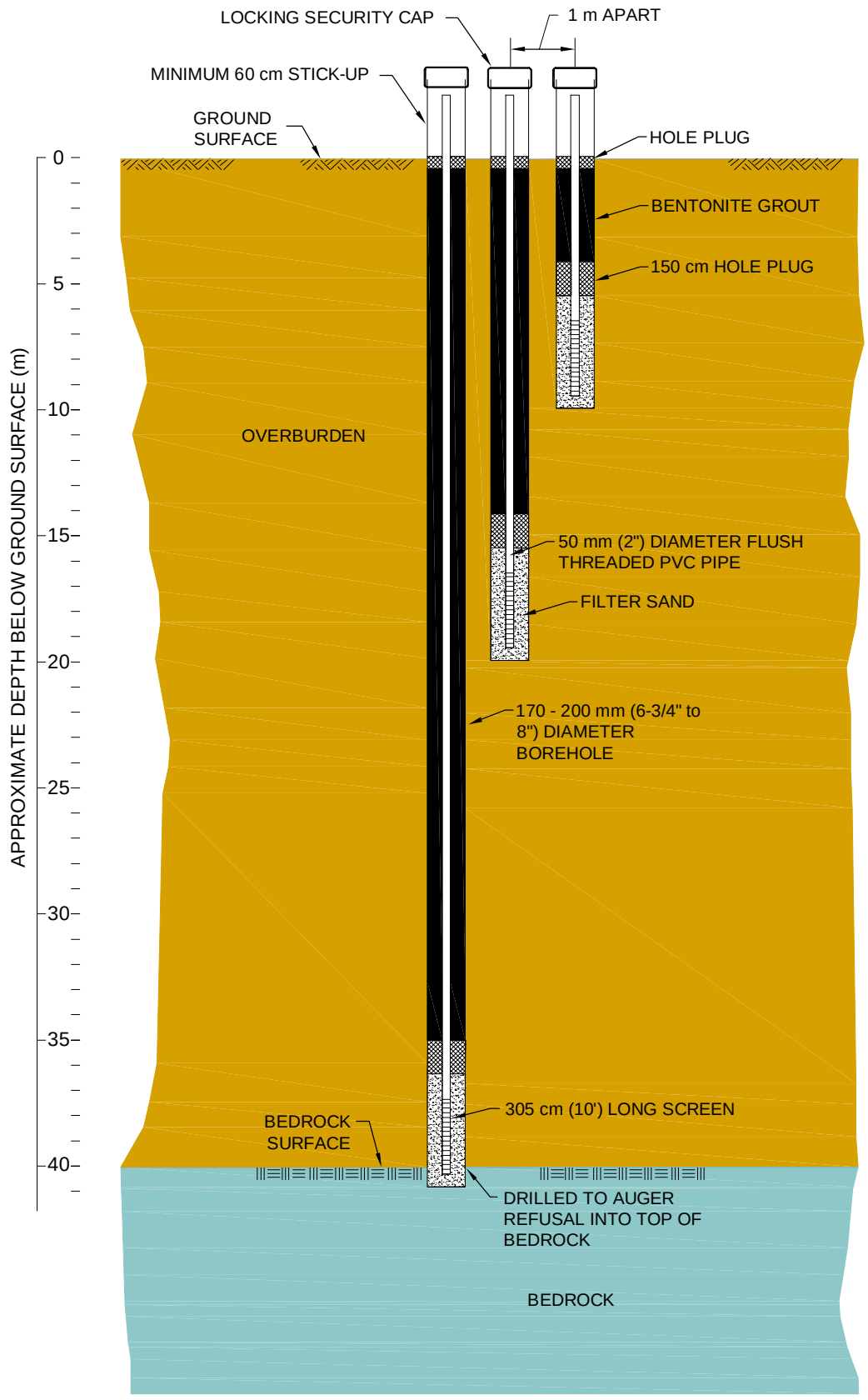
REGION OF WATERLOO

FIGURE **A1.3**

FILE No. 051112010LAA13.dwg

PROJECT No. 05-1112-010 (1500) REV. A

PLOT DATE: September 17, 2012
FILENAME: T:\Projects\2005\05-1112-010 (RMOW, Waterloo)\-LA- Class Environmental Assessment\051112010LAA13.dwg



Golder Associates
Mississauga, Ontario, Canada

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PROJECT No.	05-1112-010
REV.	A
SCALE	AS SHOWN
DATE	Sep. 17, 2012
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REVIEW	JMP

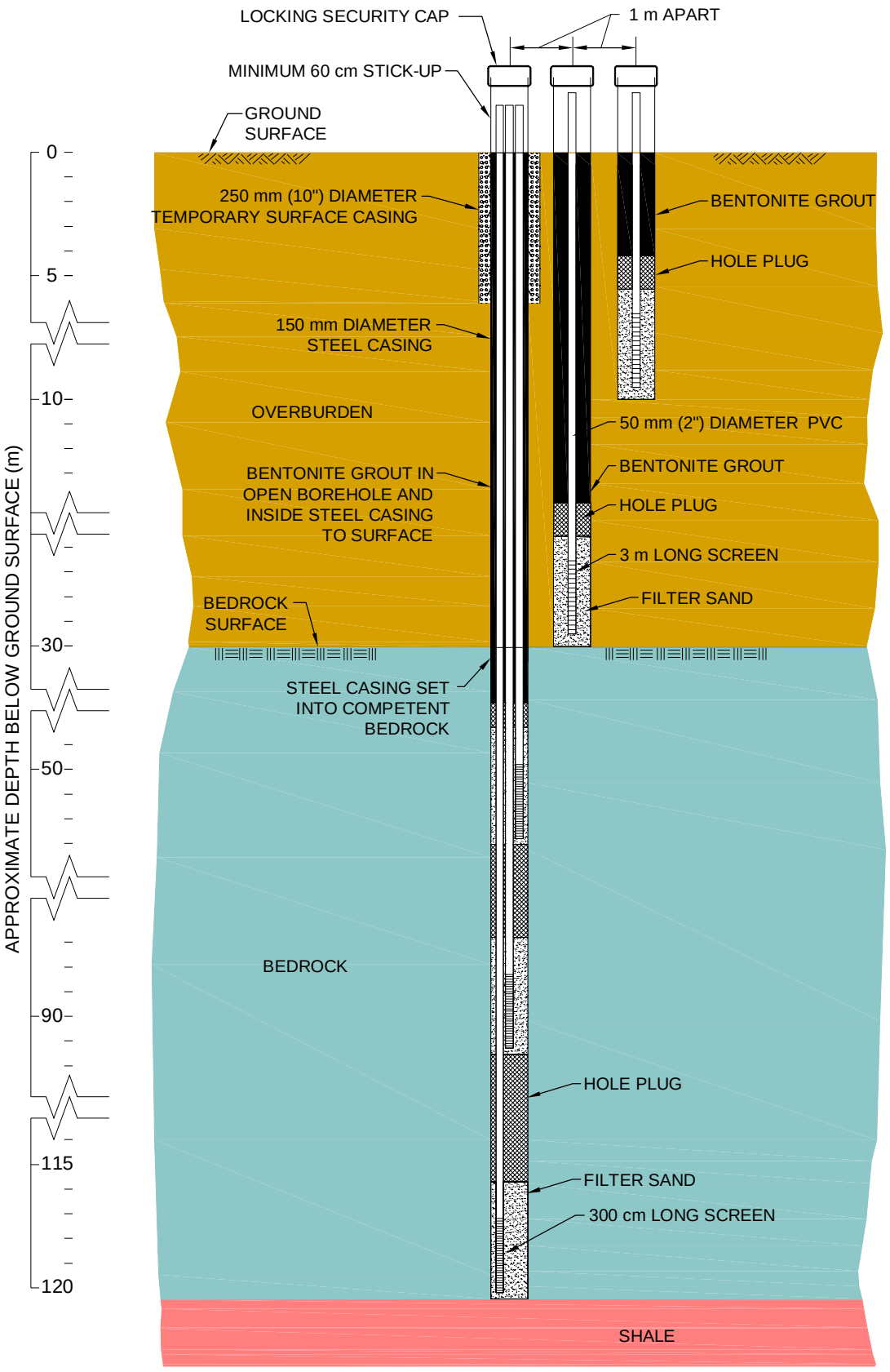
TITLE

TYPICAL OVERBURDEN MONITORING WELL NEST SCHEMATIC

REGION OF WATERLOO

FIGURE **A1.4**

PLOT DATE: September 17, 2012
FILENAME: T:\Projects\2005\05-1112-010 (RMOW, Waterloo)\-LA- Class Environmental Assessment\051112010LAA14.dwg



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Mississauga, Ontario, Canada

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REV.	A
SCALE	AS SHOWN
DATE	Sep. 17, 2012
DESIGN	ADI
CAD	KD
CHECK	JLH
REVIEW	JAP

TITLE

TYPICAL BEDROCK-OVERBURDEN MONITORING WELL NEST SCHEMATIC NORTH DUMFRIES MONITORS

REGION OF WATERLOO

FIGURE **A1.5**

PLOT DATE: September 17, 2012
FILENAME: T:\Projects\2005\05-1112-010 (RMOW, Waterloo)\-LA- Class Environmental Assessment\051112010LAA15.dwg

ATTACHMENT A2

Borehole Testing Records

- Borehole Logs with Geophysics
- Optical Televiewer Logs
- Grain-Size Analyses
- Rock Chip Photo Records
- Flow Profile Logs
- Driller's Water Well Record

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW1-06

SHEET 1 OF 3

LOCATION: N 4805314.2 ;E 558725.6

DRILLING DATE: May 9 to May 15, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	305.90
	TOPSOIL dark brown, wet, organics (rootlets and wood)	0.00 / 304.07
	Medium brown GRAVEL and SAND with some clay, hetero, angular to subangular gravel	1.83 / 302.85
	Medium brown SAND and GRAVEL with little silt, heterogeneous, wet, loose, angular to subrounded gravel	3.05 / 300.40
5	Greyish brown fine to coarse SAND, some gravel, fairly uniform, saturated, compact, subrounded to subangular gravel	5.50 / 298.28
	Greyish-brown clayey SAND and GRAVEL (TILL), heterogeneous, subrounded to subangular gravel	7.62 / 296.15
10	Medium brown CLAY, soft, uniform	9.75 / 293.30
	Greyish brown GRAVEL and SAND, heterogeneous, fairly clean, subangular to subrounded gravel	12.60 / 285.90
15		
20	Brown SILTY CLAY, trace gravel (TILL), heterogeneous, subrounded to subangular gravel	20.00 / 283.20
	Grey SAND and GRAVEL, with occasional boulder and cobbles, heterogeneous, dense, subangular to angular gravel	22.70 / 281.20
25	Brown grey CLAY, stiff, homogeneous	24.70 / 278.40
	SILTY CLAY, little gravel, little sand	27.50 / 275.80
30	Grey brown SAND and GRAVEL little cobbles, heterogeneous, subangular to sub rounded	30.10 / 273.50
	Buff brown DOLOMITE, thickly bedded, fractured, non-weathered uneven partings, few fossils (Guelph Fm)	32.40 / 271.76
		34.14 / 270.85
35	Grey DOLOMITE, fine grained, thickly bedded, fossiliferous, irregular parting (Guelph Fm)	35.05
	Buff brown DOLOMITE, fine grained, massive, moderately indurated, tabular chips (Guelph Fm)	267.80 / 38.10
	50 mm fracture at 35.7 m depth	
40	Various shades of buff grey DOLOMITE, weakly laminated, moderately indurated, platy chips (Guelph Fm)	
	Grayish brown from 42.7 to 44.2 m depth	
45	Weathered yellowish brown from 45.1 m to 45.4 m depth	
		256.83 / 49.07
50	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F E D CBA

301.33

298.43

291.57

288.53

Grout

275.42

Bentonite

272.37

Sand

Screen

Sand

Bentonite

Sand

Screen

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW1-06

SHEET 2 OF 3

LOCATION: N 4805314.2 ;E 558725.6

DRILLING DATE: May 9 to May 15, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION F E D CBA
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	DOLOMITE medium buff brown, thickly bedded, fine grained, moderately indurated, some small vugs throughout, weathered yellowish brown in areas (Guelph Fm)					Screen
55	Very vuggy from 54.9 m to 56.4 m depth Weakly indurated from 56.4 m to 59.4 m depth					
60	Becoming brownish - buff grey colour by 45.1 m and less vuggy					Sand
			244.60			
	Dark dull brown DOLOMITE with some black mineralization on fracture/bedding planes, moderately indurated, fine crystalline, blocky to platy chips with strong petroliferous odour (Eramosa Member) Fracture or void at 64.3 m depth		61.30			
65	Becoming dark blackish-brown with sparse clean white mineral from 65.5 m					Bentonite
70						
	Becoming lighter brown		231.80			
	Bluish grey DOLOMITE, blocky white, crystalline, moderately indurated, weakly laminated, platy to blocky chips (Amabel Fm)		74.10			
75			229.91			
	Light-grayish-white DOLOMITE, fine grained, fossiliferous, vuggy (small), porous rock weakly laminated, blocky irregular chips (Amabel Fm)		75.99			
80						Rock Fill
			222.08			
	Grey DOLOMITE, crystalline, well indurated, weakly laminated, irregular blocky to tabular chips, smooth parting, sparse micro vugs (Amabel Fm)		83.82			
85	Becoming fossiliferous and blocky grey colour by 88.3 m					
90						
95	Darker grey by 96.0 m					Bentonite
100						Sand
	CONTINUED NEXT PAGE					

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW1-06

SHEET 3 OF 3

LOCATION: N 4805314.2 ;E 558725.6

DRILLING DATE: May 9 to May 15, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					F E D CBA
100	Grey DOLOMITE, crystalline, well indurated, weakly laminated, irregular blocky to tabular chips, smooth parting, sparse micro vugs (Amabel Fm) Several large vugs/fractures from 102.1 m to 111.3 m depth					Sand
105						
110	Light brown and grey, vuggy from 111.3 m to 115.8 m depth					Screen
115						
120	Becoming darker grey at 118.9 m depth					Sand
			183.40			
	Grey SHALE (Rochester Fm)		122.50 182.30			
	Grey DOLOMITE, occasional fine sulphides, weakly laminated, no odour		123.60			
125	Dull greyish-brown at 124.9 m					Bentonite
	Brown, mottled black with sulphides Green soft shale		179.10 126.80			Rock Fill
	END OF BOREHOLE					
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW2-06

SHEET 1 OF 3

LOCATION: N 4804173.7 ;E 559589.2

DRILLING DATE: June 6 to June 13, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	300.66
	(TOPSOIL) brown ORGANIC SILT, rootlets	0.00
	Brown CLAY, with SANDY GRAVEL (TILL)	0.61
		297.61
	Brown SILTY SAND and GRAVEL (TILL) and trace cobbles, heterogeneous, moist, compact, subrounded to subangular gravel	3.05
5		
10		
		286.03
15	Brown-grey SAND and GRAVEL, some cobbles, porous, fairly clean, angular to subrounded Fine to coarse gravel from 15. m to 15.5 m depth	14.63
20		280.24
	Medium brown, fine SAND, some coarse sand, uniform, homogeneous, loose	20.42
25	Fine to medium sand, trace cobbles and occasional boulder from 24.4 to 25.0 m depth	275.67 24.99
	Brown-grey fine SAND and GRAVEL, some silty clay, very dense, heterogeneous (TILL)	273.53
	Brown SILTY SAND and gravel grading to coarse gravel, heterogeneous	27.13 272.01
	Buff brown DOLOMITE, fractured, moderately weathered, massive, fine grained (Guelph Fm)	28.65 270.18
30	Brown/greyish brown DOLOMITE, crystalline, weakly laminated, trace micro vugs, moderately to well indurated, blocky to platy chips (Guelph Fm) Intermittent thin fractures from 32 m to 36.6 m depth	30.48
35		
40		
45		
50		

CONTINUED NEXT PAGE

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F: 296.09, 293.04

E: 286.94, 283.90

D: 273.54, 271.70

CBA

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW2-06

SHEET 2 OF 3

LOCATION: N 4804173.7 ;E 559589.2

DRILLING DATE: June 6 to June 13, 2006

DATUM: Geodetic

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
50	Brown/greyish brown DOLOMITE, crystalline, weakly laminated, trace micro vugs, moderately to well indurated, blocky to platy chips (Guelph Fm)	
55	Fine grained, vuggy, porous rock from 57.9 m to 61.9 m depth	
60		239.56
	Dark brown DOLOMITE trace clear calcite, crystalline, moderately indurated, blocky to platy chips with strong petroliferous odour (Eramosa Member)	61.10
65	Thin grey clay seam at 66.8 m depth	
70		228.42
	Blotchy grey DOLOMITE, fine crystalline, moderately indurated, weakly laminated, tabular to platy chips (Amabel Fm)	72.24
75	Dull, light grey from 74.7 m to 93.0 m depth	
80	Micro-vugs starting at 79.2 m depth	
85		
90	Vuggy from 89.6 m to 88.4 m depth	
	Well indurated, some small vugs, trace fossils from 91.4 m to 105.2 m depth	
95		
100	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F E D CBA

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW2-06

SHEET 3 OF 3

LOCATION: N 4804173.7 ;E 559589.2

DRILLING DATE: June 6 to June 13, 2006

DATUM: Geodetic

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					F E D CBA
100	Blotchy grey DOLOMITE, fine crystalline, moderately indurated, weakly laminated, tabular to platy chips (Amabel Fm)					
	Small fracture or vug at 103.3 m depth					
105	Becoming darker grey colour and weakly laminated					
	Trace fossils from 106.7 m to 111.3 m depth					
	Trace fine sulphides from 108.2 m to 109.7 m depth					
110						
115			184.86			
	Dark grey DOLOMITE, disseminated fine sulphides, platy to flaggy chips, crystalline contains thin shale lined fractures		115.80			
			183.16			
	Grey SHALE (Rochester Fm)		117.50			
	Dark grey DOLOMITE		118.25			
			180.86			
120	Dull brownish-gray DOLOMITE, interbedded green, soft shale, black mottling, disseminated sulphides, thinly laminated, platy chips		119.80			
			179.46			
	END OF BOREHOLE		121.20			
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW3-06

SHEET 1 OF 3

LOCATION: N 4804866.4 ;E 558916.3

DRILLING DATE: July 31 - August 3, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	302.44
	Brown, moist, SILTY SAND	0.00
		300.92
	Brown, moist, medium to coarse SAND, some gravel	1.52
5		
		295.73
	Grey, moist gravelly CLAYEY SILT (TILL)	6.71
	Brown, saturated SAND and GRAVEL, (coarse)	7.32
10	Becoming fine to coarse sand from 10.7 m to 12.2 m depth	
15	Becoming medium sand from 15.5 m to 19.8 m depth	
20		
25		
	Becoming sandy gravel from 29 m to 30.5 m depth	
30		271.94
	Brown, saturated, fine to coarse SAND, some gravel	30.50
		268.30
35	Beige/brown DOLOSTONE (Guelph Fm)	34.14
40		
45		
50	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

CBA

Grout

Bentonite

Sand

Screen

Sand

Bentonite

Sand

DEPTH SCALE

1 : 250

LOGGED: KS

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW3-06

SHEET 2 OF 3

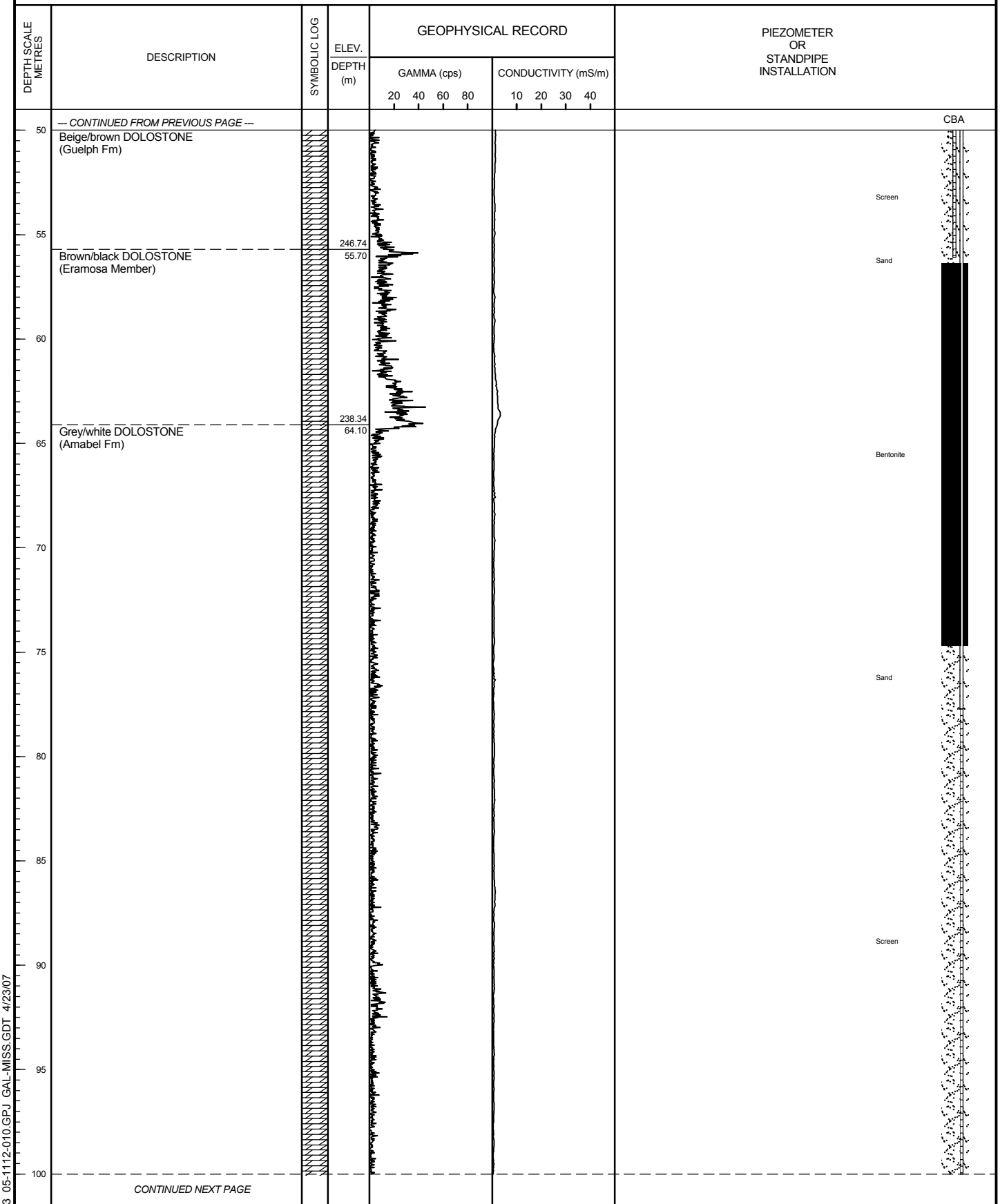
LOCATION: N 4804866.4 ;E 558916.3

DRILLING DATE: July 31 - August 3, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic



DEPTH SCALE

1 : 250

LOGGED: KS

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMOW3-06

SHEET 3 OF 3

LOCATION: N 4804866.4 ;E 558916.3

DRILLING DATE: July 31 - August 3, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					CBA
100	Grey/white DOLOSTONE (Amabel Fm)					
105						Screen
110						Sand
115						Bentonite
			185.94			
	Grey SHALE (Rochester Fm)		116.50			
			184.74			
	DOLOSTONE		117.70			Rock Fill
120						
			180.84			
	Green/grey SHALE (Cabot Head Fm)		121.60			
			179.34			
	END OF BOREHOLE		123.10			
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KS

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW1-06

SHEET 1 OF 3

LOCATION: N 4805353.2 ;E 558400.0

DRILLING DATE: May 8 to May 19, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	GROUND SURFACE	306.89
0	Brown TOPSOIL	0.30
	Light brown SILTY SAND and fine GRAVEL, some clay, angular to subangular gravel	
5		300.79
	Light grey SILT, some clay (TILL)	6.10
		299.27
	Light grey SILT, some sand, some fine gravel (TILL)	7.62
10		296.22
	Light grey fine SAND, some silt	10.67
15		290.13
	Light grey SILT, trace fine sand, trace clay (TILL)	16.76
		287.08
20	Light grey SILT, some fine sand, some gravel (TILL)	19.81
		284.03
	Light grey SILTY SAND and fine GRAVEL, angular to subangular gravel	22.86
25		280.98
	Light grey SAND and fine GRAVEL, some silt	25.91
		279.46
	Light grey SILTY SAND and fine GRAVEL	27.43
		277.93
	Light brown finely crystalline DOLOMITE (Guelph Formation)	28.96
30		
35		
		268.79
	Light grey, blotchy finely crystalline DOLOMITE, blocthes are dark grey and light grey to white (Guelph Formation)	38.10
40		
45		
50		

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

19" Diameter Cement

12" Diameter

12" Steel Casing

12" Diameter Open Borehole

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW1-06

SHEET 2 OF 3

LOCATION: N 4805353.2 ;E 558400.0

DRILLING DATE: May 8 to May 19, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50			255.07			
	Medium grey, blotchy finely crystalline DOLOMITE, increase in proportion of dark grey (Guelph Formation)		51.82			
55						
			247.45			
60	Light grey, blotchy finely crystalline DOLOMITE, small (<1 mm) vugs (Guelph Formation)		59.44			
			245.93			
	Medium grey, blotchy finely crystalline DOLOMITE, with small (<1 mm) vugs (Guelph Formation)		60.96			
			244.41			
	Medium grey, blotchy finely crystalline DOLOMITE, with small (<1 mm) vugs, light brown vuggy finely crystalline chips (weathered) (Guelph Formation)		62.48			
65			241.36			
	Medium grey blotchy finely crystalline DOLOMITE, sand size chips (Guelph Formation)		65.53			
70						
			235.49			
	Medium grey blotchy DOLOMITE and light brown vuggy dolomite (weathered) (Amabel Formation)		71.40			
			233.74			
	Medium grey blotchy fine crystalline DOLOMITE, sand size chips (Amabel Formation)		73.15			
75						12" Diameter Open Borehole
80						
85						
			216.97			
90	No sample recovered Rock pulverized by drilling action		89.92			
95						
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW1-06

SHEET 3 OF 3

LOCATION: N 4805353.2 ;E 558400.0

DRILLING DATE: May 8 to May 19, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
100	No sample recovered Rock pulverized by drilling action					
105						
110						12" Diameter Open Borehole
115						
120			185.59			
	END OF BOREHOLE		121.30			
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW2-06

SHEET 1 OF 3

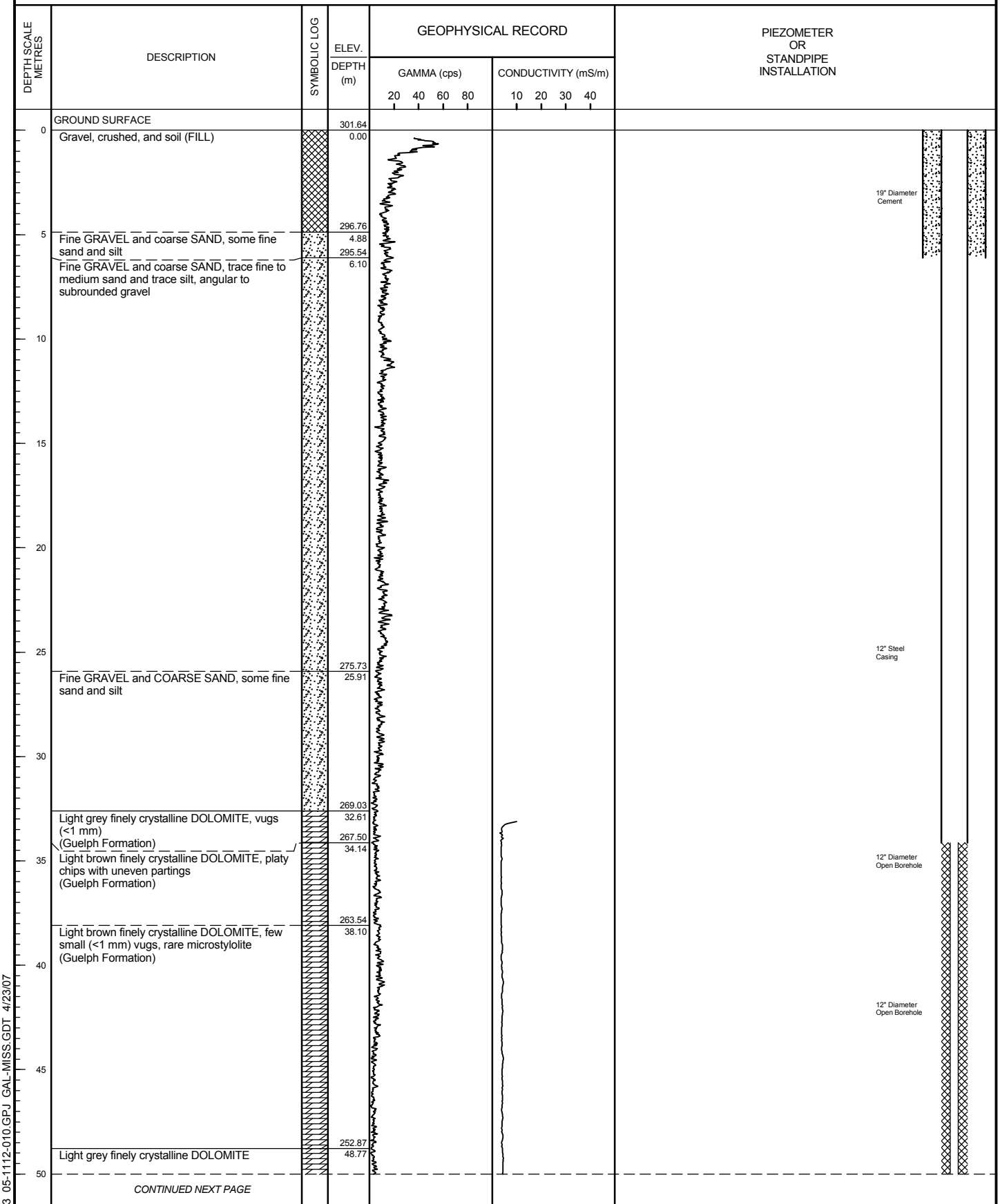
LOCATION: N 4804450.6 ;E 558967.1

DRILLING DATE: May 26 - June 7, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic



DEPTH SCALE

1 : 250

LOGGED: KM

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW2-06

SHEET 2 OF 3

LOCATION: N 4804450.6 ;E 558967.1

DRILLING DATE: May 26 - June 7, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	Light grey finely crystalline DOLOMITE					
55						
			242.34			
60	Dark grey finely crystalline DOLOMITE, sand sized chips (Eramosa Member)		59.30			
65						
			233.24			
	Blotchy white and medium grey , finely crystalline DOLOMITE, small (<1 mm) vugs (Amabel Formation)		68.40			
70						
75						12" Diameter Open Borehole
80						
	Light brownish grey, finely crystalline DOLOMITE, small (<1 mm) vugs, rare microstylolite					
85			216.30			
	No sample recovered Rock pulverized by drilling action		85.34			
90						
95						
100						
	CONTINUED NEXT PAGE					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMPW2-06

SHEET 3 OF 3

LOCATION: N 4804450.6 ;E 558967.1

DRILLING DATE: May 26 - June 7, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
100	No sample recovered Rock pulverized by drilling action					
105						
110						12" Diameter Open Borehole
115						
120			181.24			
	END OF BOREHOLE		120.40			
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW1-05

SHEET 1 OF 3

LOCATION: N 4805356.3 ;E 558402.6

DRILLING DATE: August 23 to 29, 2005

DATUM: Geodetic

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	307.11
	Brown TOPSOIL	0.30
	CLAY, with fine SAND, brown, lean, weathered, dense, trace organics (wood)	305.59 / 1.52
	Brown SAND and GRAVEL, trace clay, trace cobbles, dense, heterogeneous; angular to subangular gravel, weathered	
5		301.61
	Brown, fine to coarse SAND, homogeneous, clean	5.50 / 6.10
	Greyish-brown SAND and GRAVEL, heterogenous, fairly clean, medium dense, subrounded to angular	297.97
	Grey, Clayey SAND and GRAVEL (TILL), heterogeneous, subrounded to subangular gravel, med. dense	9.14
10		295.53
	Grey SILTY CLAY, soft, homogeneous	11.58
	- No odour	
15		
20		
		285.77
	Greyish-brown CLAY/SAND/GRAVEL, heterogenous, medium dense, non weathered (TILL)	21.34
		282.12
25	Grey CLAYEY SAND with GRAVEL, cobbles and few boulders. dense, heterogeneous, non weathered, subangular to angular gravel	24.99
		277.85
30	Light brown DOLOMITE, fine crystalline, thinly laminated, moderately indurated, trace weathering and to subangular chips, low porosity	29.26
	(Guelph Fm)	275.11 / 32.00
	Light, buff, brown DOLOMITE, fine grained, weakly laminated, mod induration platty, subangular to subrounded chips, sparse small vugs, weathered	272.36
35	(Guelph Fm)	34.75
	- No odour	
	Whitish, buff, brown DOLOMITE, medium crystalline, thinly laminated, platy to flaggy, shape chips, angular to subrounded, few small vugs, non weathered	
	(Guelph Fm)	267.49
40		39.62
	- No odour	
	Light buff gray with trace brown DOLOMITE, fine crystalline, weakly laminated, platty to blacky shape chips, angular to subangular, trace vugs, unweathered	
	(Guelph Fm)	
	Sparse secondary fine size sulphide mineralization	
45		261.39
		45.72
50		
	CONTINUED NEXT PAGE	

GEOPHYSICAL RECORD

GAMMA (cps): 20 40 60 80

CONDUCTIVITY (mS/m): 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

Cement-Bentonite Grout

9" Diameter Borehole

6" Steel Casing

6" Diameter Open Borehole

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW1-05

SHEET 2 OF 3

LOCATION: N 4805356.3 ;E 558402.6

DRILLING DATE: August 23 to 29, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	Dark grey to light grey DOLOMITE, fine crystalline, strongly indurated, weakly laminated, uneven partings, angular to subangular chips, sparse relict fossils, non weathered (Guelph Fm) - No odour					6" Diameter Open Borehole
55			250.72 56.39			
	GREY DOLOMITE, medium crystalline, moderately indurated weakly to strongly laminated, flaggy to platy shape chips angular to subangular chips, few vugs, fossiliferous, smooth to uneven partings, non weathered (Guelph Fm)					
60						
65	Grey/brown color banded					
	Dark grey, strongly indurated platy chips					
70			236.51 70.60			
	Grey/brown DOLOMITE, medium to coarse grained, weakly laminated, trace relict fossils, uneven partings, flaggy to tabular, angular to subangular chips, some vugs with fine size crystals (Amabel Fm)					
75						6" Diameter Open Borehole
80			224.81 82.30			
	Grey to brown, DOLOMITE, thinly laminated, fine crystalline, smooth to uneven parting, platy to flaggy shape chips, angular to subangular, few fossils (Amabel Fm)					
85	Very vuggy					
90			215.67 91.44			
	Dull brown DOLOMITE, weakly laminated, medium crystalline bioclastic vuggy, medium induration (Amabel Fm)					
95						
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW1-05

SHEET 3 OF 3

LOCATION: N 4805356.3 ;E 558402.6

DRILLING DATE: August 23 to 29, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
100	Dull brown DOLOMITE, weakly laminated, medium crystalline bioclastic vuggy, medium induration (Amabel Fm) granular layer					
105			201.91 105.20			
	Grey DOLOMITE, fine crystalline, medium to extremely vuggy (<1 mm), weakly indurated, platy to flaggy shape chips angular to subangular, non weathered (Amabel Fm) - No odour					
110	Fine size crystals lining vugs and joints Weakly indurated					
115						6" Diameter Open Borehole
120						
125			182.11			
	Grey SHALE (Rochester Fm)		125.00 181.11			
	Grey DOLOMITE		126.00			
			179.11			
	BROWN DOLOMITE with trace black specks throughout, strongly indurated, microcrystalline, sparse fine sulphides		128.00			
130			177.01			
	- No odour		130.10 176.01			
	Brown/greenish grey SHALE, poorly indurated, sparse sulphides (Cabot Head Fm)		131.10			
	END OF BOREHOLE					
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW2-05

SHEET 1 OF 3

LOCATION: N 4804452.2 ;E 558964.4

DRILLING DATE: November 1 to 7, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)
	GROUND SURFACE		301.80
0	Loose, wet, heterogeneous, crushed rock, soil, wood (tree trunks), boulders and cobbles (FILL) - No odour		0.00
			297.23
5	Loose, brown, homogenous fine to medium SAND		4.57
			295.70
	Loose, brown-grey coarse GRAVEL and SAND, trace cobbles, angular to subrounded gravel, heterogeneous		6.10
10			291.13
	Compact, clean homogeneous GRAVEL, angular to subrounded		10.67
15			286.56
	Compact, heterogeneous SAND and GRAVEL		15.24
			285.04
	Loose, fairly homogeneous SILTY fine SAND with gravel		16.76
			281.99
20	Loose, heterogeneous SAND and GRAVEL, subangular to subrounded gravel		19.81
25			273.15
	Compact, grey stony, heterogeneous CLAY, GRAVEL and SAND, angular to subrounded (Stoney TILL)		28.65
30			269.19
	Moderately weathered, fine grained light brown/grey DOLOMITE (Guleph Fm)		32.61 / 268.27
			33.53
35	Light dull grayish brown DOLOMITE with few vugs, moderately indurated, irregular parting, blocky to platy chips (Guelph Fm)		263.70
	Light dull brown DOLOMITE, moderately indurated, fine to medium crystalline, flaggy chips, smooth parting, few small (< 1 mm) vugs, laminated (Guelph Fm)		38.10
40			
45			
			253.03
			48.77
50	*CONTINUED NEXT PAGE*		

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

9" Diameter Borehole

Cement-Bentonite Grout

6" Steel Casing

6" Diameter Open Borehole

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW2-05

SHEET 2 OF 3

LOCATION: N 4804452.2 ;E 558964.4

DRILLING DATE: November 1 to 7, 2005

DATUM: Geodetic

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80 / CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
50	Grayish-brown DOLOMITE, dull, medium indurated, no vugs, fine crystalline, tabular to platy chips, smooth parting (Guelph Fm)				
	Poorly indurated from 53.34 m to 54.86 m depth				
55					
			243.89 / 57.91		
	Brown DOLOMITE, fine crystalline, moderately indurated, tabular to platty chips, smooth parting (Guelph Fm)		242.00 / 59.80		
60	Dark brown DOLOMITE, well indurated, non weathered, uniform texture, crystalline, blocky to tabular chips, smooth to bumpy parting (Eramosa Member) - Strong petro odour				
	Traces of clear and milky white calcite from 62.48 m to 67.06 m depth				
65					
	Thinly laminated and moderately indurated from 67.06 m to 68.58 m depth, shale partings				
			233.00 / 68.80		
	Light brownish-grey DOLOMITE, (blotchy shades) medium crystalline, moderate induration (Guelph Fm)				
70	Light whitish grey and fine grained from 71.02 m to 74.68 m depth				
			227.12 / 74.68		
75	Grey DOLOMITE, moderately indurated, fine crystalline, thick, massive beds, platy to blocky chips, both smooth and irregular partings (Guelph Fm)				6" Diameter Open Borehole
	Trace brown relict of pellets or concretion <1 cm from 77.72 m to 79.25 m depth				
80					
85	With some light brown color and fossiliferous from 85.34 m to 86.87 m depth				
	With few vugs between 88.39 m and 89.92 m depth				
90	Fractures from 90.83 m to 91.44 m depth Vuggy from 91.44 m to 92.96 m depth				
95	Fractures from 94.49 m to 96.01 m depth Vuggy from 94.49 m to 100.60 m depth				
100	*CONTINUED NEXT PAGE*				

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW2-05

SHEET 3 OF 3

LOCATION: N 4804452.2 ;E 558964.4

DRILLING DATE: November 1 to 7, 2005

DATUM: Geodetic

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80 / CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---				
100	Grey DOLOMITE, moderately indurated, fine crystalline, thick, massive beds, platy to blocky chips, both smooth and irregular partings (Guelph Fm) Grey/Brown DOLOMITE, well indurated Few shell cast fossills from 103.60 m to 105.20 m depth				
105					
			192.10		
110	Dark grey DOLOMITE, medium to indurated crystalline, platy to tabular chips, smooth to pitted parting surface (Guelph Fm)		109.70		6" Diameter Open Borehole
115					
			181.90		
120	Grey SHALE (Rochester Fm)		119.90 181.00		
	Darker grey DOLOMITE with slight greenish hue, moderately indurated, crystalline, thinly laminated, platy chips		120.80 179.30		
	Brown SHALE, moderately weathered, thinly laminated, fine grained		122.80		
	END OF BOREHOLE				
125					
130					
135					
140					
145					
150					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW3-05

SHEET 1 OF 3

LOCATION: N 4805132.0 ;E 557560.0

DRILLING DATE: November 9 and 11, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	GROUND SURFACE	
0	Dark brown to light brown CLAYEY fine SAND, homogeneous, soft, moist	0.00
	Brown SAND and GRAVEL, heterogeneous, loose, subrounded to subangular	1.83
	Brown, SILTY fine SAND, trace organics (wood-tree trunks), moist, loose	3.05
5	Brown GRAVEL, some fine sand, heterogeneous, wet, subrounded to subangular	6.10
	Brown CLAY, homogeneous, soft, no odour	8.50
10		
15	Brown CLAY, trace fine sand, trace gravel, homogeneous, moist, soft	15.00
20	Brown, SAND, GRAVEL and CLAY, heterogeneous (TILL)	19.81
	Brown CLAY, trace fine sand, gravel, homogeneous, moist, soft	20.42
25		
	COBBLES and GRAVEL, trace clay, dense massive	27.43
30	Light brown SILTY fine SAND, Compact, homogeneous, massive	30.48
35	SAND and GRAVEL, heterogeneous, loose	34.44
	Light brown DOLOMITE, fractured, poorly indurated, trace dark brown weathering, blocky rock chips, uneven parting, massive texture, crystalline, contains some grey dolomite after 38.1 m depth (Guelph Fm)	36.50
40	Light brown and brown DOLOMITE, contains intermittent laminations of weathered (orange-brown) siltstone/mudstone, trace vugs, moderately indurated, fine crystalline tabular to blocky chips (Guelph Fm)	41.15
	Light brown DOLOMITE, fine crystalline, well indurated, fine crystalline flaggy chips with fractures, trace weathering, uneven parting (Guelph Fm)	44.20
45		47.24
50	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

CBA

9" Diameter Borehole

Cement-Bentonite Grout

6" Diameter Steel Casing

Bentonite

Screen

6" Diameter Open Borehole

Bentonite

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW3-05

SHEET 2 OF 3

LOCATION: N 4805132.0 ;E 557560.0

DRILLING DATE: November 9 and 11, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					CBA
50	Light grey DOLOMITE, well indurated, crystalline, platy chips, thinly to medium layered, faintly weathered, contains trace small vugs (Guelph Fm)					
	Light brownish-grey DOLOMITE, crystalline, thinly to medium bedded, platy to blocky chips, irregular parting (Guelph Fm)		53.34			
55						Bentonite
	Grey DOLOMITE slight bluish hue, well indurated, thinly to medium layered, flaggy chips, crystalline, smooth to uneven parting (Guelph Fm)		58.83			
60						Sand
65	Less indurated, coarser grained, some vugs starting at 67.1 m depth					Screen
70	Coarse crystalline, fossiliferous, vuggy from 71.6 m to 76.2 m depth Fractured rock at 71.9 m					Sand
75						
	Light greyish-brown DOLOMITE, coarse crystalline, moderately indurated tabular chips, smooth - uneven parting, trace secondary sulphide mineralization		77.72			
80	Dark grey DOLOMITE, fine crystalline, well indurated with relict spheres, blocky to platy chips, smooth parting Some small (< 1 mm) vugs from 82.3 m to 85.3 m depth		80.77			
85						Bentonite
	Brown DOLOMITE, moderately indurated, coarse grained, tabular to platy chips, smooth parting		86.87			
90	Fractured rock at 89.9 m to 91.4 m depth					
	Fractured rock with strong sulphur odour from 92.7 m to 93.0 m depth		92.96			
95	Light grey DOLOMITE, vuggy, porous, moderately indurated, coarse crystalline, tabular to blocky chips (Amabel Fm)					
			99.06			
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: CMTW3-05

SHEET 3 OF 3

LOCATION: N 4805132.0 ;E 557560.0

DRILLING DATE: November 9 and 11, 2005

DATUM: Geodetic

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80 / CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---				CBA
100	Grey DOLOMITE, moderately indurated, fine crystalline, blocky to platy chips, smooth to irregular parting (Amabel Fm) Vuggy from 99.1 m to 100.6 m depth Fractured zone from 101.5 m to 101.8 m depth				Bentonite
105	Greyish-brown colour from 105.2 m to 108.2 m depth				Sand
110	Trace small (< 2 mm) vugs from 109.7 m to 112.8 m depth Dark brown, soft layer from 110.3 m 110.5 m depth				
	Grayish brown DOLOMITE, moderately indurated, fine crystalline, platy to tabular chips, smooth parting, relict fossils (Amabel Fm)		112.80		
115	Light grey DOLOMITE, moderately to well indurated, predominantly fine crystalline with thin coarse grained beds (Amabel Fm)		115.80		Screen
120					
125	Dark grey DOLOMITE, moderately indurated, fine crystalline, thinly to medium bedded, platy chips, smooth to uneven parting (Amabel Fm)		125.00		Sand
	Light grey DOLOMITE, moderately indurated, fine grained, tabular to platy chips (Amabel Fm)		128.00		Bentonite
130					
	Grey SHALE (Rochester Fm)		134.00		
135	Brown DOLOMITE, well indurated, fine crystalline, tabular chips, smooth parting, trace sulphides, trace black mottling		135.00		Rock Fill
	Gray SHALE, poorly indurated, fine grained (Cabot Head Fm)		138.40		
140	END OF BOREHOLE		140.50		
145					
150					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: HPOW1-06

SHEET 1 OF 1

LOCATION: N 4804394.6 ;E 558786.2

DRILLING DATE: August 22, 2006

DATUM: Geodetic

DRILL RIG: Direct Push with Continuous Scope

DRILLING CONTRACTOR: Strata Soil Sampling Inc.

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
0	GROUND SURFACE		299.90			B A
	SILT, some gravel		0.15			
	Fine grained SILTY SAND, some gravel		298.38			
	SILT, some clay, trace fine sand		1.52			
	Medium grained SAND, some gravel, trace silt		2.29			
			295.64			
5	SANDY SILT		4.26 294.72			
	Fine to medium grained SAND, some silt, some fine gravel		5.18 5.63			
	Fine SILTY SAND, trace fine gravel		292.58			
	END OF BOREHOLE		7.32			
10						
15						
20						
25						
30						
35						
40						
45						
50						

297.77
297.16

DEPTH SCALE
1 : 250

Golder Associates

LOGGED: JLH
CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW1ABCDE-08

SHEET 1 OF 3

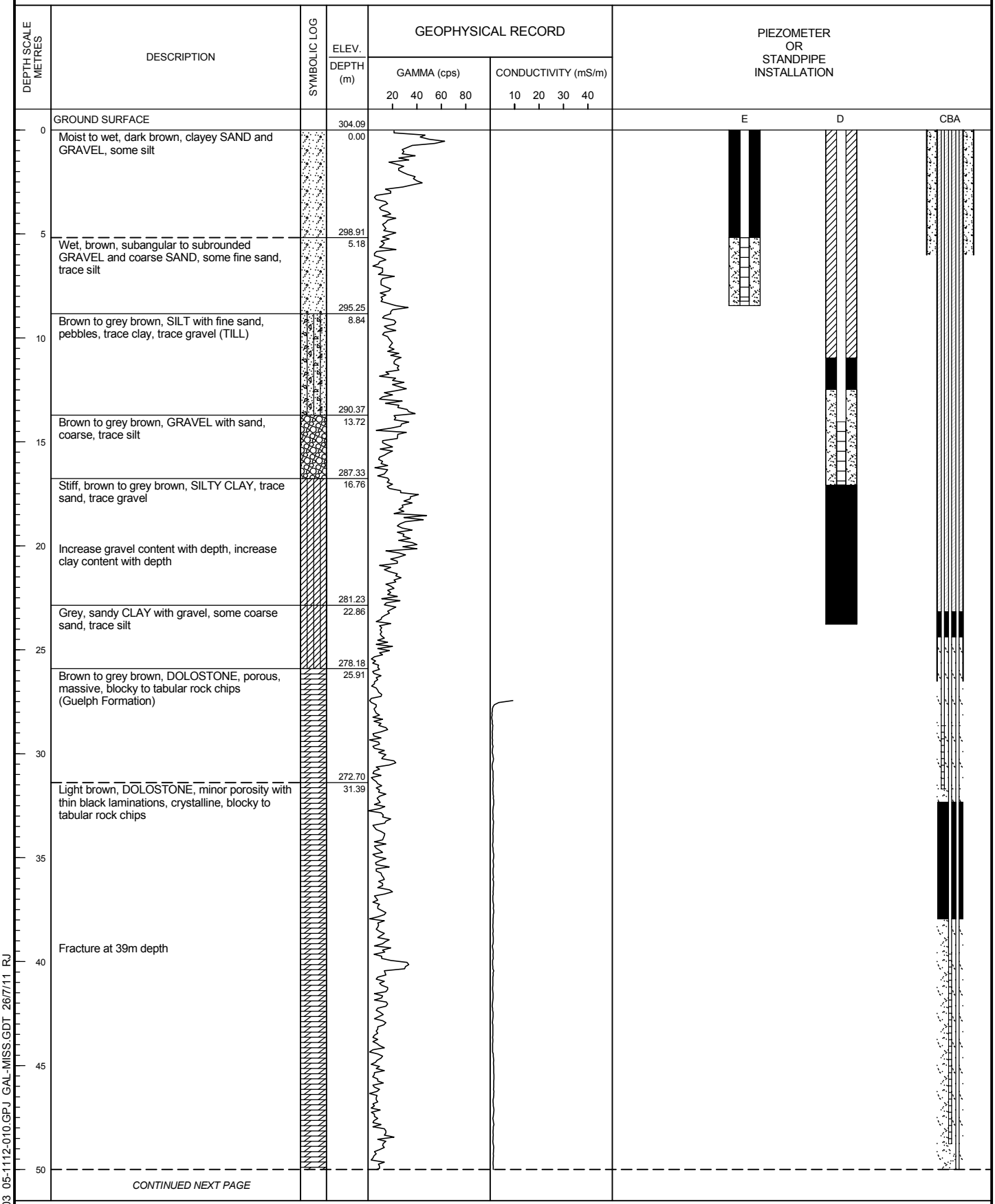
LOCATION: N 4804735.6 ;E 562254.3

DRILLING DATE: October 28 - December 10, 2008

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DATUM: Geodetic



DEPTH SCALE

1 : 250

Golder Associates

LOGGED: DN/SC

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW1ABCDE-08

LOCATION: N 4804735.6 ;E 562254.3

DRILLING DATE: October 28 - December 10, 2008

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
50			252.27			
	Dark brown, DOLOSTONE, massive, crystalline, minor porosity, blacky rock chips with irregular partings (Eramosa Member)		51.82			
55	Hydrocarbon odour detected during drilling, oily sheen noted on discharge water					
60	Becoming darker brown to black with depth					
65	Fracture at 65.5m depth					
	Grey to dark grey mottled, DOLOSTONE, porous, coarse grained, massive bedding (Amabel Formation)		237.03 67.06			
70	Colour variations from brown to dark grey					
75						
	Large fracture at 78m depth					
80	Fractured rock from 81.6m to 81.9m depth					
85						
90						
95						
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: DN/SC

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW1ABCDE-08

SHEET 3 OF 3

LOCATION: N 4804735.6 ;E 562254.3

DRILLING DATE: October 28 - December 10, 2008

DATUM: Geodetic

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
100	Grey to dark grey mottled, DOLOSTONE, porous, coarse grained, massive bedding (Amabel Formation) Vug/fracture at 103m and 107.8m depth					
105						
			194.36			
110	Dark grey DOLOSTONE with grey shale, thinly laminated (Rochester Formation)		109.73 192.53			
	Dull brown to grey brown DOLOSTONE with black speckled appearance, trace sulphide mineral present		111.56 190.09			
115	Grey to green SHALE, soft, thinly laminated (Cabot Head Formation)		114.30			
	END OF BOREHOLE					
120						
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: DN/SC

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW2ABCDE-08

SHEET 1 OF 3

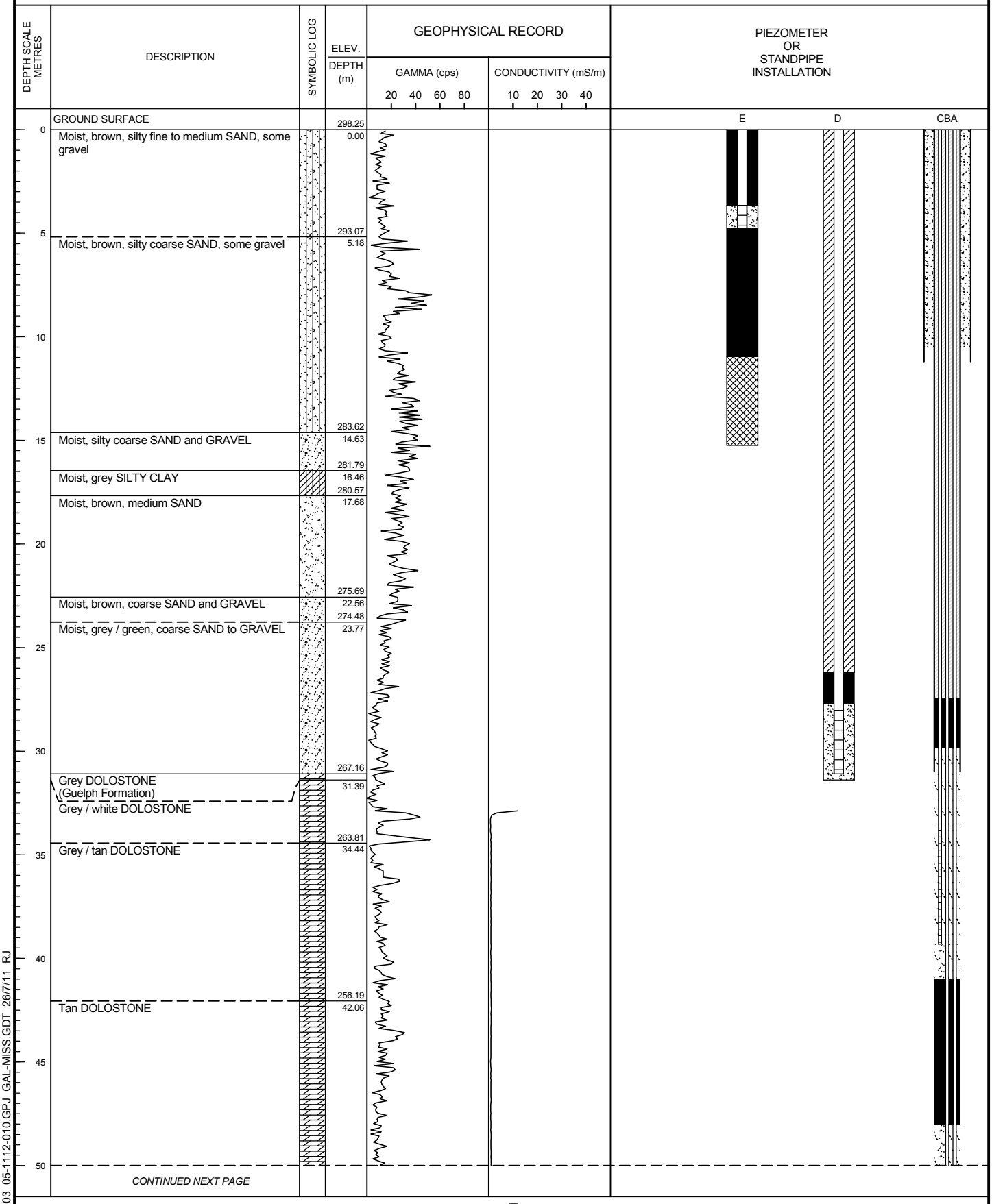
LOCATION: N 4803775.5 ;E 561220.1

DRILLING DATE: November 10 - December 22, 2008

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DATUM: Geodetic



DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW2ABCDE-08

SHEET 2 OF 3

LOCATION: N 4803775.5 ;E 561220.1

DRILLING DATE: November 10 - December 22, 2008

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
50	Tan DOLOSTONE					
55	Darker tan					
			239.42			
	Tan / black DOLOSTONE		58.83			
60			237.90			
	Dark grey / black DOLOSTONE, petroleum odour (Eramosa Member)		60.35			
65						
			231.19			
	Black / light grey DOLOSTONE, petroleum odour		67.06			
70						
			224.79			
	Light grey / tan DOLOSTONE (Amabel Formation)		73.46			
			74.07			
75	Tan DOLOSTONE					
			221.14			
	Light grey DOLOSTONE		77.11			
80			218.09			
	Light grey / tan DOLOSTONE		80.16			
			215.04			
	Light grey DOLOSTONE		83.21			
85						
90						
95						
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW2ABCDE-08

SHEET 3 OF 3

LOCATION: N 4803775.5 ;E 561220.1

DRILLING DATE: November 10 - December 22, 2008

DRILL RIG: Formost DR-12 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
100	Light grey DOLOSTONE					
105						
110						
115			182.43			
	Grey DOLOSTONE (with black specks), green shale (Cabot head Formation)		115.82			
	END OF BOREHOLE		116.43			
120						
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW3AB-08

SHEET 1 OF 1

LOCATION: N 4803928.6 ;E 562046.3

DRILLING DATE: November 17, 2008

DRILL RIG: Geoprobe 6620 DT

DRILLING CONTRACTOR: CMT Engineering

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		299.47			B A
0	Soft, brown to black, sandy soil with organics, becoming stony with depth (TOPSOIL)		0.00 299.19			
	Coarse to medium SAND and GRAVEL, sub-angular gravel		0.28			
1						
	- Wet below 1.5 m depth					
2						
3			296.27			
	Red-brown, silty fine SAND, uniform		3.20 295.81			
	Wet, clean, coarse SAND and GRAVEL, uniform		3.66			
4			295.20			
	Compact, grey-brown, sandy SILT with pebbles, trace clay (TILL)		4.27			
5						
6	- Heterogeneous layer of sand and gravel between 6.1 m and 6.9 m depth					
			292.58			
7	Grey SILTY CLAY with pebbles		6.89 292.15			
	Wet, clean, medium to coarse SAND and GRAVEL		7.32			
8						
9			290.02			
	Grey, gravelly SILT with fine sand (TILL)		9.45 289.72			
	END OF BOREHOLE		9.75			
10						

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DN

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW4AB-08

SHEET 1 OF 1

LOCATION: N 4803605.8 ;E 562601.2

DRILLING DATE: November 17, 2008

DRILL RIG: Geoprobe 6620 DT

DRILLING CONTRACTOR: CMT Engineering

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		299.27			B A
0	Black soil, organic, with rootlets (TOPSOIL)		0.00 / 298.97			
	Red-brown, fine SAND, some organics		0.30 / 298.76			
	Brown, fine SAND and SILT, some gravel, trace organics		0.51			
1	- Wet at 1.2 m depth		297.90			
	Loose to compact, moist to wet, light brown, silty fine SAND with stones		1.37			
2						
3			295.61			
	Wet, brown, heterogeneous, coarse SAND and GRAVEL with intermittent fine sand lenses		3.66			
4						
5						
6			292.56			
	Grey-brown, SILT with fine sand and pebbles (TILL)		6.71			
7						
8			290.74			
	END OF BOREHOLE		8.53			
9						
10						

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DN

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDOW5-08

SHEET 1 OF 1

LOCATION: N 4805018.4 ;E 563380.0

DRILLING DATE: November 18, 2008

DRILL RIG: Geoprobe 6620 DT

DRILLING CONTRACTOR: CMT Engineering

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		295.24			
0	Black, organic TOPSOIL		0.00			
			294.83			
	Loose to compact, moist to wet, brown, heterogeneous, silty SAND with gravel		0.41			
1						
2	- Becoming sandier, and less cohesive with depth, wet at 2.4m depth					
			292.34			
3	Compact, grey-brown, SILT with pebbles, trace clay (TILL)		2.90			
4						
5						
6						
7						
8			286.71			
	END OF BOREHOLE		8.53			
9						
10						

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DN

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDPW1-08

SHEET 1 OF 3

LOCATION: N 4804072.2 ;E 562219.2

DRILLING DATE: December 20, 2008

DRILL RIG: Formost DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		300.49			
0	Brown to dark brown, medium to coarse SAND		0.00			20" Borehole
			295.92			
5	Moist, brown to grey, GRAVEL, some medium to coarse sand		4.57			16" Steel Casing
			292.87			
	Moist, grey to brown, medium to coarse SAND, some gravel		7.62			
10			289.82			
	Moist, dark brown, medium to fine SAND, some silt		10.67			12" Steel Casing
			286.77			
	Moist, dark brown to grey, SILTY CLAY, trace sand		13.72			
15			283.73			
	Moist, dark brown/grey, fine to medium SAND, some clay		16.76			
			280.68			
20	Moist, dark brown, fine to medium SAND		19.81			
			278.54			
	Light grey, DOLOSTONE (Guelph Formation)		21.95			
			276.11			
25	Dark grey, DOLOSTONE, fine crystalline		24.38			
	- Dark to light grey					
	- Light grey					
	- Light grey/tan					
30	- Light/dark grey					
	- Light brown/grey					
35	- Brown/grey					Open Hole
	- Light brown					
40	- Light brown/grey, fractures from 42.6 m to 43.9 m					
45						
	- Light grey					
50	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDPW1-08

LOCATION: N 4804072.2 ;E 562219.2

DRILLING DATE: December 20, 2008

DRILL RIG: Formost DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	Dark grey, DOLOSTONE, fine crystalline - Light grey/tan, fracure at 51.8 m		248.67			
	Tan/black, DOLOSTONE, fine crystalline, petroleum odour (Eramosa Member) - Black		51.82			
55						
60						
65	- Black/dark grey		233.43			
	Tan/light grey, DOLOSTONE, fine crystalline (Amabel Formation) - Tan/dark grey		67.06			
70	- Light/dark grey - Light grey - Light/dark grey					
75						Open Hole / Open Hole
80	- Fracture at 79.2 m - Light grey - Light/dark grey					
85	- Light grey					
90	- Large fracture at 88.3 m - Light/dark grey - Large fracture at 90.8 m					
95						
100	- Dark grey					
	CONTINUED NEXT PAGE					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDPW1-08

SHEET 3 OF 3

LOCATION: N 4804072.2 ;E 562219.2

DRILLING DATE: December 20, 2008

DRILL RIG: Formost DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
100	*--- CONTINUED FROM PREVIOUS PAGE ---*					
	Tan/light grey, DOLOSTONE, fine crystalline (Amabel Formation)					Open Hole / Open Hole
105			193.81			
	END OF BOREHOLE		106.68			
110						
115						
120						
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW1ABCDE-08

SHEET 1 OF 3

LOCATION: N 4804125.2 ;E 562366.8

DRILLING DATE: October 7 - December 17, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		300.95			E D CBA
0	Dry, light brown, fine to medium SAND, trace gravel		0.00			
			296.99			
	Moist to wet, tan-light brown, GRAVEL, trace coarse sand		3.96			
5			295.46			
	Moist to wet, grey to dark brown, medium to coarse SAND, some gravel, trace silt		5.49			
			292.42			
	Grey to dark brown, medium to coarse SAND, trace gravel, trace silt		8.53			
10			289.06			Grout
	Moist, grey brown, coarse to medium silty SAND, trace gravel		11.89			
			287.54			
	Wet, grey, silty fine SAND, trace clay		13.41			
15			283.27			
	Grey to dark grey, SILTY CLAY, trace sand, trace gravel		17.68			
20			280.22			
	Firm, dark grey, SILTY CLAY, trace coarse sand, trace gravel		20.73			
			279.00			Bentonite
	Moist, grey, crushed rock, medium to coarse SAND, some gravel		21.95			
			276.57			Sand
	Grey, DOLOSTONE, platy chips, sub-angular, laminated, no odour (Guelph Formation)		24.38			
25						Screen
						Sand
30			270.47			
	Light grey, DOLOSTONE		30.48			
	Grey brown, platy chips, sub-angular, sugary texture, no odour					
35						Bentonite
			264.37			
	Brown grey, DOLOSTONE, platy chips, sub-angular, no odour		36.58			
40						Sand
45			255.23			
	Brown, DOLOSTONE, rounded to angular chips, no odour		45.72			Screen
			252.18			
	Grey brown, DOLOSTONE, rounded to angular chips, no odour		48.77			
50						
	CONTINUED NEXT PAGE					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW1ABCDE-08

LOCATION: N 4804125.2 ;E 562366.8

DRILLING DATE: October 7 - December 17, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
50	Grey brown, DOLOSTONE, rounded to angular chips, no odour		249.13			Screen, Sand
	Brown grey, DOLOSTONE, no odour, porous		51.82 247.61			
	Brown black, DOLOSTONE, fine crystalline (Eramosa Member)		53.34 246.09			
55	Black, DOLOSTONE, fine crystalline, petroleum odour (Eramosa Member)		54.86			
60						
			236.94			
	Black with white chips, DOLOSTONE, fine crystalline, no odour		64.01 235.42			Bentonite
65	Black to dark grey, yellow on some chips, DOLOSTONE, fine crystalline, no odour		65.53 233.89			
	Grey to dark grey, DOLOSTONE, fine crystalline, no odour (Amabel Formation) Becoming dark grey		67.06			
70	Becoming light grey					
75	Mixture of light and dark grey					Sand
	Vuggy from 79m to 81m					
80						
85	Dark grey					
	Light and dark grey					Screen
90						
	Dark grey					
95	Dark grey					
	Fracture at 96m depth					
	Dark grey					Sand
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW1ABCDE-08

LOCATION: N 4804125.2 ;E 562366.8

DRILLING DATE: October 7 - December 17, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					E D CBA
100	Dark grey, DOLOSTONE, fine crystalline, no odour		200.37 100.58			
105						
	Grey SHALE (Rochester Formation)		193.95 107.00			Bentonite
110	Dark grey / black, DOLOSTONE, fine crystalline, no odour		191.22 109.73			
	Mixture of light and dark grey, medium hard, DOLOSTONE, fine crystalline, no odour		189.70 111.25			
	Light tan, DOLOSTONE, red / green shale, medium hard, fine crystalline, no odour (Cabot Head Formation)		188.17 112.78			
115	END OF BOREHOLE		186.35 114.60			
120						
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW2-08

SHEET 1 OF 3

LOCATION: N 4804075.7 ;E 562219.7

DRILLING DATE: October 3-8, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE		300.55			
0	Brown to dark brown, medium to coarse SAND, some gravel		0.00			Cement-bentonite Grout; 10" Diameter Borehole
5	Moist, brown to grey, GRAVEL, some medium to coarse sand		295.37 5.18			
	Moist, brown grey, medium to coarse SAND, some gravel		292.32 8.23			
10	Moist, dark brown, medium to fine SAND, some silt		289.27 11.28			
	Moist, dark brown/grey, SILTY CLAY, trace fine sand		286.22 14.33			6 " Steel Casing
15	Moist, dark brown, silty fine to medium SAND, trace clay		283.18 17.37			
	Moist, dark brown/grey, medium to fine SAND, some clay		281.65 18.90			
20	Light grey, DOLOSTONE, sub-angular, small amount vugs, no odour (Guelph Formation)		278.60 21.95			
	Dark grey, DOLOSTONE, platy chips, sub-angular, fine crystalline, no odour		275.56 24.99			
25	Dark to light grey					
	Light grey					
30	Light grey / tan					
	Light / dark grey					
	Light brown / grey					
35						Open Borehole
	Brown / grey					
	Light brown					
40						
	Light brown / grey					
45						
	Light grey Mix of light / tan					
50	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW2-08

SHEET 2 OF 3

LOCATION: N 4804075.7 ;E 562219.7

DRILLING DATE: October 3-8, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50			249.65			
	Mix of light grey / tan, DOLOSTONE, fine crystalline, petroleum odour (Eramosa Member)		50.90			
			248.12			
	Black, DOLOSTONE, platy chips, sub-angular, fine crystalline, petroleum odour		52.43			
			246.60			
55	Black, DOLOSTONE, fine crystalline, petroleum odour (Eramosa Member)		53.95			
60						
65	Mix of black and dark grey					
			232.88			
	Tan / light grey, DOLOSTONE, fine crystalline, no odour (Amabel Formation)		67.67			
70	Tan / dark grey					
	Light / dark grey					
	Light grey					
75	Light / dark grey					
	Platy chips, fracture at 77 m depth					
80						
	Light grey					
	Light / dark grey					
85						
	Light grey to dark grey					
	Light / dark grey					
90	Dark / light grey					
	Light / dark grey					
95						
	Dark grey					
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1900)

BOREHOLE LOG OF: NDTW2-08

SHEET 3 OF 3

LOCATION: N 4804075.7 ;E 562219.7

DRILLING DATE: October 3-8, 2008

DRILL RIG: DR-24 Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
100	Tan / light grey, DOLOSTONE, fine crystalline, no odour (Amabel Formation)					
105	Darker grey					
			190.82			
110	Mix of light and dark grey, medium hard, DOLOSTONE, fine crystalline, no odour		109.73			
	Light grey / tan, crushed, DOLOSTONE, fine crystalline, no odour		110.34 188.69			
	Tan, crushed, DOLOSTONE, green/red SHALE, fine crystalline, no odour (Cabot Head Formation)		111.86			
115			185.03			
	END OF BOREHOLE		115.52			
120						
125						
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: BH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 26/7/11 RJ

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW1-06

SHEET 1 OF 3

LOCATION: N 4806058.2 ;E 559285.8

DRILLING DATE: June 21 to June 26, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	GROUND SURFACE	308.21
0	Brown CLAY, lean, moist, uniform, contains rootlets	0.00
		306.38
	Medium brown SILTY CLAY, some sand, some gravel, fairly uniform, weathered	1.83
		305.16
	Brown, GRAVELLY SILT, trace clay, heterogeneous, wet, moderate weathered (TILL)	3.05
5		302.43
	Grey SILTY SAND and GRAVEL, heterogeneous (TILL)	5.78
	With clay from 7.0 m to 7.3 m depth	300.89
	Grey SAND and GRAVEL, little silt, heterogeneous, subangular to subrounded gravel	7.32
10		
	Predominantly coarse gravel from 11.3 m to 11.7 m depth	
		294.19
	Greyish-brown fine SAND, loose, clean, homogeneous	14.02
15		292.82
	Grey SILTY CLAY with coarse SAND, heterogeneous, compact (TILL)	15.39
		290.84
	Brown SAND and fine GRAVEL, heterogeneous, compact	17.37
20		288.09
	Brown fine SAND, loose, homogeneous, clean	20.12
25		
		278.21
30	Trace gravel at 30.0 m to 30.5 m depth	30.00
	Grey CLAY with SAND, heterogeneous, stiff (TILL)	276.51
		31.70
	Brown GRAVEL and SAND, trace silt, heterogeneous, fairly clean, dense, angular to subrounded gravel	
	With cobbles from 32.0 m to 23.6 m depth	273.62
35	Grayish brown DOLOMITE, fine grained, blocky to platy chips, irregular parting, uniform, medium indurated (Guelph Fm)	34.59
40		
45		
	Becoming a dull, light brown, color at 48.8 m depth	
50		

CONTINUED NEXT PAGE

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F E CBA

299.91

296.86

288.33

285.88

Grout

276.21

Bentonite

Sand

272.70

Screen

Bentonite

Sand

Screen

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW1-06

SHEET 2 OF 3

LOCATION: N 4806058.2 ;E 559285.8

DRILLING DATE: June 21 to June 26, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---				F E CBA
50	Grayish brown DOLOMITE, fine grained, blocky to platy chips, irregular parting, uniform, medium indurated (Guelph Fm) Vuggy rock from 50.3 m to 53.3 m depth				Screen
55	Darker, dull brown from 54.6 m to 56.7 m depth				Sand
		251.52			
	Dark brown DOLOMITE, crystalline, thickly bedded, platy to blocky chips, moderately indurated with strong petroliferous odour (Eramosa Member)	56.69			
60					
		245.81			
	Dull, light brownish grey blotchy, crystalline, platy to blocky chips (Amabel Fm)	62.40			
65	Trace sulphides at 65.2 m depth				
	Relict peloids/fossils from 67.1 m to 71.6 m depth				
70					
	With micro-vugs from 73.2 m to 80.8 m depth				Bentonite
75					
80					
	Small fracture at 83.8 m depth				
85	Fossiliferous (coral) porous rock from 85.3 m to 111.3 m depth				
	Crinoids, peloids and shell fossils from 88.4 m to 89.9 m depth				
90	Dull light grey from 89.9 m to 99.1 m depth				Sand
95					Screen
	Fracture or vug (30 cm thick) at 98.5 m depth				
100	*CONTINUED NEXT PAGE*				

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW1-06

SHEET 3 OF 3

LOCATION: N 4806058.2 ;E 559285.8

DRILLING DATE: June 21 to June 26, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					F E CBA
100	Dull, light brownish grey blotchy, crystalline, platy to blocky chips (Amabel Fm) Very vuggy (porous) from 100.6 m to 111.3 m depth					Screen
105						
110						Sand
			196.91			
	Grey DOLOMITE, crystalline, weakly laminated, moderately indurated, smooth parting, no odour (Amabel Fm)		111.30			Bentonite
115						
120						Rock Fill
			186.71			
	Grey SHALE (Rochester Fm)		121.50			
	Brown DOLOMITE with green shale stringers, mottled black, contains disseminated fine sulphides Sparse sulphides from 121.9 m to 123.4 m depth		122.00			
125			182.61			
	Grey SHALE, soft (Cabot Head Fm)		125.60 181.71			
	END OF BOREHOLE		126.50			
130						
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW2-06

SHEET 1 OF 3

LOCATION: N 4806923.4 ;E 558534.7

DRILLING DATE: July 11 to July 24, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	GROUND SURFACE	310.68
0	Brown, fine to medium SAND, trace gravel, silt, moist, loose to compact, subangular to subrounded, fairly uniform	0.00
		307.63
	Brown CLAYEY SILT, trace coarse sand, little gravel, firm to stiff, moist, heterogeneous, 0.5 cm to 1 cm subangular (TILL)	3.05
5		
10		
		298.49
	Grey, fine to medium SAND, trace silt, wet, homogeneous	12.19
15		
		291.68
	Grey CLAYEY SILT, trace pebbles and gravel, heterogeneous, 0.5 cm to 1 cm subangular (TILL)	19.00
20		289.68
	Grey to brown, medium SAND, trace GRAVEL, loose, fairly uniform	21.00
25		284.77
	Medium brown, coarse SAND and GRAVEL, 0.5 cm to 1 cm subrounded, compact	25.91
	Some silt becoming present by 28.9 m	
30		
		277.15
	Beige GRAVELLY SAND, little silt, contains broken dolostone, subangular gravel, heterogenous	33.53
35		275.17
	Buff brown DOLOMITE, fine grained, poorly indurated, contains small vugs, tabular to blocky chips (Guelph Fm)	35.51
	Trace fossils (coral) from 41.2 to 42.7	
40		
45		
	Greyish brown and friable rock from 48.8 m to 51.8 m depth	
50		

CONTINUED NEXT PAGE

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F E D CBA

296.66

293.62

285.69

282.64

Grout

Bentonite

277.46

274.41

Screen

Bentonite

Screen

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW2-06

SHEET 2 OF 3

LOCATION: N 4806923.4 ;E 558534.7

DRILLING DATE: July 11 to July 24, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
50	Buff brown DOLOMITE, fine grained, poorly indurated, contains small vugs, tabular to blocky chips (Guelph Fm) Becoming crystalline at 51.8 m depth	
		257.18
	Grey DOLOMITE, crystalline, moderately indurated, blocky and irregular chips (Eramosa Member) Fractured rock from 54.0 m to 54.9 m depth Contains trace fine disseminated sulphides from 54.0 m to 61.0 m depth	53.50
55		
60		
	Dull, grey with some fossils (crinoids and coral) from 61.0 m to 73.1 m depth	
		246.88
	DOLOMITE, fine crystalline, well indurated, contains relict fossils (Amabel Fm)	63.80
65		
70		
	Dark grey from 73.2 m to 77.7 m depth	
75		
	Weakly laminated, platy to flaggy chips, greyish brown from 77.7 m to 85.3 m depth	
80		
		225.34
85	Grey DOLOMITE, fine crystalline, well to moderately indurated, blocky to flaggy chips (Amabel Fm)	85.34
	With some brown dolomite from 89.9 m to 93.0 m depth	
90		
	Vuggy after 94.5 m depth	
95		
	Large vugs from 96.0 m to 100.6 m depth	
100		
	CONTINUED NEXT PAGE	

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

F E D CBA

Screen

Bentonite

Rock Fill

Bentonite

Sand

Screen

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBOW2-06

SHEET 3 OF 3

LOCATION: N 4806923.4 ;E 558534.7

DRILLING DATE: July 11 to July 24, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					F E D CBA
100	Grey DOLOMITE, fine crystalline, well to moderately indurated, blocky to flaggy chips (Amabel Fm)					
	Large fracture or vug at 103.3 m depth					
105	Fractures (0.15 cm thick) at 104.4 m depth Brown colour from 105.2 m to 106.7 m depth					Screen
	Large fracture (~0.30 cm thick) at 107.9 m depth Brown colour from 108.2 m to 112.8 m depth					
110						Sand
			197.88 112.80			
	Grey DOLOMITE, fine crystalline, moderately indurated, tabular to flaggy chips, thinly laminated, uniform texture (Amabel Fm) Trace disseminated sulphides from 112.8 m to 114.3 m depth					Bentonite
115						
120						Rock Fill
			187.18			
	Grey SHALE (Rochester Fm)		123.50			
	Grey DOLOMITE		124.00 185.68			
125	Dull Brown DOLOMITE, mottled black, moderately indurated, tabular to platy chips, with trace disseminated sulphides		125.00			
			183.28			
	Green SHALE, soft, becoming grey at 128 m depth (Cabot Head Fm) Dark brown shale, weakly indurated		127.40 181.78			
130	END OF BOREHOLE		128.90			
135						
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBPW1-06

SHEET 1 OF 3

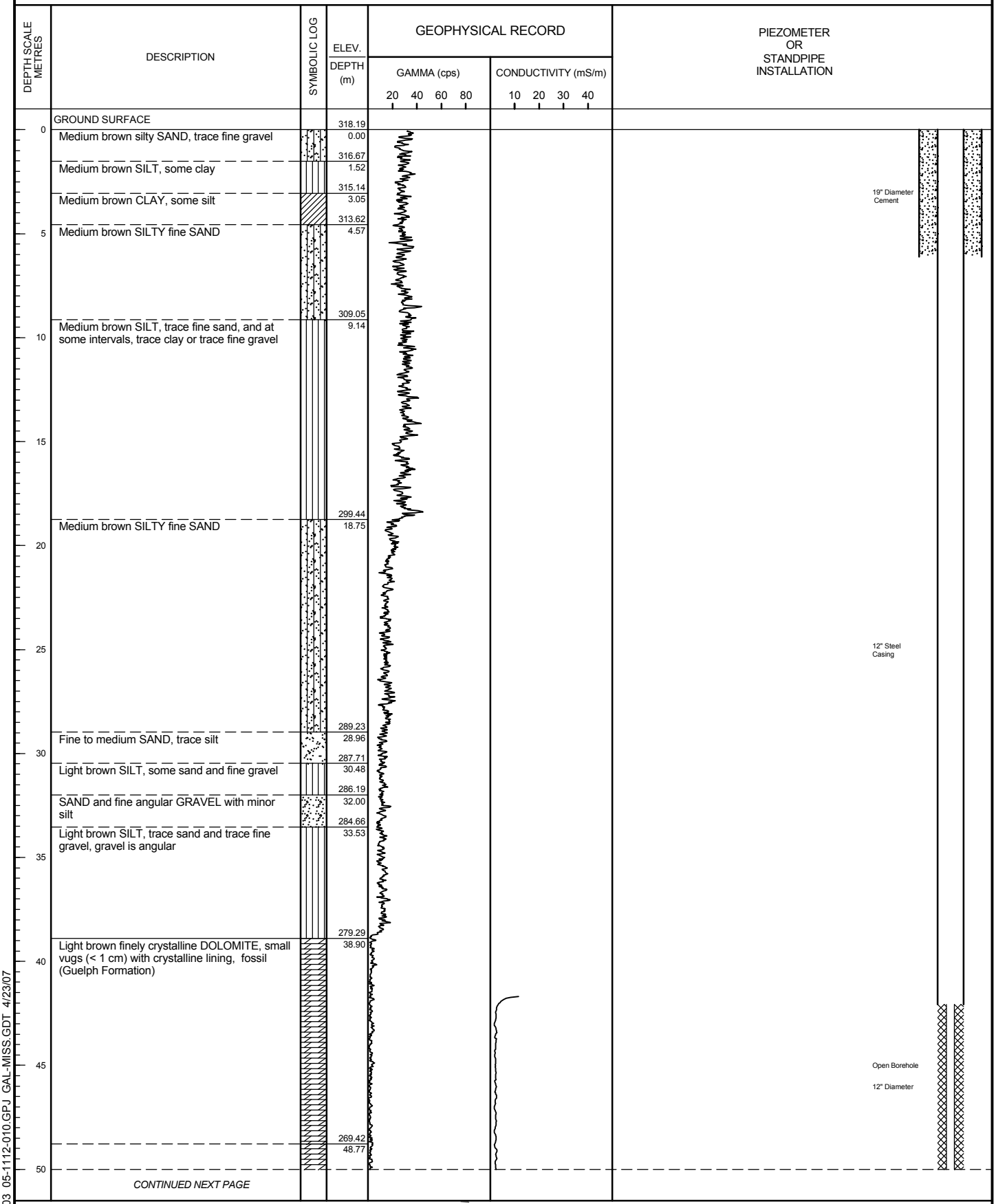
LOCATION: N 4806229.1 ;E 558217.2

DRILLING DATE: June 29 to July 14, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic



DEPTH SCALE

1 : 250

LOGGED: KM

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBPW1-06

LOCATION: N 4806229.1 ;E 558217.2

DRILLING DATE: June 29 to July 14, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	Light grey to blotchy finely crystalline DOLOMITE, botches are medium grey and light grey to white, rare vug (< 3 mm) with crystalline lining and fossil coral (Guelph Formation)					
55						
60			257.23 / 60.96			
	Medium grey blotchy finely crystalline DOLOMITE, increase in proportion of medium grey					
65						
70						
75			243.51 / 74.68			
	No sample recovered Rock pulverized by drilling action					12" Diameter
80						
85						
90						
95						
100						
	CONTINUED NEXT PAGE					

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBPW1-06

SHEET 3 OF 3

LOCATION: N 4806229.1 ;E 558217.2

DRILLING DATE: June 29 to July 14, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
100	*--- CONTINUED FROM PREVIOUS PAGE ---*					
	No sample recovered Rock pulverized by drilling action					
105						
110						
115						
120						12" Diameter
125						
130						
135			179.49			
	END OF BOREHOLE		138.70			
140						
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBPW2-08

SHEET 1 OF 3

LOCATION: N 4805910.8 ;E 557478.2

DRILLING DATE: April 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary Foremost D-24

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		GROUND SURFACE		308.85					
0	Air Rotary, 305mm ID Steel Casing	Dry, brown, fine SAND, trace to some silt		0.00	1	AS			Cement Grout
					2	AS			
					3	AS			457 mm Dia. Steel Casing (0-6m)
5					4	AS			
					5	AS			
				301.23					
		Brown, fine to medium SAND, trace fine gravel		7.62	6	AS			
10					7	AS			
				298.18					
		Wet, dark brown, gravelly SAND, medium to coarse sand, fine gravel		10.67	8	AS			
				296.66					
		Moist to wet, dark brown, fine sandy SILT		12.19	9	AS			
				295.13					
15		Moist to wet, dark brown, GRAVEL and fine sandy SILT, gravel fine to medium grained, sub-rounded to sub-angular		13.72	10	AS			300 mm Dia. Steel Casing (0-29.26 m)
					11	AS			
		Less gravel at 16.8-18.3 m depth			12	WS			
				290.56					
		Brown, fine to coarse GRAVEL, sub-rounded to sub-angular, trace silty sand		18.29	13	WS			
20					14	WS			
				287.51					
		Brown, medium SAND, trace gravel		21.34	15	WS			
				285.99					
		Brown, SILT, some fine to coarse gravel and fine sand		22.86	16	WS			
25					17	WS			
				282.94					
		Brown, gravelly fine SAND, trace silt		25.91	18	WS			
				282.03					
		Yellowish brown to light brown DOLOSTONE, medium crystalline, some iron staining, trace calcite (29-30.5 m) (GUELPH FORMATION)		26.82	19	WS			
30					20	WS			
		Greyish brown colour at 30.5-33.5 m depth			21	WS			
					22	WS			
		Whitish brown colour, slightly porous at 33.5-36.6 m depth			23	WS			
35				273.80					
	Air Rotary, Open Hole	Brown to dark brown DOLOSTONE, fine to medium crystalline, slightly to moderately porous		35.05	24	WS			
					25	WS			
					26	WS			300 mm Dia. Open Hole (29.26 -128 m)
40					27	WS			
					28	WS			
				266.18					
		Light grey DOLOSTONE, white mottling, finely crystalline, moderately to hightly porous (AMABEL FORMATION)		42.67	29	WS			
45					30	WS			
					31	WS			
					32	WS			
					33	WS			
50		*CONTINUED NEXT PAGE*							

DEPTH SCALE

1 : 250

LOGGED: JH

CHECKED: AI

Golder Associates

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBPW2-08

SHEET 2 OF 3

LOCATION: N 4805910.8 ;E 557478.2

DRILLING DATE: April 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary Foremost D-24

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							
50		Greyish brown DOLOSTONE, coarsely crystalline, slightly to moderately porous (AMABEL FORMATION)		258.56 30.29	34	WS			
					35	WS			
					36	WS			
55					37	WS			
					38	WS			
		Very highly porous and fossiliferous at 57.9-61 m depth			39	WS			
60					40	WS			
		Dary grey DOLOSTONE, white mottling, finely crystalline, slightly porous		247.89 60.96	41	WS			
					42	WS			
65					43	WS			
					44	WS			
					45	WS			
		Becoming light grey at 68.6 m depth			46	WS			
70					47	WS			
		Becoming highly porous at 71.6 m depth		237.22 71.63	48	WS			
		Greyish brown DOLOSTONE, finely to coarsely crystalline			49	WS			
75	Air Rotary Open Hole				50	WS			300 mm Dia. Open Hole (29.26 -128 m)
					51	WS			
					52	WS			
80					53	WS			
					54	WS			
					55	WS			
85					56	WS			
					57	WS			
					58	WS			
		Grey DOLOSTONE, some brown mottling, coarsely crystalline, moderately porous		220.46 88.39	59	WS			
90					60	WS			
		Producing lots of water at 91.4-94.5 m depth			61	WS			
					62	WS			
95					63	WS			
					64	WS			
					65	WS			
100					66	WS			
		CONTINUED NEXT PAGE							

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: AI

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBPW2-08

SHEET 3 OF 3

LOCATION: N 4805910.8 ;E 557478.2

DRILLING DATE: April 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary Foremost D-24

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---								
100	Air Rotary Open Hole	Grey DOLOSTONE, some brown mottling, coarsely crystalline, moderately porous Large fracture at 100.3 m depth			66	WS				
					67	WS				
					68	WS				
					69	WS				
105					70	WS				
					71	WS				
					72	WS				
110					73	WS				
					74	WS				
					75	WS				300 mm Dia. Open Hole (29.26 -128 m)
115					76	WS				
					77	WS				
					78	WS				
120					79	WS				
					80	WS				
					81	WS				
125					82	WS				
					83	WS				
				180.83	84	WS				
		END OF BOREHOLE		128.02						
130										
135										
140										
145										
150										

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: AI

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW1-05

LOCATION: N 4806856.7 ;E 558317.2

DRILLING DATE: August 15 to 22, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

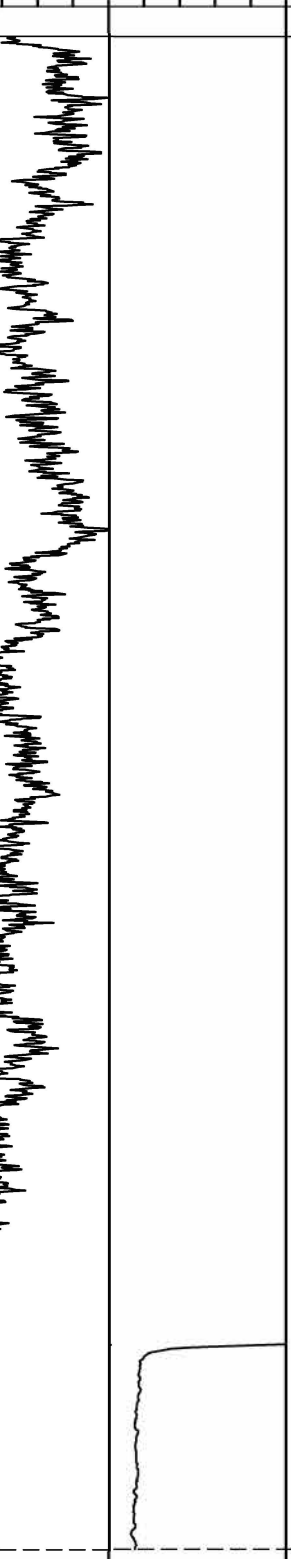
DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	GROUND SURFACE	314.56
0	Brown, fine SAND, some silt, uniform, loose	0.00
		309.68
5	Grey, CLAY and coarse GRAVEL, dense, tear: clay, subangular to subrounded gravel (TILL)	4.88
		307.24
	Grey SILTY fine GRAVEL, thin layers of grey clay and fine sand ; heterogeneous, subrounded to subangular gravel (TILL);	7.32
10		
15		
		296.27
	Grey CLAY, fat, greasy feel, uniform, no odour	18.29
20		
		290.79
	GRAVEL	23.77
	Grey CLAY, soft, fat, greasy feel, uniform	24.38
25		
30		
		283.78
	Grey SAND and GRAVEL, loose, clean, heterogeneous, subrounded to subangular gravel	30.78
35		
		276.76
	SILTY SAND and GRAVEL, Compact, heterogeneous, subangular to subroundec gravel	37.80
		274.66
40	Light brown DOLOMITE, hard, fractured, porous (Guelph Fm)	39.90
		273.41
	Darker brown DOLOMITE, microcrystalline smooth fracture, dense, non weathered, nc odour (Guelph Fm)	41.15
		271.89
45	Light whitish brown DOLOMITE, dull, fossiliferous, vuggy, platy to flaggy rock chips with uneven fracture, no odour, non weathered (Guelph Fm)	42.67
50		

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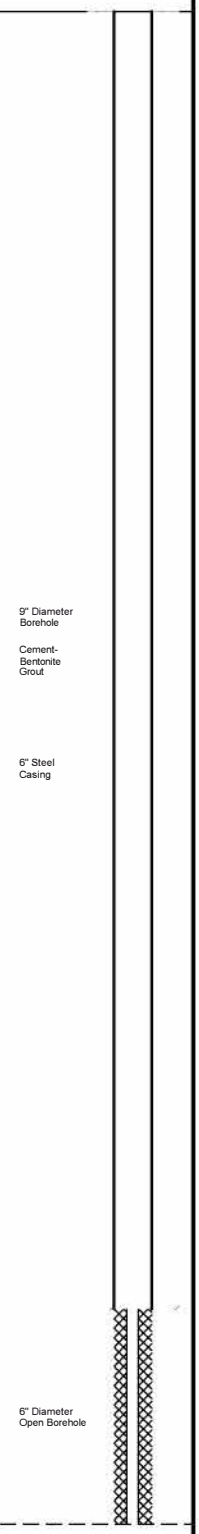
GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12



PIEZOMETER OR STANDPIPE INSTALLATION



DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW1-05

SHEET 2 OF 3

LOCATION: N 4806856.7 ;E 558317.2

DRILLING DATE: August 15 to 22, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
50	Light whitish brown DOLOMITE, dull, fossiliferous, vuggy, platy to flaggy rock chips with uneven fracture, no odour, non weathered (Guelph Fm)	
	Slightly grayer at 50.3 m	
	Greyish brown at 51.8 m	
55		258.17
	Light bluish grey DOLOMITE, fine crystalline, platy to blocky chips, ang to subangular chips some small (< 1mm) vugs, uneven fracture thinly laminated (Guelph Fm)	56.39
60		
65		247.06
	Darker bluish grey DOLOMITE, smooth fracture, sparse vugs, platty, sub-ang to ang chips (Eramosa Member)	67.50
70	Becoming dull bluish grey	244.56 70.00
	Dull bluish grey DOLOMITE, fine crystalline, platy to blocky chips, angular to subangular chips some small (< 1mm) vugs, unever fracture, thinly laminated (Amabel Fm)	
	Smoother rock chip fracture and sparse vugs	
75		236.84
	Grey brown DOLOMITE, fine crystalline, platy angular to subangular, some small vugs, thinly laminated (Amabel Fm)	77.72 235.31 79.25
80	Light brown, trace grey DOLOMITE, coarse, crystalline, hackly fracture, dull, no odour, non weathered	
85		
	Becoming darker brown with trace grey unever fracture, sparse vugs, crystalline, non weathered, no odour	
90	Dark brown, trace grey DOLOMITE, coarse, crystalline, hackly fracture, dull, no odour, non weathered (Amabel Fm)	224.56 90.00
95		
	Becoming dull, greyish brown	
100		214.56
	CONTINUED NEXT PAGE	

GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12

PIEZOMETER OR STANDPIPE INSTALLATION

6" Diameter Open Borehole

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW1-05

SHEET 3 OF 3

LOCATION: N 4806856.7 ;E 558317.2

DRILLING DATE: August 15 to 22, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
100	Dull greyish brown, trace grey DOLOMITE coarse, crystalline, hackly fracture, dull, no odour, non weathered (Amabel Fm) With large size vugs or fractures	100.00
105	Large cavity or fracture	207.86
	Buff Grey DOLOMITE vuggy, porous, weakly indurated, fossiliferous, coarse, crystalline, uneven fractures (Amabel Fm) Rods dropped ~ 3 inches, large cavity or fracture	106.70
110		
115	Becoming less porous	
120	Dark grey DOLOMITE, medium crystalline, platy angular to subangular chips, hard, thinly laminated, non weathered, no odour (Amabel Fm)	194.56 120.00
125	Grey SHALE (Rochester Fm)	189.06 125.50
	Dark grey DOLOMITE	126.00
	Dark brown DOLOMITE, microcrystalline, dense, noodour, some sulphides	186.55 128.01
130	Clayey Grey SHALE weakly indurated, no odour non-weathered (Cabot Head Fm)	185.02 129.54 183.96
	END OF BOREHOLE	130.60
135		
140		
145		
150		

GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12

PIEZOMETER OR STANDPIPE INSTALLATION

6" Diameter Open Borehole

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW2-06

SHEET 1 OF 3

LOCATION: N 4806227.2 ;E 558219.6

DRILLING DATE: May 26 - May 31, 2006

DATUM: Geodetic

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	318.31
	TOPSOIL	0.30
	Brown CLAYEY fine SAND with some gravel, heterogeneous, low moisture (TILL)	
	Few cobbles at 3.1 m depth	
5	Sandy clay (TILL) from 3.1 m to 9.1 m depth	
		309.17
	Medium brown SILTY fine SAND and trace clay and coarse sand, fairly uniform	9.14
10	Increasing clay content from 12.2 m depth	
		303.68
15	Medium brown CLAY, stiff, homogeneous	14.63
		299.31
	Medium brown fine SAND, homogeneous, fairly clean	19.00
20		
25	With gravel from 25.9 m to 26.5 m depth	
		289.05
	With medium to coarse sand and gravel from 29.0 m to 26.3 m depth	29.26
30	SAND and GRAVEL with intermittent fine sand, heterogeneous, medium brown, angular to subrounded gravel	
	With cobbles from 31.4 m to 32 m depth	
35		
		279.21
	Medium brown DOLOMITE, moderately weathered, fine grained, irregular parting, blocky to tabular chips (Guelph Formation)	39.10
40	Small fracture at (~7 mm) at 41.5 m depth	
		274.11
	Dull, buff, medium brown DOLOMITE, fine grained, few crystallined vugs, blocky chips, uneven parting (Guelph Formation)	44.20
45		
		271.07
	Dull grey/greyish-brown DOLOMITE, dense, crystalline, fossiliferous (coral) with dense interbedded cherty dolomite, blocky chips (Guelph Formation)	47.24
50		

CONTINUED NEXT PAGE

GEOPHYSICAL RECORD

GAMMA (cps) 20 40 60 80

CONDUCTIVITY (mS/m) 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

Cement-Bentonite Grout

10" Diameter Steel Casing

6" Diameter Steel Casing

6" Diameter Open Borehole

DEPTH SCALE

1 : 250

LOGGED: KM

CHECKED:

Golder Associates

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW2-06

SHEET 2 OF 3

LOCATION: N 4806227.2 ;E 558219.6

DRILLING DATE: May 26 - May 31, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
50	Dull grey/greyish-brown DOLOMITE, dense, crystalline, fossiliferous (coral) with dense interbedded cherty dolomite, blocky chips (Guelph Formation)					
	fossiliferous (coral) from 53.3 m to 56.4 m depth					
55			261.31 / 57.00			
	Predominantly grey DOLOMITE with brown/blotchy grey-brown beds, well indurated, massive, irregular parting, blocky to irregular chips, crystalline with occasional fossiliferous beds					
60						
65						
70						
75						6" Diameter Open Borehole
80						
85						
	Coral from 86.9 m to 88.4 m depth					
90			227.48 / 90.83			
	Light grey DOLOMITE, crystalline, well indurated with micro vugs, platy to blocky chips, weakly laminated (Amabel Formation)					
95						
100	*CONTINUED NEXT PAGE*					

DEPTH SCALE

1 : 250

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PBTW2-06

SHEET 3 OF 3

LOCATION: N 4806227.2 ;E 558219.6

DRILLING DATE: May 26 - May 31, 2006

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
	--- CONTINUED FROM PREVIOUS PAGE ---					
100	Light grey DOLOMITE, crystalline, well indurated with micro vugs, platy to blocky chips, weakly laminated (Amabel Formation)		215.61			
	Light brown DOLOMITE, fine grained, tabular to irregular chips, moderately indurated, vugs, bioclastic beds, porous rock		102.70			
105						
110	Fossiliferous from 109.7 m to 112.8 m depth					
	Large vugs from 112.8 m to 117.3 m depth					
115						
120						6" Diameter Open Borehole
			196.41			
	Grey DOLOMITE, platy chips, crystalline, well indurated, weakly laminated, smooth parting, sparse micro-vugs		121.90			
125	Trace white mineral (calcium) from 125 m to 128.0 m depth					
130						
135			183.31			
	Grey SHALE (Rochester Formation)		135.00			
	Dark grey DOLOMITE, shale partings, crystalline, weakly laminated, platy chips, moderately laminated, trace sulphides		135.60			
			179.61			
	Becoming dull brown, mottled at 138.4 m depth		138.70			
140	END OF BOREHOLE					
145						
150						

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: KM

CHECKED:

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBTW3-07

SHEET 1 OF 3

LOCATION: N 4805907.7 ;E 557466.3

DRILLING DATE: December 18-20, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m
		GROUND SURFACE	308.59			
0	Air Rotary, 156mm ID Steel Casing	Brown, fine SAND, homogeneous	0.00			
10		Coarse SAND	298.23 10.36			
		Firm, brown, CLAYEY SILT with coarse gravel, some angular cobbles (TILL)	296.40 12.19			
15		Coarse SAND and GRAVEL with some clay (TILL) sub-rounded to angular gravel - Saturated at 18.29 m depth	293.35 15.24			
20		Loose, brown, SILT, trace sand, trace gravel (TILL)	287.25 21.34			
		Coarse SAND and GRAVEL	21.95 284.21			
25		Brown, fine SAND, trace silt, heterogeneous	24.38			
		Medium to coarse SAND, some rock fragments (Limestone)	24.99			
		TOP OF BEDROCK	281.36 27.23			
30	Air Rotary, Open Hole	Light brown to yellow brown, DOLOSTONE, sugary texture, with some minor iron staining, sub-angular to platy rock chips (Guelph Formation) - Becomes grey-brown - With some calcite mineralization - Becomes light brown to cream colour with minor laminations along bedding planes and trace calcite		1 2 3 4 5 6	WS WS WS WS WS WS	
35		Brown to dark brown, DOLOSTONE, faint petroliferous odour, some black staining	272.32 36.27	7	WS	
40		- With fossils and calcite crystals		8 9	WS WS	
		Dark grey to grey, DOLOSTONE, mottled, some calcite fossils	266.53 42.06	10 11	WS WS	
45				12 13	WS WS	
				14	WS	
50				15	WS	
		CONTINUED NEXT PAGE				

GEOPHYSICAL RECORD

GAMMA (cps): 40 80 120 160

CONDUCTIVITY (mS/m): 30 60 90 120

NOTES WATER LEVELS INSTRUMENTATION

Cement Betonite Grout

10" Dia. Steel Casing (0-6m)

6" Dia. Steel Casing (0-29.2m)

6" Dia. Open Hole

DEPTH SCALE

1 : 250

LOGGED: DN

CHECKED: JAP

Golder Associates

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBTW3-07

SHEET 2 OF 3

LOCATION: N 4805907.7 ;E 557466.3

DRILLING DATE: December 18-20, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---								
50	Air Rotary / Open Hole	Dark grey to grey, DOLOSTONE, mottled, some calcite fossils - Becoming grey/white, vuggy porosity, fossils and calcite mineralization			16	WS				
					17	WS				
		- Becoming white dolostone, light grey mottling, vuggy porosity, medium crystalline fossiliferous			18	WS				
55					19	WS				
					20	WS				
					21	WS				
60		- Fracture at 60.05m, 60.48-60.79m			22	WS				
					23	WS				
					24	WS				
65					25	WS				
					26	WS				
					27	WS				
		- More frequent lamination			28	WS				
70					29	WS				
					30	WS				
					31	WS				
75					32	WS				6" Dia. Open Hole
					33	WS				
					34	WS				
		- Large fracture, sulphur odour at 78.64-79.55m - Large fracture at 79.86-81.08m - Becoming dark grey, mottled appearance - Fracture, sulphur odour in discharge water at 81.69m - Vugs present with calcite mineralization at 82.6m			35	WS				
80					36	WS				
					37	WS				
					38	WS				
85		- Becoming light brown at 85.04m - Light grey to white to light brown mottled, with occasional vugs at 85.34m			39	WS				
					40	WS				
					41	WS				
90					42	WS				
		- Fracture at 90.83m								
		- Grading to darker grey at 92.05m			43	WS				
					44	WS				
95		- Fractures at 94.18-94.49m, 95.4m, 96.32m and 97.32m			45	WS				
					46	WS				
					47	WS				
100					48	WS				
		CONTINUED NEXT PAGE								

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: DN

CHECKED: JAP

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: PBTW3-07

SHEET 3 OF 3

LOCATION: N 4805907.7 ;E 557466.3

DRILLING DATE: December 18-20, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							
100	Air Rotary Open Hole	- Large fracture at 99.67-100.28m Dark grey to grey, DOLOSTONE, mottled, some calcite fossils - Fracture, dark grey with minor iron staining, large vugs at 100.89m - Fracture at 101.5m and 102.1m			48	WS			
					49	WS			
					50	WS			
					51	WS			
105					52	WS			
		- Grading to light brown at 107.3m			53	WS			
					54	WS			
110					55	WS			
		- Becoming light grey to light brown at 111.25m			56	WS			
					57	WS			
115					58	WS			
		- Light grey mottled dolostone, vuggy, fossiliferous with calcite mineralization			59	WS			6" Dia. Open Hole
					60	WS			
		- Mottled light grey to dark grey dolostone with occasional vugs			61	WS			
120					62	WS			
					63	WS			
					64	WS			
125					65	WS			
					66	WS			
		- Grading to dark grey at 128m			67	WS			
130				178.14	68	WS			
		Hard, grey to dark brown, SHALE, platy chips		130.45					
		- Hard, brown shale with black mineral (Sulphide) at 131.7m		176.61 131.98	69	WS			
		Soft, green, SHALE (Cabot Head Formation)		175.39 133.20					
		END OF BOREHOLE							
135									
140									
145									
150									

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: DN

CHECKED: JAP

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PLOW1-06

SHEET 1 OF 1

LOCATION: N 4806775.2 ;E 559402.9

DRILLING DATE: August 17 and 18, 2006

DATUM: Geodetic

DRILL RIG: Direct Push with Continuous Scope

DRILLING CONTRACTOR: Strata Soil Sampling Inc.

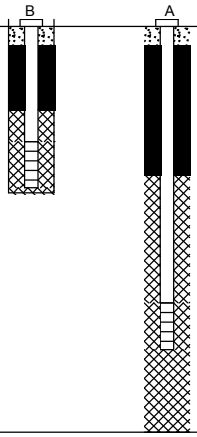
DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)
0	GROUND SURFACE		307.30
	GRAVELLY silt, (FILL)		0.00
	Coarse gravelly SAND		0.76 / 305.47
	Fine SAND, some gravel		1.83
	Coarse SAND and GRAVEL		2.43 / 303.95
	Medium-grained SAND and GRAVEL, some silt		3.35 / 303.04
			4.26
5	Fine SAND and GRAVEL, little silt		4.72
	Medium grained GRAVELLY SAND		5.48
	Fine SANDY SILT, some clay		6.10
	Fine grained SAND, some silt		6.70
	CLAY		299.08
	SAND, some fine gravel, trace silt		8.22
	GRAVEL and coarse grained SAND		8.99
10	Fine grained SAND		9.75
	Coarse SAND and GRAVEL		10.36 / 295.10
	Coarse SAND		12.20 / 293.88
	END OF BOREHOLE		13.42
15			
20			
25			
30			
35			
40			
45			
50			

GEOPHYSICAL RECORD

GAMMA (cps): 20 40 60 80

CONDUCTIVITY (mS/m): 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION



DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JLH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: PLOW2-06

SHEET 1 OF 1

LOCATION: N 4806671.4 ;E 559066.4

DRILLING DATE: August 18 and 22, 2006

DRILL RIG: Direct Push with Continuous Scope

DRILLING CONTRACTOR: Strata Soil Sampling Inc.

DATUM: Geodetic

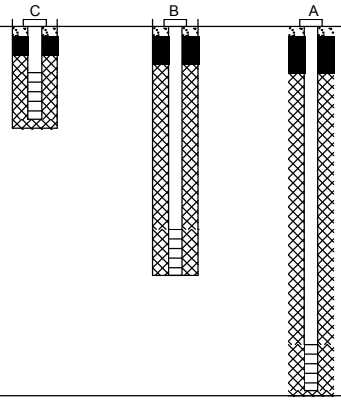
DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)
0	GROUND SURFACE		305.96
	SANDY SILT, trace gravel		0.00 / 304.76
	GRAVEL and fine SAND, little silt		1.20 / 303.53
	GRAVEL and medium to coarse-grained SAND		2.43 / 302.31
5	Fine to medium grained SAND, some fine gravel		3.65 / 300.02
	Fine grained SAND and SILT		5.94 / 299.11
	Fine to medium grained SAND, little gravel		6.85 / 297.43
	SILTY CLAY		8.84
10	CLAY		295.91
	Fine CLAYEY SAND		10.21
	Medium grained SAND and GRAVEL		293.76
	END OF BOREHOLE		12.20
15			
20			
25			
30			
35			
40			
45			
50			

GEOPHYSICAL RECORD

GAMMA (cps): 20 40 60 80

CONDUCTIVITY (mS/m): 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION



DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JLH

CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SM3ABC-07

SHEET 1 OF 3

LOCATION: N 4803409.8 ;E 557938.0

DRILLING DATE: Sep. 6-11, 2007 (For piezometer installation)

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG:

DRILLING CONTRACTOR: Gerrits Drilling (For piezometer installation)

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. / DEPTH (m)
0		GROUND SURFACE	296.07
	150mm Steel Casing	FILL	0.00
			293.07
		SAND and GRAVEL	3.00
5			
			286.07
10		Grey CLAY	10.00
15			
			278.07
		CLAY and GRAVEL	18.00
		DOLOSTONE	18.50
20			
25			
30			
35	Open Hole		
40			
45			
50		*CONTINUED NEXT PAGE*	

SAMPLES: NUMBER, TYPE, BLOWS/0.3m

GEOPHYSICAL RECORD

GAMMA (cps): 20, 40, 60, 80

CONDUCTIVITY (mS/m): 10, 20, 30, 40

NOTES WATER LEVELS INSTRUMENTATION

C B A

Bentonite Grout (0-20.4m)

Hole Plug (20.4-21.9m)

Sand (21.9-32m)

Screen (27.4-30.5m)

Hole Plug (32-45.7m)

Sand (45.7-65.6m)

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: JAP

MIS-GEO 001 05-1112-010_2.GPJ GAL-MISS.GDT 2/25/08

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SM3ABC-07

SHEET 2 OF 3

LOCATION: N 4803409.8 ;E 557938.0

DRILLING DATE: Sep. 6-11, 2007 (For piezometer installation)

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG:

DRILLING CONTRACTOR: Gerrits Drilling (For piezometer installation)

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	NOTES WATER LEVELS INSTRUMENTATION
50		*--- CONTINUED FROM PREVIOUS PAGE ---*								C B A
		DOLOSTONE								
55										Screen (48.8-64m)
60										
65										
70										
75	Open Hole									
80										Hole Plug (65.5-91.4m)
85										
90										Sand (91.4-115.8m)
95										Screen (91.4-109.7m)
100		*CONTINUED NEXT PAGE*								

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: JAP

MIS-GEO 001 05-1112-010_2.GPJ GAL-MISS.GDT 2/25/08

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SM3ABC-07

SHEET 3 OF 3

LOCATION: N 4803409.8 ;E 557938.0

DRILLING DATE: Sep. 6-11, 2007 (For piezometer installation)

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG:

DRILLING CONTRACTOR: Gerrits Drilling (For piezometer installation)

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps)	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m)	NOTES, WATER LEVELS, INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---						GAMMA (cps) 20 40 60 80	CONDUCTIVITY (mS/m) 10 20 30 40	C B A
100	Open Hole	DOLOSTONE								
105										
110										
115										Hole Plug (115.8-118.5m)
120				174.07						
		SHALE		122.00						Rock Fill (118.8-128.3m)
125										
130										Caved in Rock (128.3-134.7m)
135				159.07						
		END OF BOREHOLE		137.00						
140		Note: 1. Original well, SM3-93 drilled on October 26, 1993. Stratigraphy based on driller's Water Well Record.								
145										
150										

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: JAP

MIS-GEO 001 05-1112-010_2.GPJ GAL-MISS.GDT 2/25/08

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMOW1ABC-08

SHEET 1 OF 2

LOCATION: N 4803478.9 ;E 558969.6

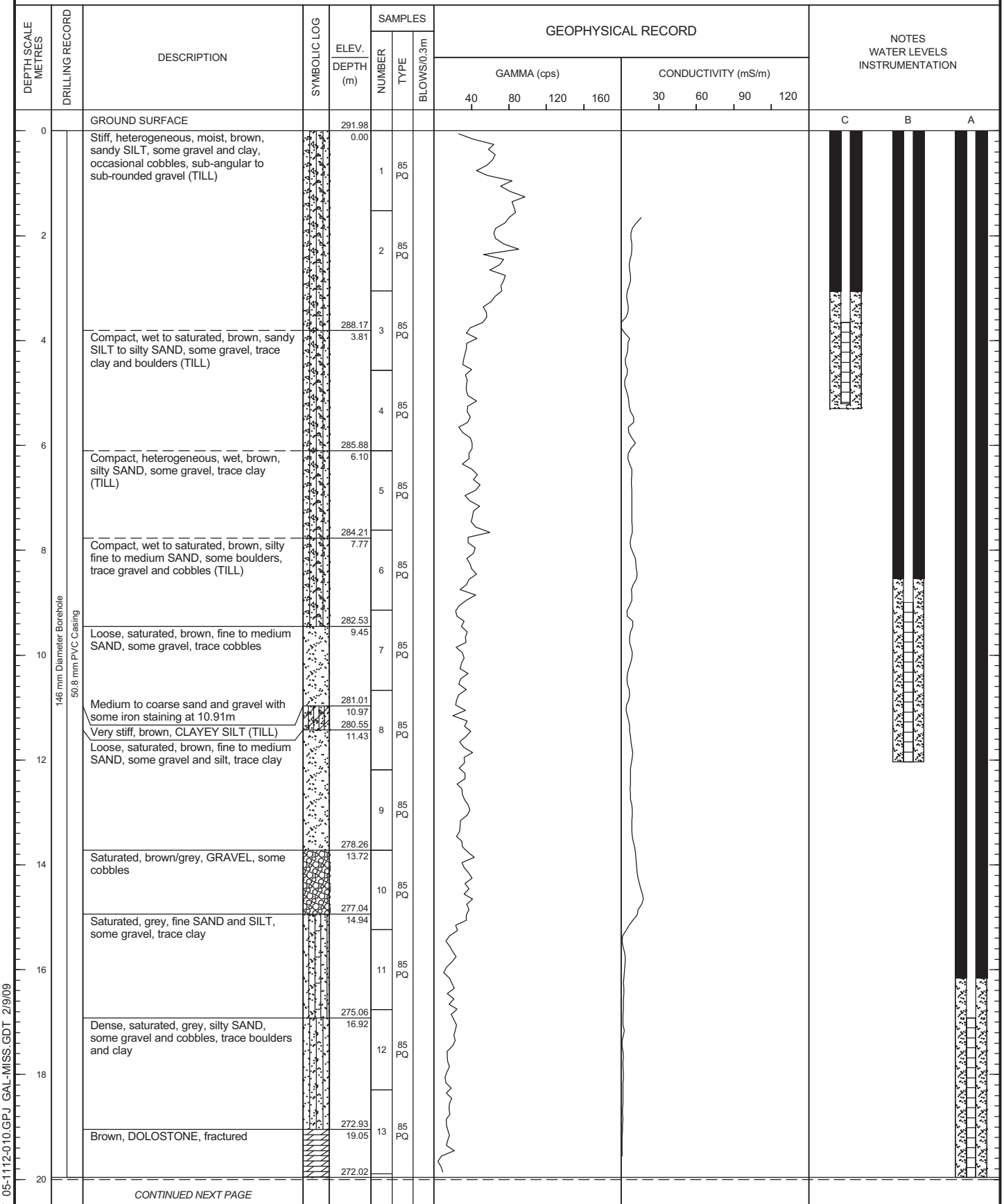
DRILLING DATE: February 12-14, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-75 Auger Rig

DRILLING CONTRACTOR: All-Terrain



CONTINUED NEXT PAGE

DEPTH SCALE

1 : 100

Golder Associates

LOGGED: KS

CHECKED: AI

MIS-GEO 007 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMOW1ABC-08

SHEET 2 OF 2

LOCATION: N 4803478.9 ;E 558969.6

DRILLING DATE: February 12-14, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-75 Auger Rig

DRILLING CONTRACTOR: All-Terrain

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION C B A
20		*--- CONTINUED FROM PREVIOUS PAGE ---*								
		END OF BOREHOLE		19.96						
22										
24										
26										
28										
30										
32										
34										
36										
38										
40										

DEPTH SCALE

1 : 100

Golder Associates

LOGGED: KS

CHECKED: AI

MIS-GEO 007 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: SMTW1-05

SHEET 1 OF 3

LOCATION: N 4803672.6 ;E 558520.3

DRILLING DATE: August 9 to 12, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
0	GROUND SURFACE	292.77
	COBBLES and large GRAVEL, light brown, poorly graded (homogeneous), clast supported, compact	0.00
		286.06
	SAND and GRAVEL, some cobbles, trace boulders, grey to brown heterogeneous	6.71
		282.07
	SAND and GRAVEL, some intermittent clay layers, brown with grey clay, heterogeneous , loose	10.70
		273.27
20	Grey DOLOMITE, trace weathering, moderately indurated, no odour, angular to subangular rock chips	19.50
	(Guelph Fm)	271.44
	DOLOMITE, buff brown, platy, crystalline, subangular to angular	21.33
	(Guelph Fm)	269.07
	DOLOMITE, buff brown, crystalline, platy (tabular) fragments, angular to subangular fragments, low porosity, no odour, non weathered	23.70
25	(Guelph Fm)	
	Becoming lighter in colour and more brittle	
	Brownish-grey colour with small (<1 mm vugs fine grained, porous	
30	More brittle (friable)	
		258.02
35	DOLOMITE, light brownish-grey colour, platy laminated with small < 1 mm porous, angular to subangular chips	34.75
	(Guelph Fm)	
40	Less greyish	
	Light brown layers, with sugar like texture, friable, no odour	
45		246.44
	DOLOMITE, light whitish brown, laminated medium grained, friable, angular to subangular fragments, porous, non weathered	46.33
	(Guelph Fm)	
50	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12

PIEZOMETER OR STANDPIPE INSTALLATION

9" Diameter Borehole

Grout

6" Diameter Steel Casing

Bentonite

Sand

6" Diameter Open Borehole

Screen

Sand

Bentonite

Sand

Screen

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: SMTW1-05

SHEET 2 OF 3

LOCATION: N 4803672.6 ;E 558520.3

DRILLING DATE: August 9 to 12, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
50	DOLOMITE, light whitish brown, laminated medium grained, friable, angular to subangular fragments, porous, non weathered (Guelph Fm)	
55	Becoming light grey, thickly laminated, slightly harder	234.86 / 57.91
	DOLOMITE, light brown medium grained, tabular angular to subangular, non weathered (Guelph Fm)	233.03 / 59.74
60	Transitional contact from Guelph Formation to Eramosa Member	231.81 / 60.96
	Dark brown	
	DOLOMITE, dark brown, crystalline, laminated, tabular shape fragments with smooth parting surface, hard, uniform texture, Petroliferous (Eramosa Member)	
65		
70	non weathered, highly indurated, subangular to angular rock chips	218.27 / 74.50
75	DOLOMITE, grey-white, crystalline, thinly laminated, non weathered, angular to subangular, tabular rock fragments, some luster (Amabel Fm) Becoming light-blush grey colour	
80		211.08 / 81.69
	DOLOMITE, bluish-grey with blotches of white, medium crystalline, small < 1 mm vugs, some luster, non weathered angular to subangular chips, tabular shape, fairly hard (Amabel Fm)	
85	Bluish-grey with blotches of beige	
90		199.81 / 92.96
	DOLOMITE, bluish-grey with light beige blotches, crystalline, small < 1 mm vugs, some luster, non weathered, angular to subangular tabular chips, laminated (Amabel Fm) Noticed fossils	
95	With relict of oolites or pellets (2 mm diameter)	
100	*CONTINUED NEXT PAGE*	

GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12

PIEZOMETER OR STANDPIPE INSTALLATION

Screen

Sand

Bentonite

Sand

Screen

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

PROJECT: 05-1112-010(1000)

BOREHOLE LOG OF: SMTW1-05

SHEET 3 OF 3

LOCATION: N 4803672.6 ;E 558520.3

DRILLING DATE: August 9 to 12, 2005

DRILL RIG: Mud Rotary

DRILLING CONTRACTOR: Davidson Well Drilling

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (m)
	--- CONTINUED FROM PREVIOUS PAGE ---	
100	DOLOMITE, bluish-grey with light beige blotches, crystalline, small < 1 mm vugs, some luster, non weathered, angular to subangular tabular chips, laminated (Amabel Fm)	
	Becoming darker bluish-grey color and less vuggy	188.57
	Trace of secondary calcium flakes	104.20
105	DOLOMITE, bluish-grey, crystalline, non weathered, tabular chips, angular to subangular chip fragments, fairly hard rock (Amabel Fm)	
110	Becomes dark grey colour, massive texture, no apparent fossils	181.07 111.70
	Grey SHALE (Rochester Formation);	180.07 112.70
115	DOLOMITE, brown/grey, crystalline with some soft green layers, laminated, flaggy shape chips, angular to subangular, trace secondary sulphide mineralization	
		173.87
	Weathered SHALE, tan brown, thinly laminated	118.90
120	Grey-greenish SHALE, weakly indurated (Cabot Head Fm)	119.50 172.37
	END OF BOREHOLE	120.40
125		
130		
135		
140		
145		
150		

GEOPHYSICAL RECORD

GAMMA (cps) 10 20 30 40

CONDUCTIVITY (mS/m) 3 6 9 12

PIEZOMETER OR STANDPIPE INSTALLATION

Screen

Sand

Bentonite

Rock Fill

Grout

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED:

MISHYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/20/07

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW2ABC-07

SHEET 1 OF 3

LOCATION: N 4802637.6 ;E 557668.7

DRILLING DATE: August 14, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		GROUND SURFACE							C B A
0	254 mm Bore / 150 mm Steel Casing	Loose, to medium dense, dry, light brown, fine SAND, trace fine gravel, well sorted		0.00	1				
		Compact, wet, grey/brown silty SAND and GRAVEL (TILL)		1.83	2				
		- Sub-angular to sub-rounded gravel, heterogeneous			3				
5		With cobbles from 3.4 m to 5.8 m depth			4				Bentonite Grout (0-13.4m)
		Wet, grey SAND and GRAVEL		8.23	5				6" Steel Casing (0-16.8m)
10		- Sub-angular to sub-rounded gravel, heterogeneous			6				
		Brown DOLOSTONE, fine crystalline, well indurated, blocky to platy rock chips, no odour, effervesces weakly in hydrochloric acid (Guelph Formation)		14.17	7				Hole Plug (13.4-15m)
15					8				
					9				Sand (15-30.5m)
					10				
20	Air Rotary / 150 mm Steel Casing	Becoming lighter, buff brown colour			11				
					12				Screen (21.3-24.4m)
					13				
25					14				
					15				
					16				
30					17				
					18				
					19				
					20				
35					21				
		Becoming fossiliferous at 36.6 m depth			22				Hole Plug (30.5-43.9m)
		With greyish blotches at 38.1 m depth			23				
40		Grey DOLOSTONE, finely crystalline, moderately indurated, blocky rock chips with irregular partings, no odour, fossiliferous, with some pine hole size vugs, effervesces weakly in hydrochloric acid		39.62	24				
					25				
					26				
45					27				Sand (43.9-64m)
					28				
					29				Screen (45.7-62.5m)
50					30				
		CONTINUED NEXT PAGE							

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED: JAP

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW2ABC-07

SHEET 2 OF 3

LOCATION: N 4802637.6 ;E 557668.7

DRILLING DATE: August 14, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
50	Air Rotary; 150 mm Steel Casing	Grey DOLOSTONE, finely crystalline, moderately indurated, blocky rock chips with irregular partings, no odour, fossiliferous, with some pine hole size vugs, effervesces weakly in hydrochloric acid			31				
					32				
					33				
55					34				Screen (45.7-62.5m)
					35				
					36				
60		Blotchy, grey DOLOSTONE, fine crystalline, blocky to platy chips		59.44	37				
					38				
					39				
65					40				Hole Plug (64-65.8m)
					41				
					42				
					43				
70					44				
		Buff, light brown DOLOSTONE, platy rock chips, weakly laminated, sparse pinhole size vugs, trace fossils (Crinoid Stem) (Amabel Formation) Becomes light greyish-brown at 74.4 m depth		71.63	45				
					46				
75					57				
					58				Hole Plug & Gravel (65.8-89.6m)
					59				
80					60				
		Becomes light grey at 80.8 m depth			61				
					62				
					63				
85		Grey DOLOSTONE, with trace translucent white flakes, with some small vugs, finely crystalline, blocky to platy rock chips, effervesces weakly in hydrochloric acid (Amabel Formation) With some brown after 88.4 m depth		85.34	64				
					65				
					66				
90					67				Hole Plug (89.6-91.1m)
					68				Sand (91.1-112.6m)
					69				
95		Becomes grey at 94.5 m depth, no noticeable translucent white flakes			70				
					71				Screen (94.5-109.7m)
		Crystallined vugs from 97.5 m to 99.1 m depth			72				
100					73				
		CONTINUED NEXT PAGE							

DEPTH SCALE

1 : 250

LOGGED: AI

CHECKED: JAP

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW2ABC-07

SHEET 3 OF 3

LOCATION: N 4802637.6 ;E 557668.7

DRILLING DATE: August 14, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
100	Air Rotary 150 mm Steel Casing	Grey DOLOSTONE, with trace translucent white flakes, with some small vugs, finely crystalline, blocky to platy rock chips, effervesces weakly in hydrochloric acid (Amabel Formation)			73 74 75 76				
105					77 78 79				Screen (94.5-109.7m)
110		Becoming darker grey at 109.4 m depth			80 81 82				
115					83 84 85				Hole Plug (112.6-124.2m)
120		Dark grey DOLOSTONE with intermittent thin laminations of grey shale, crystalline (Rochester Formation)		118.87	86				
		Dull greyish-brown DOLOSTONE with trace sulphides		120.40 121.00	87				
		Black specks on dolostone, with some fine sulphides, layers of bright green shale , soft from 123.4 m to 124.1 m depth			88 89				
125		END OF BOREHOLE		124.21					
130									
135									
140									
145									
150									

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: AI

CHECKED: JAP

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

PROJECT: 05-1112-010(1000)

RECORD OF DRILLHOLE: SMTW3ABC-07

SHEET 1 OF 3

LOCATION: N 4802866.6 ;E 558417.6

DRILLING DATE: August 20-23, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		GROUND SURFACE		290.29					C B A
0	Air Rotary, 150 mm Steel Casing	Dry, brown, SILT to SILTY CLAY, some fine to coarse grained gravel, trace fine sand, containing organics at 0-1.52 m depth		0.00	1 2 3				
				285.72					
5		Brown, sandy GRAVEL to gravelly SAND, trace to some silty clay		4.57	4 5 6				Bentonite Grout (0-16.7m)
				281.15					
10		Brown, coarse SAND, some fine gravel, trace silt		9.14	7 8 9 10 11 12				
15									
				272.31					
20		Brownish-grey DOLOSTONE, finely to medium crystalline, slightly porous, sulphide minerals at 18.28-19.81 m depth (Guelph Formation)		17.98	13 14 15 16				Hole Plug (16.7-21.3m) Sand (21.3-30.5m)
25		Few crystalized vugs (1-2 mm diameter) at 24.38-26.82 m depth Fracture at 25.3 m depth Fracture at 27.43 m depth			17 18 19 20 21				Screen (24.4-27.4m)
30				258.29					
	Air Rotary, Open Hole	Light brown DOLOSTONE, finely crystalline, slightly porous Fracture at 33.22 m depth		32.00	22 23 24 25 26				Hole Plug (30.5-45.7m)
35									
40		Fracture at 39.93 m depth			27 28 29				
45		Fracture at 44.81 m depth			30 31				
				243.05					Sand (45.7-59.3m)
				47.24	32 33				Screen (48.8-57.9m)
50		*CONTINUED NEXT PAGE*							

DEPTH SCALE

1 : 250

LOGGED: JH

CHECKED: JAP

Golder Associates

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

PROJECT: 05-1112-010(1000)

RECORD OF DRILLHOLE: SMTW3ABC-07

SHEET 2 OF 3

LOCATION: N 4802866.6 ;E 558417.6

DRILLING DATE: August 20-23, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
50		Light whitish brown DOLOSTONE, finely crystalline, moderately porous, trace crystallined vugs (up to 2 mm diameter), some calcite crystals (Guelph Formation)		34					
				35					
				36					Screen (48.8-57.9m)
55				37					
				38					
		Fracture at 58.52 m depth	231.46	39					
		Dark blackish brown DOLOSTONE, finely crystalline, slightly porous, trace calcite crystalls (Eramosa Formation)	58.83	40					
60				41					
				42					
				43					
65		Fracture at 64.92 m depth	224.76						
		Brown-grey DOLOSTONE, finely to medium crystalline, slightly porous (Amabel Formation)	65.53	44					Hole Plug (59.3-73.3m)
				45					
				46					
70		Whitish grey DOLOSTONE, medium crystalline, slightly porous (Amabel Formation)	220.19 70.10	47					
		Fracture at 72.54 m depth		48					
				49					
75	Air Rotary Open Hole	Becoming darker grey		50					Sand (73.3-91.4m)
				51					
		Fracture at 77.42 m depth		52					
		Whitish grey colour at 79.25-81.38 m depth		53					
80				54					
		Becoming darker grey		55					Screen (76.2-88.4m)
		Fracture at 82.91 m depth		56					
85			204.95						
		Greyish brown DOLOSTONE, medium crystalline, slightly porous, some white mottling (Amabel Formation)	85.34	57					
				58					
				59					
90				60					
			198.85						
		Grey DOLOSTONE, medium crystalline, moderately porous (Amabel Formation)	91.44	61					Hole Plug (91.4-94.5m)
		Fracture at 93.57 m depth (dry)		62					
95		Fracture at 94.79 m depth (dry)		63					
				64					Hole Plug & Gravel (94.5-117.5m)
				65					
				66					
100		*CONTINUED NEXT PAGE*							

DEPTH SCALE

1 : 250

LOGGED: JH

CHECKED: JAP

Golder Associates

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

PROJECT: 05-1112-010(1000)

RECORD OF DRILLHOLE: SMTW3ABC-07

SHEET 3 OF 3

LOCATION: N 4802866.6 ;E 558417.6

DRILLING DATE: August 20-23, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
100	Air Rotary / Open Hole	Grey DOLOSTONE, medium crystalline, moderately porous (Amabel Formation)			66				
		Becoming darker grey			67				
		Fossilferous at 103.63-105.16 m depth			68				
105					69				
					70				
					71				
					72				Hole Plug & Gravel (94.5-117.5m)
110		Interbedded DOLOSTONE and SHALE (Amabel Formation)			73				
				177.89	74				
		Grey SHALE (Rochester Formation)		112.40					
				176.49	75				
		Interbedded DOLOSTONE and SHALE (Amabel Formation)		113.80					
115					76				
				174.47					
		Brown SHALE, very finely crystalline, sulfide minerals		115.82	77				
				172.33	78				Hole Plug (117.5-118.4m)
		Green SHALE (Cabot Head Formation)		117.96					
		END OF BOREHOLE		118.41					
120									
125									
130									
135									
140									
145									
150									

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: JAP

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/2/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW4ABC-08

SHEET 1 OF 3

LOCATION: N 4803334.3 ;E 559025.9

DRILLING DATE: February 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		GROUND SURFACE	301.62						C B A
0	Air Rotary / 254mm Steel Casing	Moist, dark brown, SILTY CLAY, some organics (rootlets), trace coarse sand	0.00 / 300.10	1					
		Dry, brown to light brown, fine silty SAND, trace to some coarse sand, trace fine to coarse gravel	1.52	2					
				3					
5		Becoming moist at 4.57 m		4					
				5					
		Dry, dark brown, medium to coarse SAND, some fine gravel, trace silt	7.62 / 294.00	6					
				7					
10		Brown, gravelly SAND, some silt	10.67 / 290.95	8					Bentonite Grout (0-22.9m)
				9					
	Air Rotary / 156 mm I.D. Steel Casing	Brown, sandy fine to medium GRAVEL, trace silt	13.72 / 287.90	10					
15		Trace clay at 4.57-7.62 m		11					
		Brown, fine SAND, trace to some silt	16.76 / 284.86	12					
				13					
20		Trace fine gravel at 19.81-20.34 m		14					
		Brown, silty fine to medium GRAVEL, some fine sand	21.34 / 280.28	15					
		Brown, silty fine SAND, some fine gravel	22.86 / 278.76	16					Hole Plug (22.9-24.4m)
25		Brownish grey, DOLOSTONE, finely crystalline (Guelph Formation)	24.99 / 276.63	17					
				18					
		Moderately porous at 27.43-28.96 m		19					Sand (24.4-35.1m)
		Fracture at 28.96 m		20					
30		Brown layer at 28.96-30.48 m		21					Screen (30.5-33.5m)
				22					
		Brown, DOLOSTONE, finely crystalline, slightly porous (Guelph Formation)	33.53 / 268.09	23					
35				24					
				25					
	Air Rotary / Open Hole			26					
40		Medium crystalline and moderately porous at 39.62-41.15 m		27					
				28					Hole Plug (35.1-48.8m)
				29					
45				30					
				31					
				32					
		Moderately porous at 48.77-50.29 m		33					Sand (48.8-64m)
50		*CONTINUED NEXT PAGE*							

DEPTH SCALE

1 : 250

LOGGED: JH

CHECKED: ADI

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW4ABC-08

SHEET 2 OF 3

LOCATION: N 4803334.3 ;E 559025.9

DRILLING DATE: February 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD GAMMA (cps) 40 80 120 160	GEOPHYSICAL RECORD CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
50	Air Rotary / Open Hole	Brown, DOLOSTONE, finely crystalline, slightly porous (Guelph Formation) Becoming medium crystalline at 51.82 m, some iron staining		34					
				35					
				36					
55				37					Sand (48.8-64m) Screen (50.3-62.5m)
				38					
		Greyish brown at 57.91-59.44 m and 60.96 m, some lamination		39					
60				40					
				41					
			239.14						
		Dark brown, DOLOSTONE, medium crystalline, calcite crystals at 64.01-65.53 m	62.48	42					
				43					
65			236.09						Hole Plug (64-67.1m)
		Dark brown to black, DOLOSTONE, finely crystalline, calcite crystals, petroliferous odour (Eramosa Formation)	65.53	44					
				45					
				46					
70				47					
				48					
				49					
75				50					
			225.42						
		Grey, DOLOSTONE, finely to medium crystalline, moderately porous, some crystallined vugs, white mottling (Amabel Formation)	76.20	51					Hole Plug & Gravel (67.1-88.4m)
				52					
		Fossils at 79.25-80.27 m and 85.34-86.87 m		53					
80				54					
		Brownish grey colour at 82.30-91.44 m		55					
				56					
85		Fracture at 84.43 m		57					
				58					
				59					
90				60					Hole Plug (88.4-91.4m)
		Large amount of water encountered from 90.83-92.96 m		61					
				62					
95		Light brown colour from 94.49-96.01 m		63					
		Fracture at 95.4 m	205.61						
		Light grey to light brown, DOLOSTONE, white/grey mottling, finely crystalline, slightly porous (Amabel Formation) Fossils from 97.54-99.06 m	96.01	64					Screen (94.5-109.7m)
				65					
100				66					
		CONTINUED NEXT PAGE							

DEPTH SCALE

1 : 250

Golder Associates

LOGGED: JH

CHECKED: ADI

MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

PROJECT: 05-1112-010(1010)

RECORD OF DRILLHOLE: SMTW4ABC-08

SHEET 3 OF 3

LOCATION: N 4803334.3 ;E 559025.9

DRILLING DATE: February 14-18, 2008

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Air Rotary

DRILLING CONTRACTOR: Gerrits Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	GEOPHYSICAL RECORD: GAMMA (cps) 40 80 120 160 / CONDUCTIVITY (mS/m) 30 60 90 120	NOTES WATER LEVELS INSTRUMENTATION
		--- CONTINUED FROM PREVIOUS PAGE ---							C B A
100	Air Rotary / Open Hole				66				
					67				
				199.51					
		Grey, DOLOSTONE, whilte mottling, more coarsely crystalline, moderately porous (Amabel Formation) Fracture at 104.24 m		102.11	68				
105					69				Screen (94.5-109.7m) Sand (91.4-112.8m) Sand (91.4-112.8m)
					70				
		Light grey layer from 106.68-109.73 m, calcite crystals			71				
					72				
110					73				
					74				
		Calcite from 112.78-114.30 m and 117.35-118.87 m			75				Hole Plug (112.8-115.8m)
115					76				
					77				
					78				
					79				
120				181.22					
		Interbedded grey DOLOSTONE and grey to brown SHALE, some white mottling, platy chips Calcite at 121.31 m		120.40	80				Hole Plug & Gravel (115.8-128m)
					81				
		Black specks from 123.44-124.97 m and 126.49-127.71 m			82				
125					83				
					84				
				173.91	85				
		Green, SHALE, black specks, sulphide minerals		127.86					
		END OF BOREHOLE							
130									
135									
140									
145									
150									

DEPTH SCALE

1 : 250

LOGGED: JH

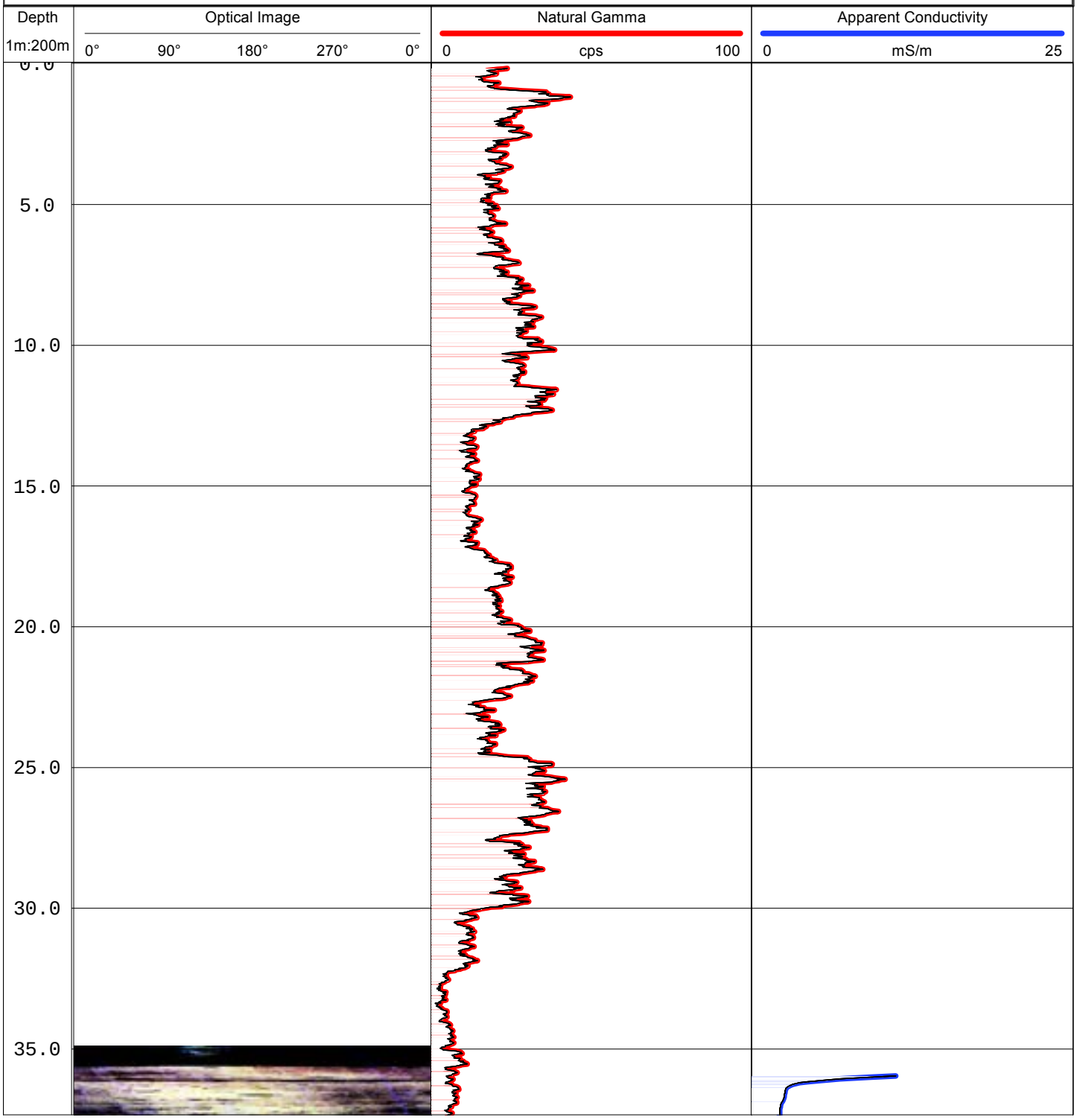
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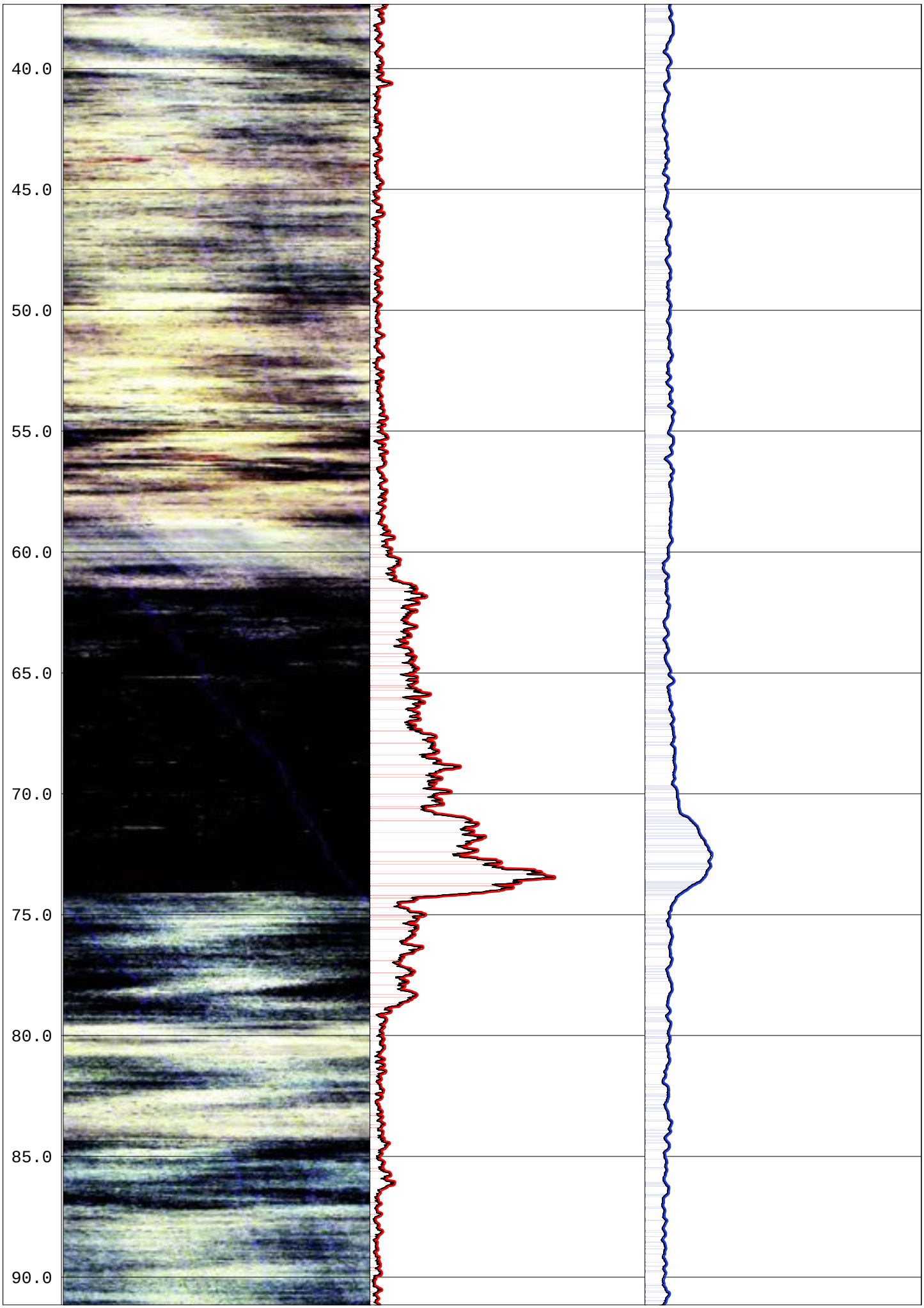
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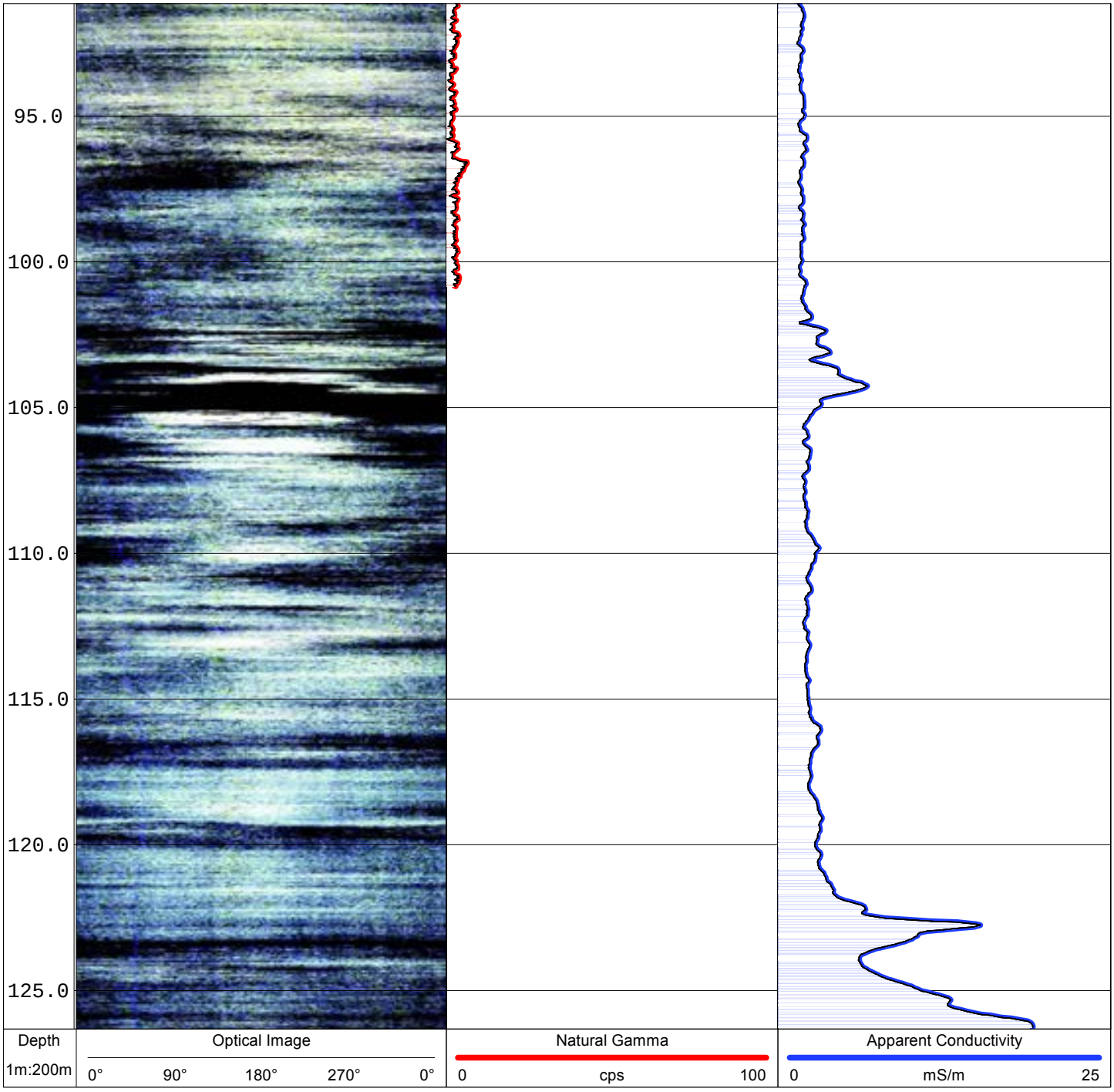
MIS-GEO 001 05-1112-010.GPJ GAL-MISS.GDT 2/9/09

GEOPHYSICAL RECORD OF BOREHOLE CMOW1-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558725.647*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4805314.228*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Portuguese Club*	**GROUND SURFACE**	*305.901 masl*
LOG DATE	*June 29, 2006 / July 7, 2006*	**BOREHOLE DEPTH**	*126.8 m*
LOGGED BY	*RF*	**CASING DEPTH**	*35.0 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

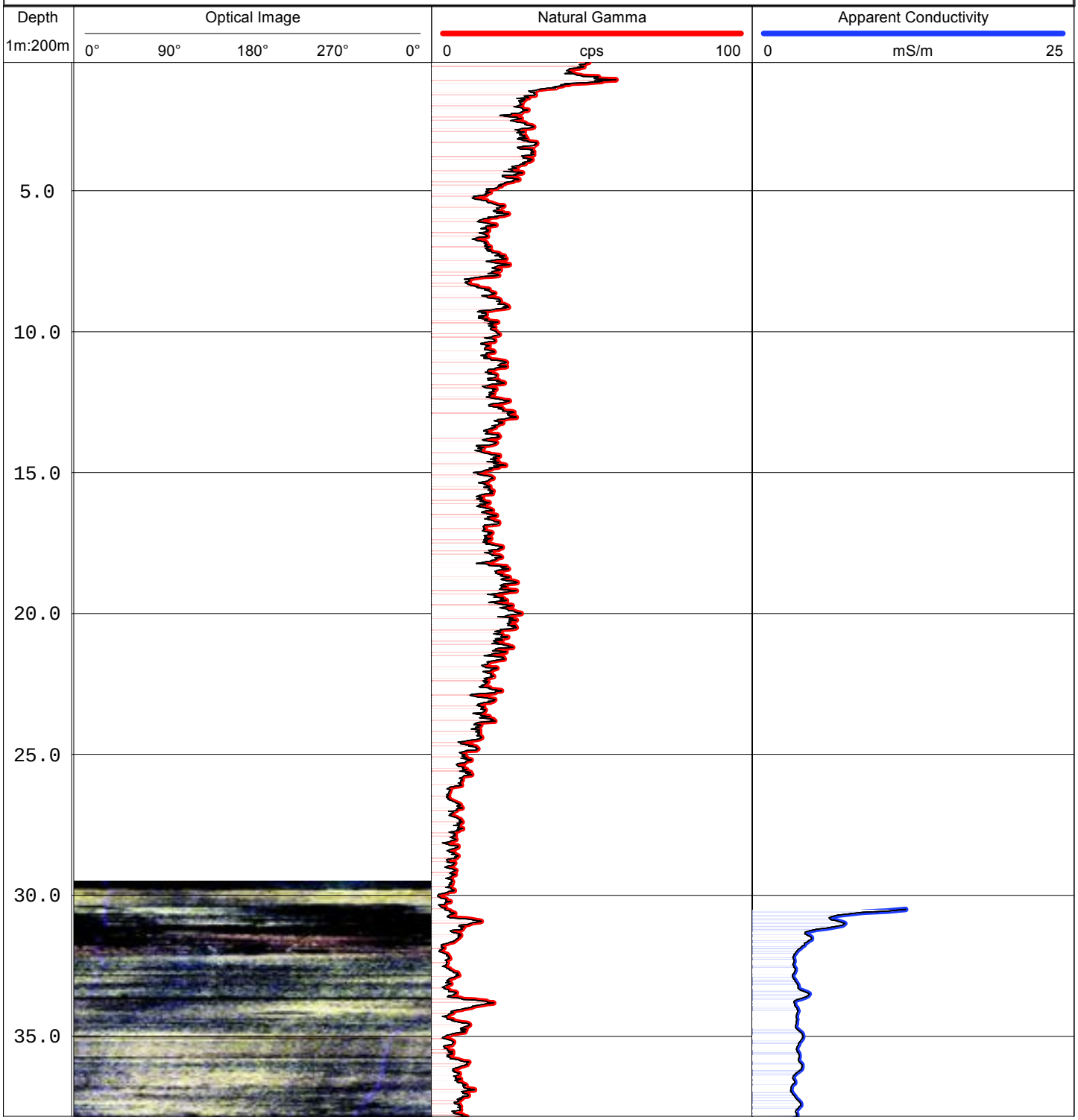


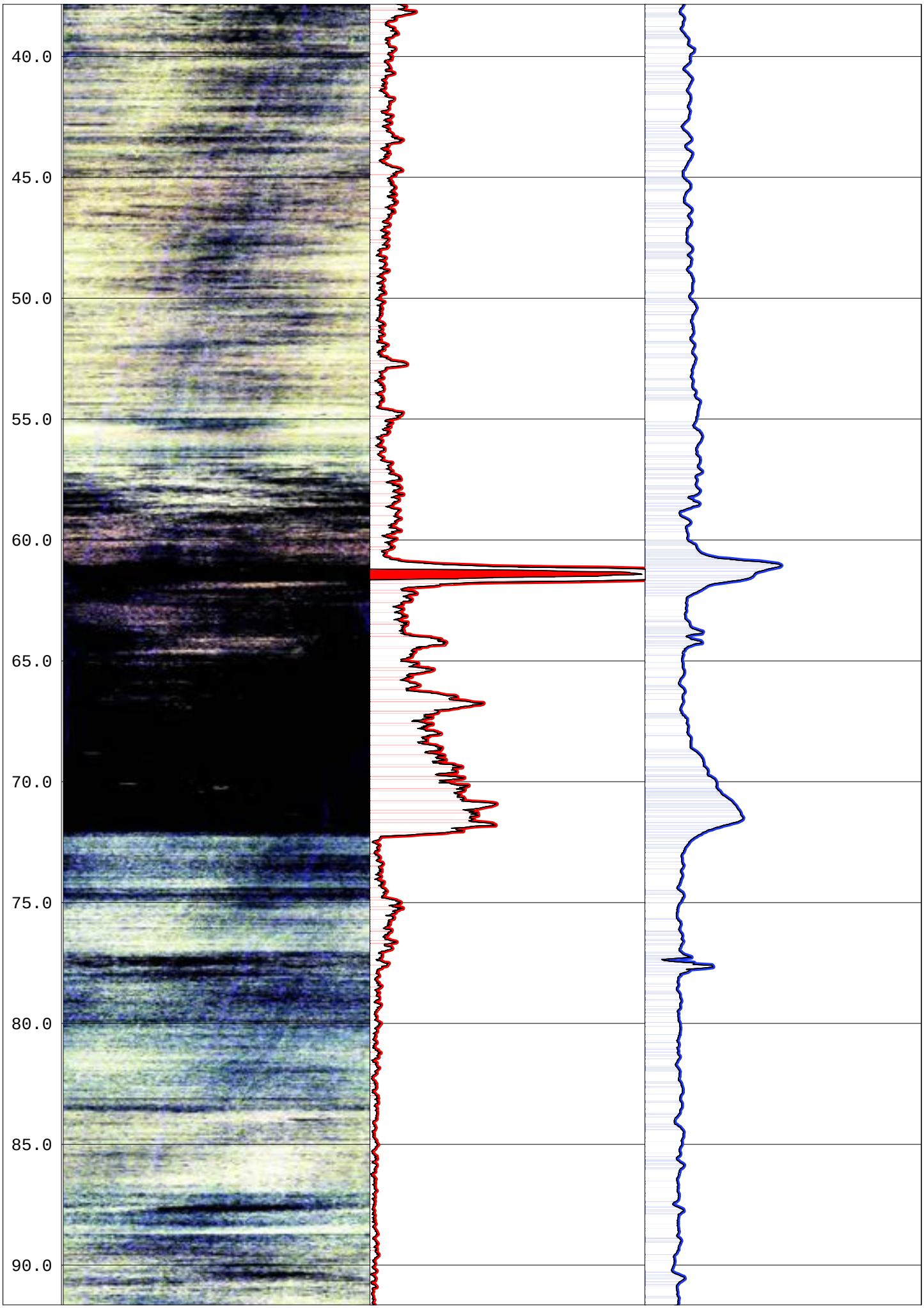

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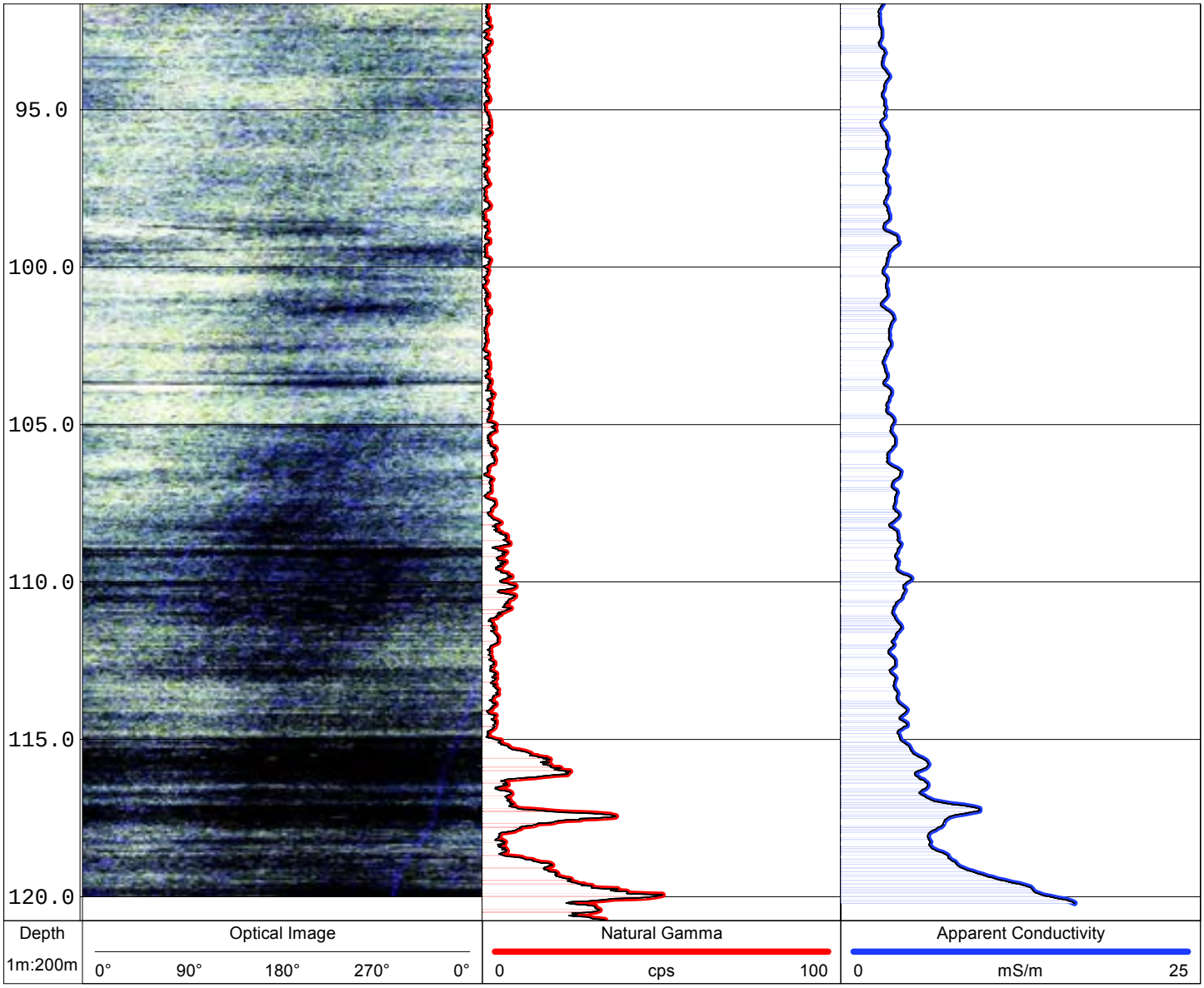

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GEOPHYSICAL RECORD OF BOREHOLE CMOW2-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*559589.185*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4804173.669*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Hunt Property*	**GROUND SURFACE**	*300.877 masl*
LOG DATE	*June 30, 2006*	**BOREHOLE DEPTH**	*121.2 m*
LOGGED BY	*GRB*	**CASING DEPTH**	*29.57 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

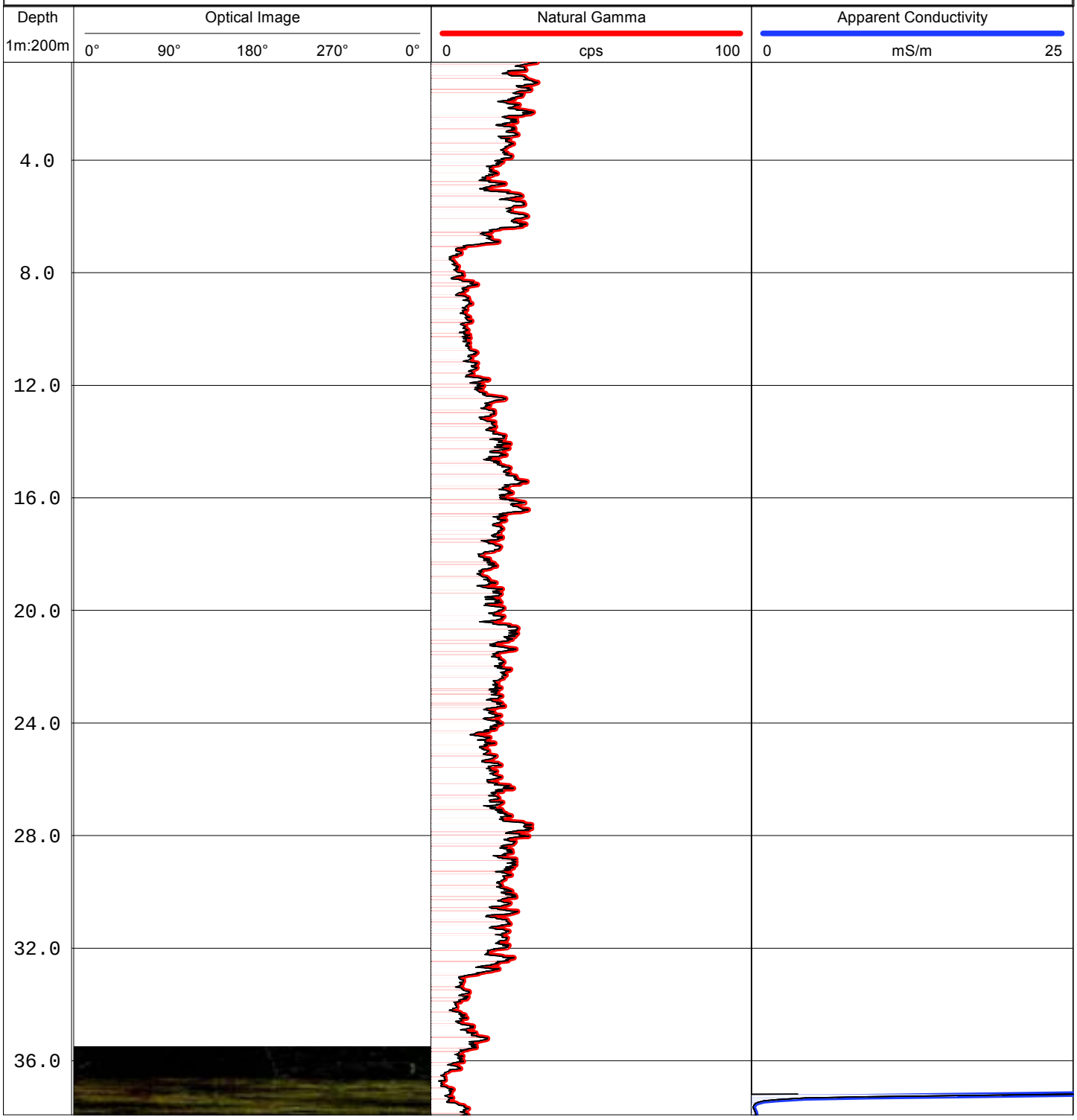


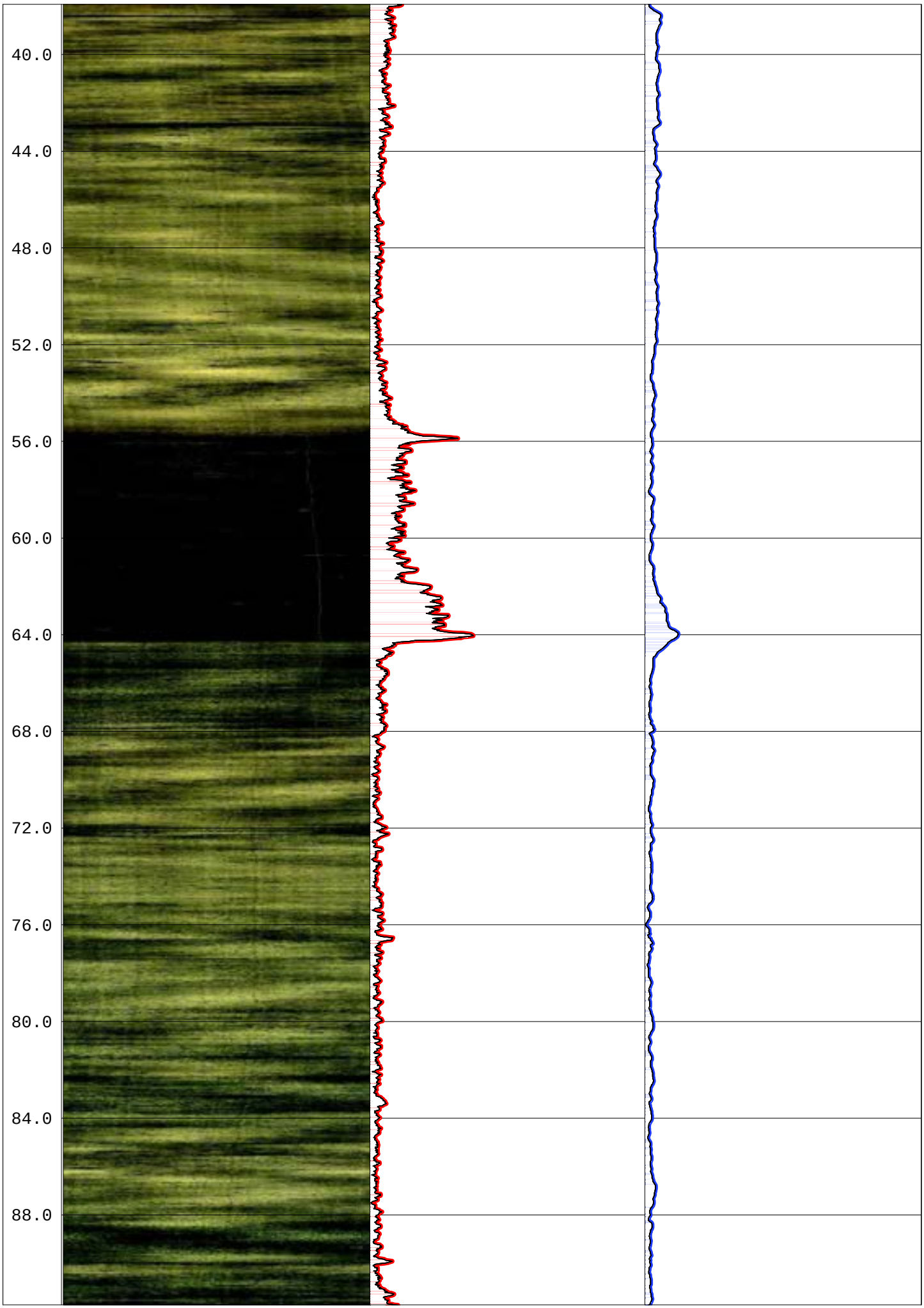

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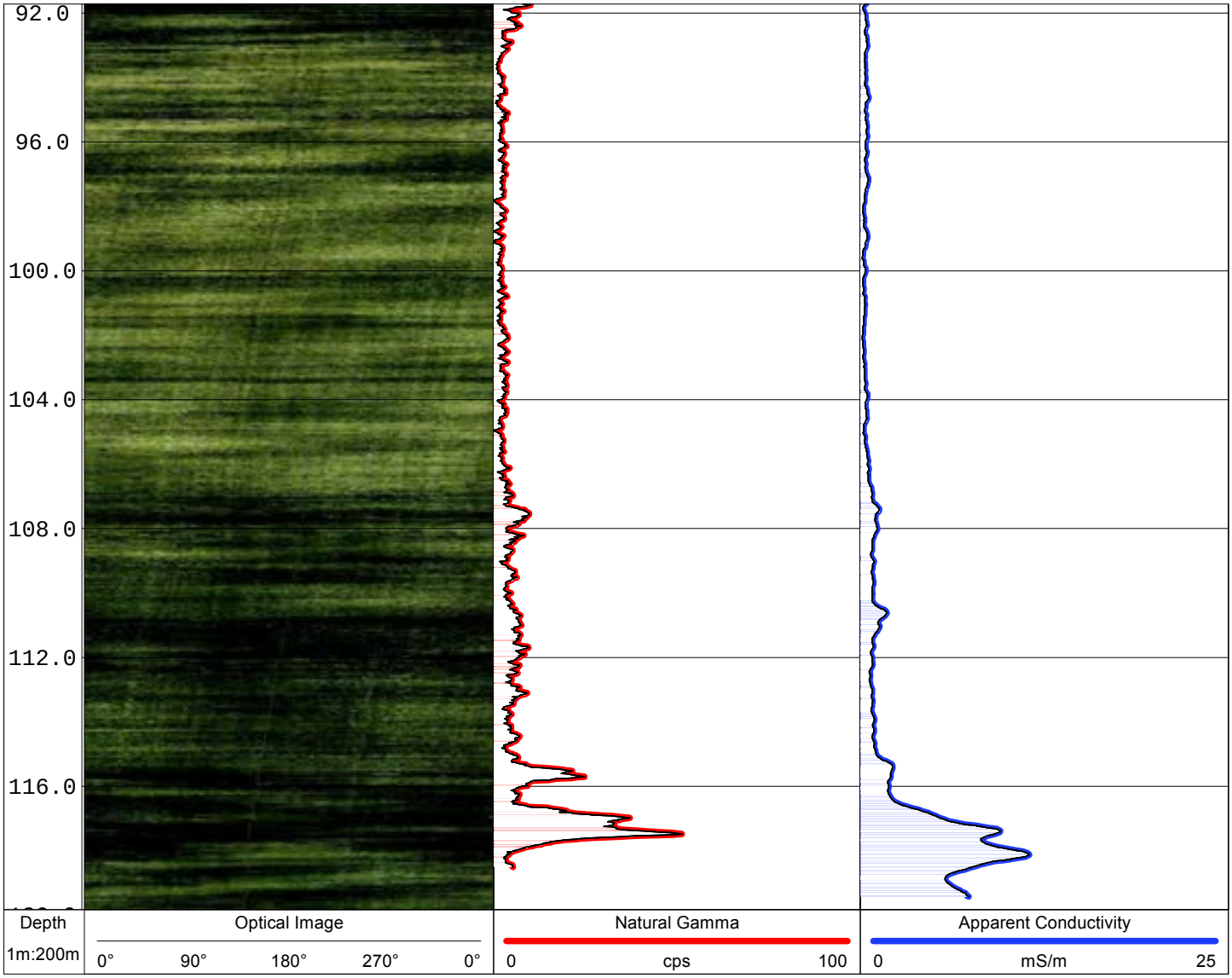

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GEOPHYSICAL RECORD OF BOREHOLE CMOW3-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558916.253*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4804866.435*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - South Saginaw*	**GROUND SURFACE**	*302.44 masl*
LOG DATE	*August 8, 2006*	**BOREHOLE DEPTH**	*123.1 m*
LOGGED BY	*RF*	**CASING DEPTH**	*36.57 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

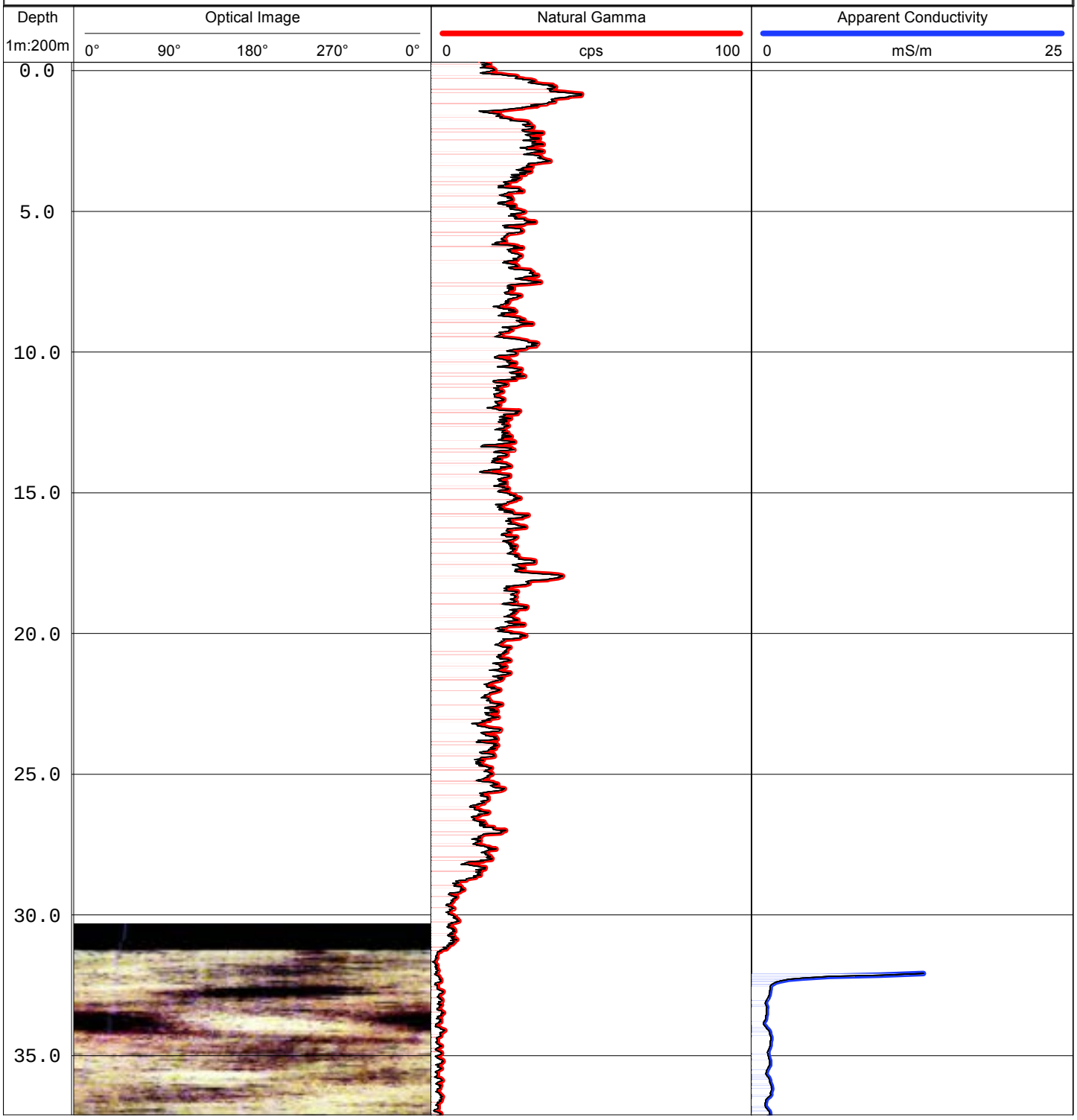


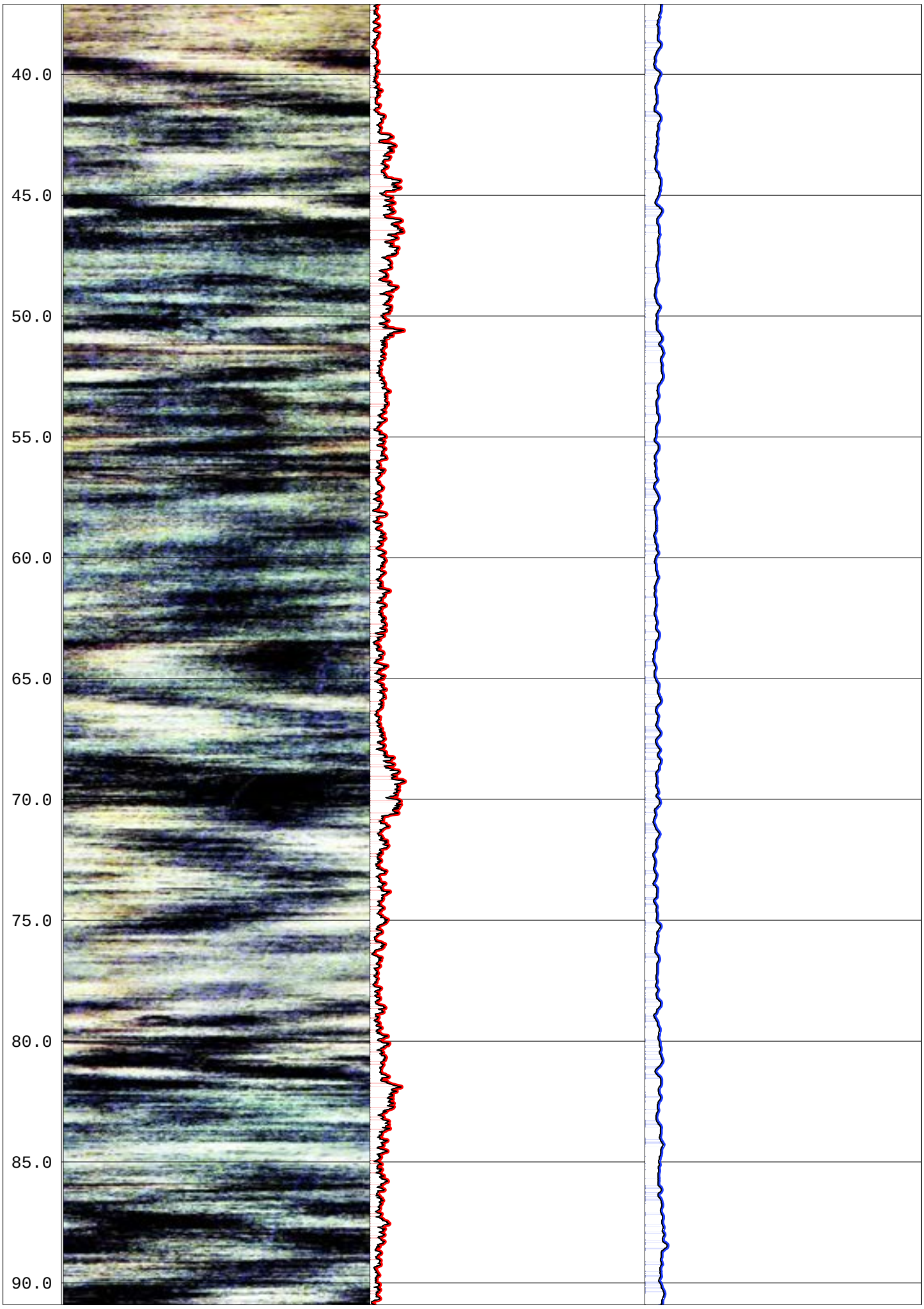

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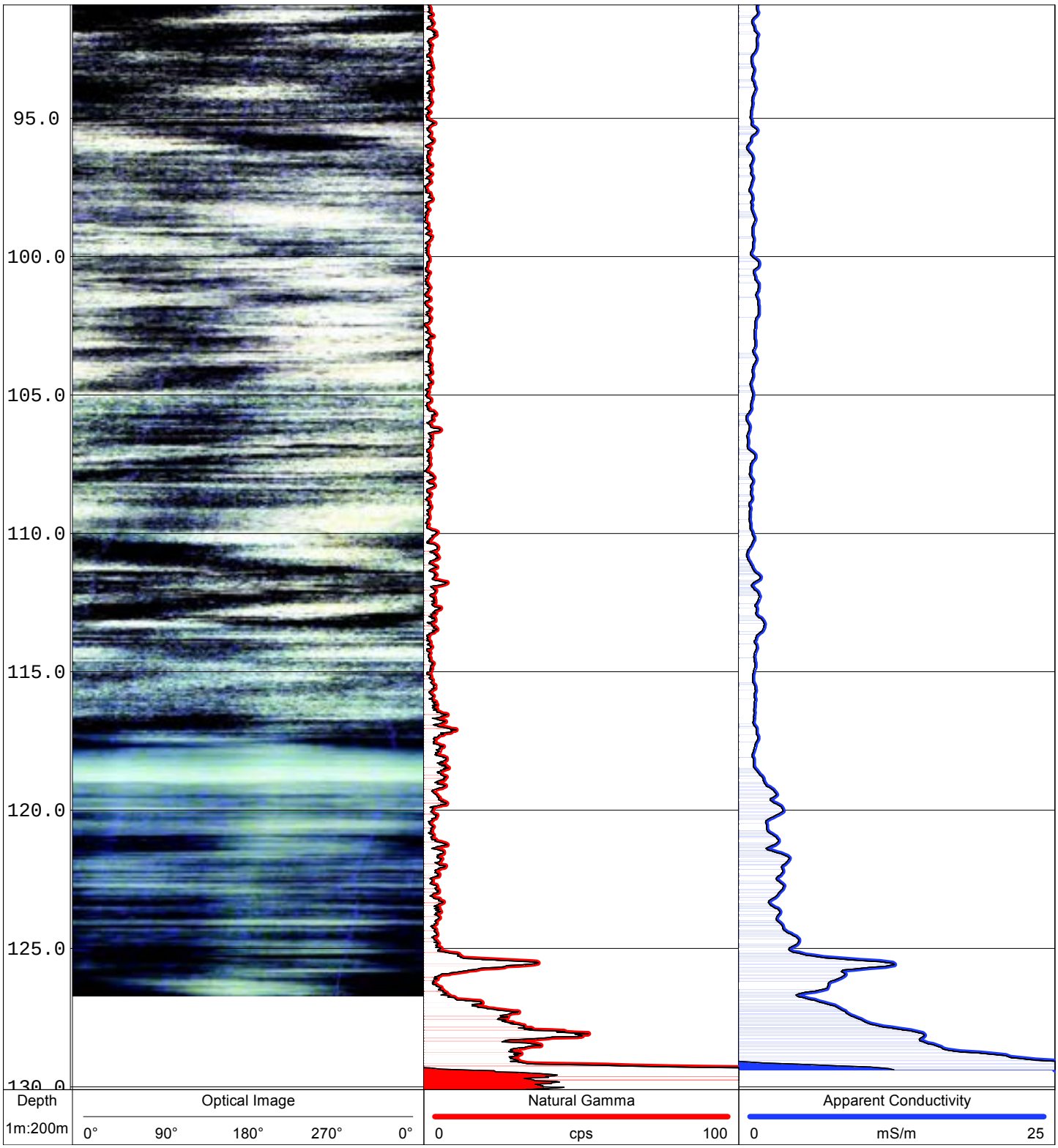

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GEOPHYSICAL RECORD OF BOREHOLE CMTW1-05

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558402.634*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4805356.269*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Portuguese Club*	**GROUND SURFACE**	*307.108 masl*
LOG DATE	*September 1, 2005/July 7, 2006*	**BOREHOLE DEPTH**	*131.06 m*
LOGGED BY	*GRB/RF*	**CASING DEPTH**	*31.7 m*
DRILL METHOD	*Mud Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

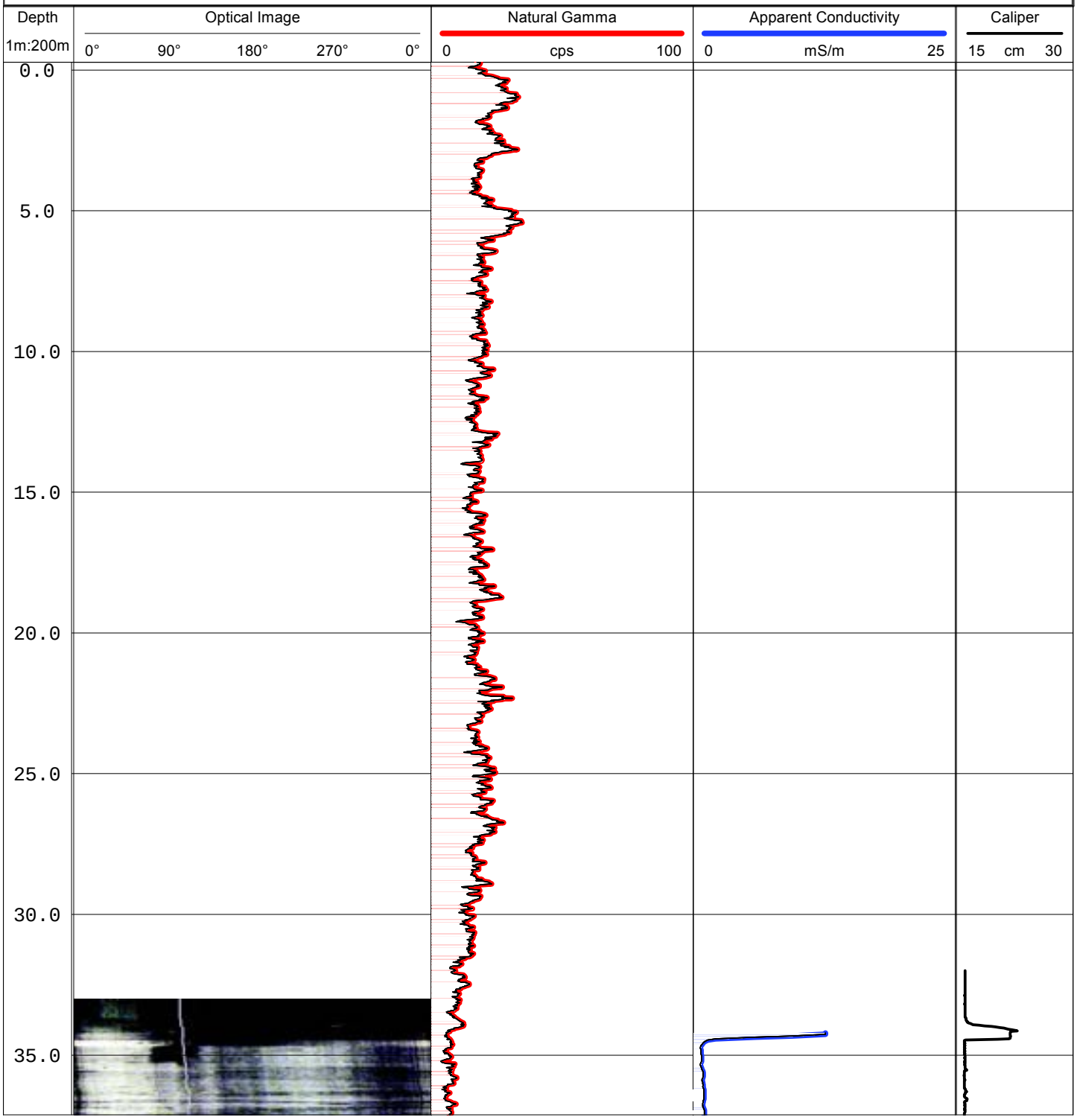


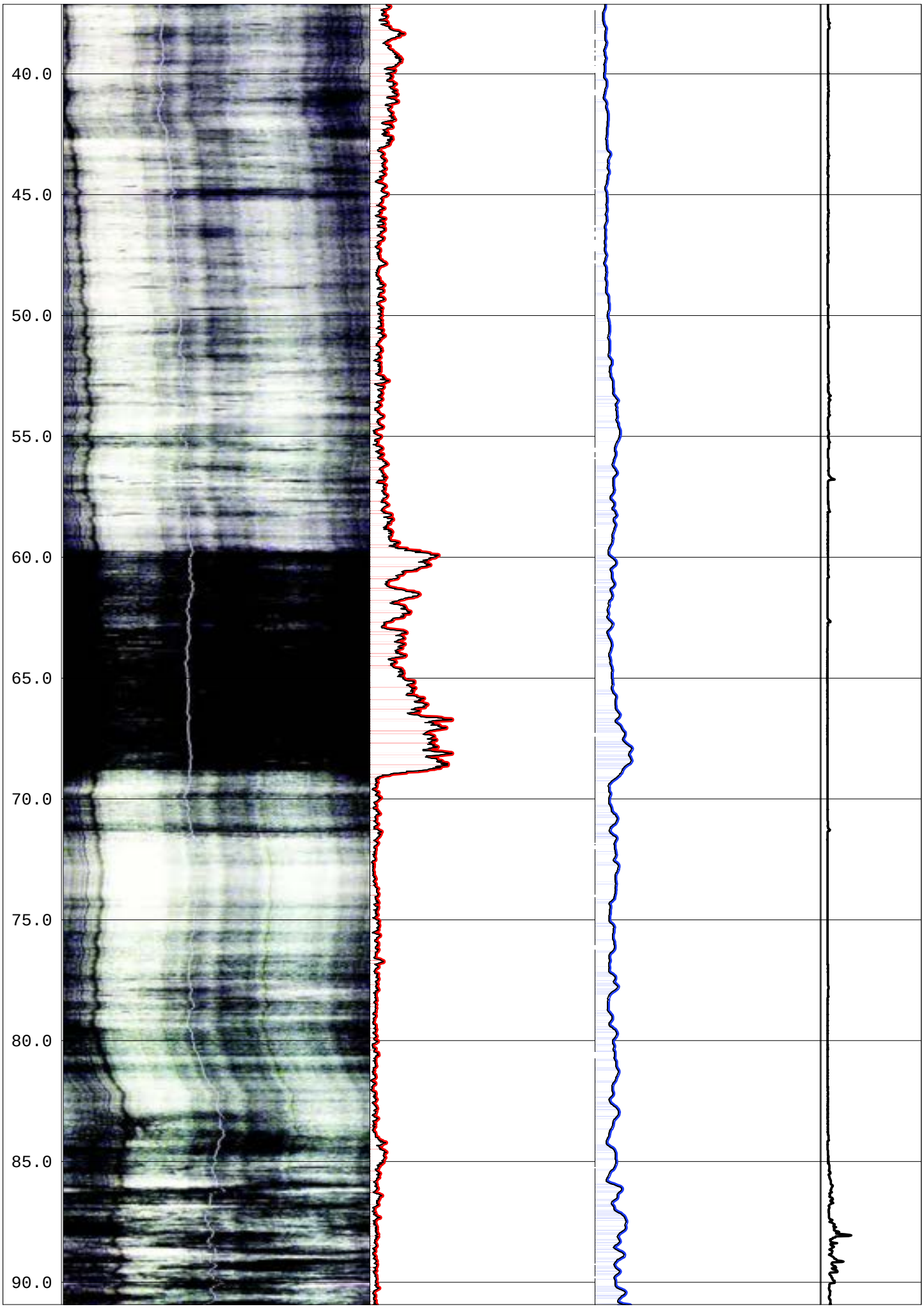

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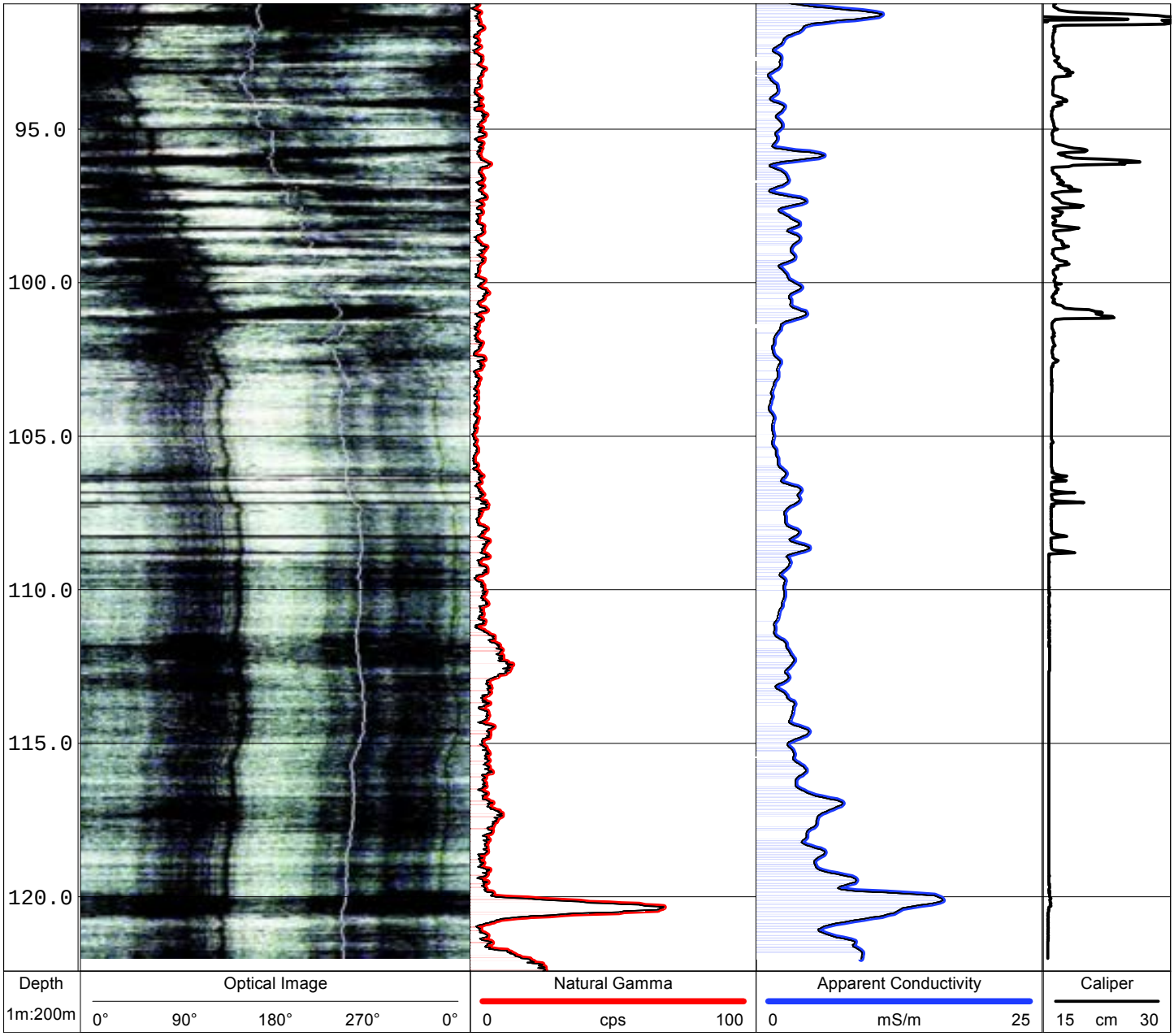

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GEOPHYSICAL RECORD OF BOREHOLE CMTW2-05

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558964.441*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4804452.146*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge*	**GROUND SURFACE**	*301.803 masl*
LOG DATE	*May 19, 2006*	**BOREHOLE DEPTH**	*122.83 m*
LOGGED BY	*GRB*	**CASING DEPTH**	*34.44 m*
DRILL METHOD	*Mud Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

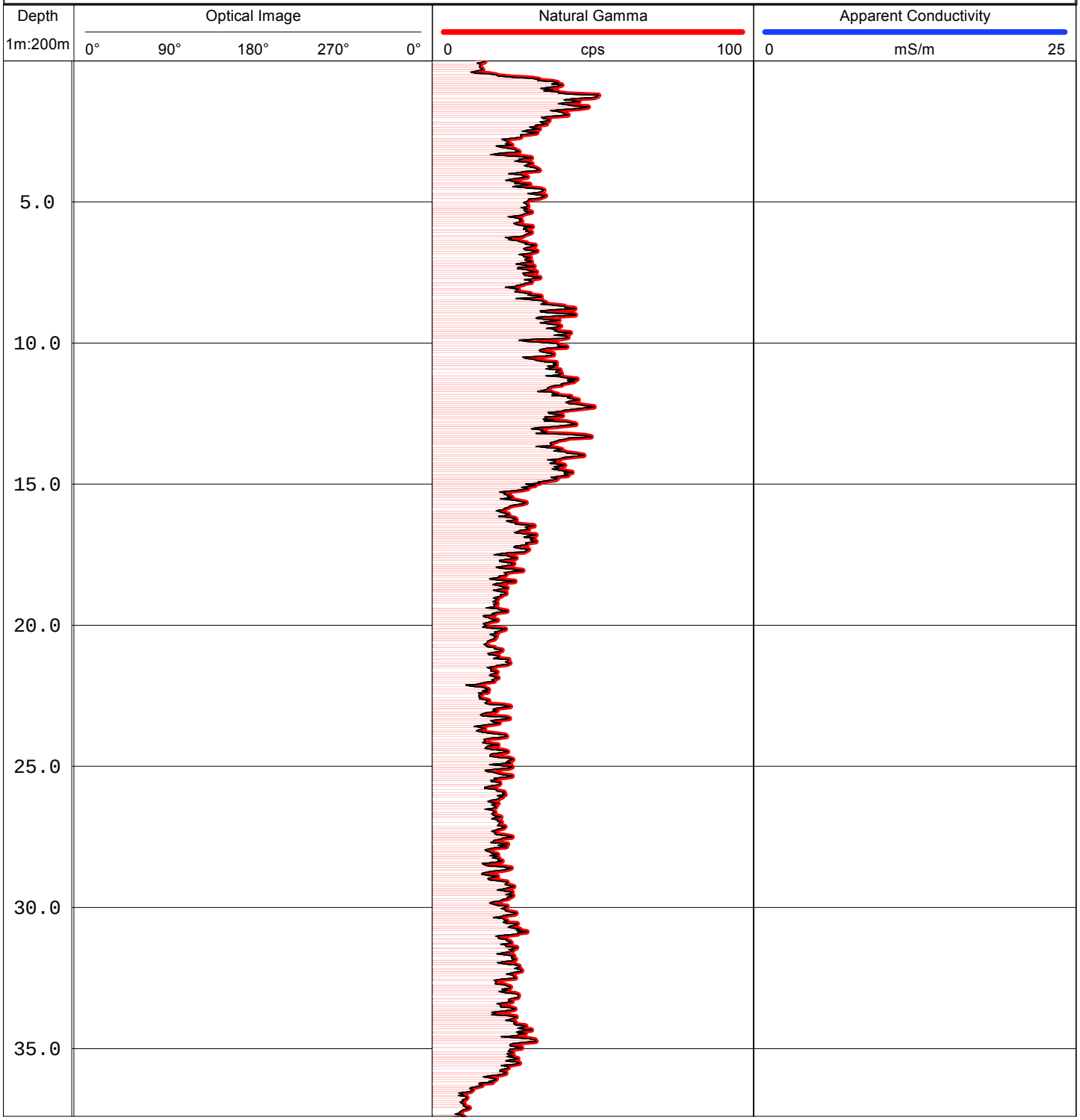


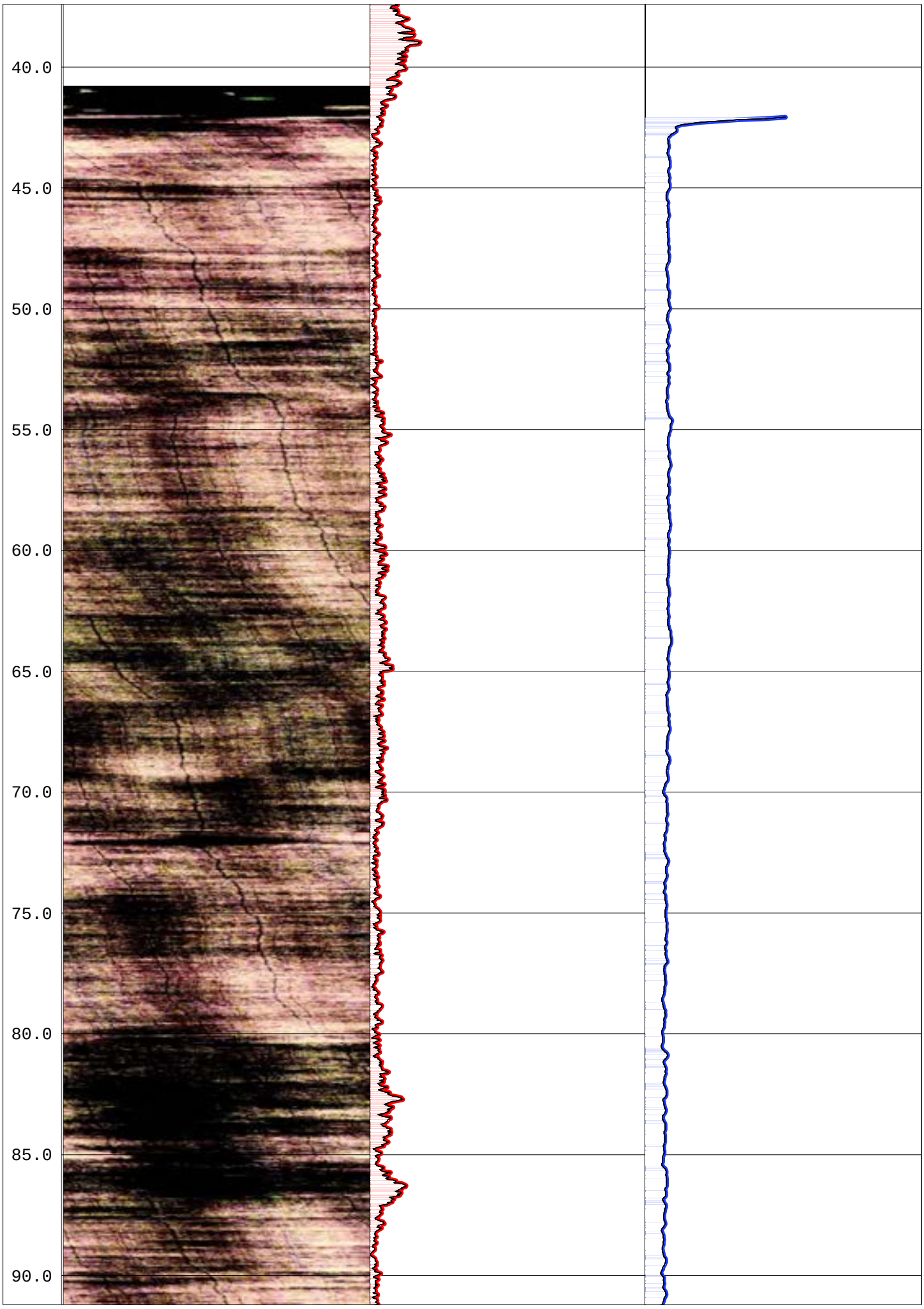

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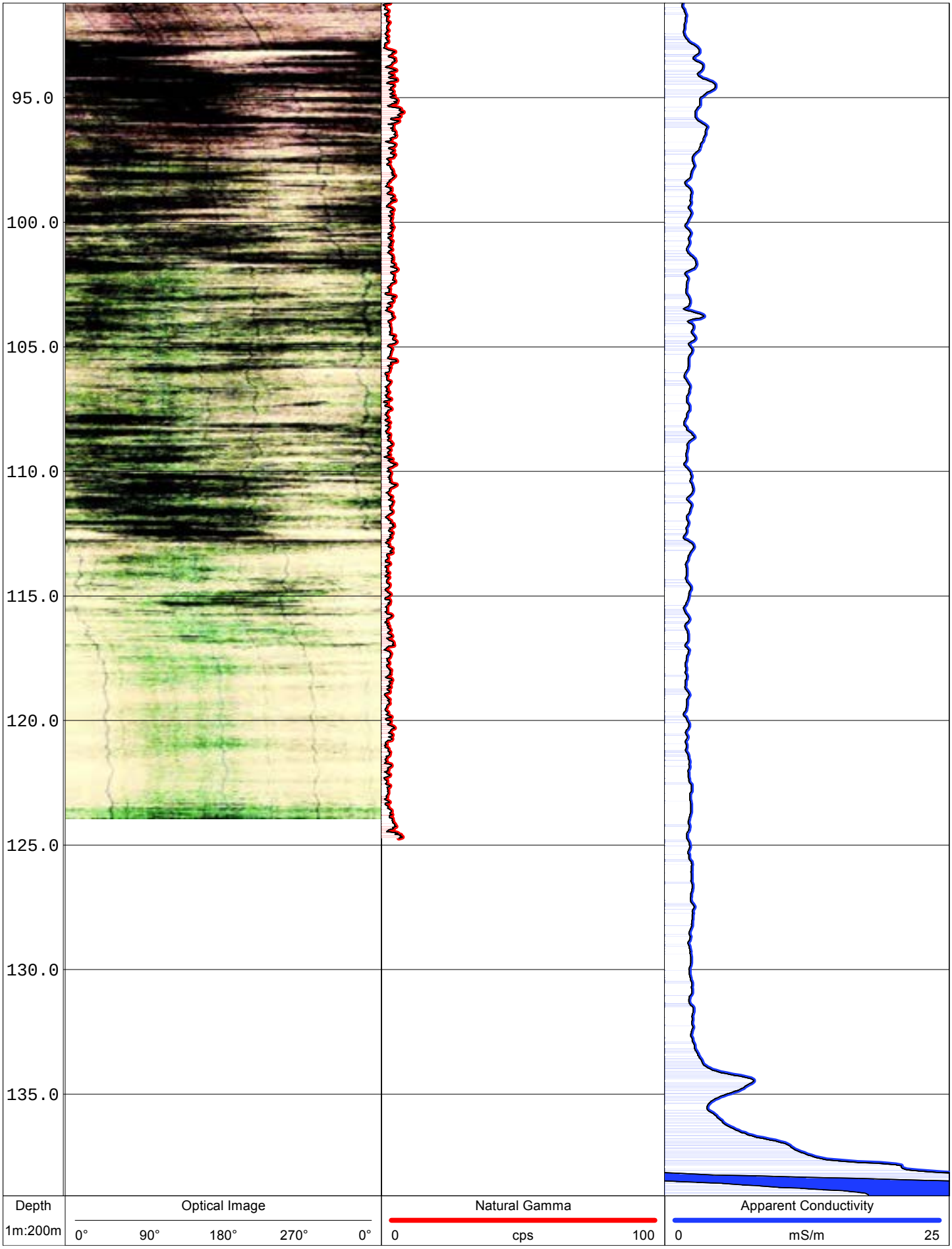

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GEOPHYSICAL RECORD OF BOREHOLE CMTW3-05

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*557559.897*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4805180.595*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Burnett Ave.*	**GROUND SURFACE**	*313.59 masl*
LOG DATE	*February 14, 2006 / July 3, 2006*	**BOREHOLE DEPTH**	*140.5 m*
LOGGED BY	*ADI/GRB*	**CASING DEPTH**	*64.0 m*
DRILL METHOD	*Mud Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

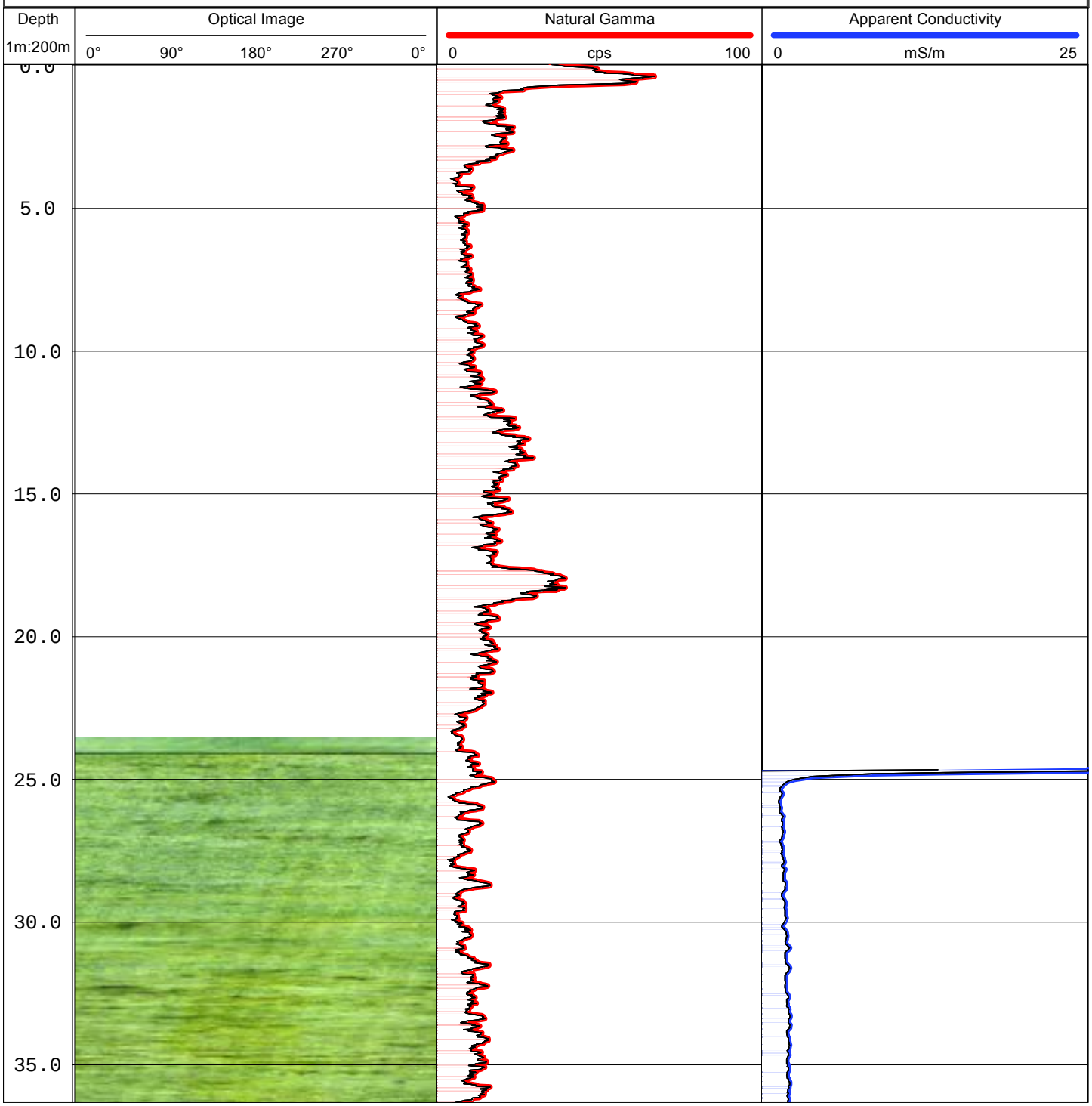


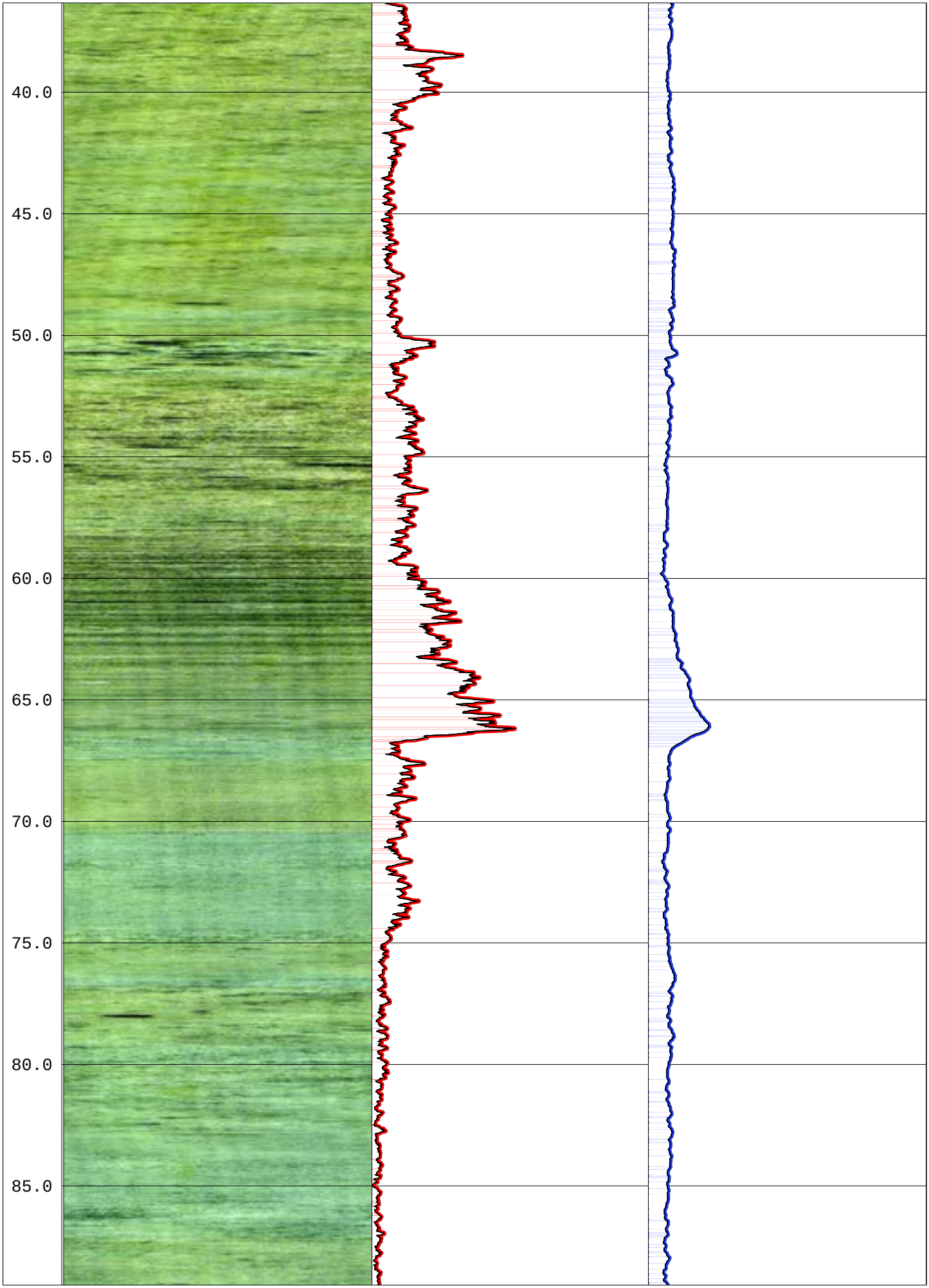

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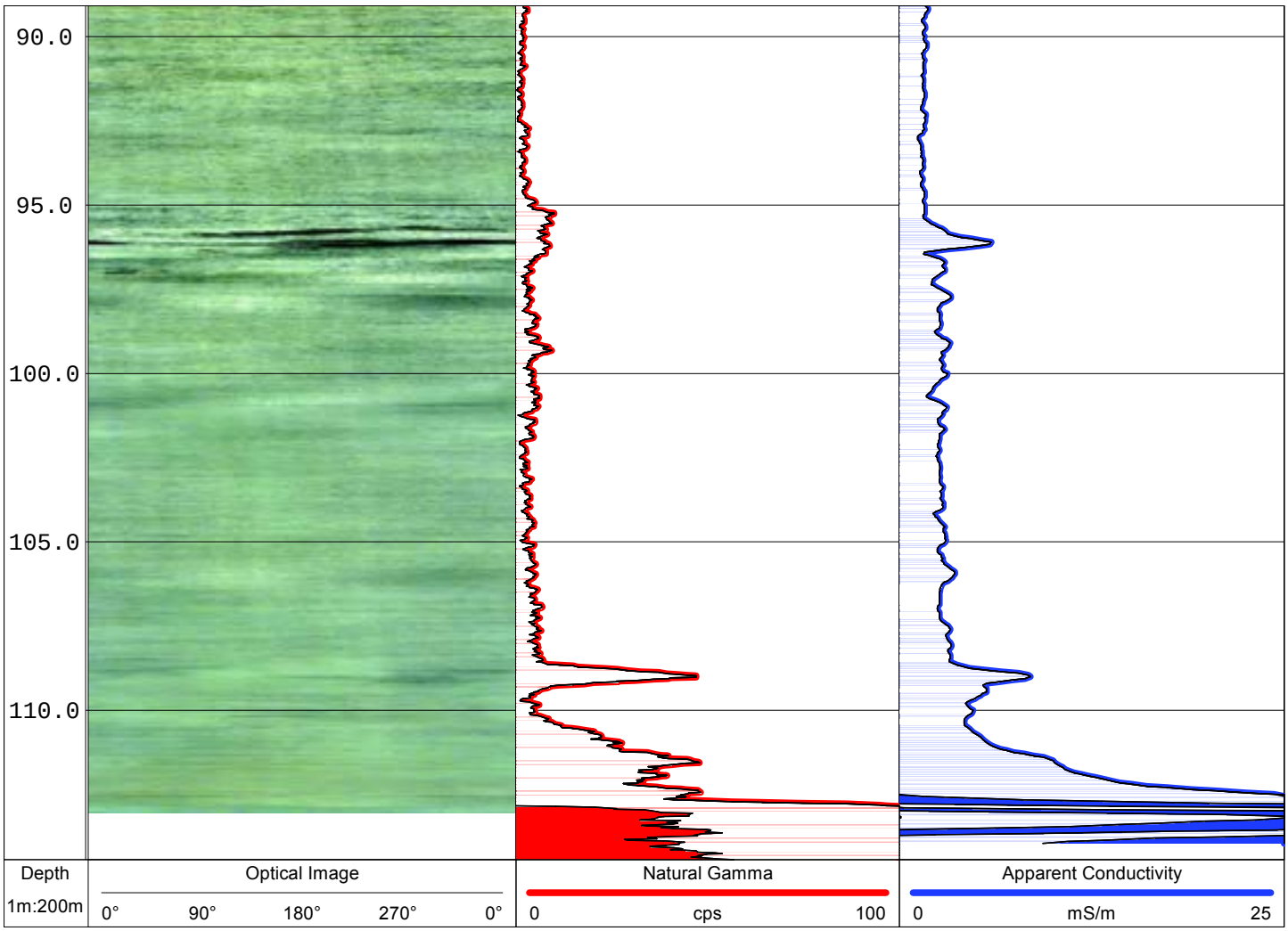

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GEOPHYSICAL RECORD OF BOREHOLE NDTW1-08

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*562366.77*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4804125.205*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Clyde Park, North Dumfries*	**GROUND SURFACE**	*300.953 masl*
LOG DATE	*October 27, 2008*	**BOREHOLE DEPTH**	*114.6 m*
LOGGED BY	*BB*	**CASING DEPTH**	*23.77 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

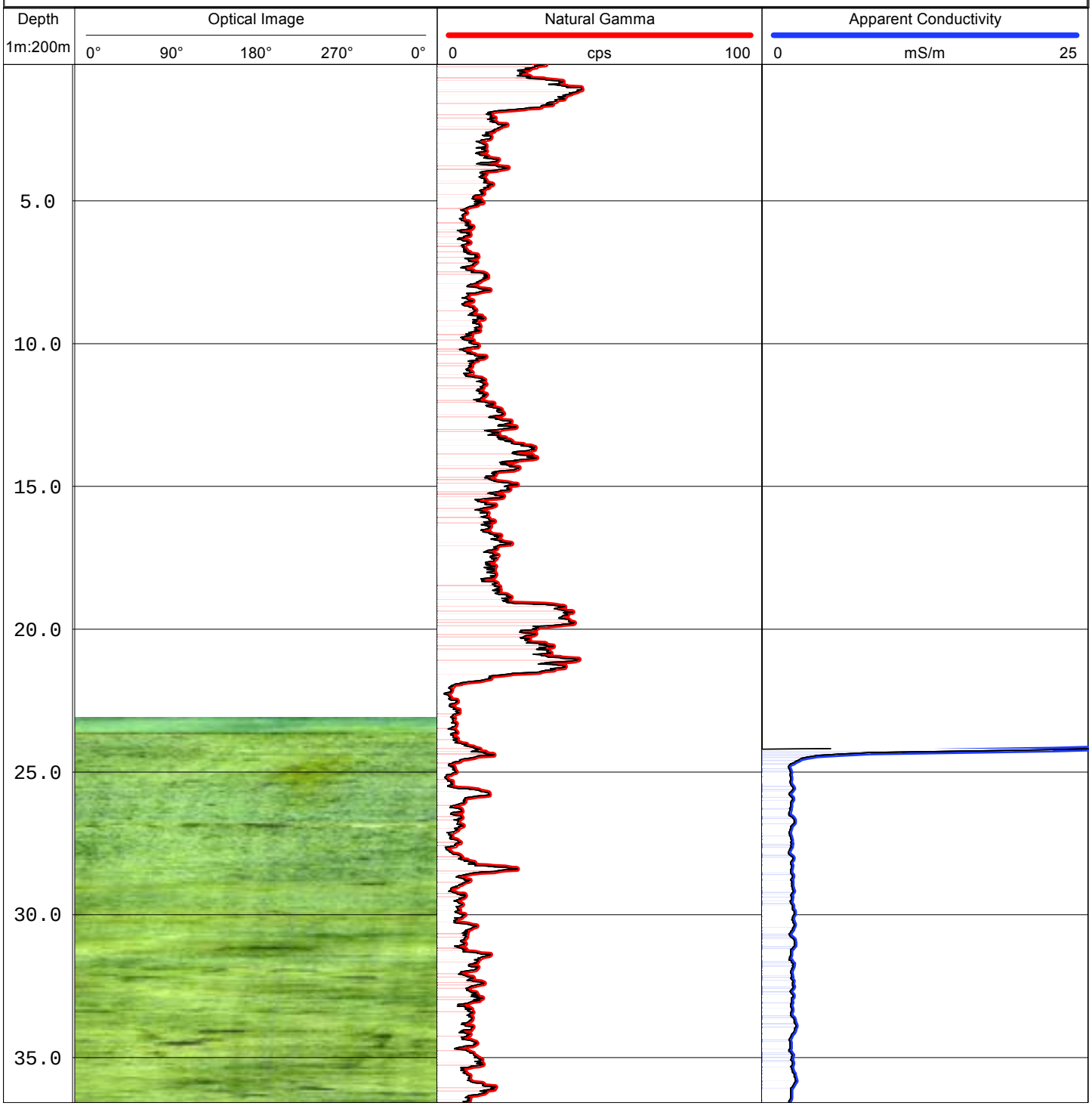


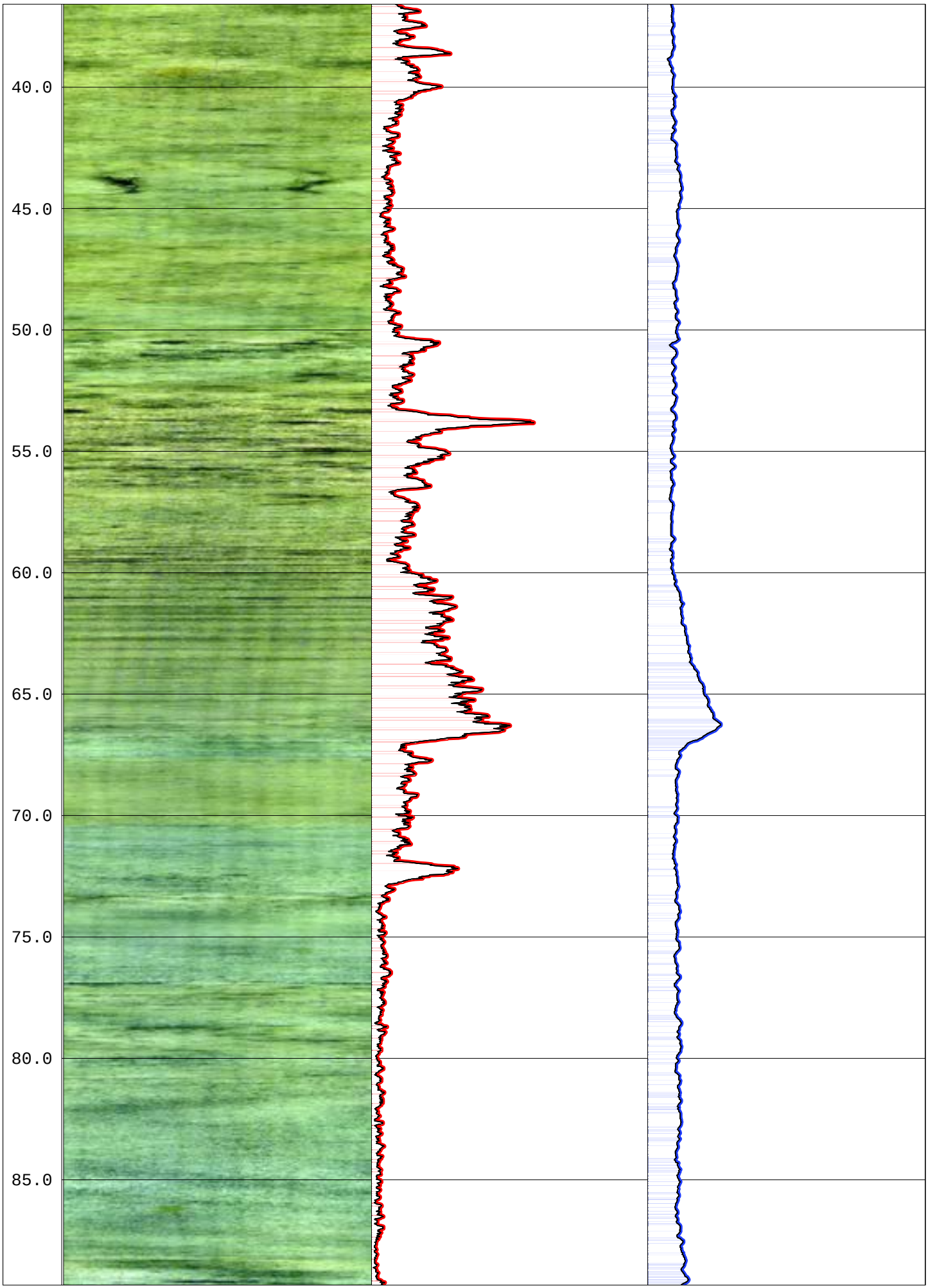

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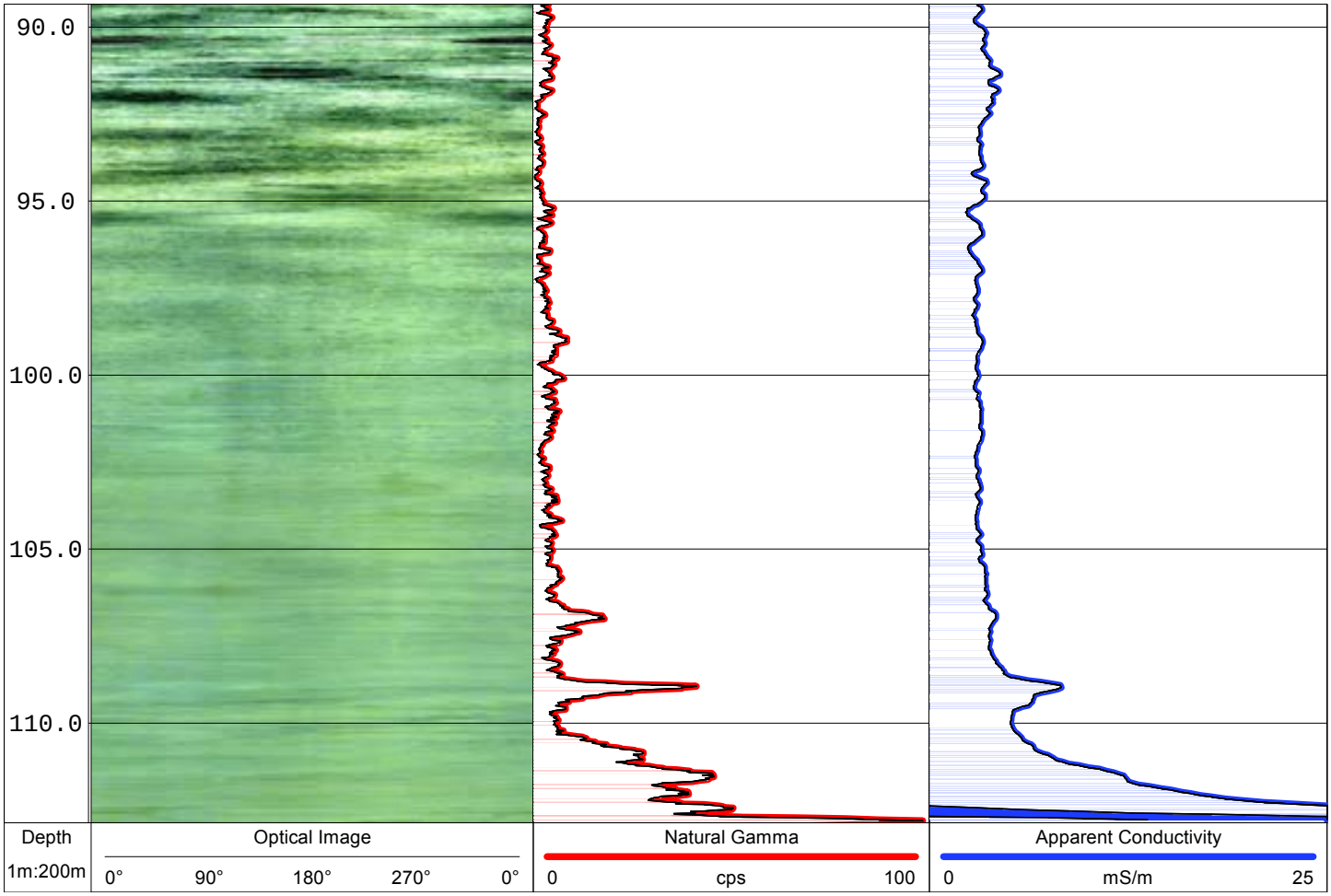

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GEOPHYSICAL RECORD OF BOREHOLE NDTW2-08

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*562219.742*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4804075.713*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Clyde Park, Clyde, ON*	**GROUND SURFACE**	*300.548 masl*
LOG DATE	*October 24, 2008*	**BOREHOLE DEPTH**	*115.52 m*
LOGGED BY	*BB*	**CASING DEPTH**	*22.9 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

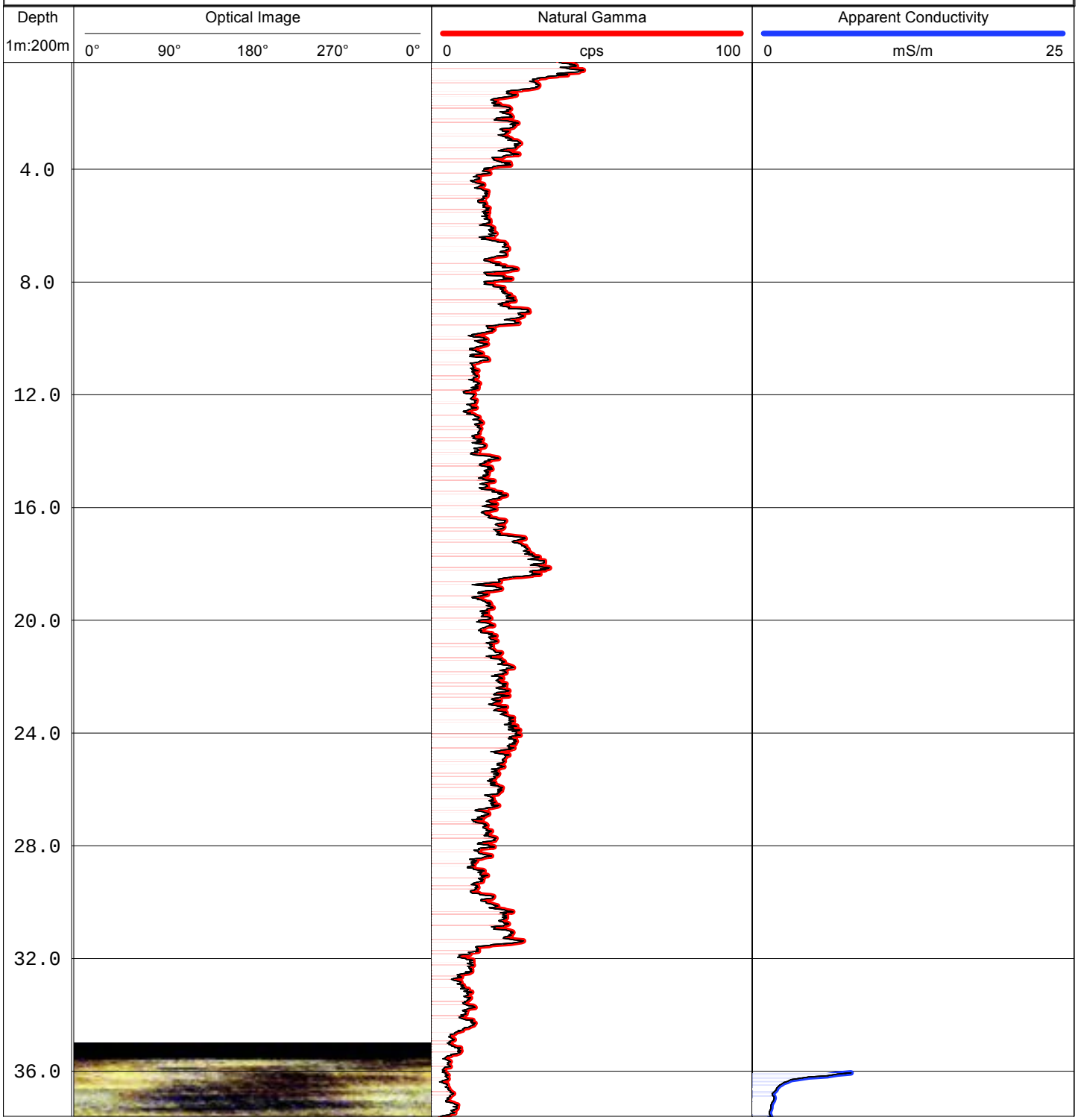


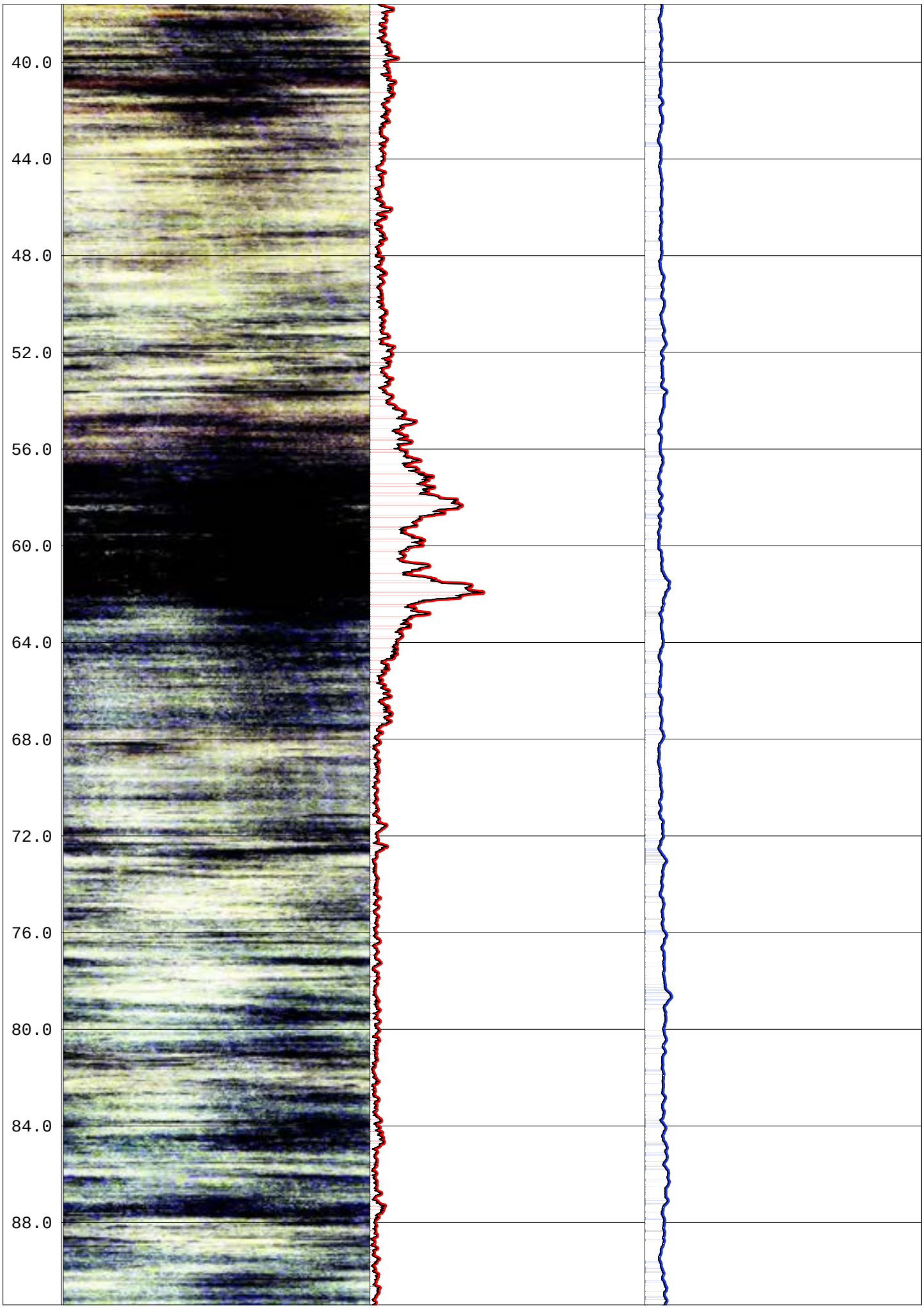

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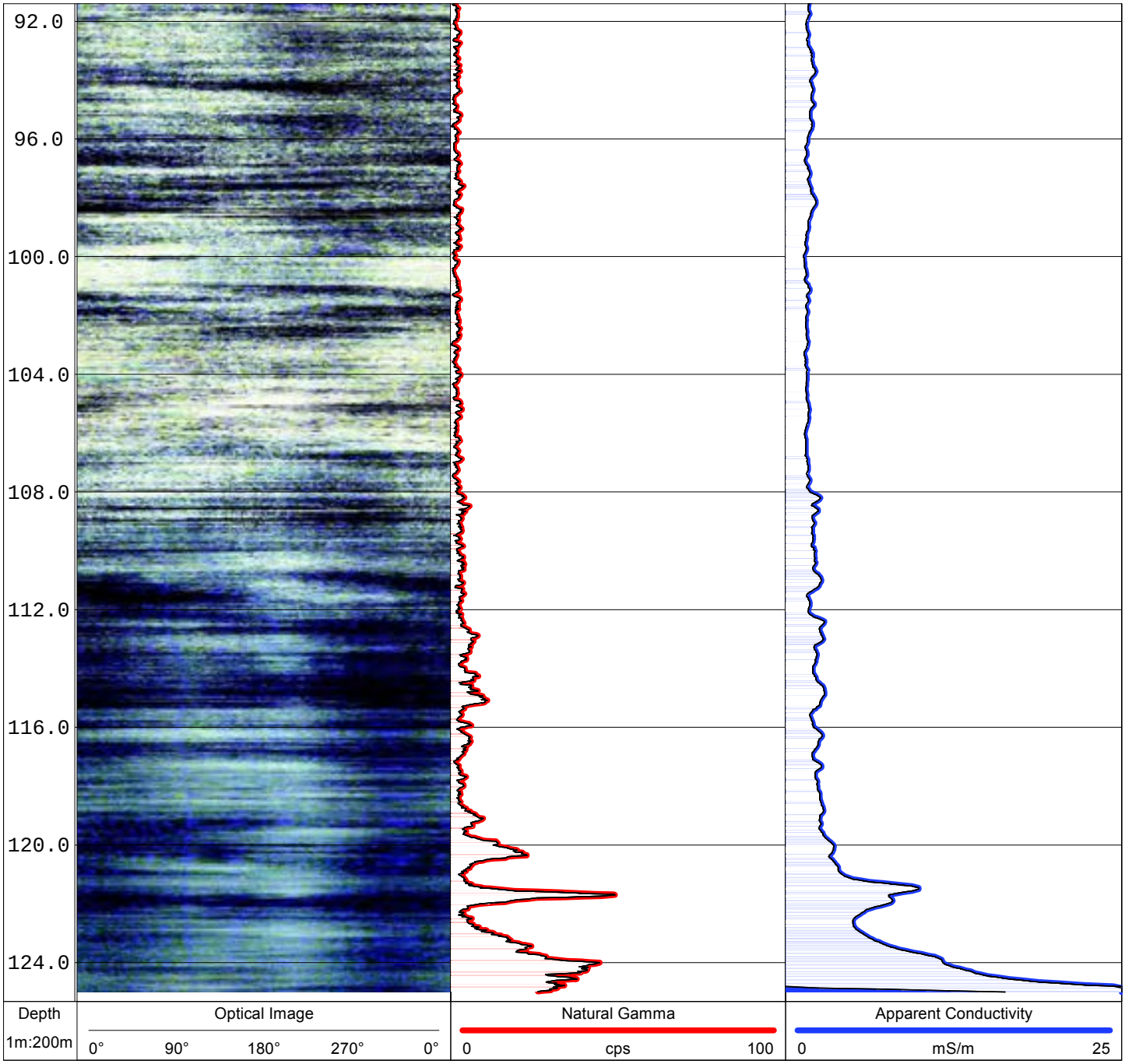

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GEOPHYSICAL RECORD OF BOREHOLE PBOW1-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*559285.847*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4806058.192*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Concession 1*	**GROUND SURFACE**	*308.205 masl*
LOG DATE	*July 4, 2006*	**BOREHOLE DEPTH**	*126.5 m*
LOGGED BY	*GRB*	**CASING DEPTH**	*35.35 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

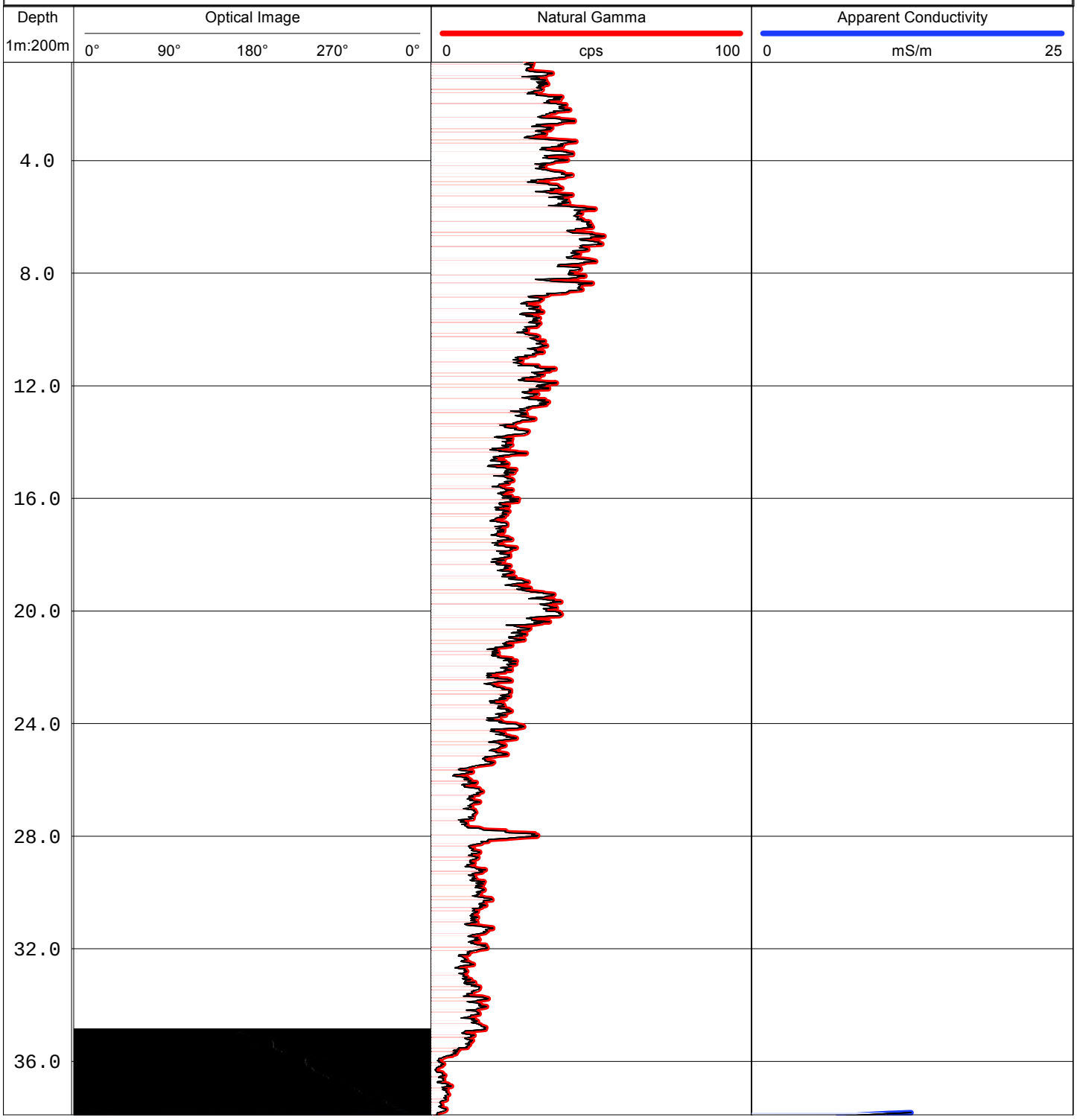


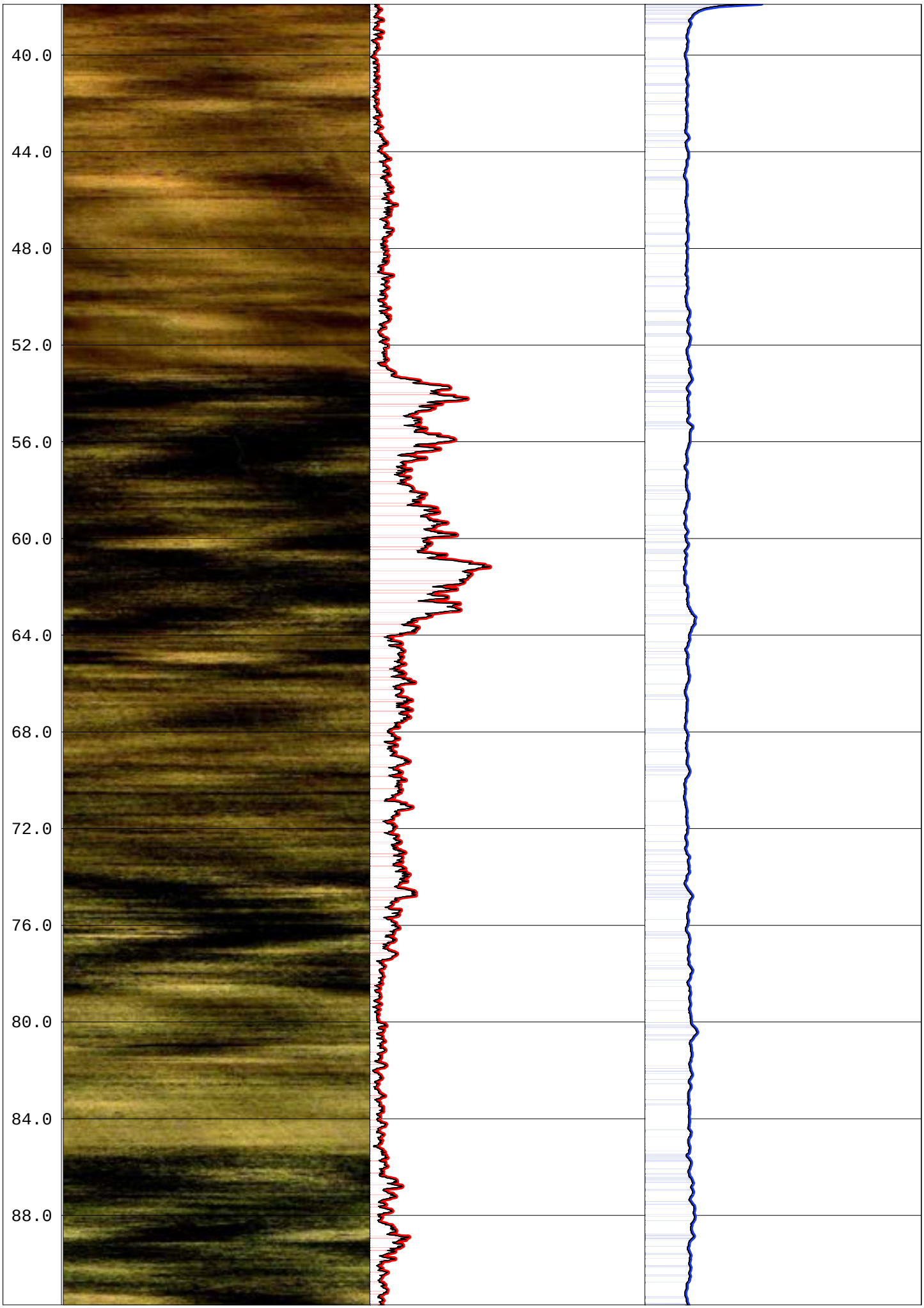

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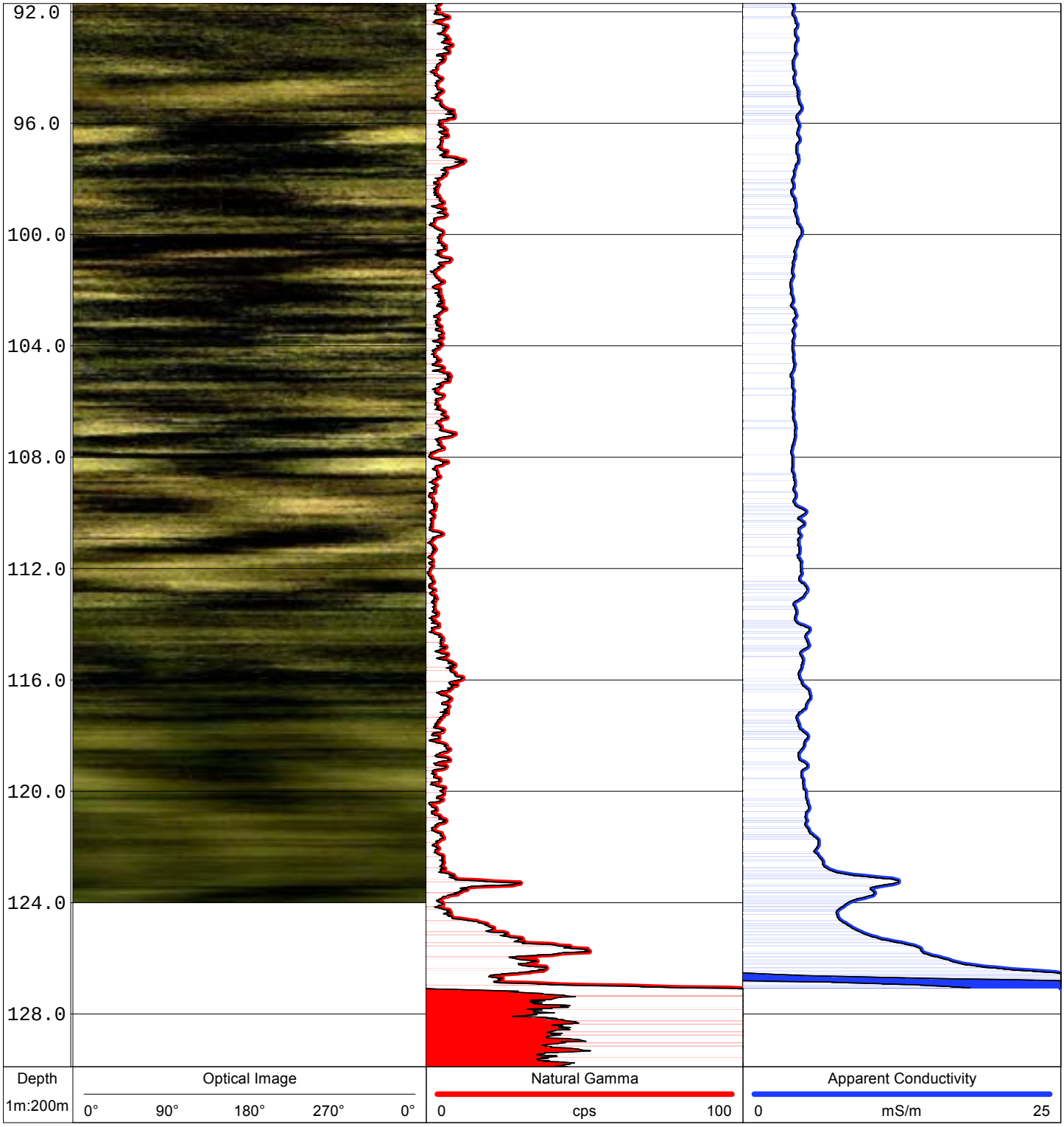

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Apparent Conductivity
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GEOPHYSICAL RECORD OF BOREHOLE PBOW2-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558534.664*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4806923.415*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - GRCA Traffic Circle*	**GROUND SURFACE**	*310.684 masl*
LOG DATE	*July 31, 2006*	**BOREHOLE DEPTH**	*128.9 m*
LOGGED BY	*RF/TF*	**CASING DEPTH**	*37.5 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

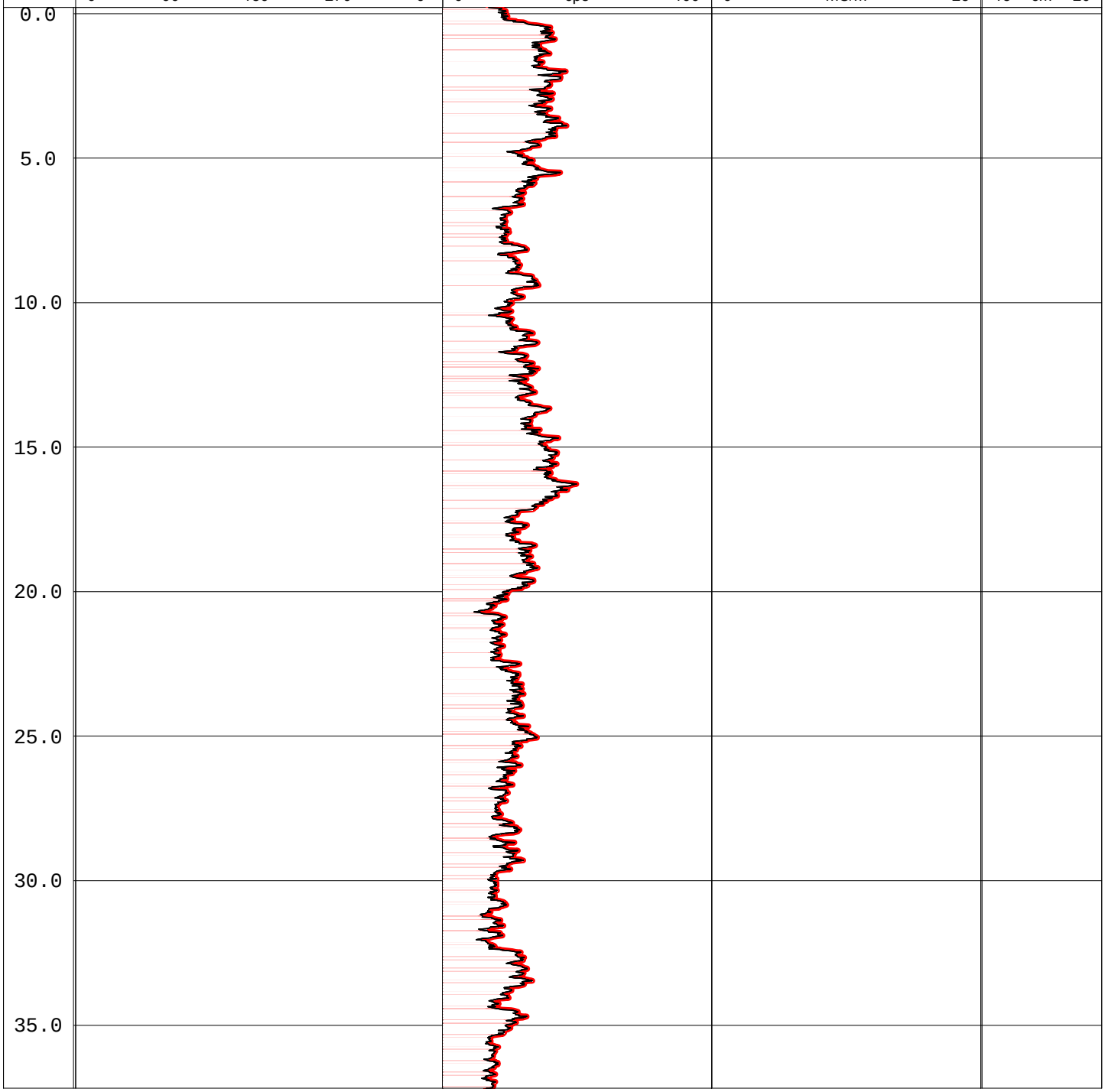


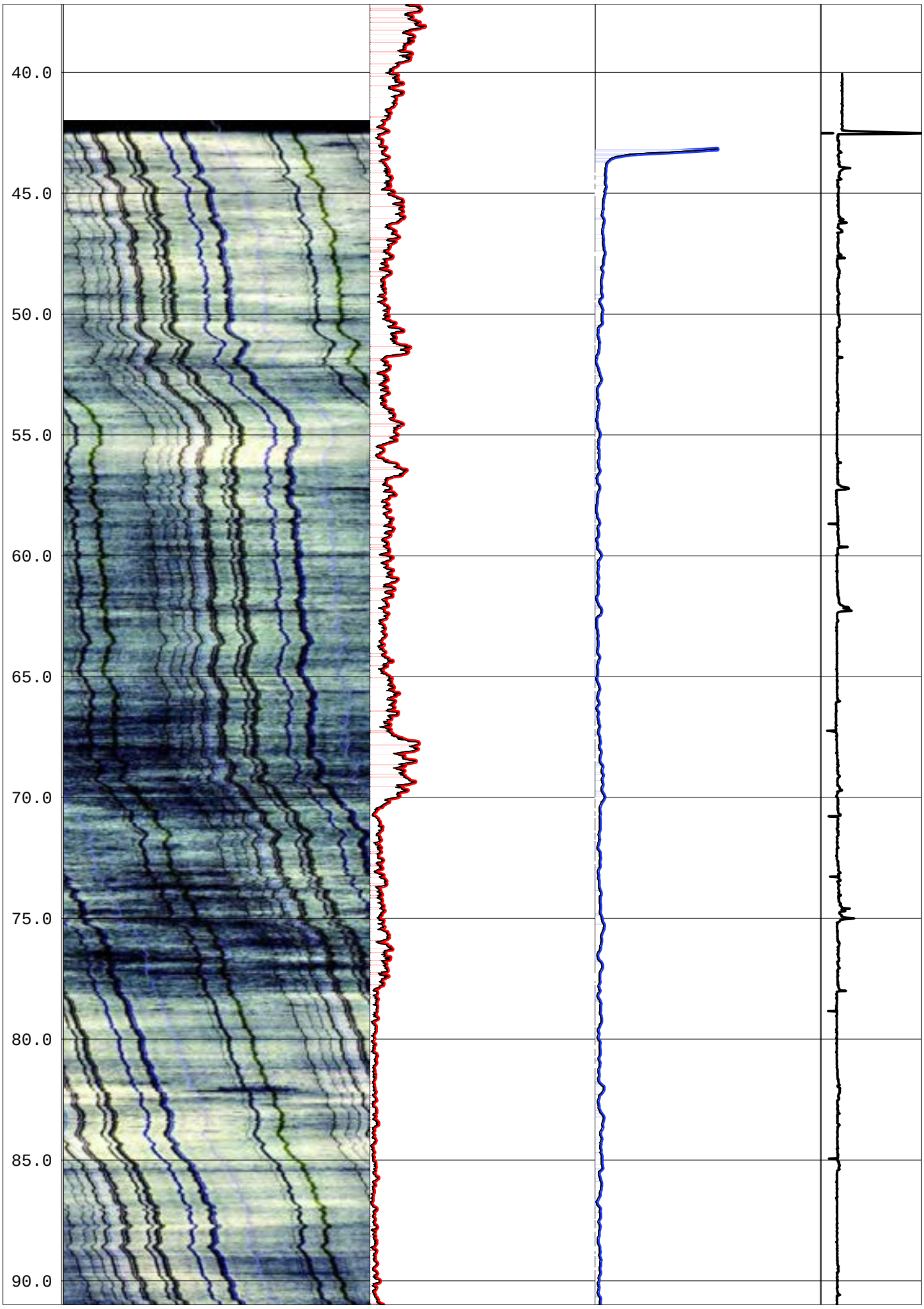

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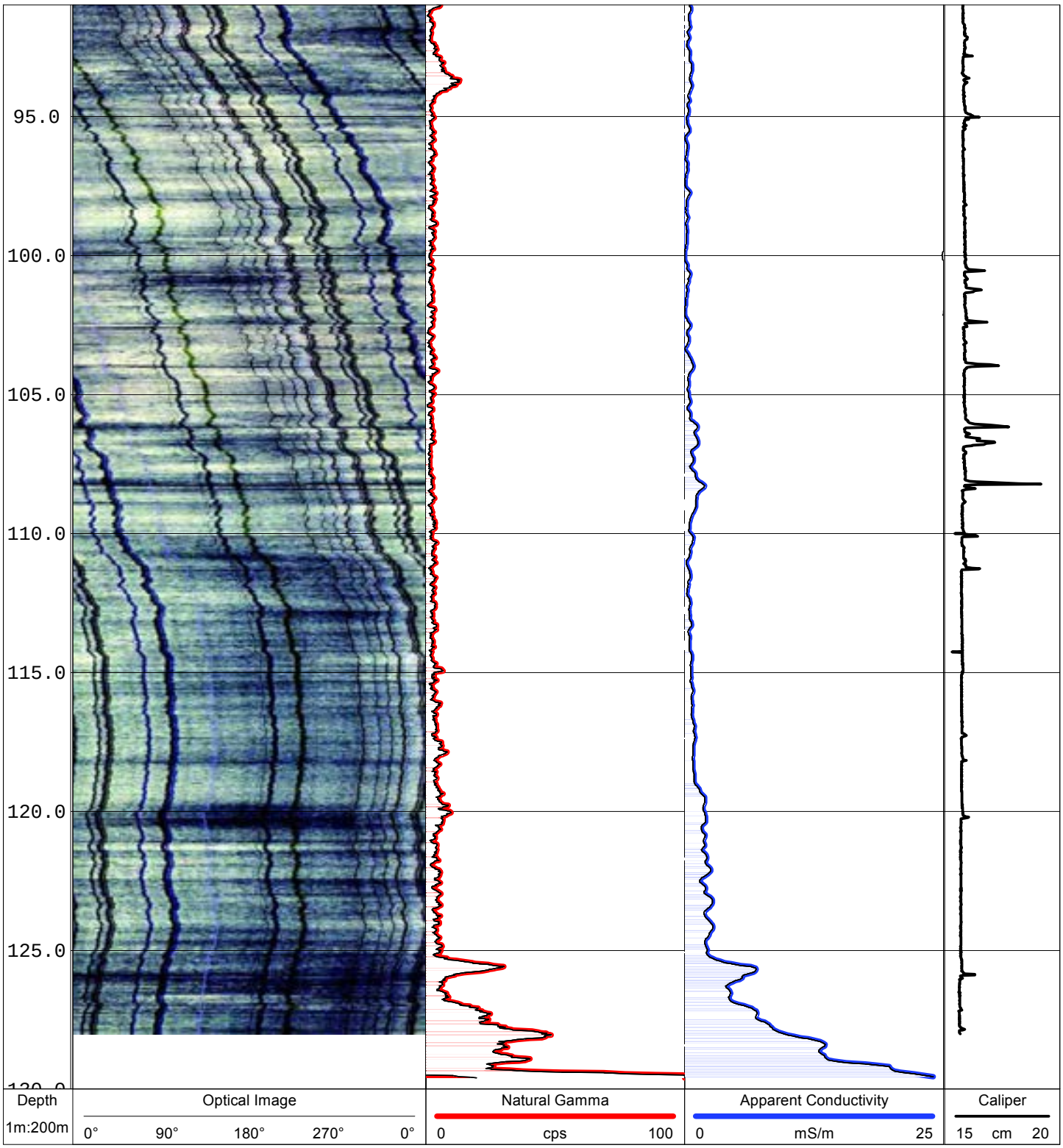

92.0
96.0
100.0
104.0
108.0
112.0
116.0
120.0
124.0
128.0
Depth
1m:200m
Optical Image
0°
90°
180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25

GEOPHYSICAL RECORD OF BOREHOLE PBTW1-05

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558317.21*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4806856.68*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge*	**GROUND SURFACE**	*314.56 masl*
LOG DATE	*May 17, 2006*	**BOREHOLE DEPTH**	*130.45 m*
LOGGED BY	*GRB*	**CASING DEPTH**	*42.67 m*
DRILL METHOD	*Mud Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

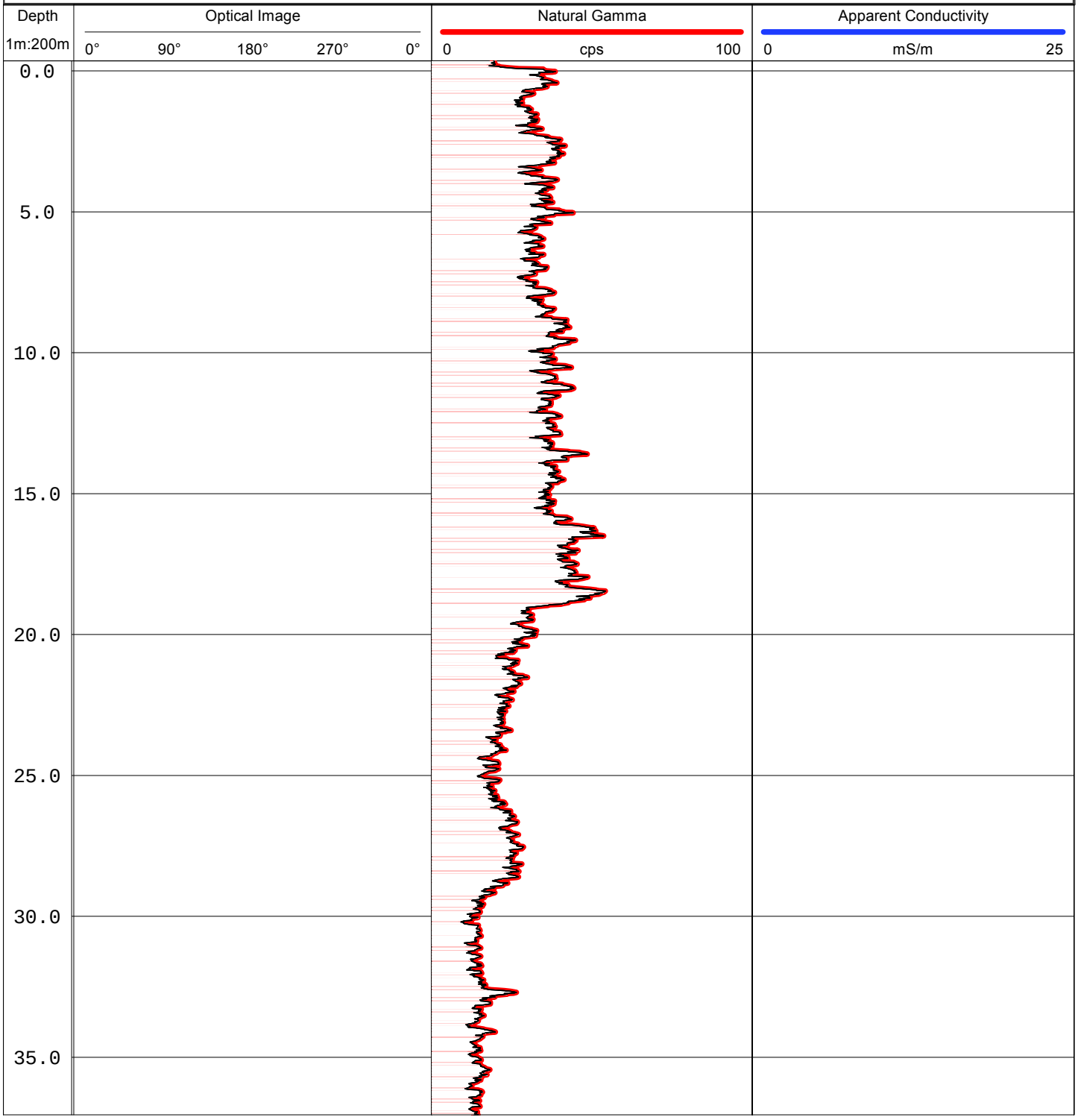


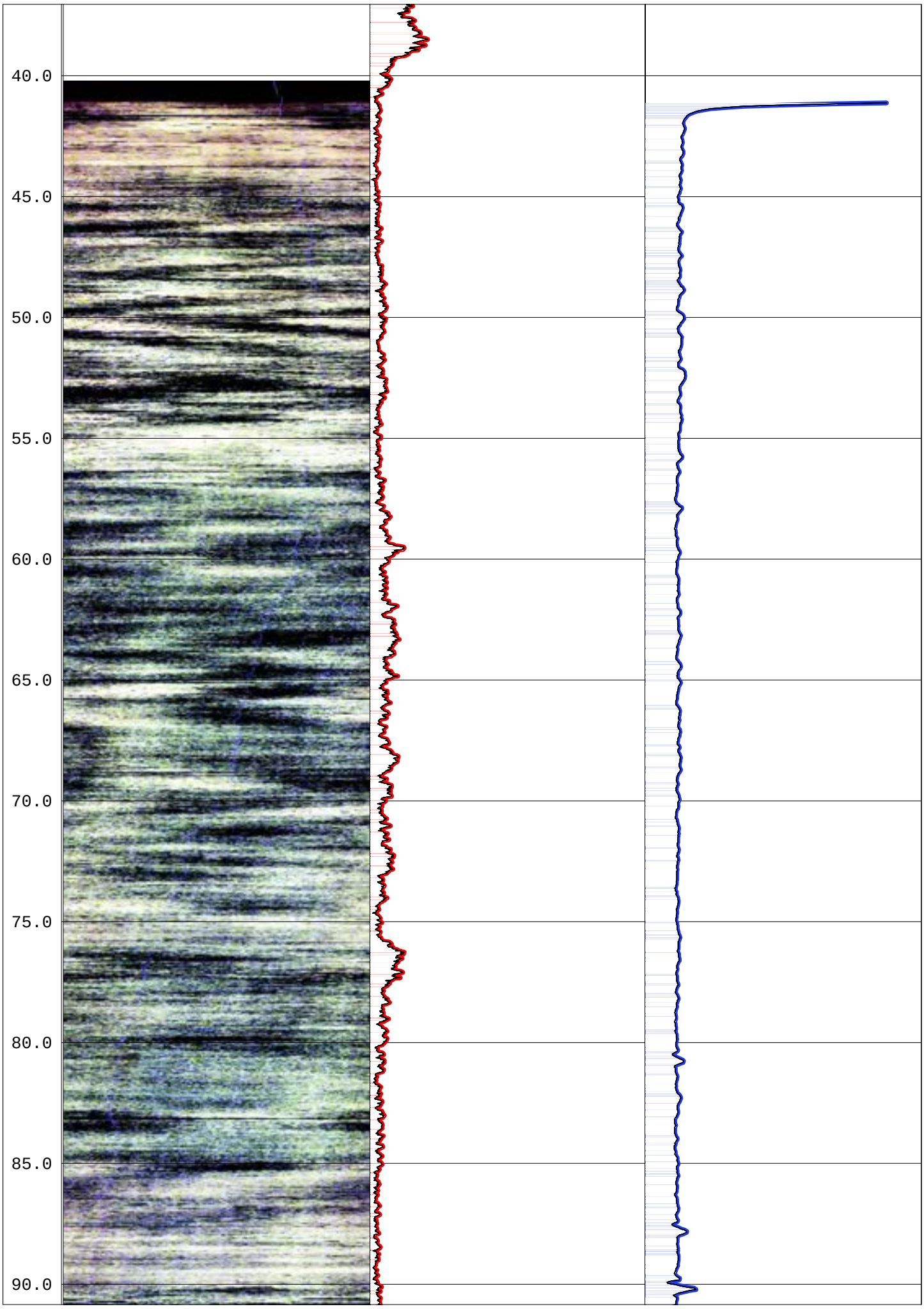

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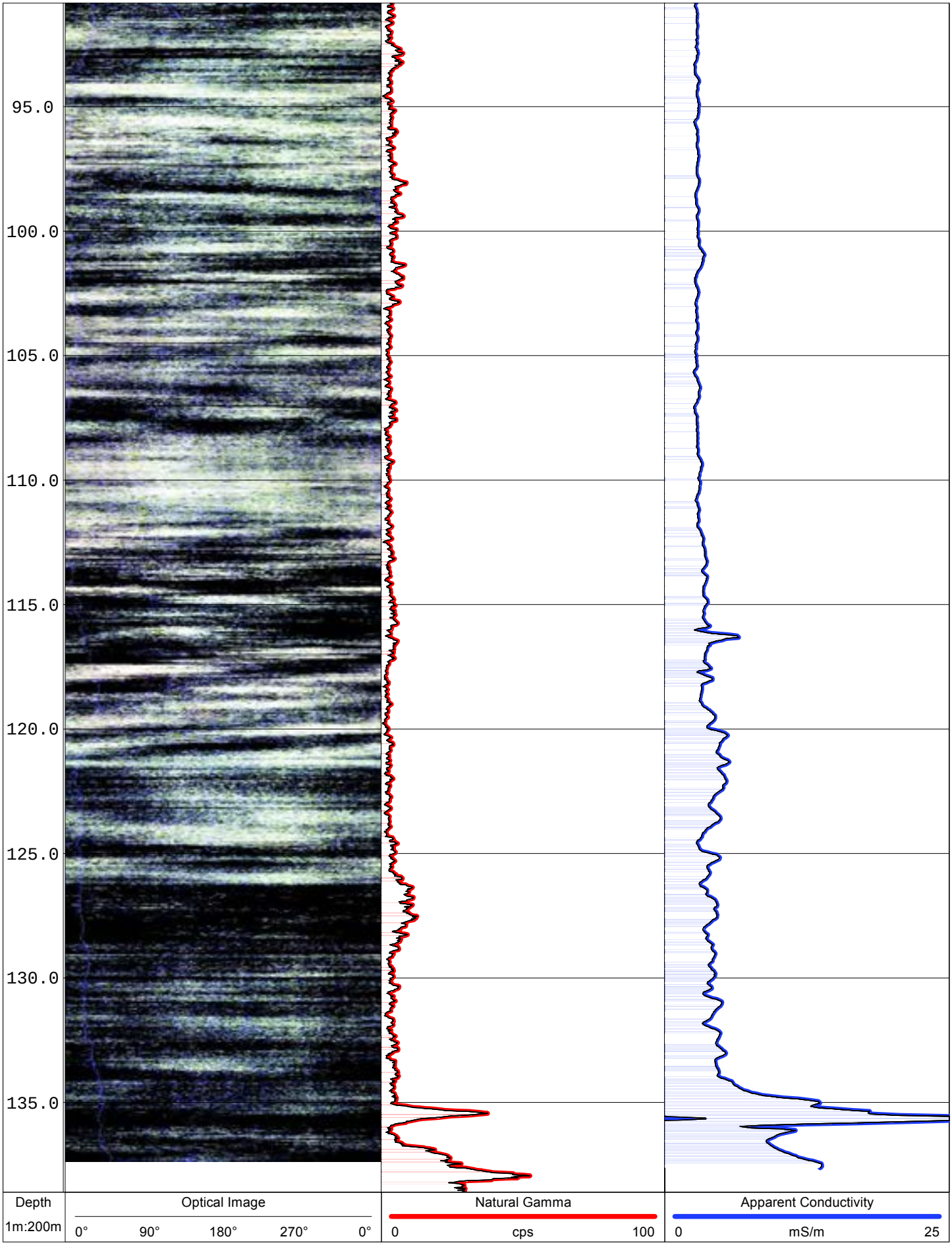

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125.0
Depth
1m:200m
Optical Image
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180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25
Caliper
15
cm
20

GEOPHYSICAL RECORD OF BOREHOLE PBTW2-06

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558219.628*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*6806227.233*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Witmer Park*	**GROUND SURFACE**	*318.308 masl*
LOG DATE	*June, 2006*	**BOREHOLE DEPTH**	*139.59 m*
LOGGED BY	*RF*	**CASING DEPTH**	*42.06 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

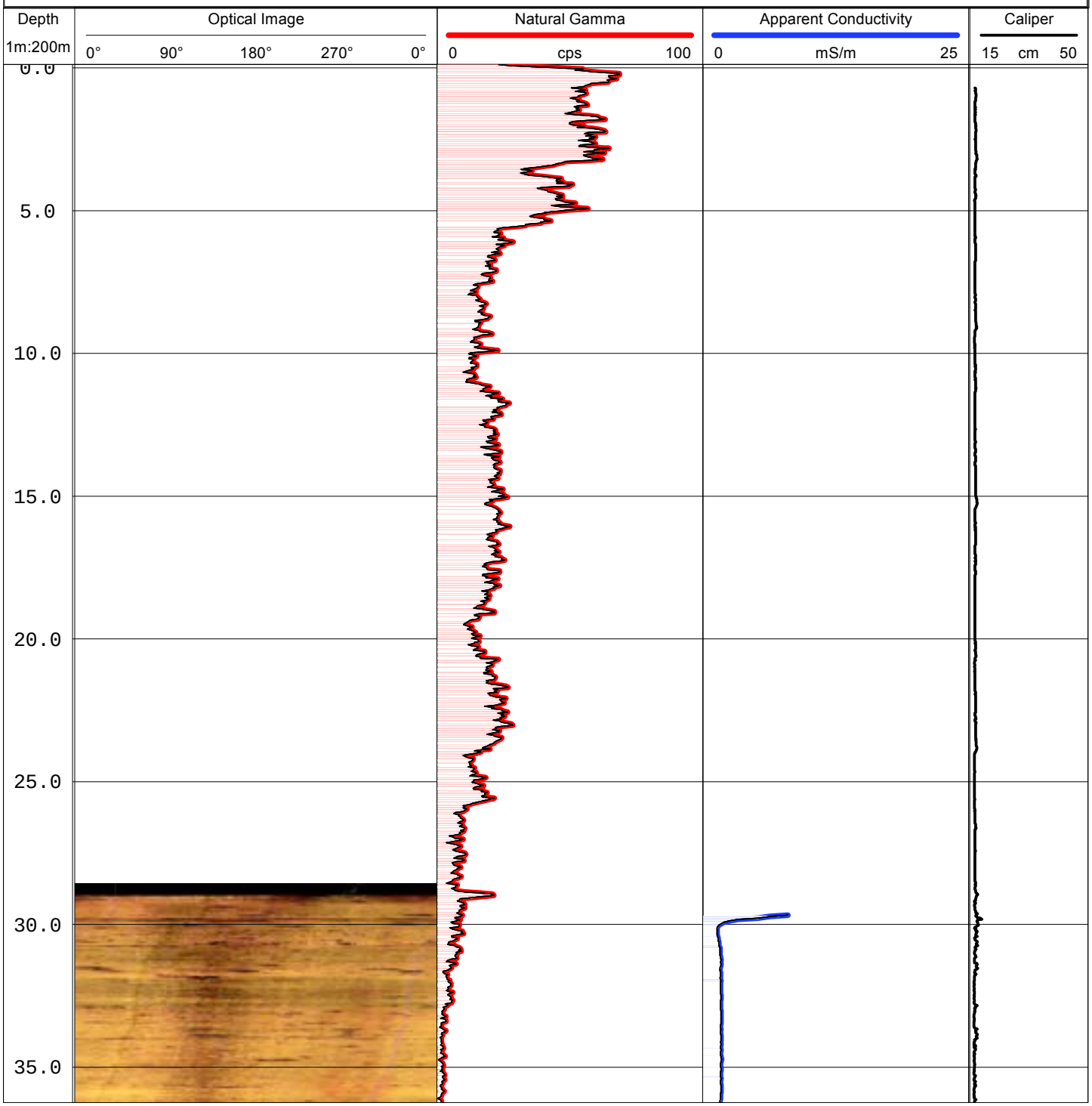


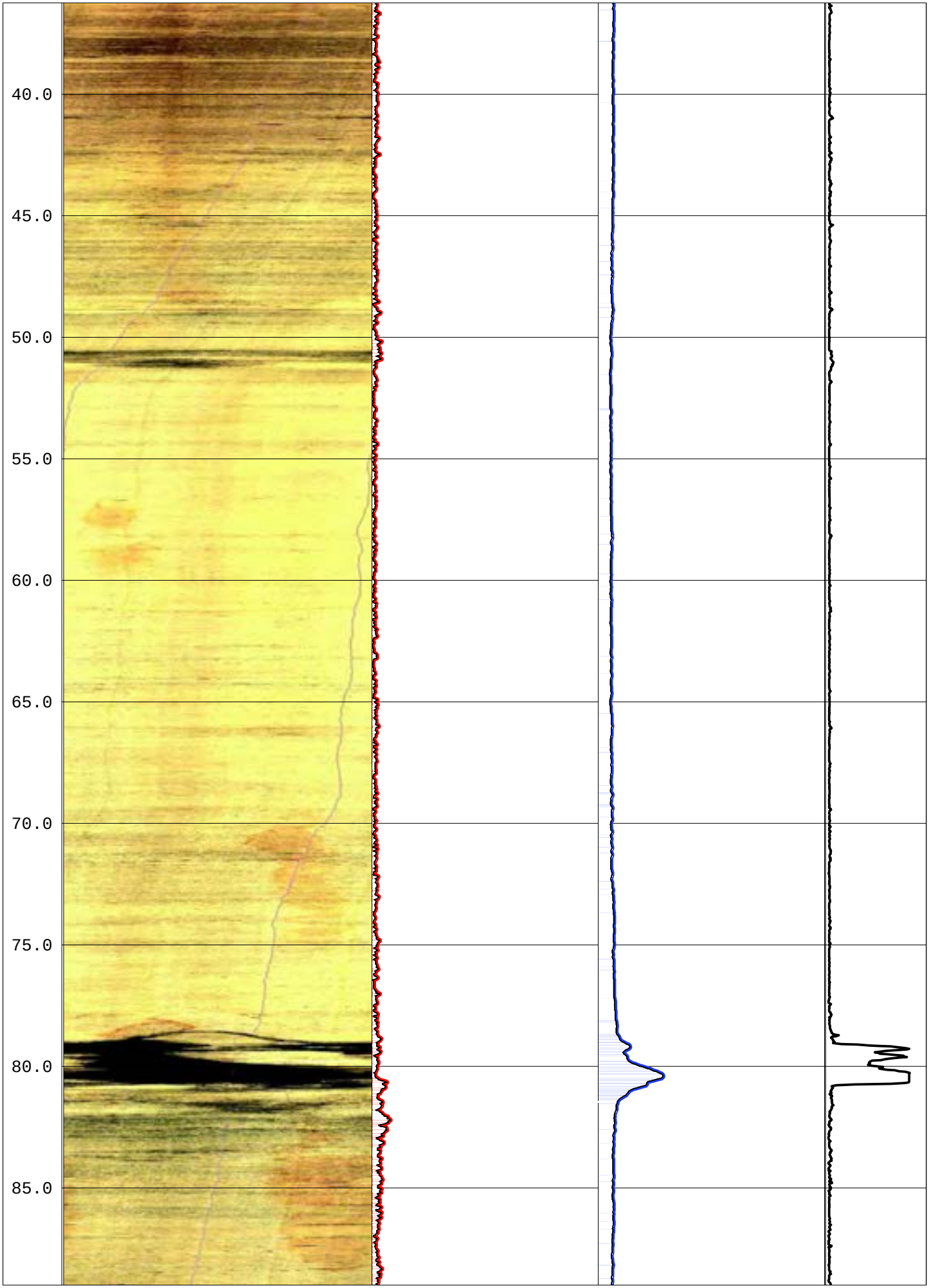

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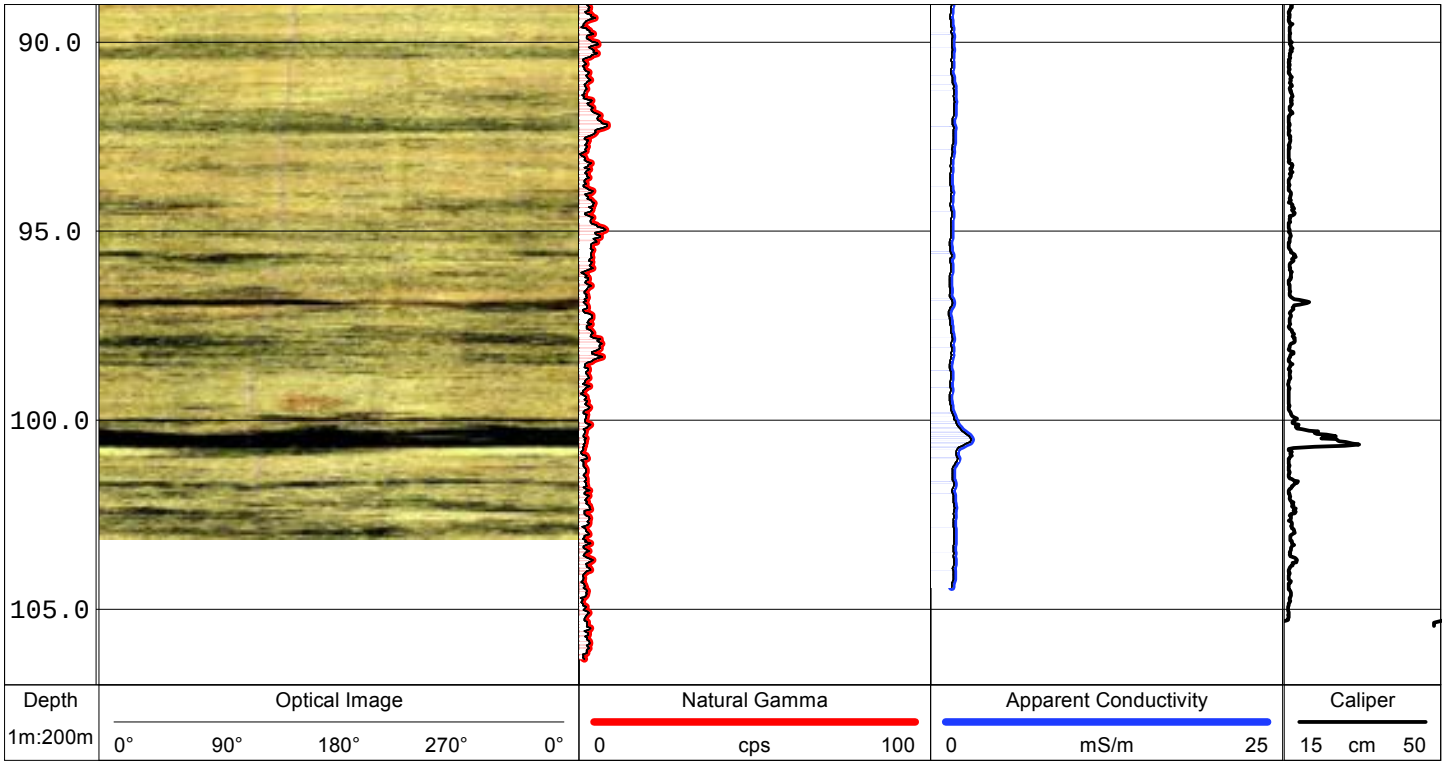

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120.0
125.0
130.0
135.0
Depth
1m:200m
Optical Image
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180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25

GEOPHYSICAL RECORD OF BOREHOLE PBTW3-07

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*557466.339*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4805907.686*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge, Can-Amera Parkway*	**GROUND SURFACE**	*308.587 masl*
LOG DATE	*February 11-12, 2008*	**BOREHOLE DEPTH**	*133.2 m*
LOGGED BY	*BB*	**CASING DEPTH**	*29.2 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

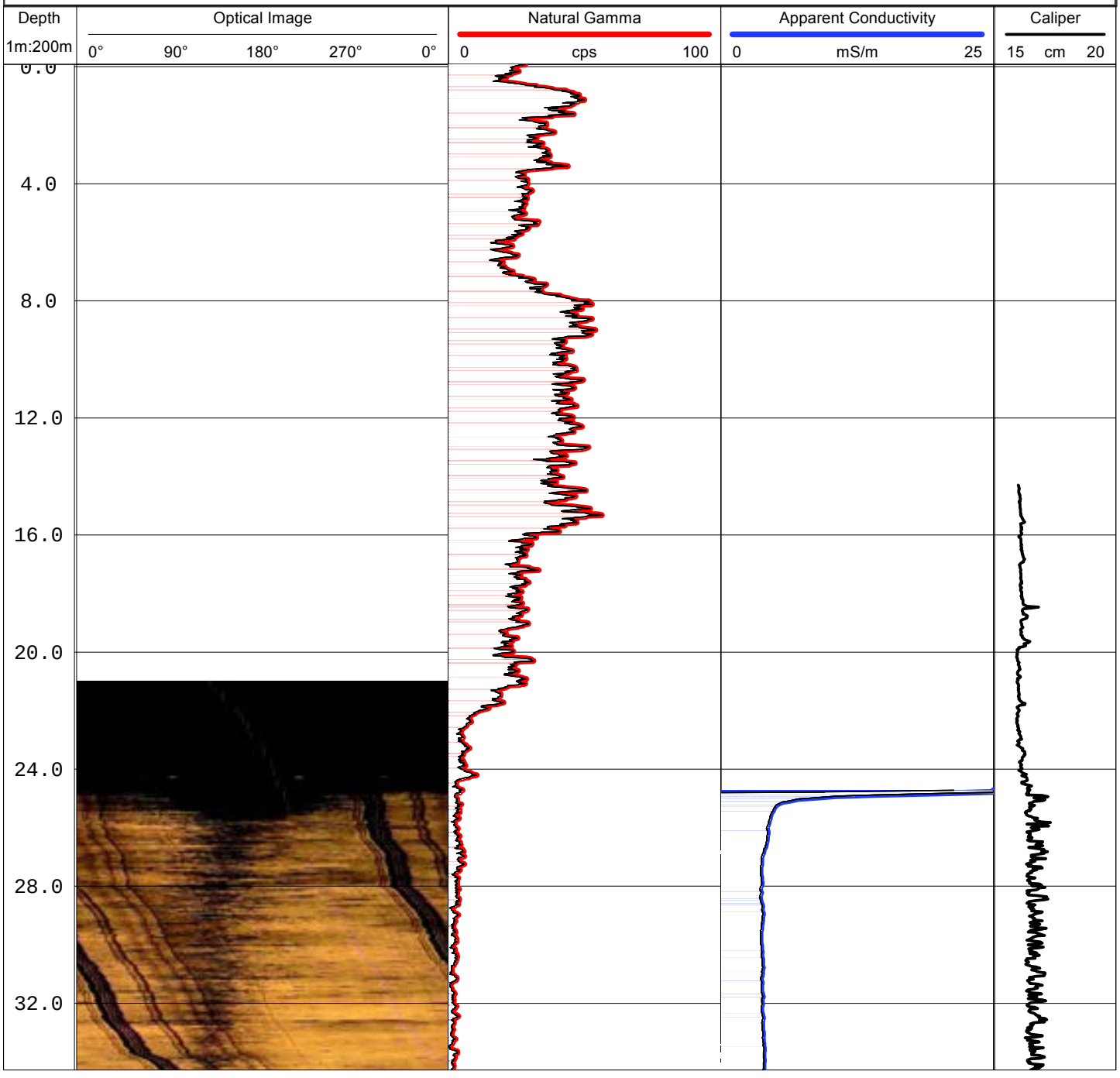


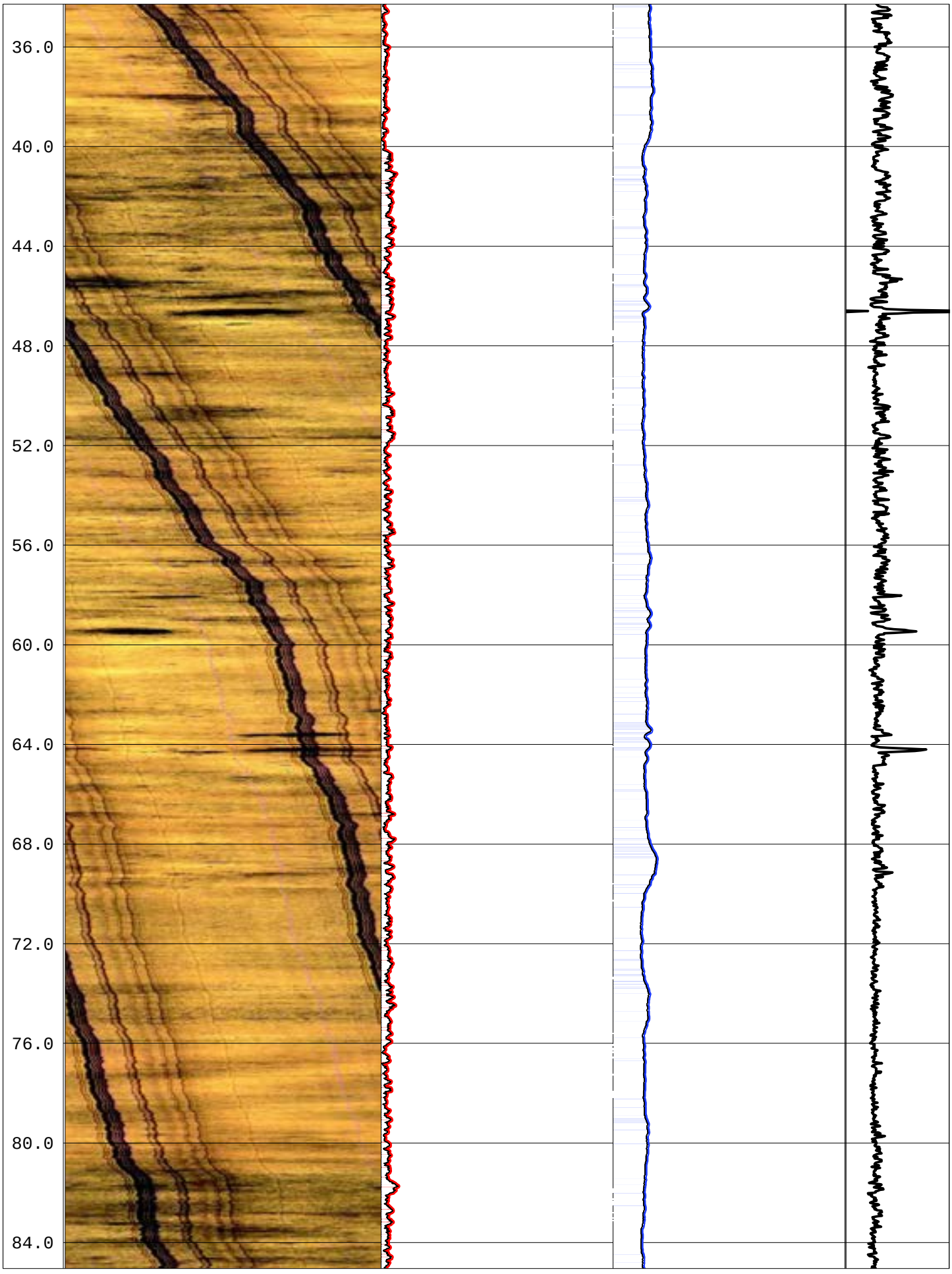

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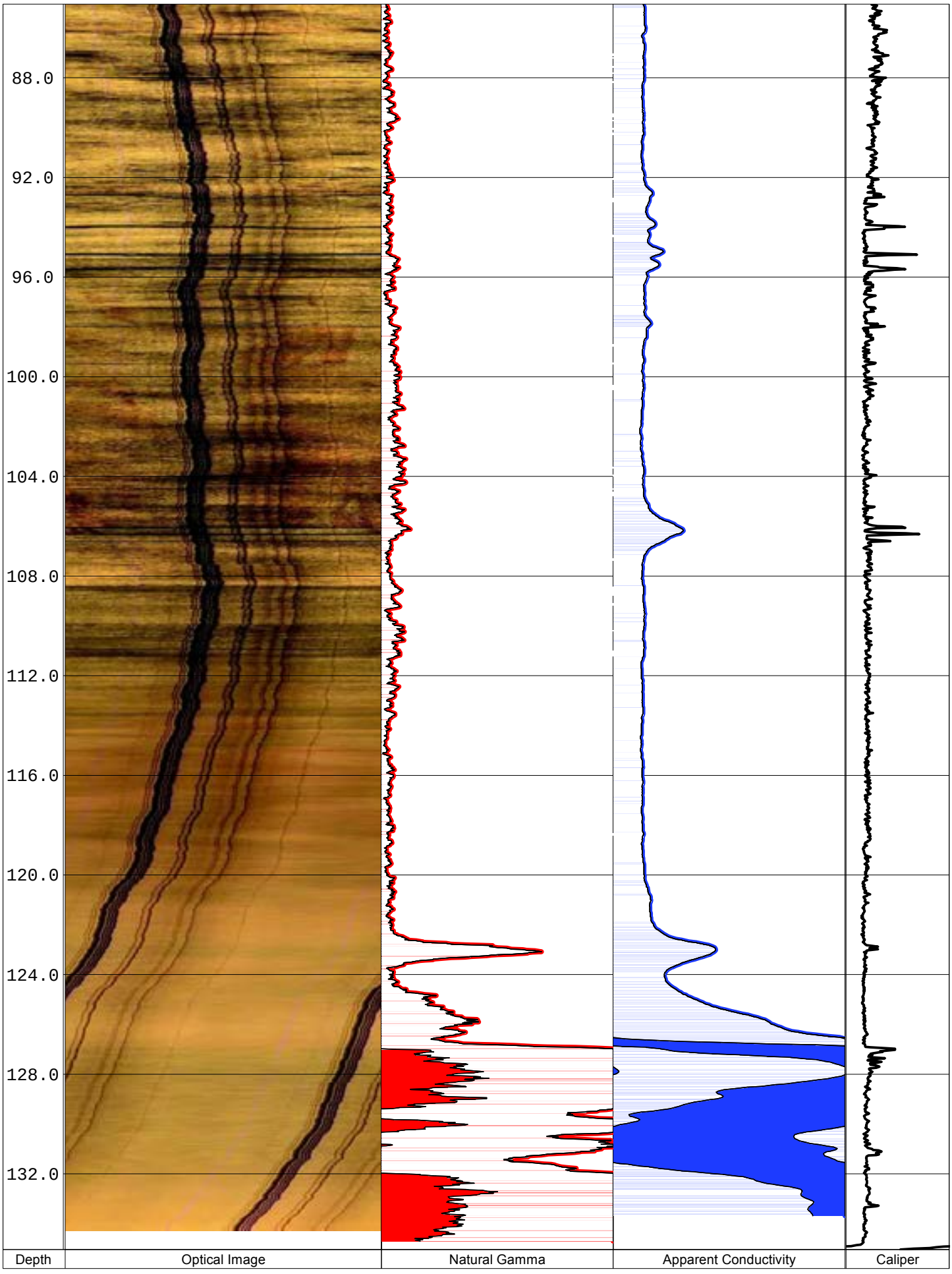

90.0
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100.0
105.0
Depth
1m:200m
Optical Image
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270°
0°
Natural Gamma
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cps
100
Apparent Conductivity
0
mS/m
25
Caliper
15
cm
50

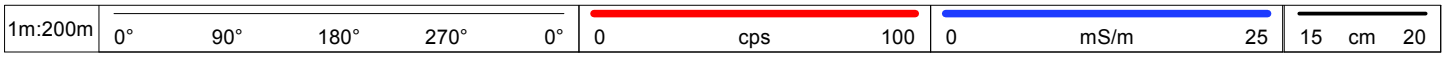
GEOPHYSICAL RECORD OF BOREHOLE SM3A-93

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*557938.02*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4803409.841*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge, Shades Mill*	**GROUND SURFACE**	*296.065 masl*
LOG DATE	*August 30, 2007*	**BOREHOLE DEPTH**	*137.0 m*
LOGGED BY	*WEM*	**CASING DEPTH**	*24.26 m*
DRILL METHOD	*Logged in 1993*	**BOREHOLE DIAMETER**	*152.4 mm*



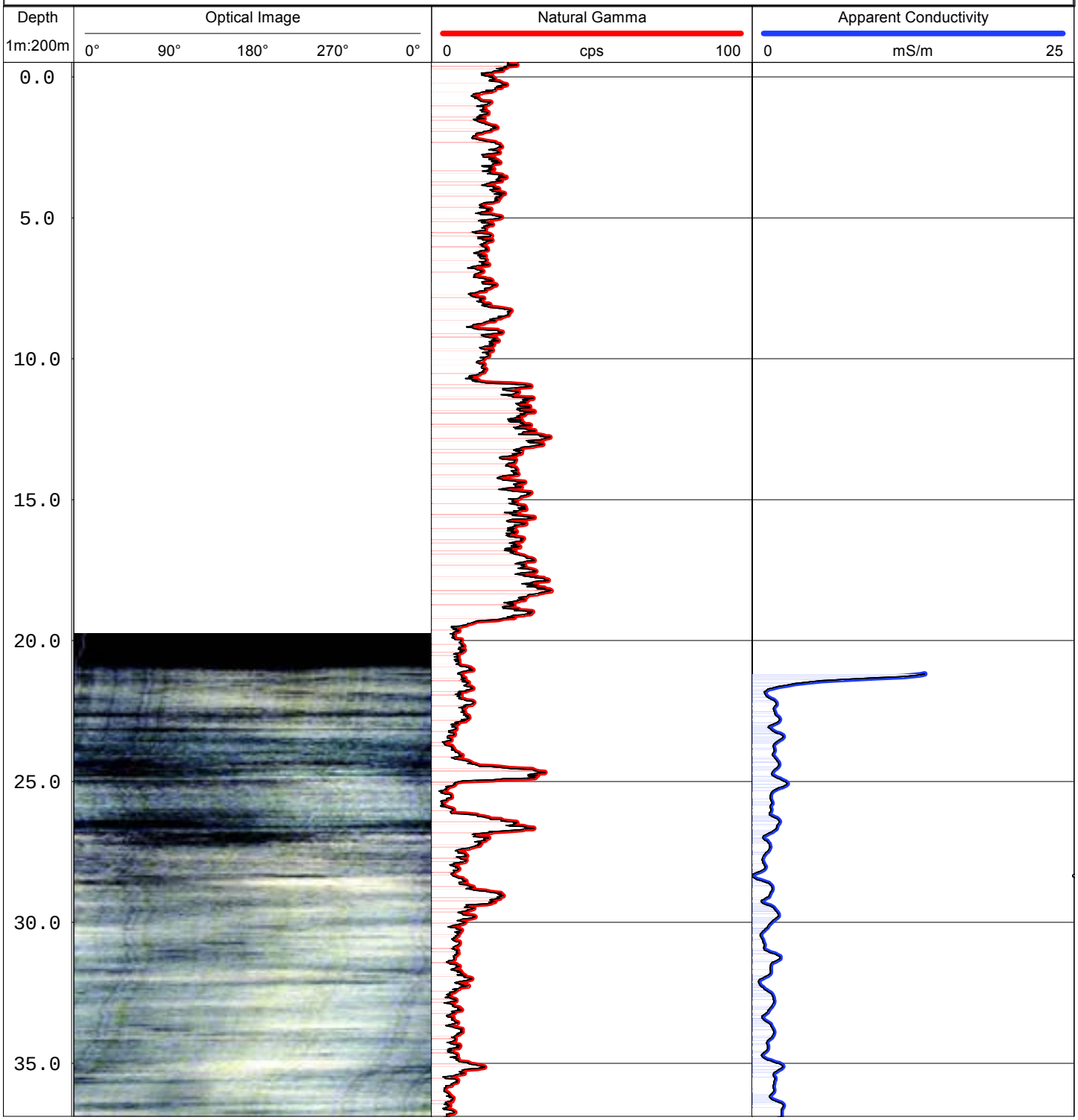

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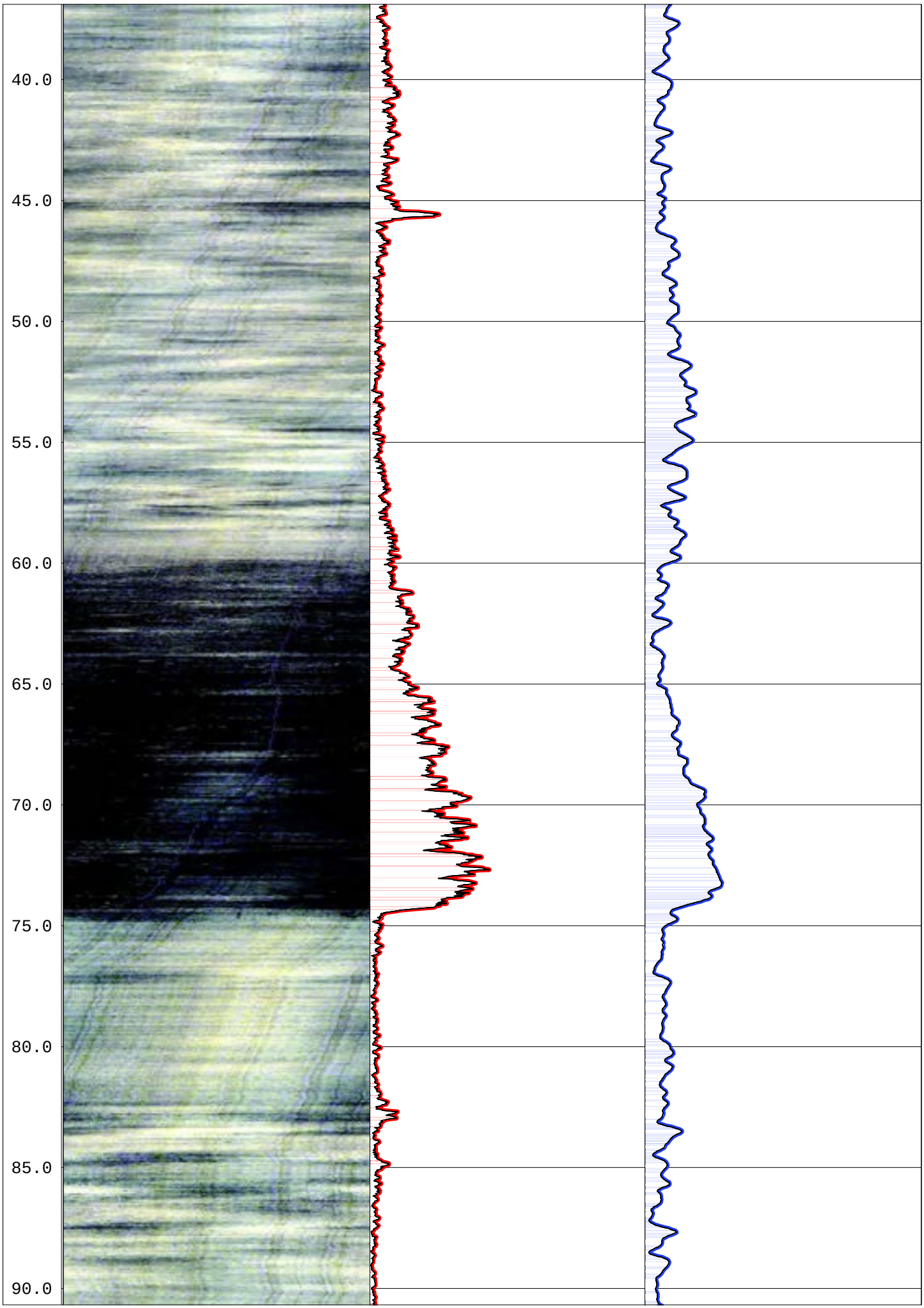

88.0
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120.0
124.0
128.0
132.0
Depth
Optical Image
Natural Gamma
Apparent Conductivity
Caliper

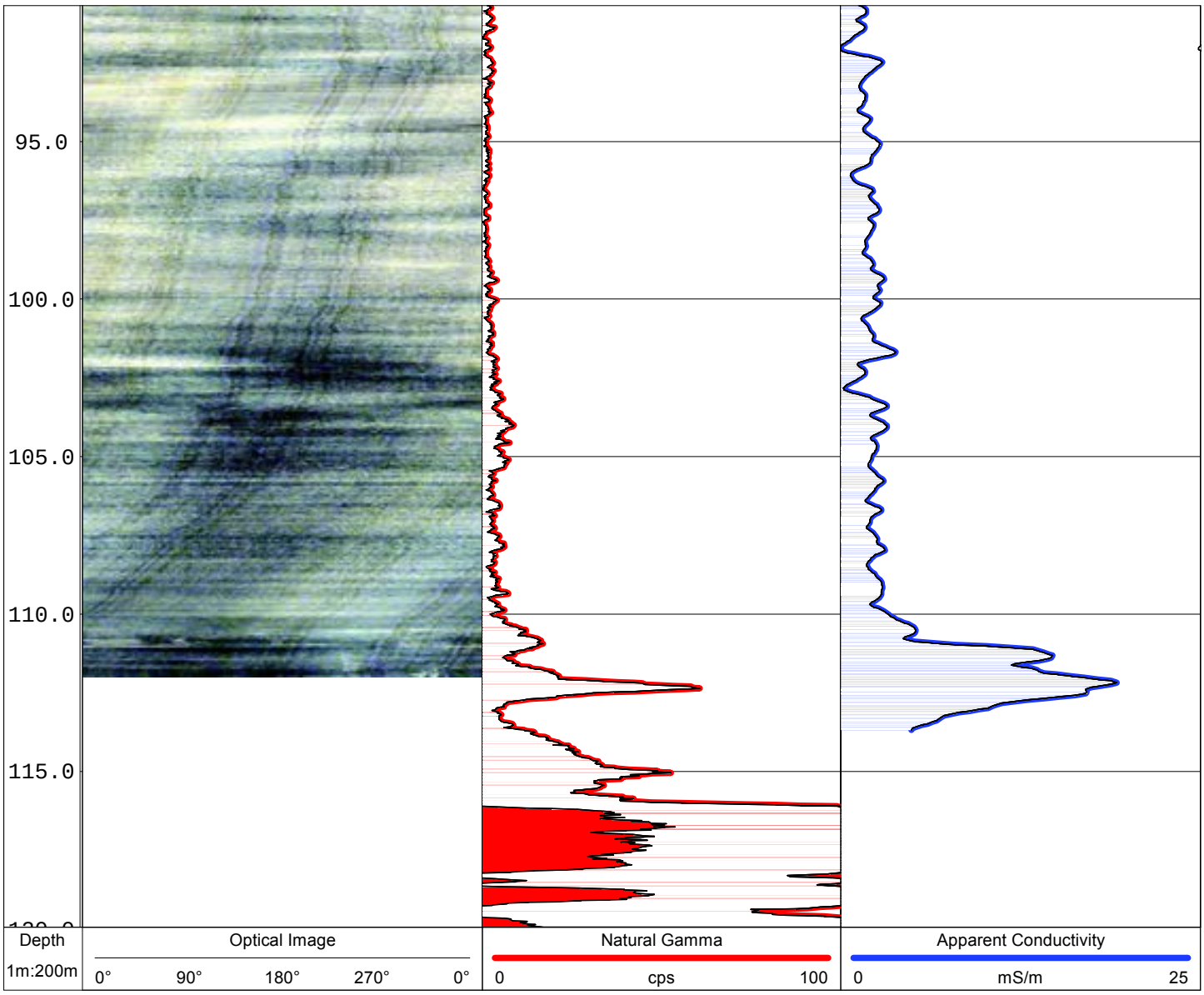

1m:200m
0°
90°
180°
270°
0°
0
cps
100
0
mS/m
25
15
cm
20

GEOPHYSICAL RECORD OF BOREHOLE SMTW1-05

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558520.3*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4806372.55*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge, Shades Mill*	**GROUND SURFACE**	*292.77 masl*
LOG DATE	*July 6, 2006*	**BOREHOLE DEPTH**	*120.4 m*
LOGGED BY	*GRB*	**CASING DEPTH**	*21.03 m*
DRILL METHOD	*Mud Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

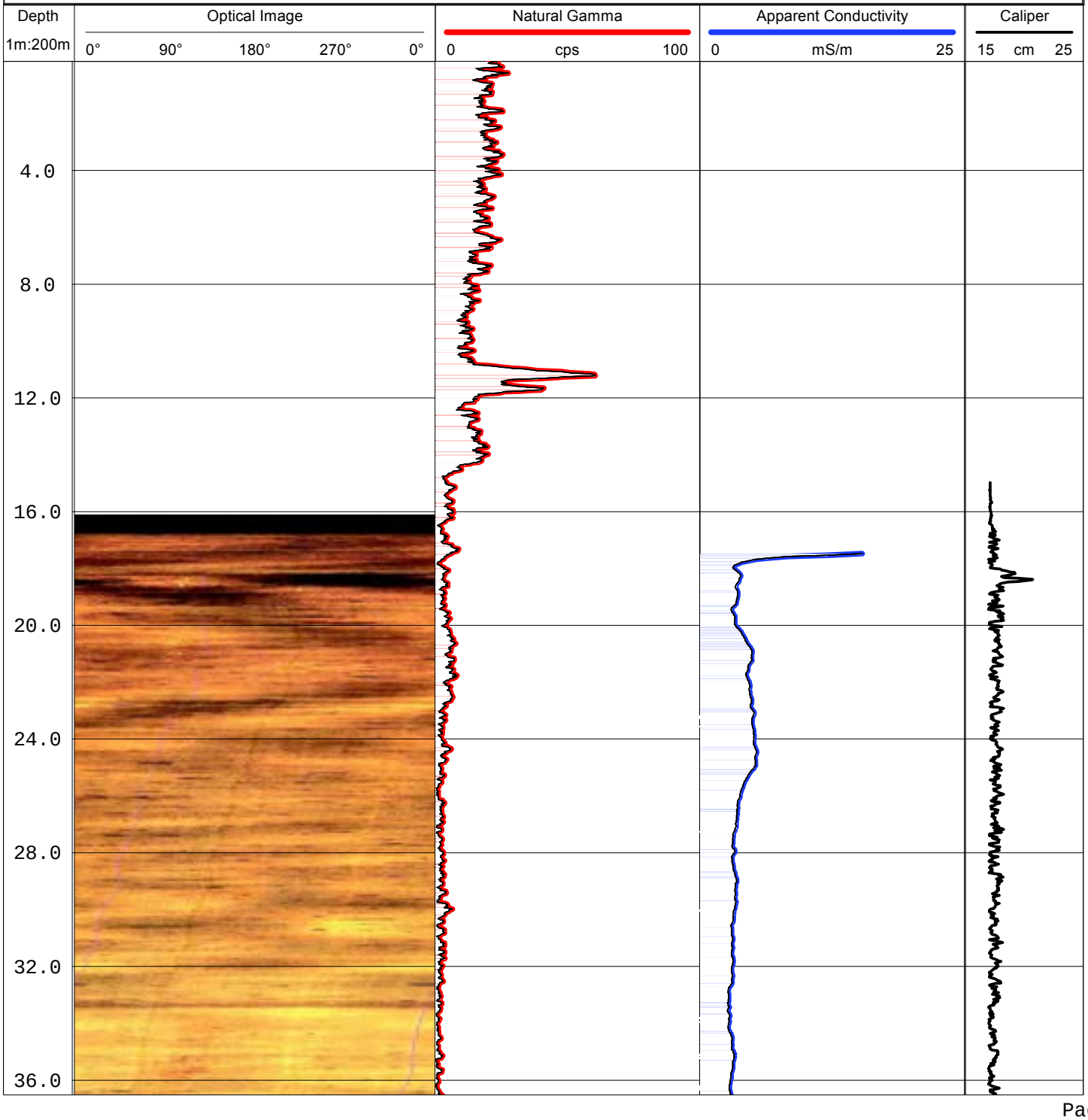


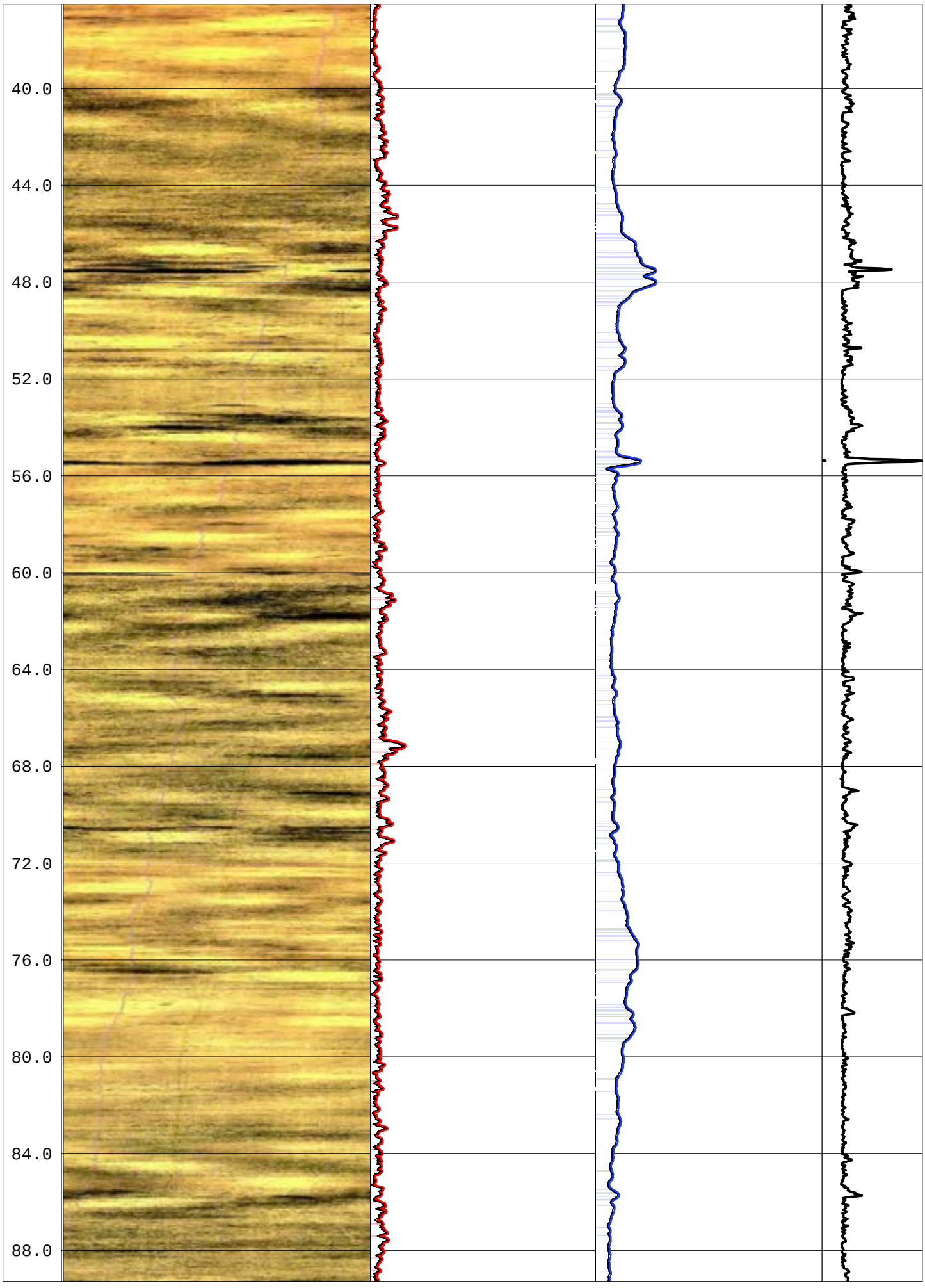

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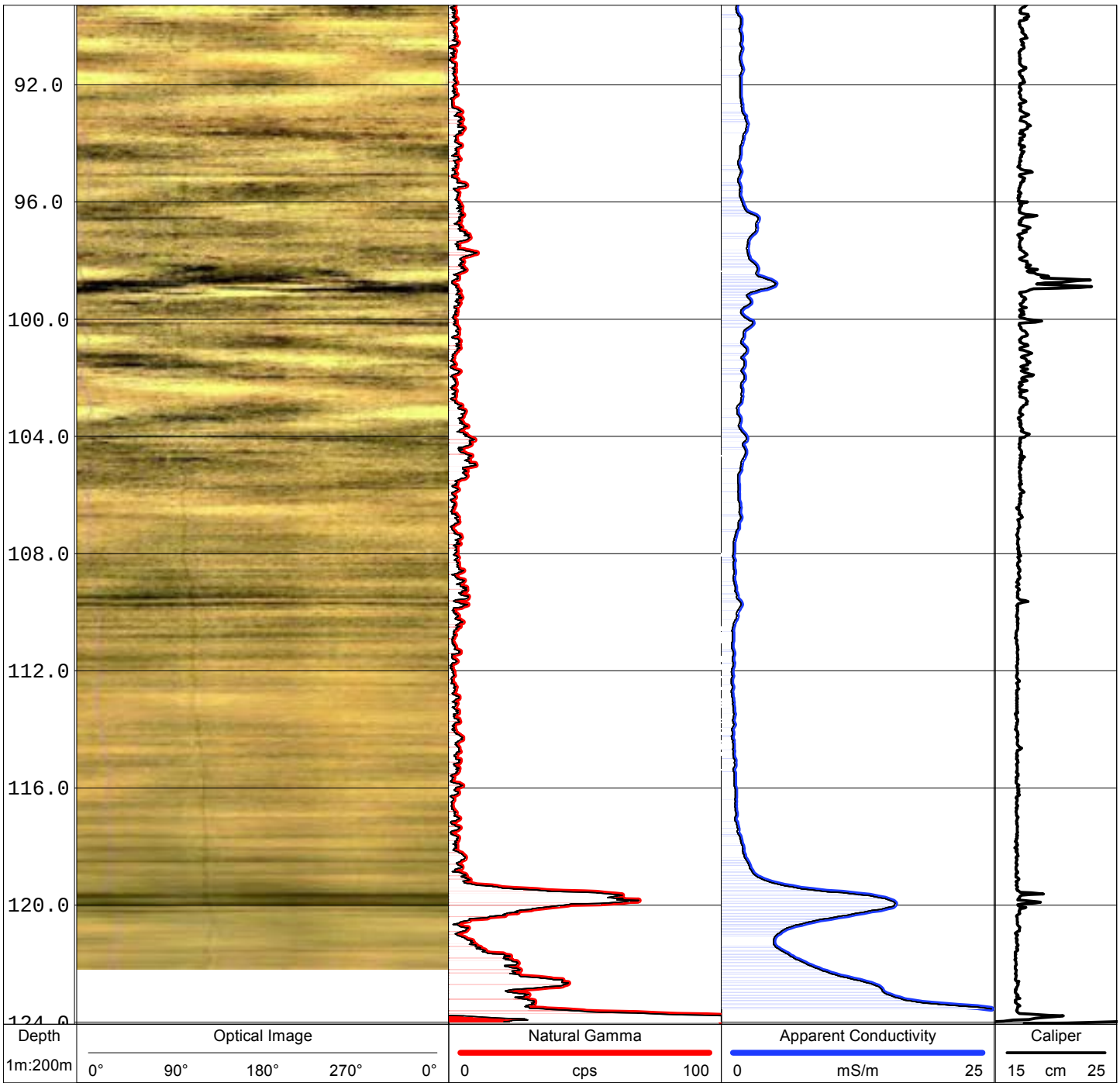

95.0
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110.0
115.0
Depth
1m:200m
Optical Image
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90°
180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25

GEOPHYSICAL RECORD OF BOREHOLE SMTW2-07

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*557668.711*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4802637.588*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Clyde Road*	**GROUND SURFACE**	*288.639 masl*
LOG DATE	*August 30, 2007*	**BOREHOLE DEPTH**	*124.21 m*
LOGGED BY	*WEM*	**CASING DEPTH**	*16.8 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

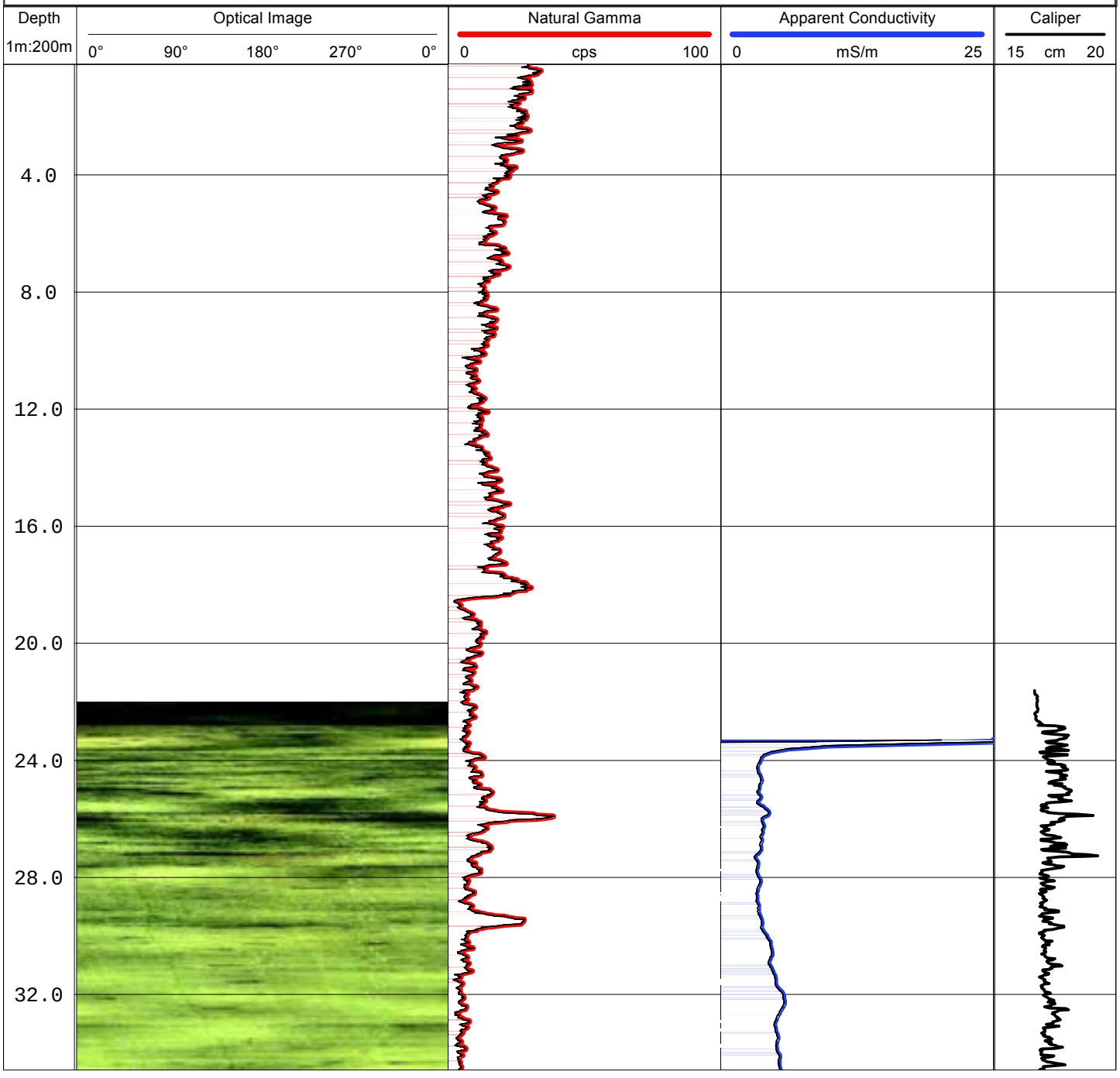


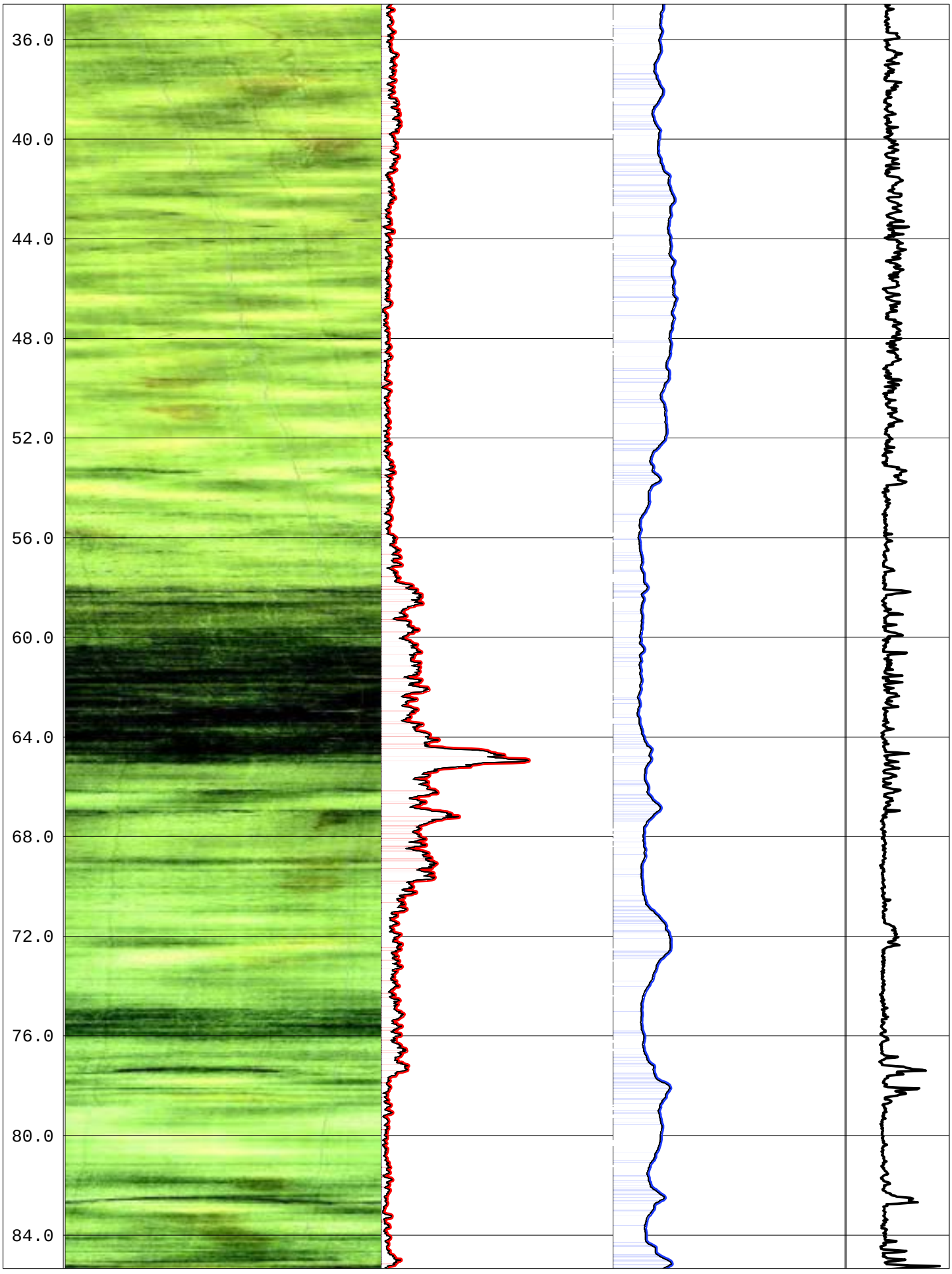

40.0
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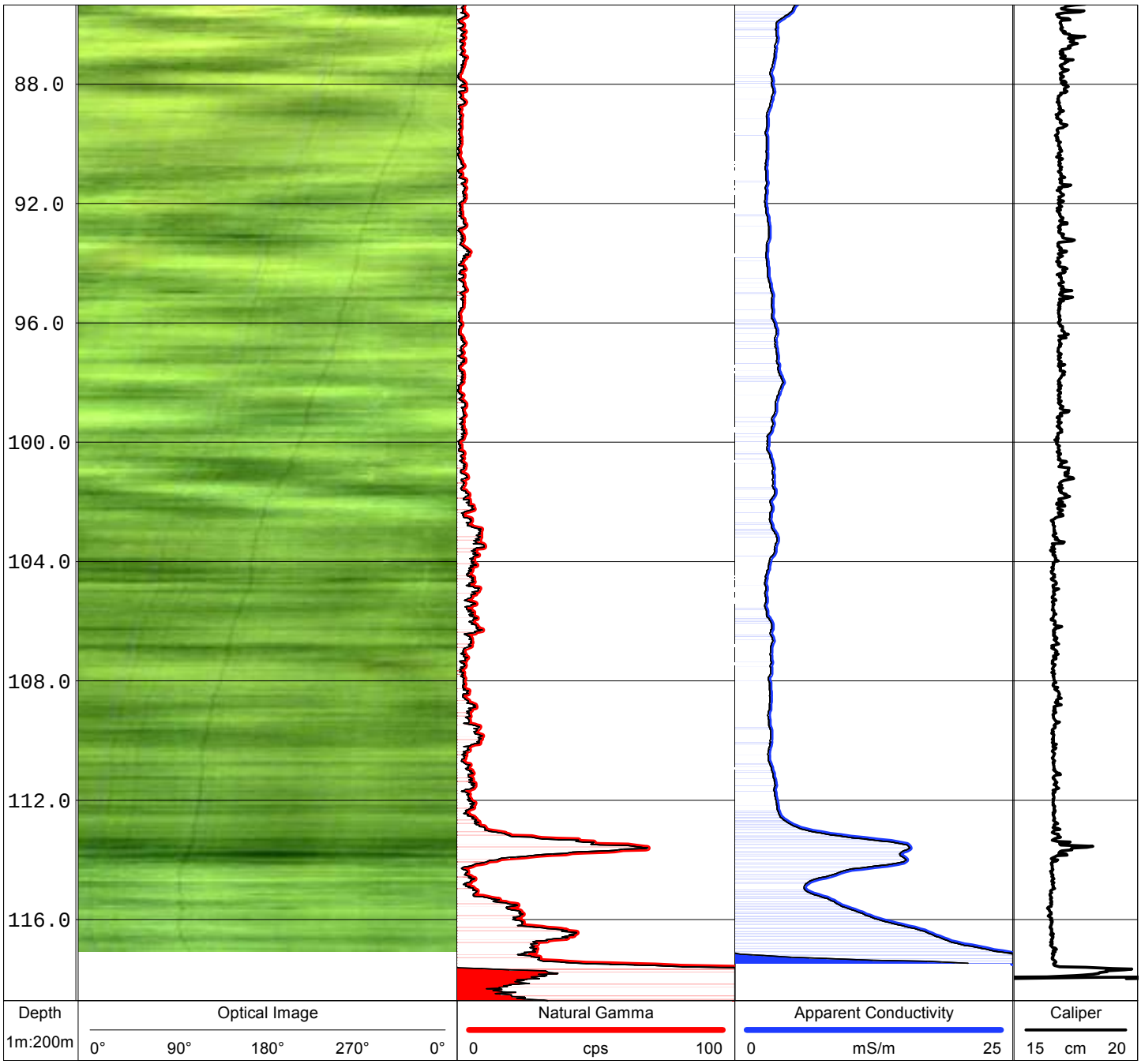

92.0
96.0
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104.0
108.0
112.0
116.0
120.0
124.0
Depth
1m:200m
Optical Image
0°
90°
180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25
Caliper
15
cm
25

GEOPHYSICAL RECORD OF BOREHOLE SMTW3-07

PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*558417.581*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4803334.557*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge - Clyde Road*	**GROUND SURFACE**	*290.293 masl*
LOG DATE	*August 30, 2007*	**BOREHOLE DEPTH**	*118.41 m*
LOGGED BY	*WEM*	**CASING DEPTH**	*22.86 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*

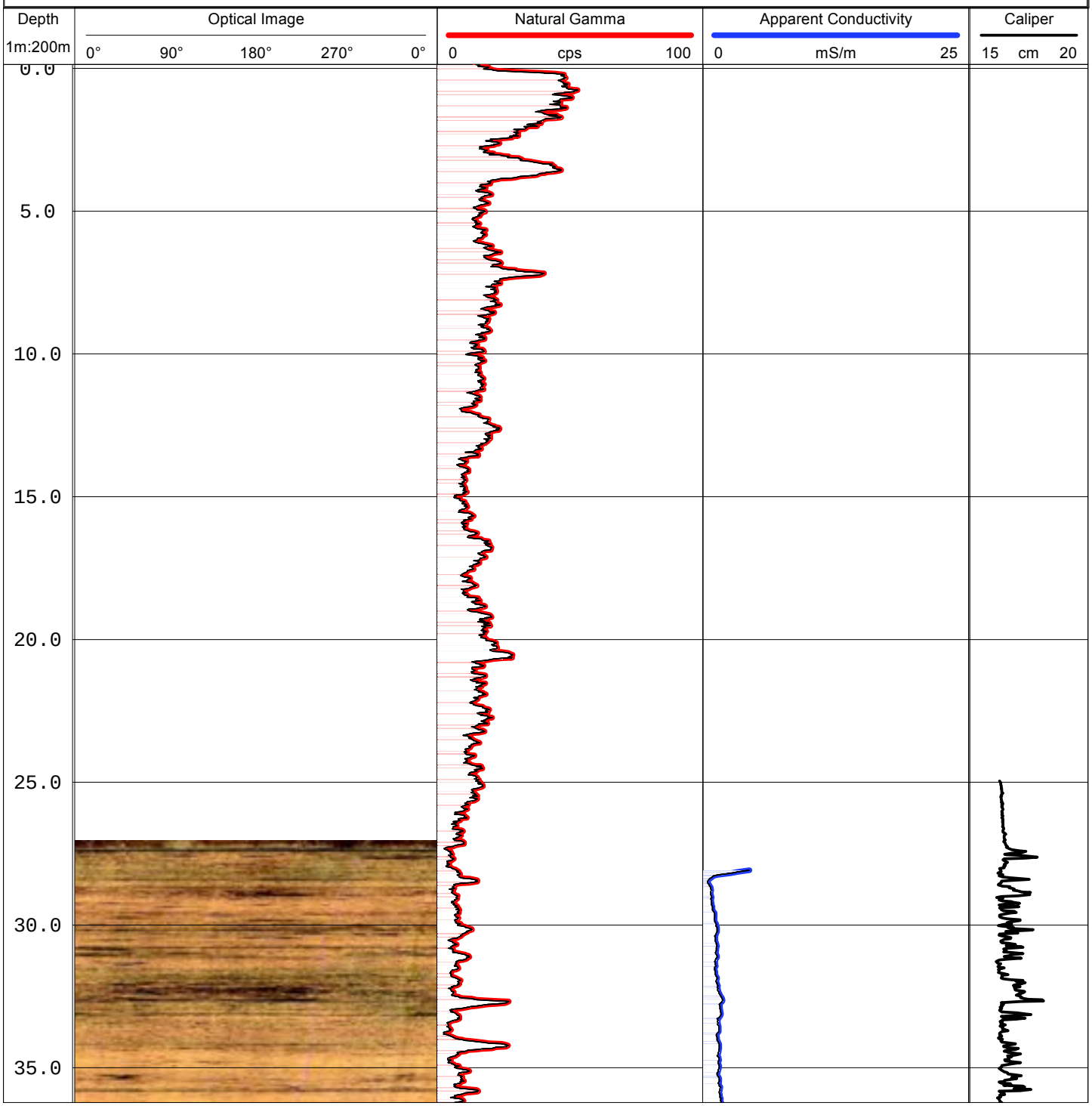


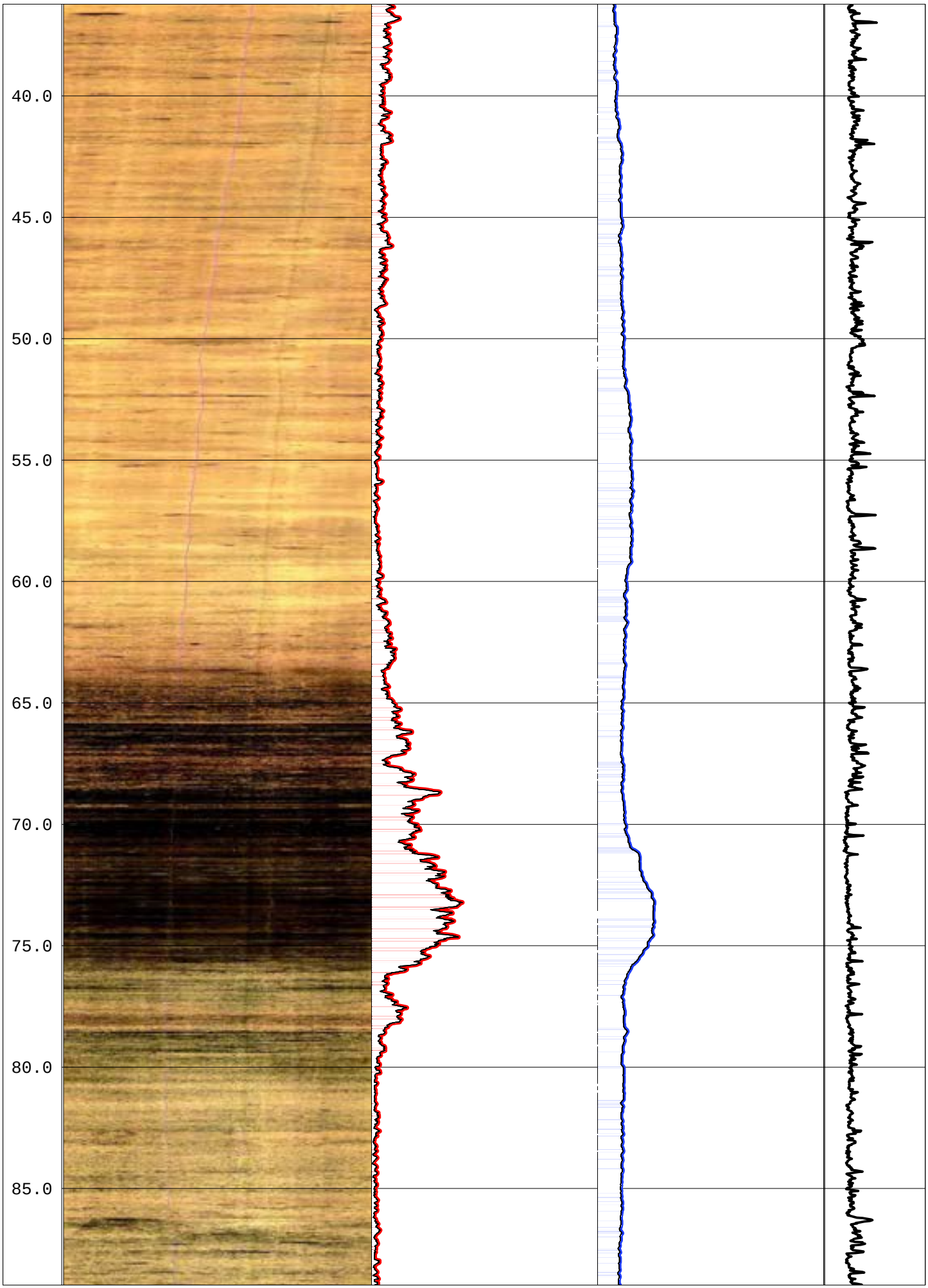

36.0
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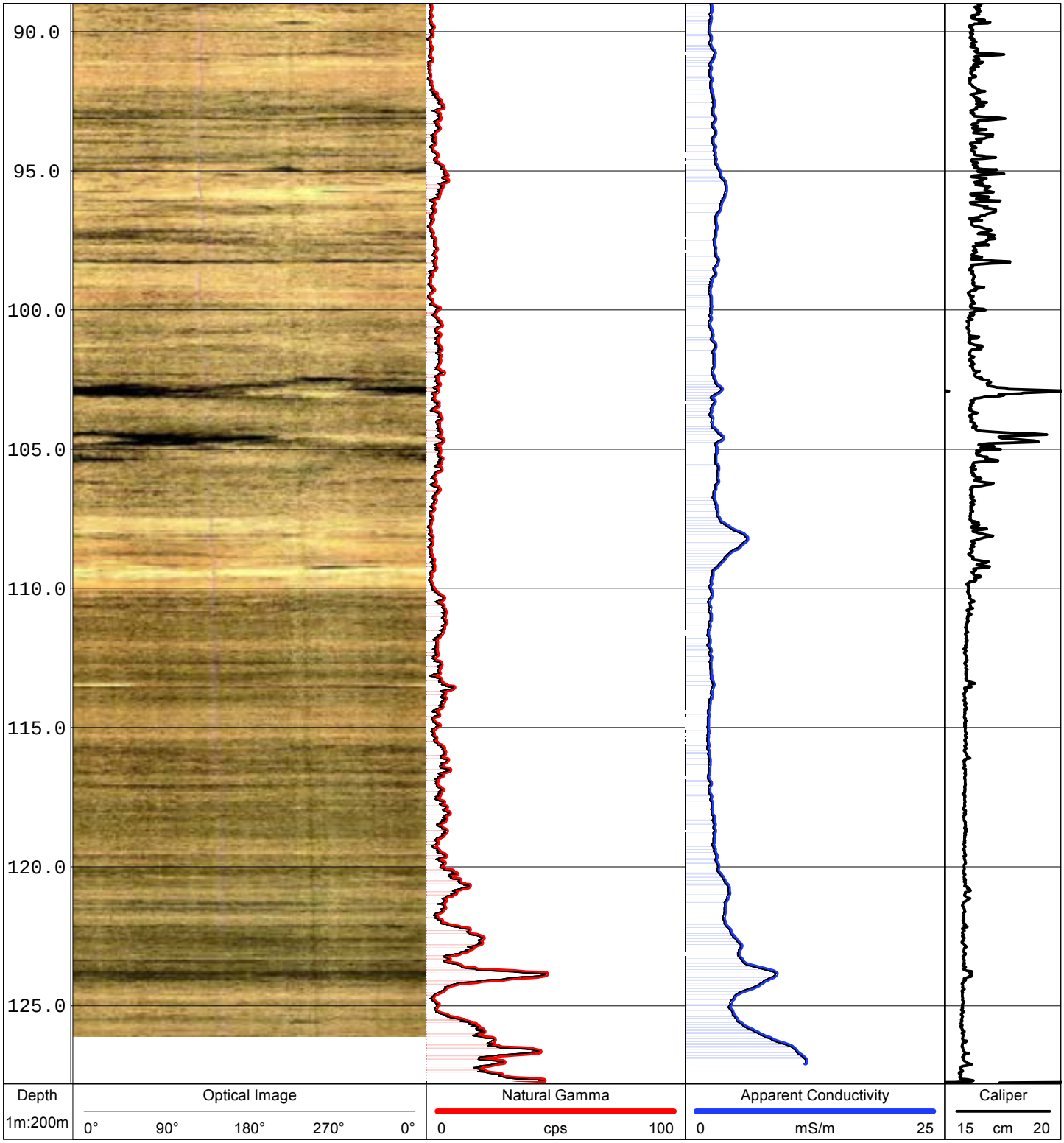

88.0
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108.0
112.0
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Depth
1m:200m
Optical Image
0°
90°
180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25
Caliper
15
cm
20

GEOPHYSICAL RECORD OF BOREHOLE SMTW4-08

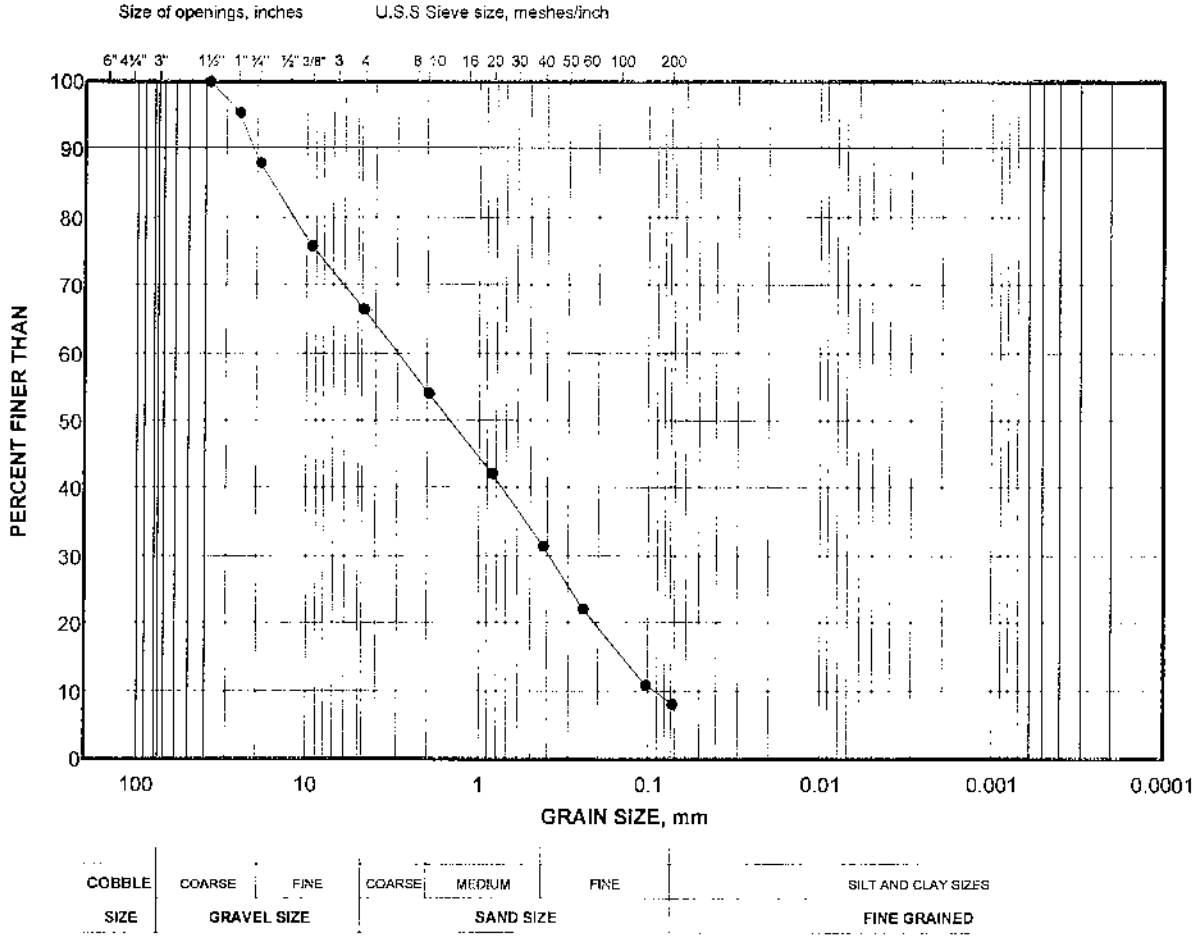
PROJECT	*IUS Project, Cambridge East*	**UTM EASTING**	*559025.999*
PROJECT NO.	*05-1112-010*	**UTM NORTHING**	*4803334.501*
CLIENT	*Regional Municipality of Waterloo*	**LOG REFERENCE**	*Ground Surface*
LOCATION	*Cambridge, Shades Mill*	**GROUND SURFACE**	*301.615 masl*
LOG DATE	*March 7-8, 2008*	**BOREHOLE DEPTH**	*128.02 m*
LOGGED BY	*BB*	**CASING DEPTH**	*28.04 m*
DRILL METHOD	*Air Rotary*	**BOREHOLE DIAMETER**	*152.4 mm*




40.0
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Depth
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Optical Image
0°
90°
180°
270°
0°
Natural Gamma
0
cps
100
Apparent Conductivity
0
mS/m
25
Caliper
15
cm
20

GRAIN SIZE DISTRIBUTION	FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW1-06	10.0 - 25.0

Project Number: 05-1112-010

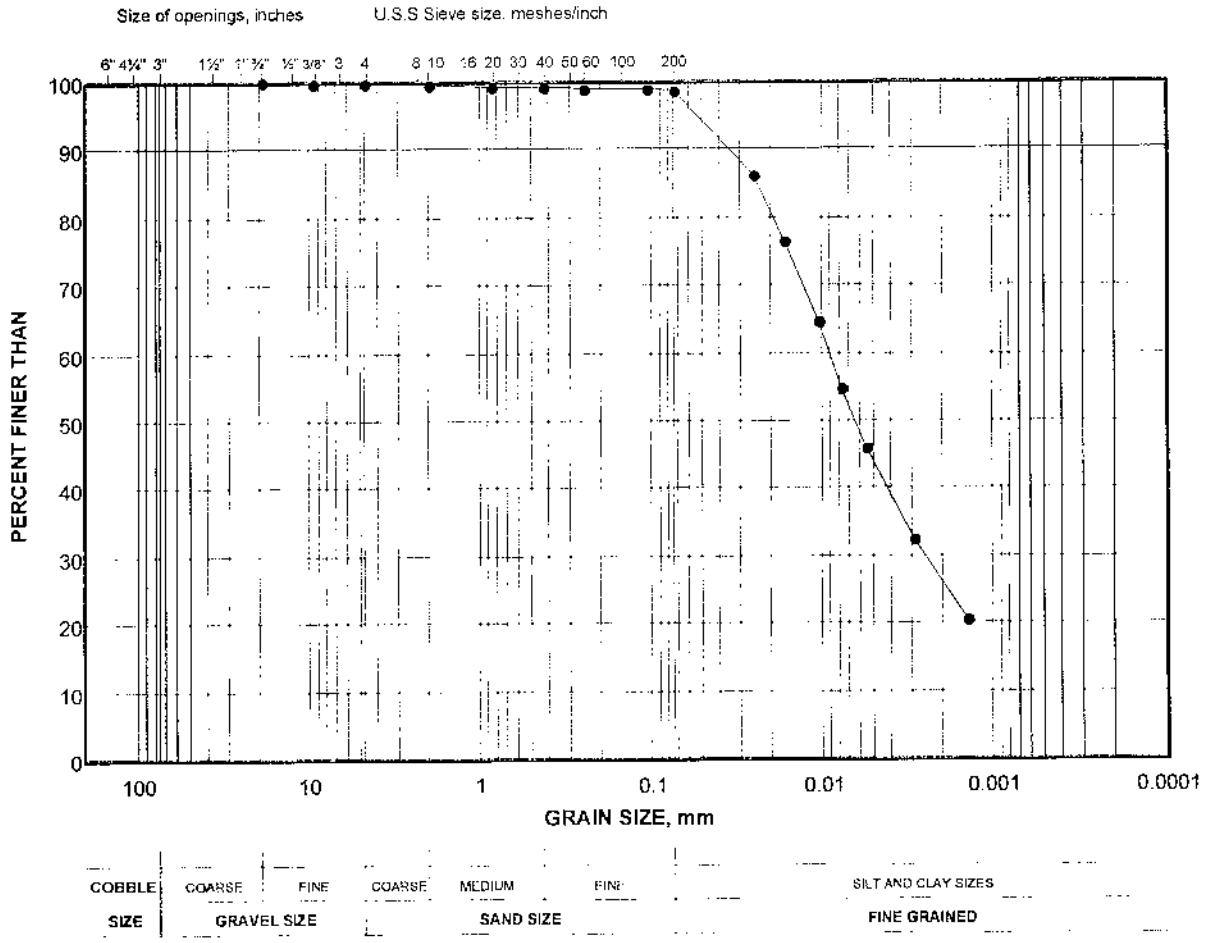
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW1-06	30.0 - 35.0

Project Number: 05-1112-010

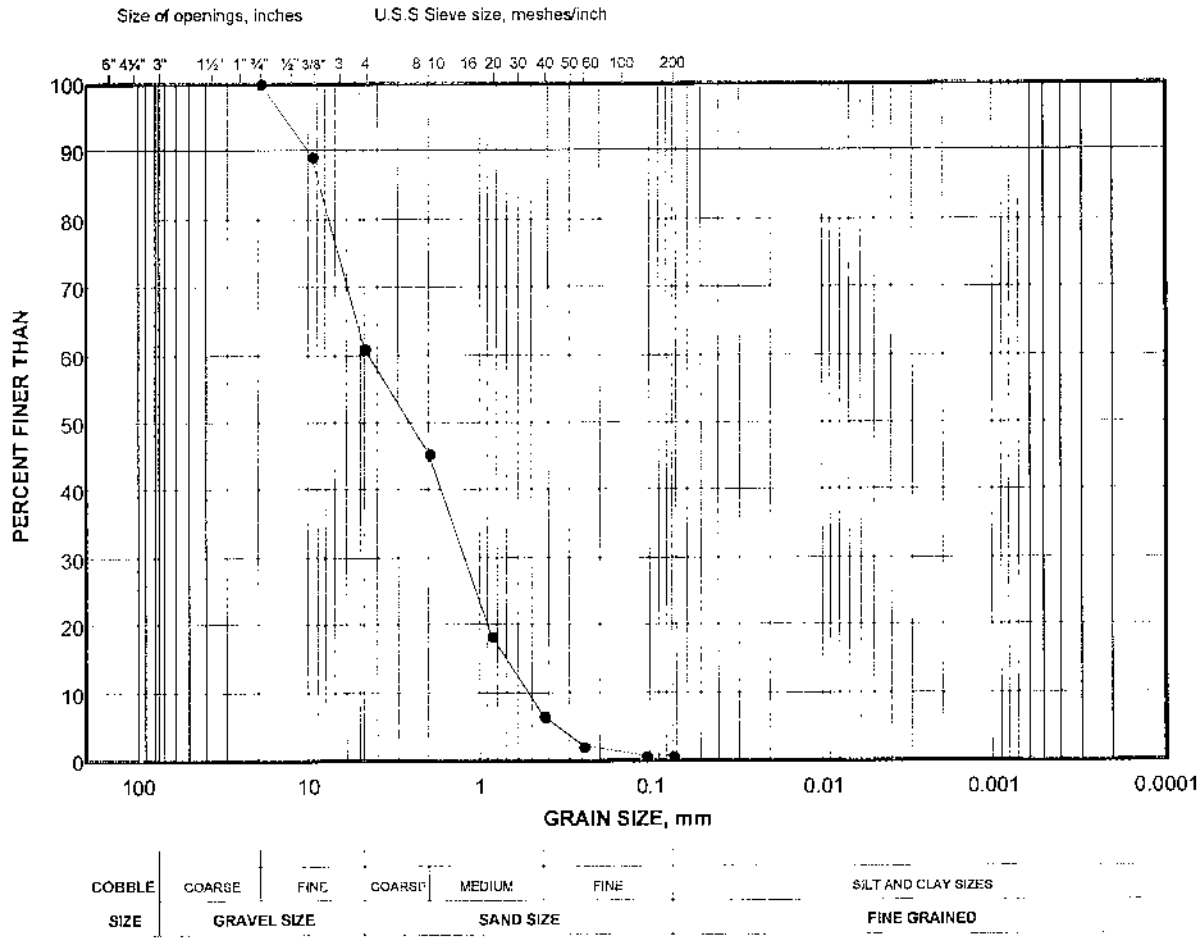
Checked By: _____

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW1-06	45.0 - 60.0

Project Number: 05-1112-010

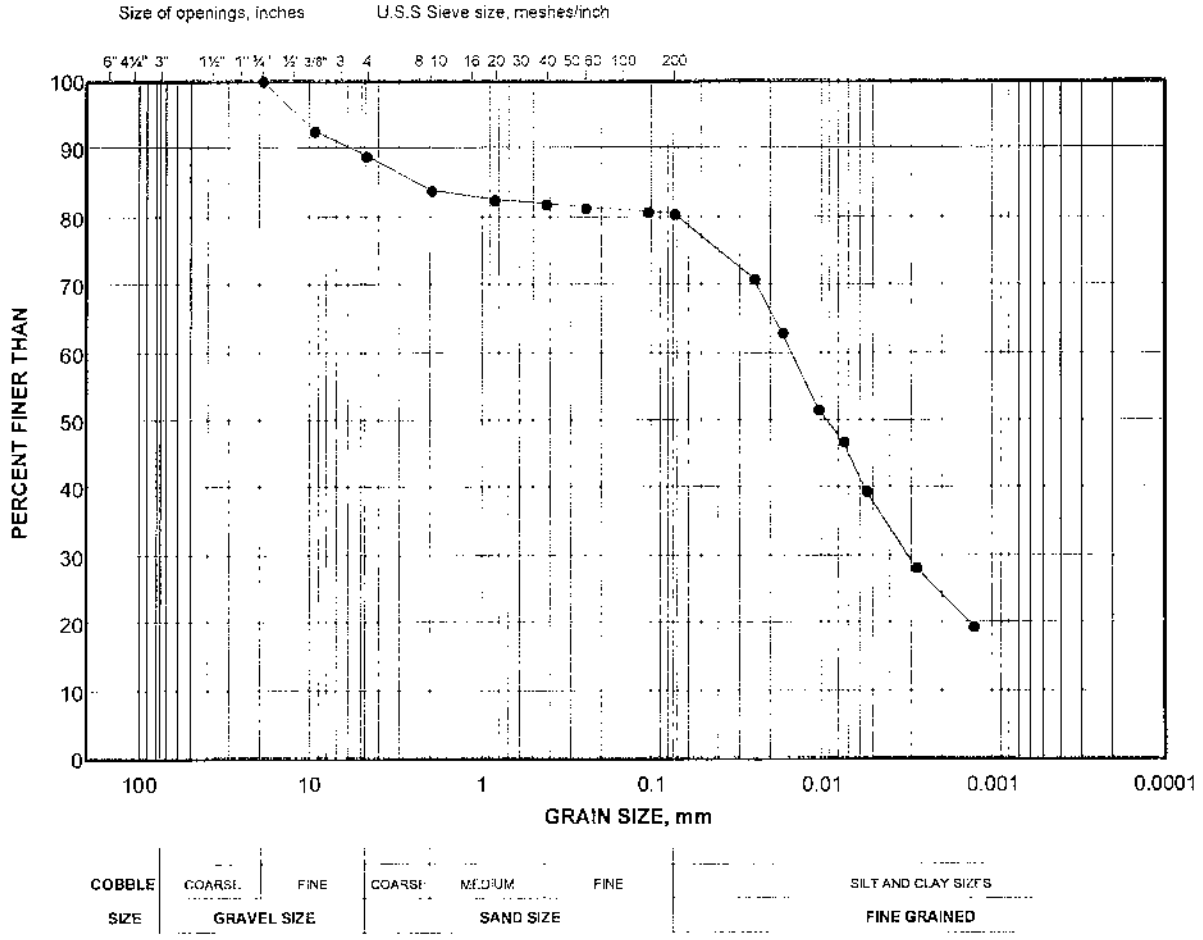
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
•		CMOW1-06	90.0 - 95.0

Project Number: 05-1112-010

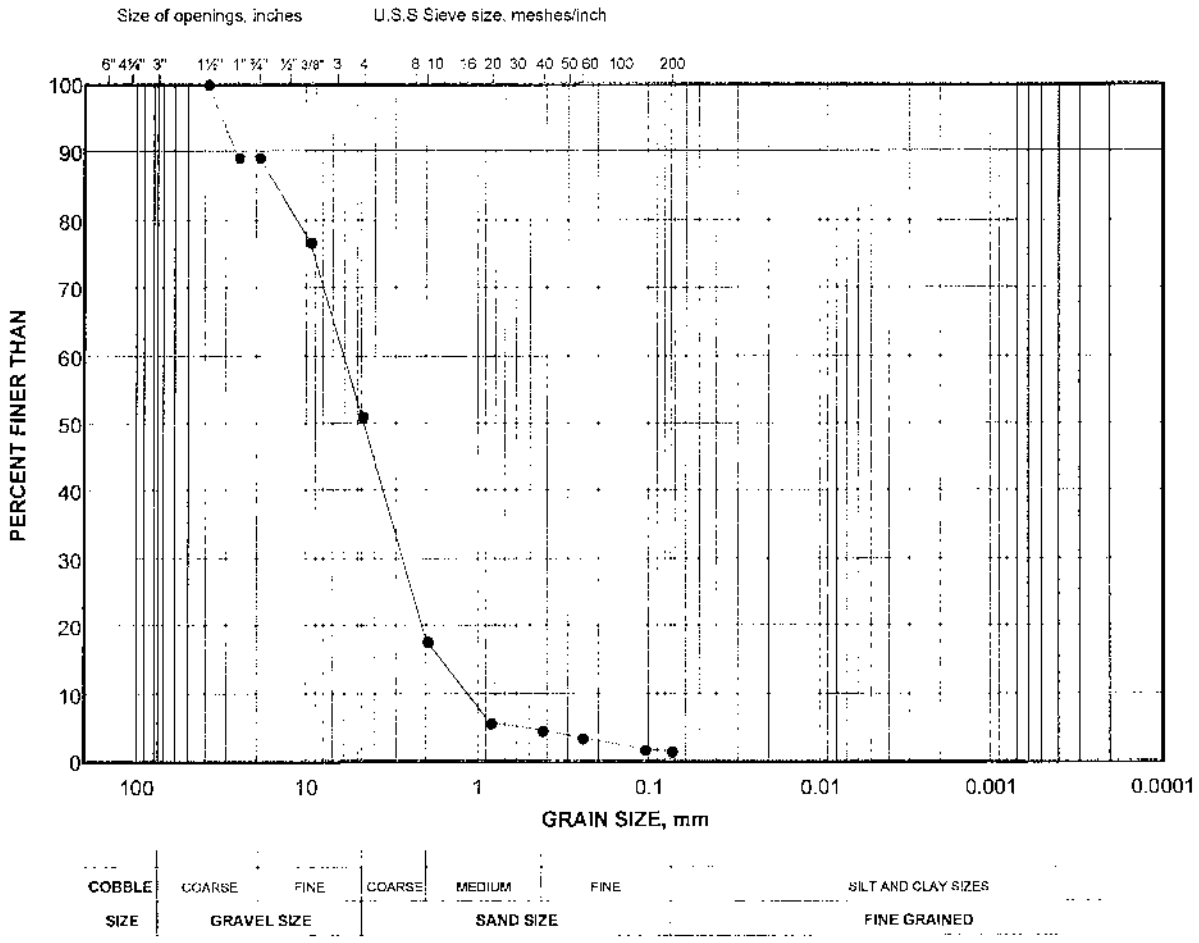
Checked By: _____

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW1-06	100.0 - 107.0

Project Number: 05-1112-010

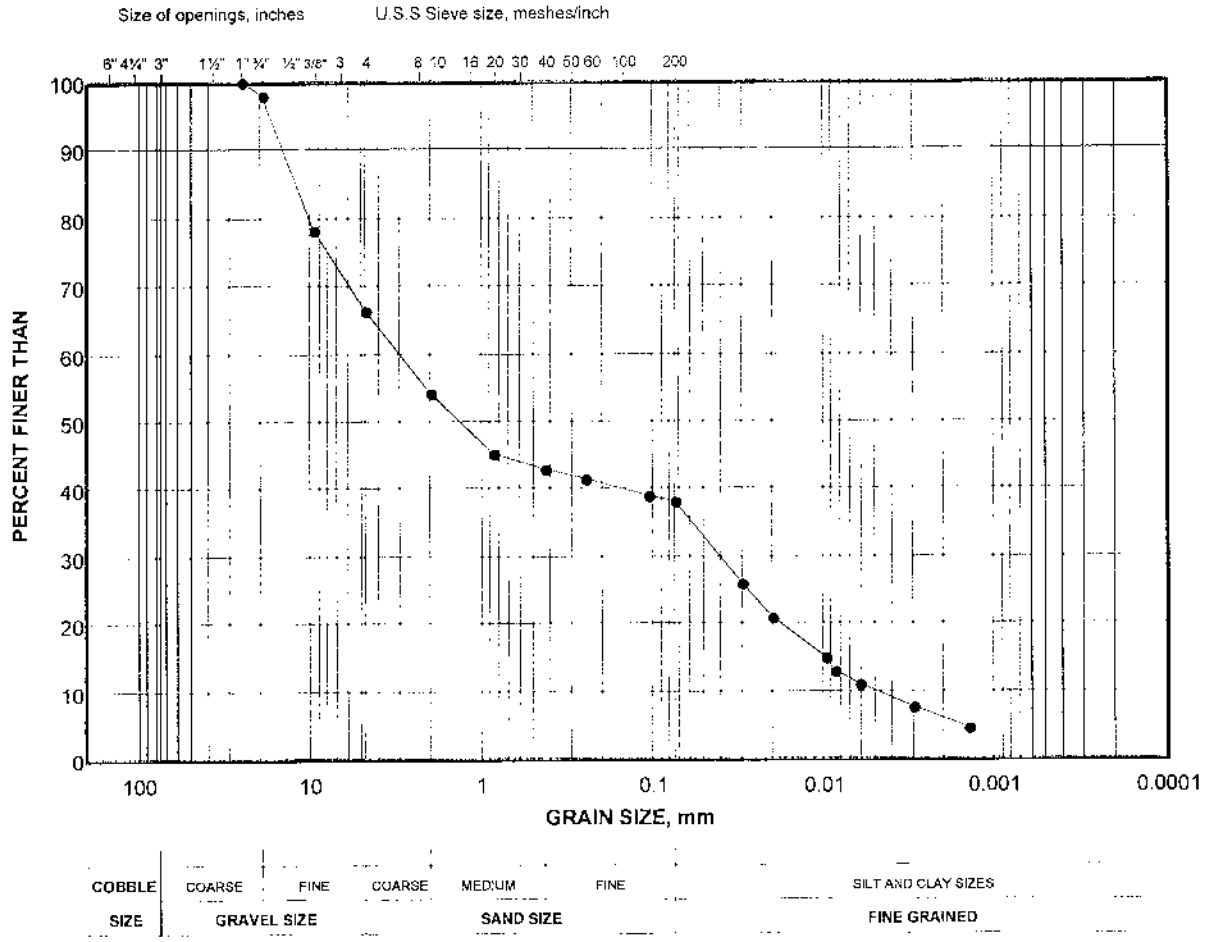
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW2-06	0.0 - 10.0

Project Number: 05-1112-010

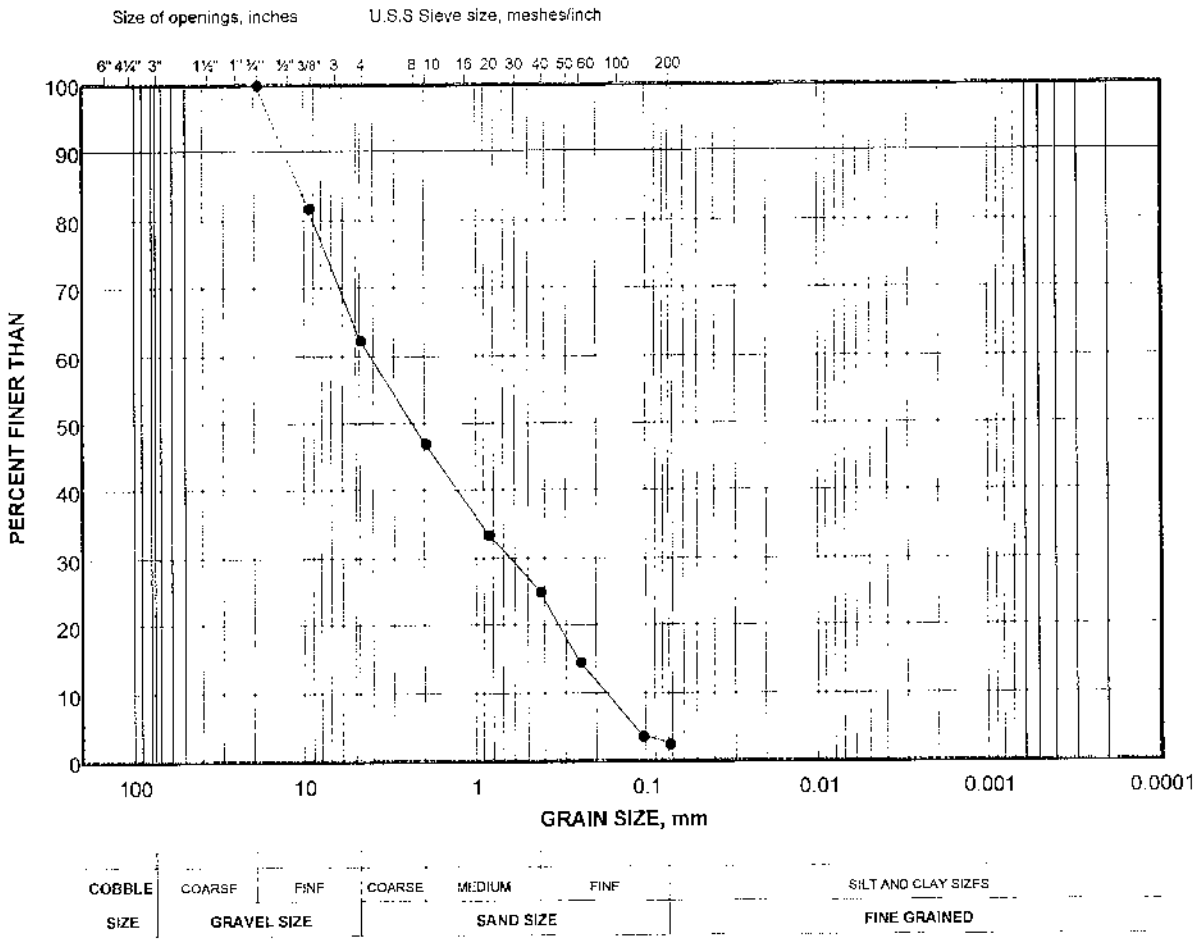
Checked By: _____

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
•		CMOW2-06	17.0 - 21.0

Project Number: 05-1112-010

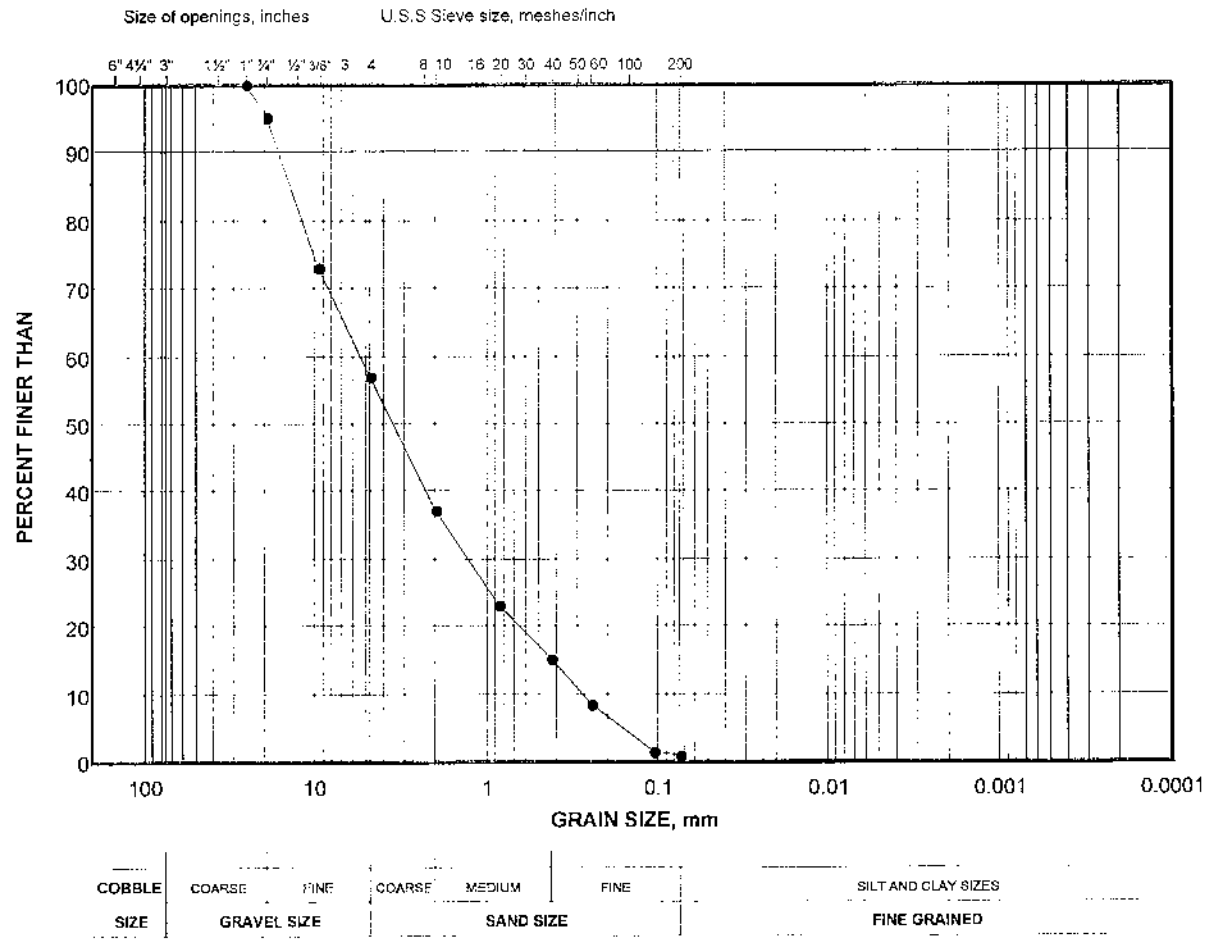
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW2-06	48.0 - 67.0

Project Number: 05-1112-010

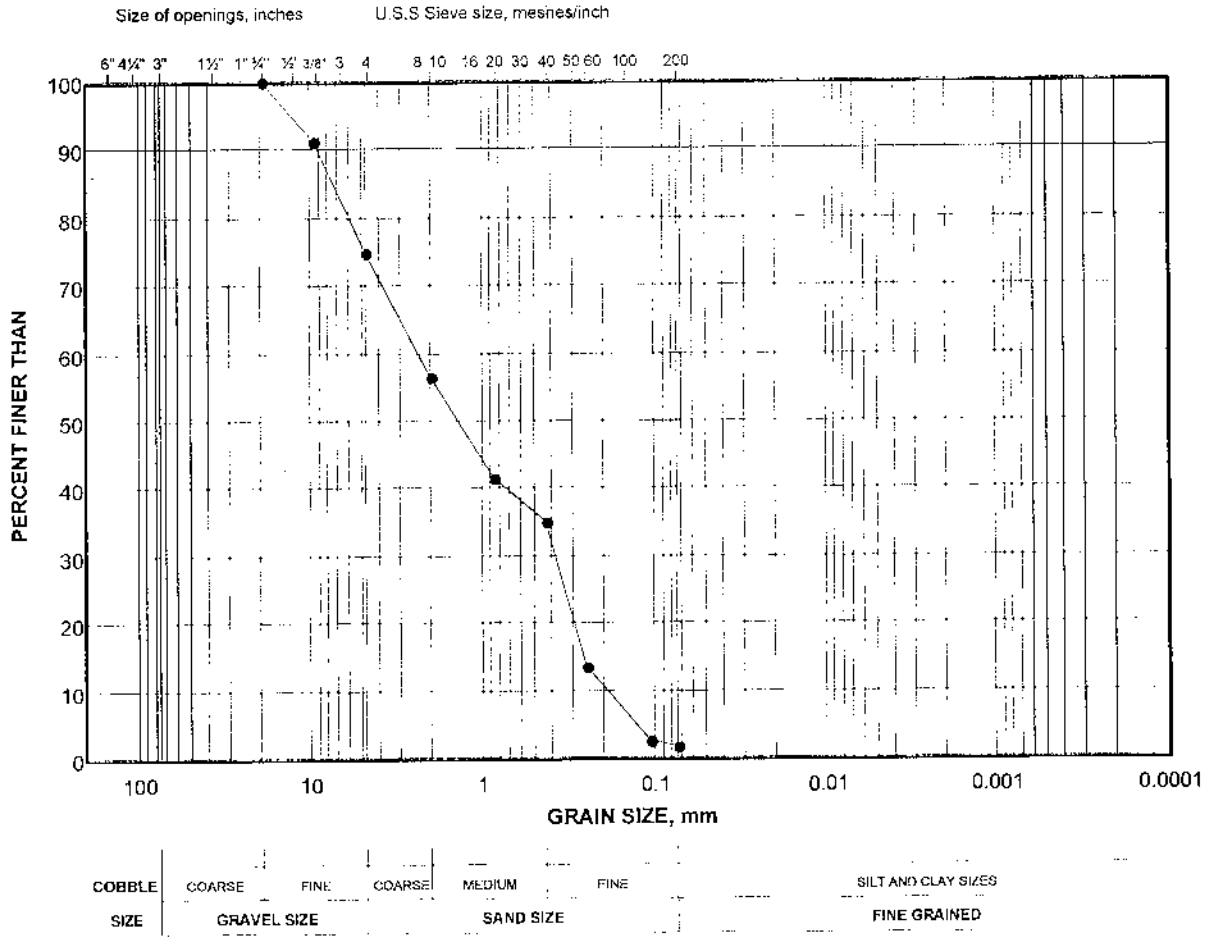
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		CMOW2-06	80.0 - 94.0

Project Number: 05-1112-010

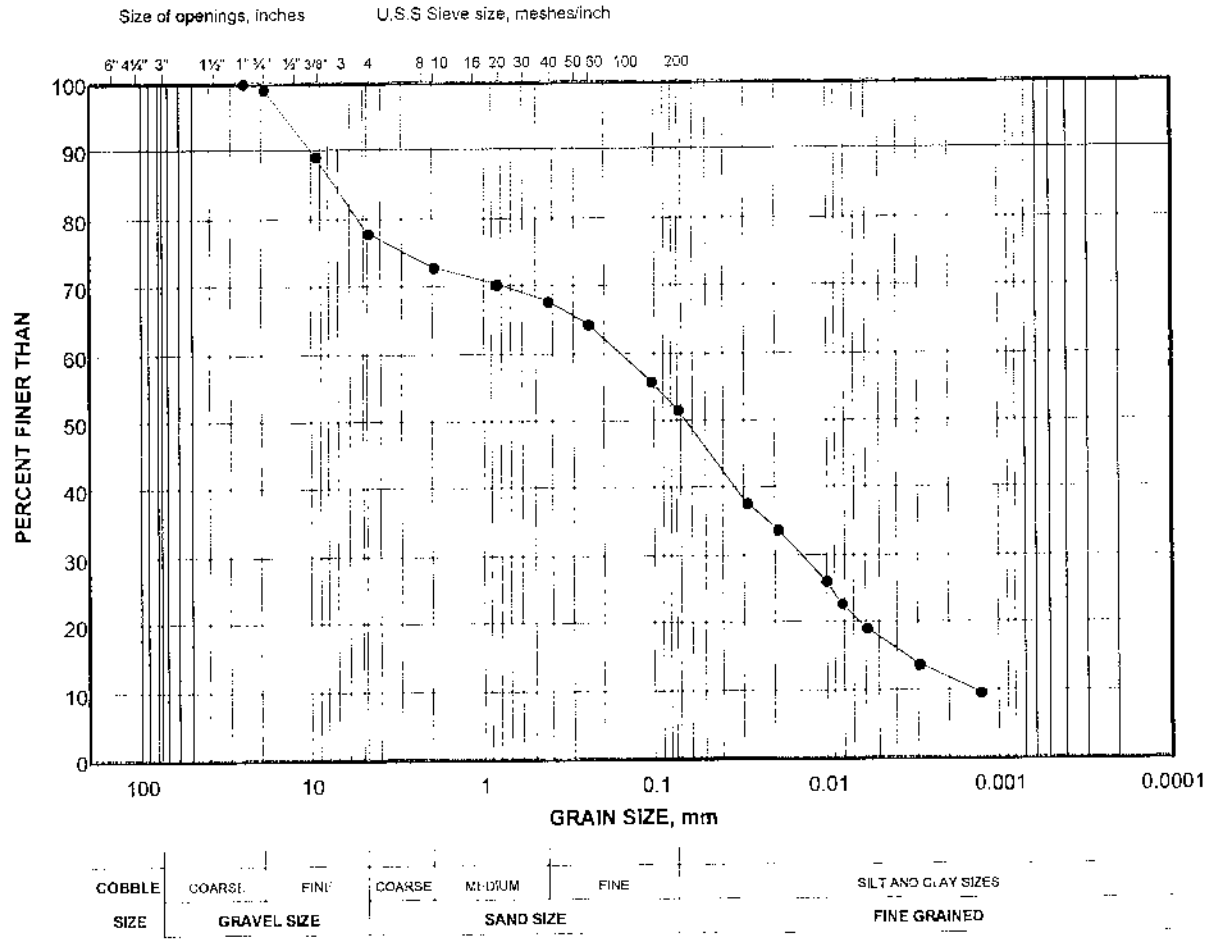
Checked By: MH

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW1-06	0.0 - 10.0

Project Number: 05-1112-010

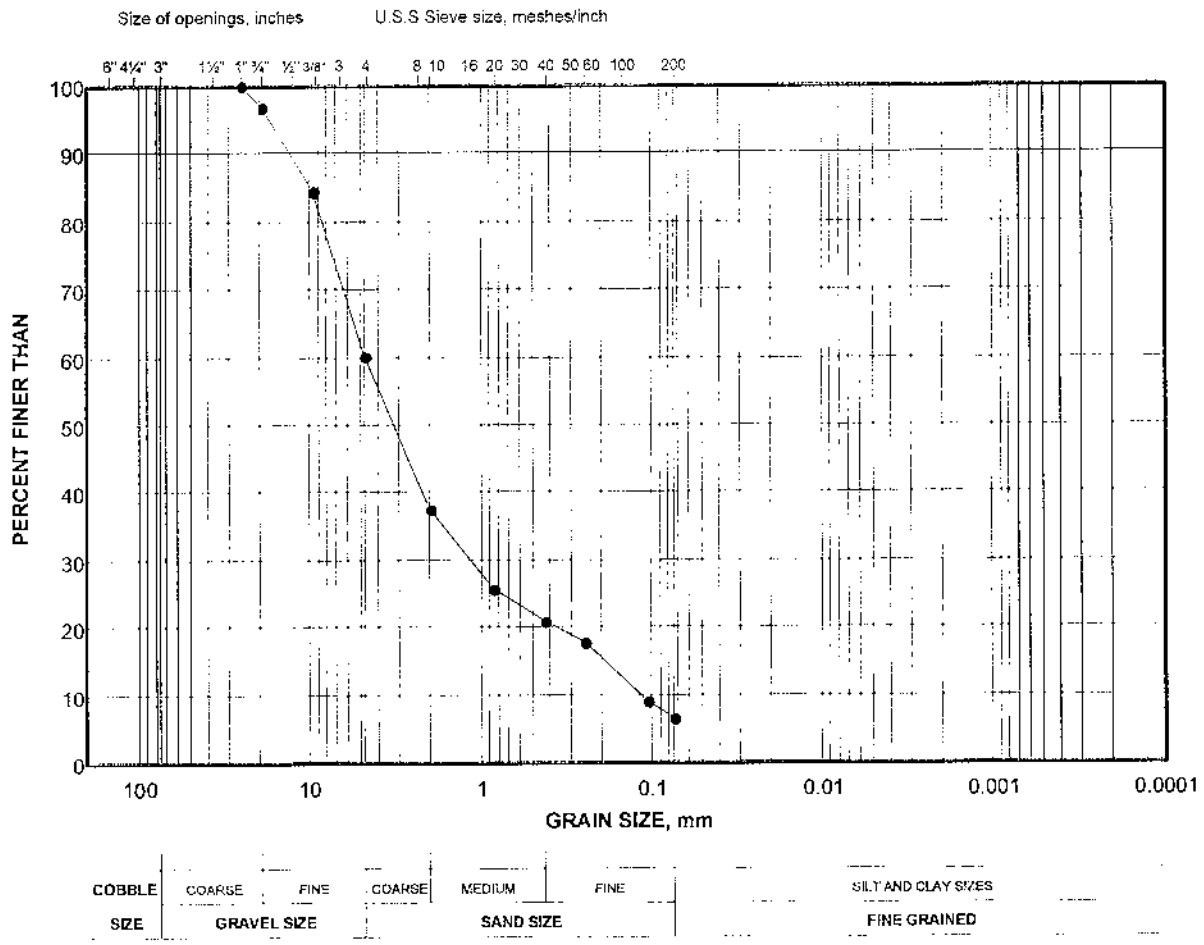
Checked By: _____

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW1-06	20.0 - 45.0

Project Number: 05-1112-010

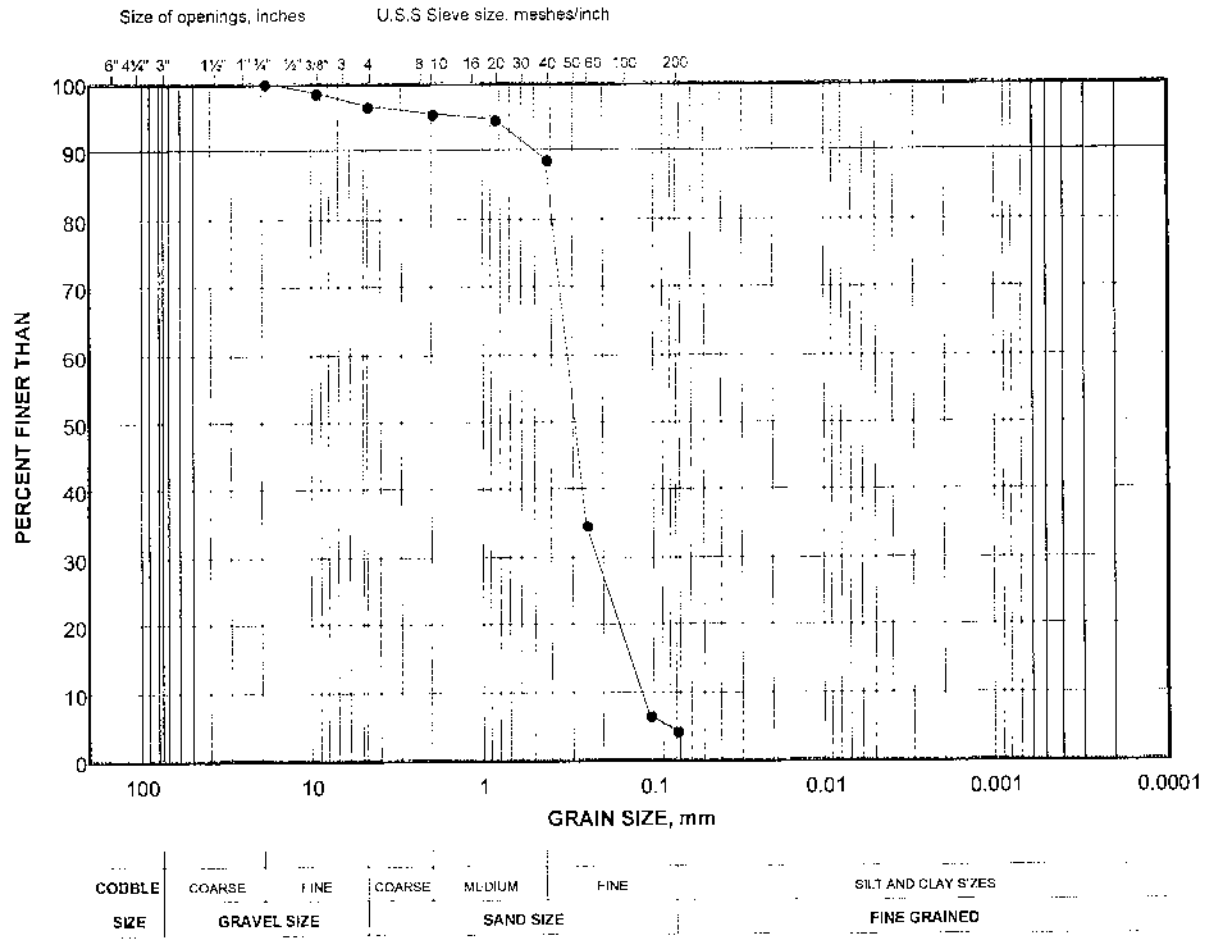
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW1-06	60.0 - 100.0

Project Number: 05-1112-010

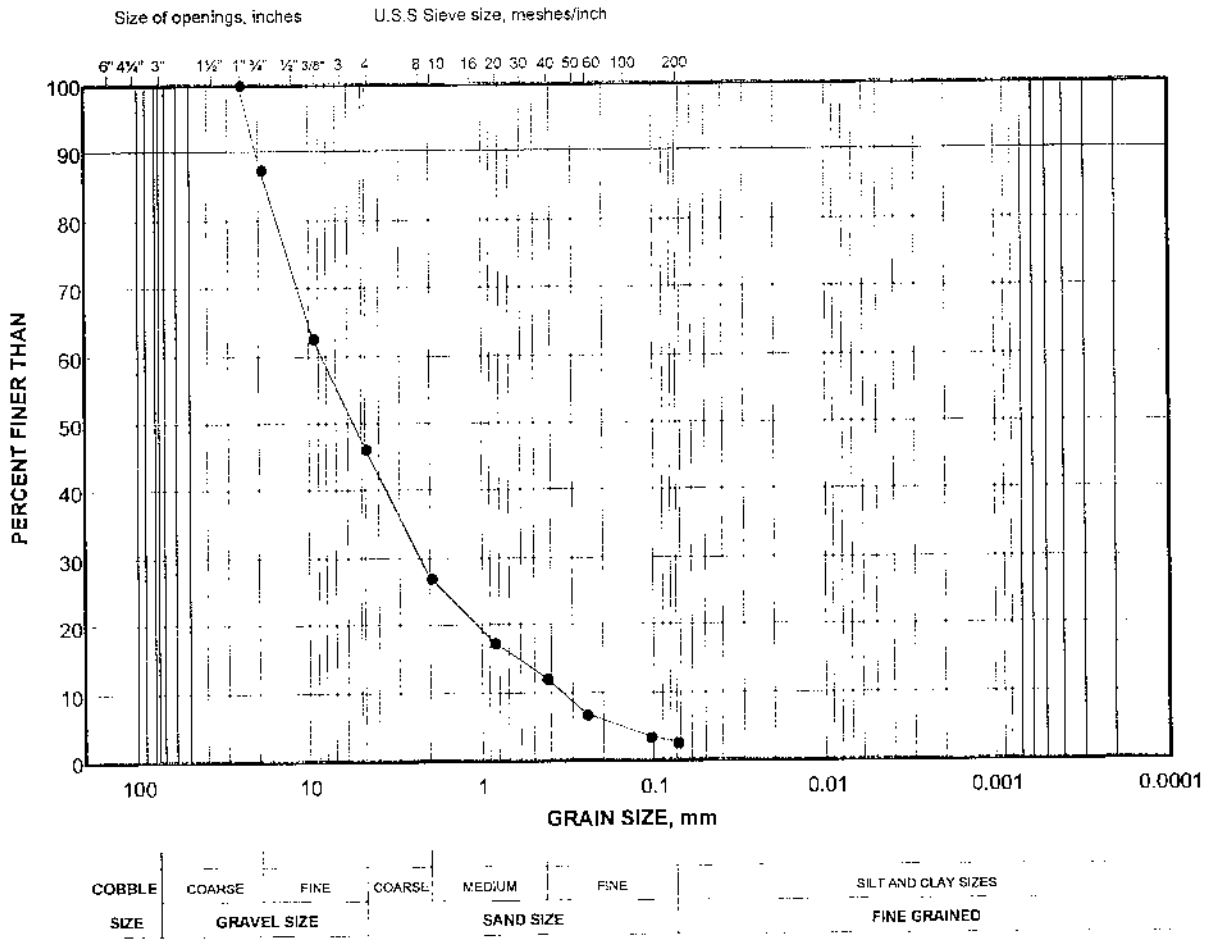
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW1-06	105.0 - 113.0

Project Number: 05-1112-010

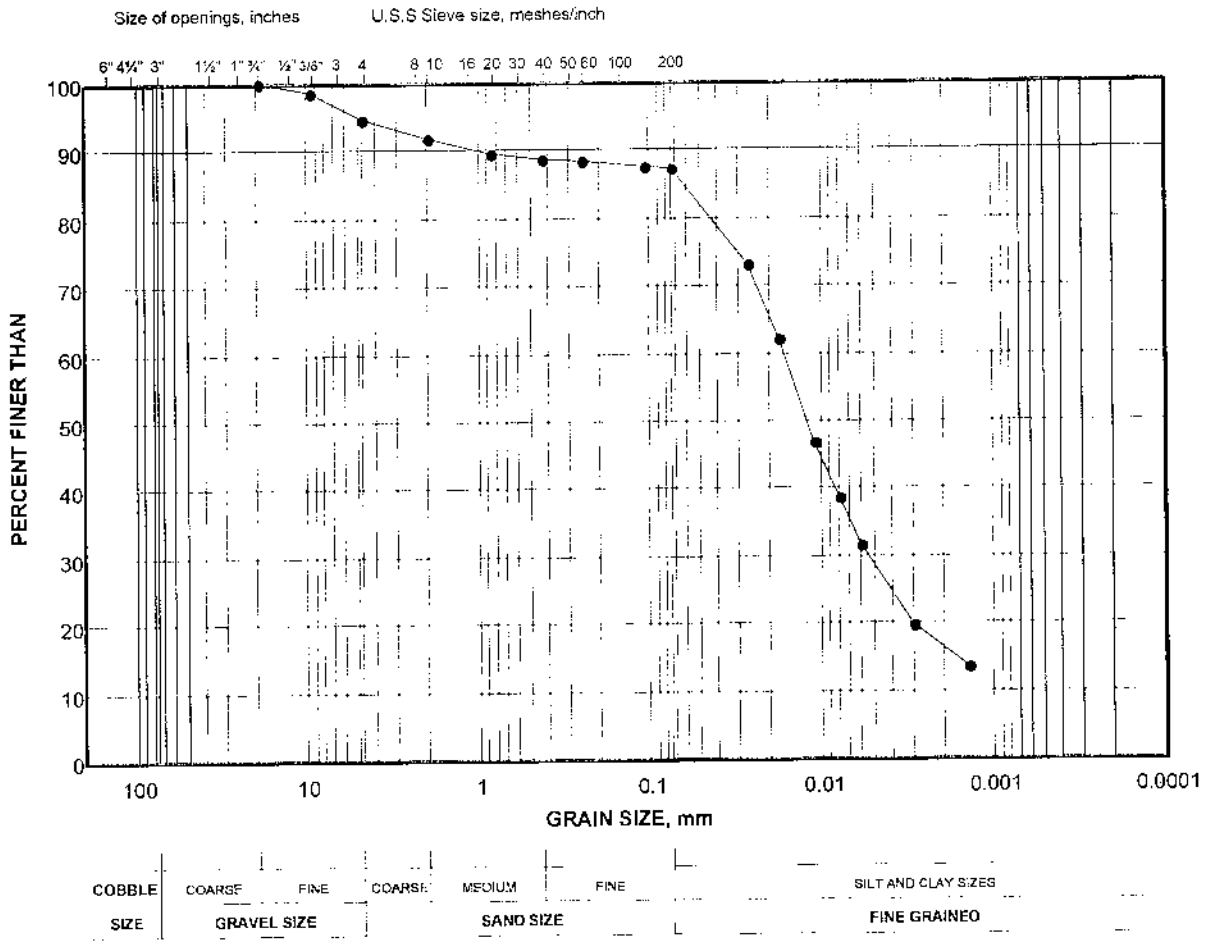
Checked By: _____

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
•		PBOW2-06	15.0 - 30.0

Project Number: 05-1112-010

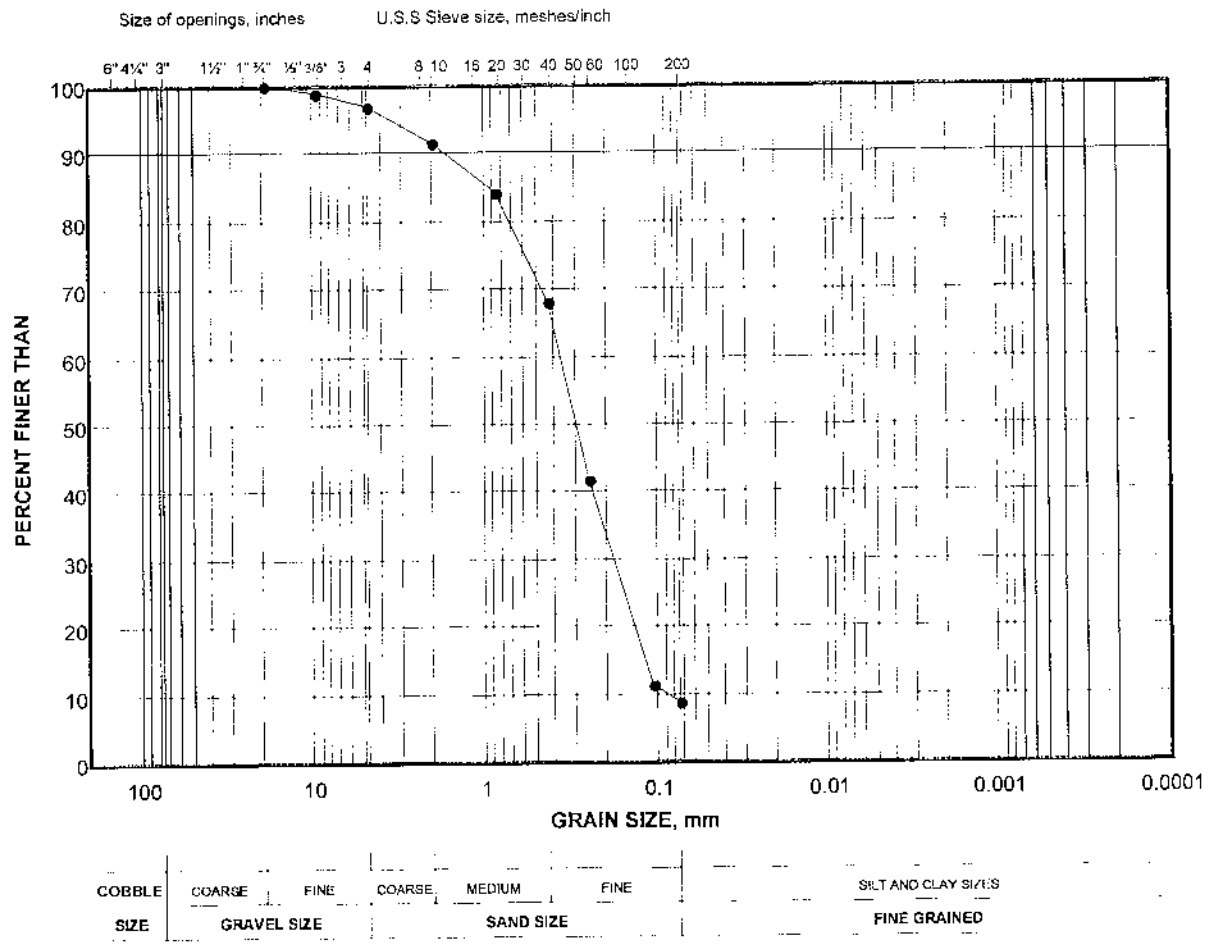
Checked By: MH

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW2-06	40.0 - 60.0

Project Number: 05-1112-010

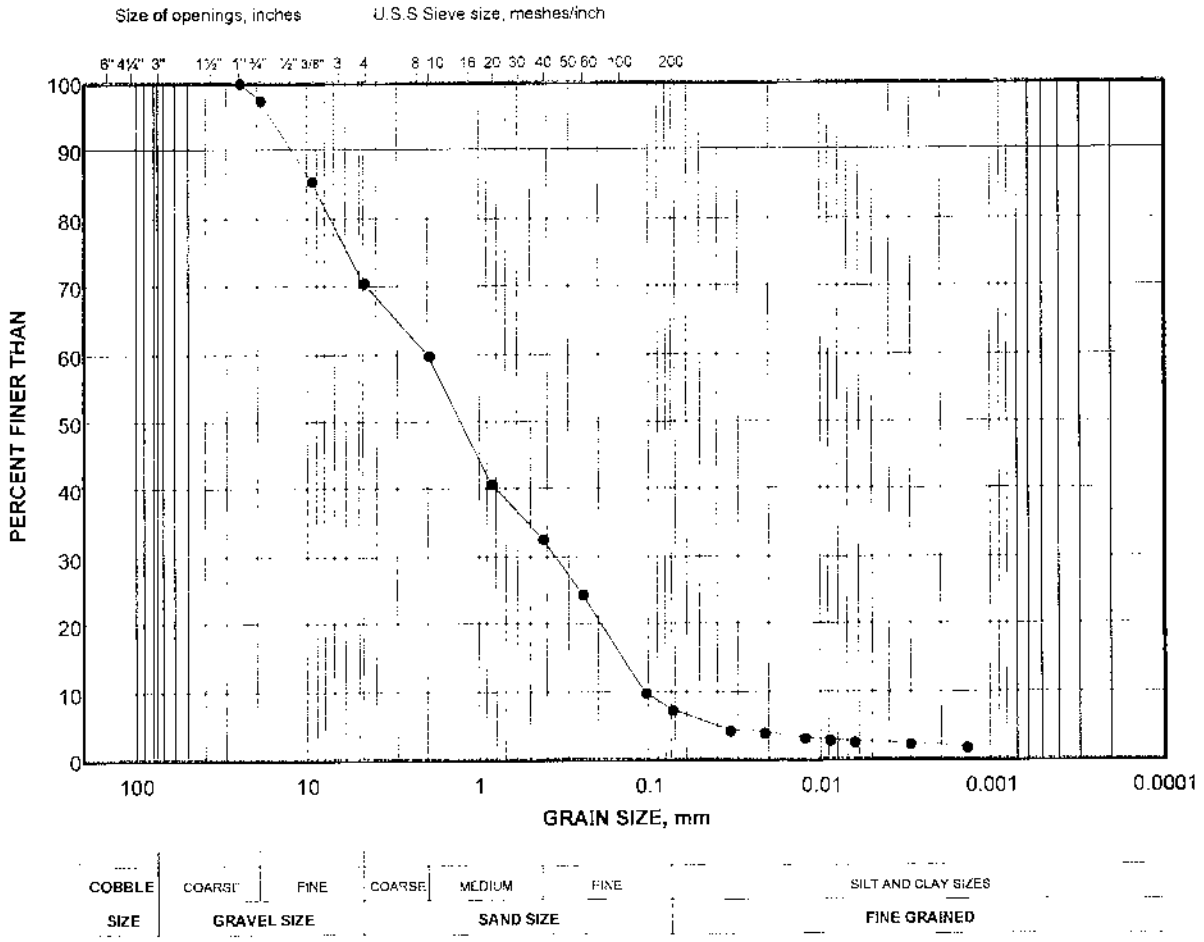
Checked By: MM

Golder Associates

Date: 28-Feb-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW2-06	80.0 - 95.0

Project Number: 05-1112-010

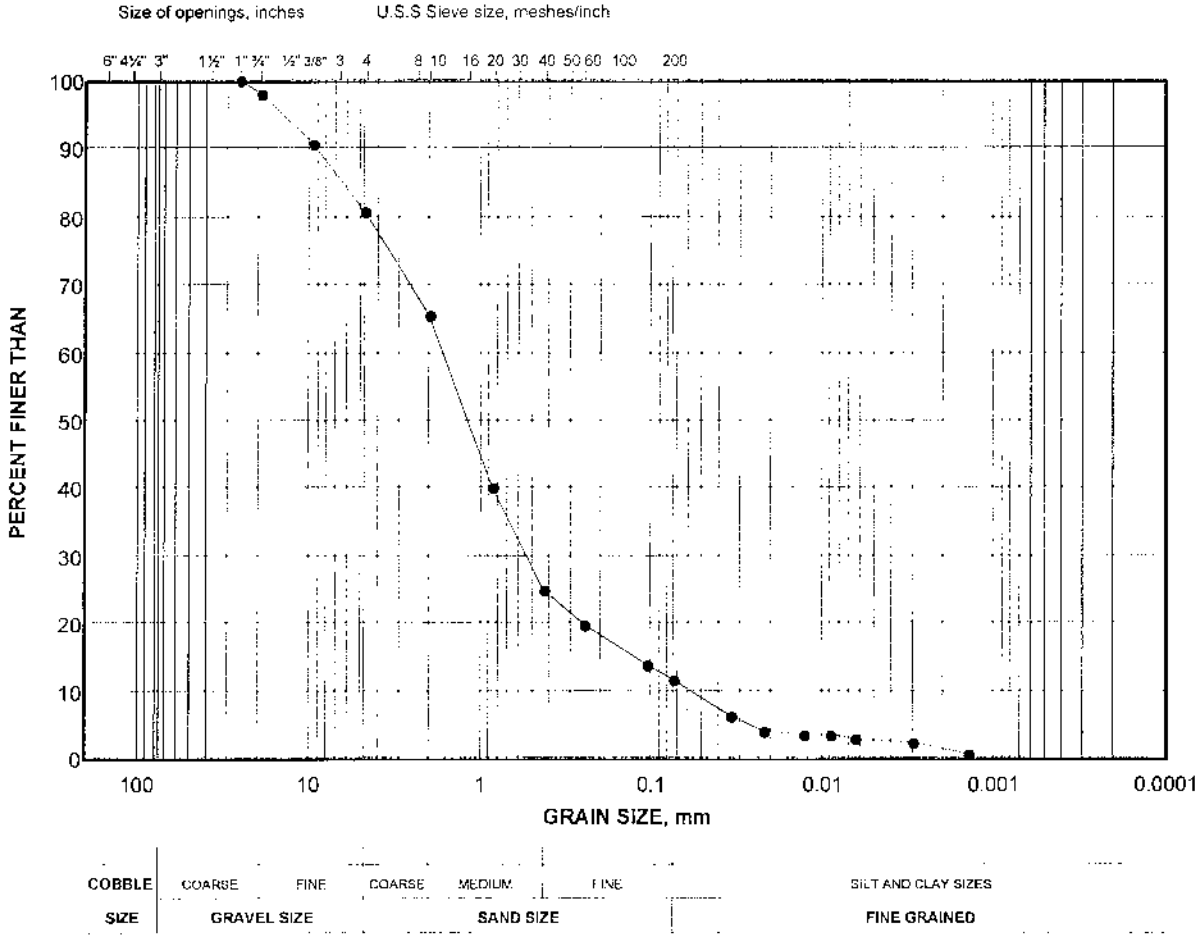
Checked By: _____

Golder Associates

Date: 06-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(ft)
●		PBOW2-06	105.0 - 115.0

Project Number: 05-1112-010

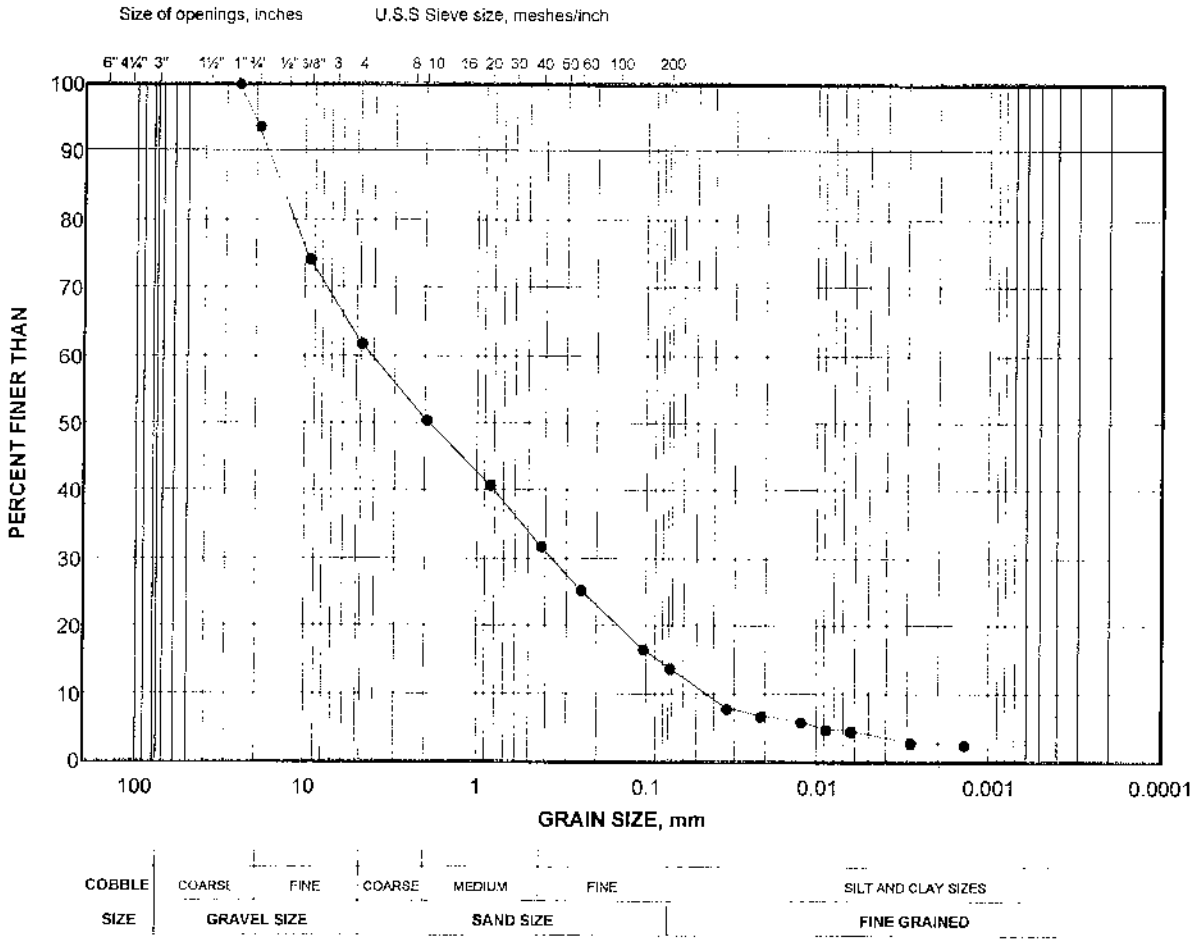
Checked By: _____

Golder Associates

Date: 01-Mar-07

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
•	PLOW1-06	-	4.30 - 4.90

Project Number: 05-1112-010

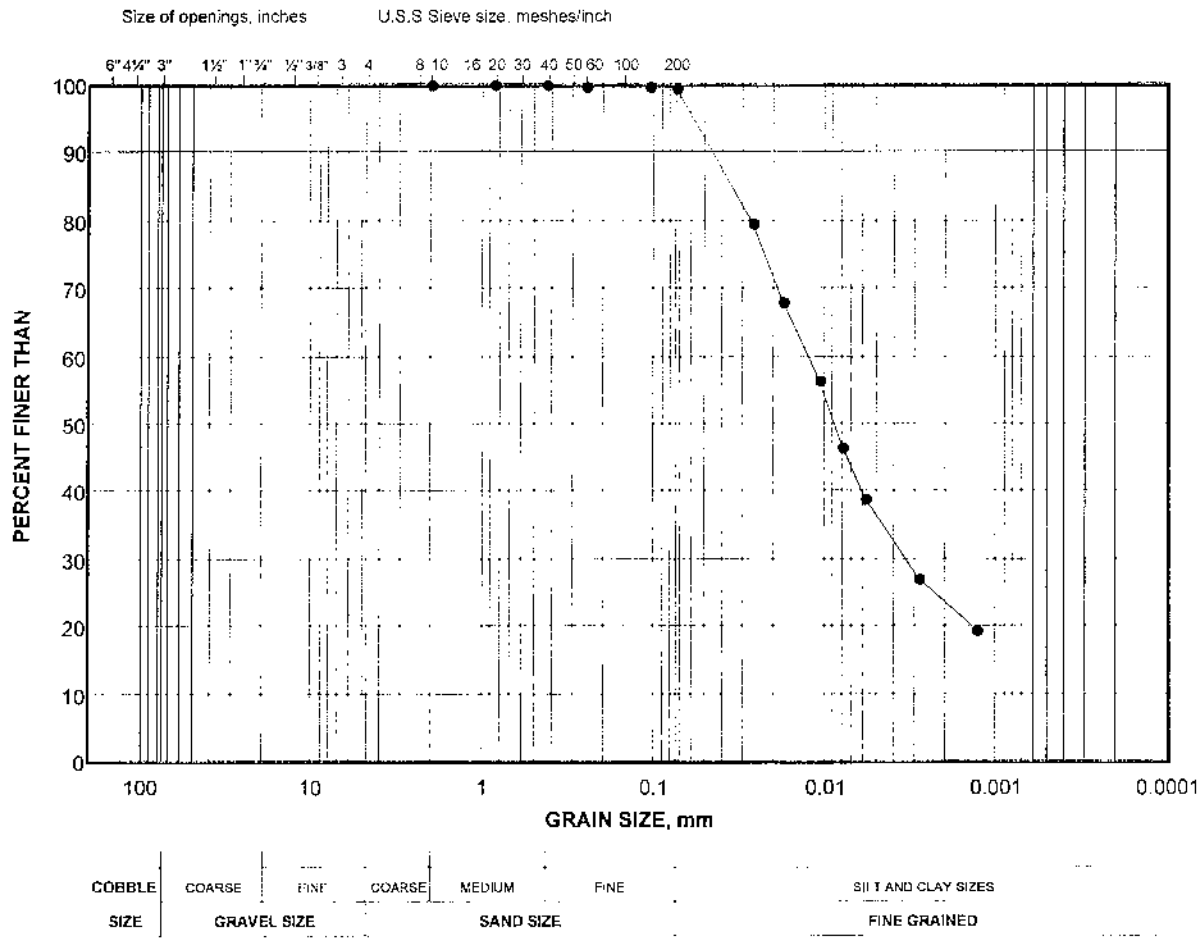
Checked By: RO

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
•	PLOW1-06	-	6.70 - 7.90

Project Number: 05-1112-010

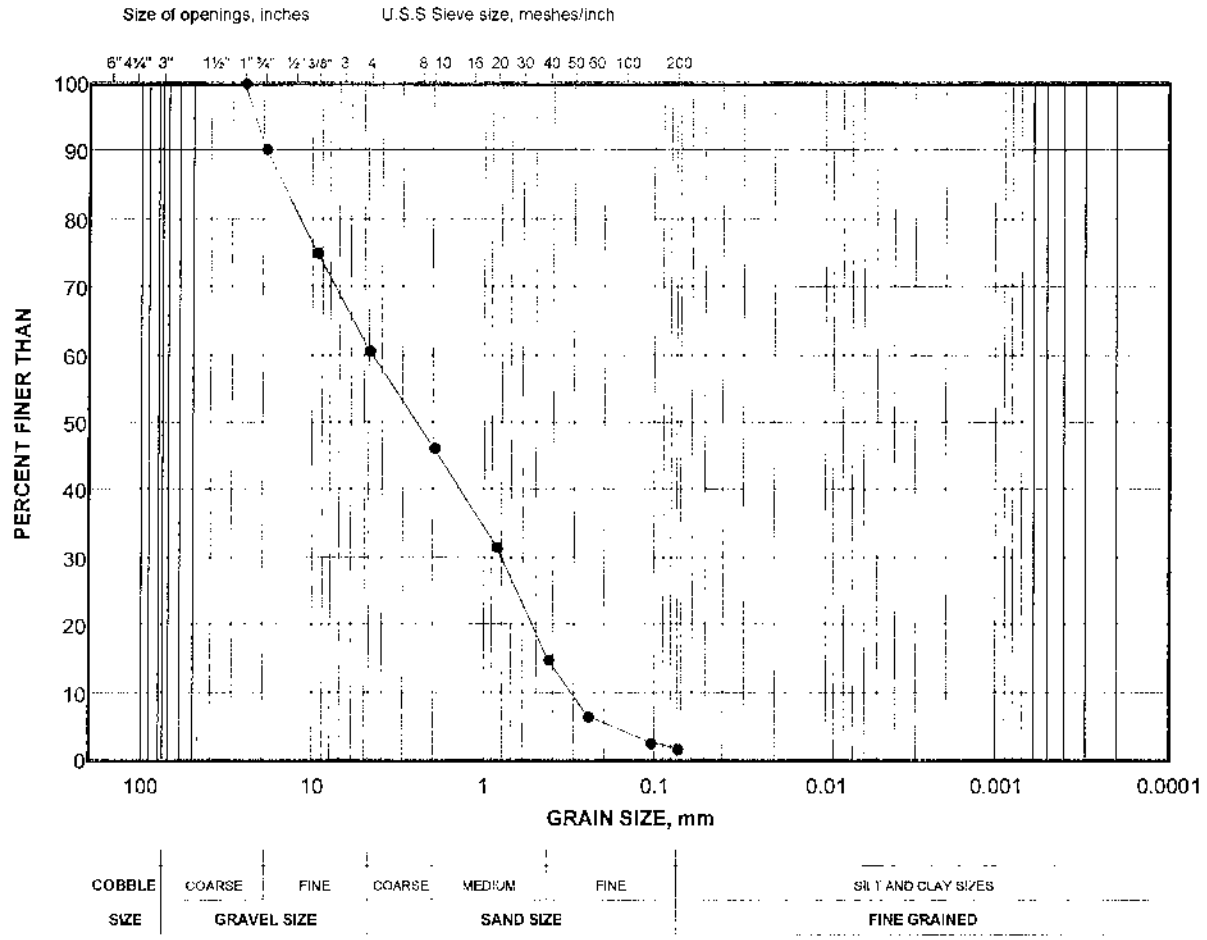
Checked By: RO

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
•	PLOW1-06	-	9.10 - 10.70

Project Number: 05-1112-010

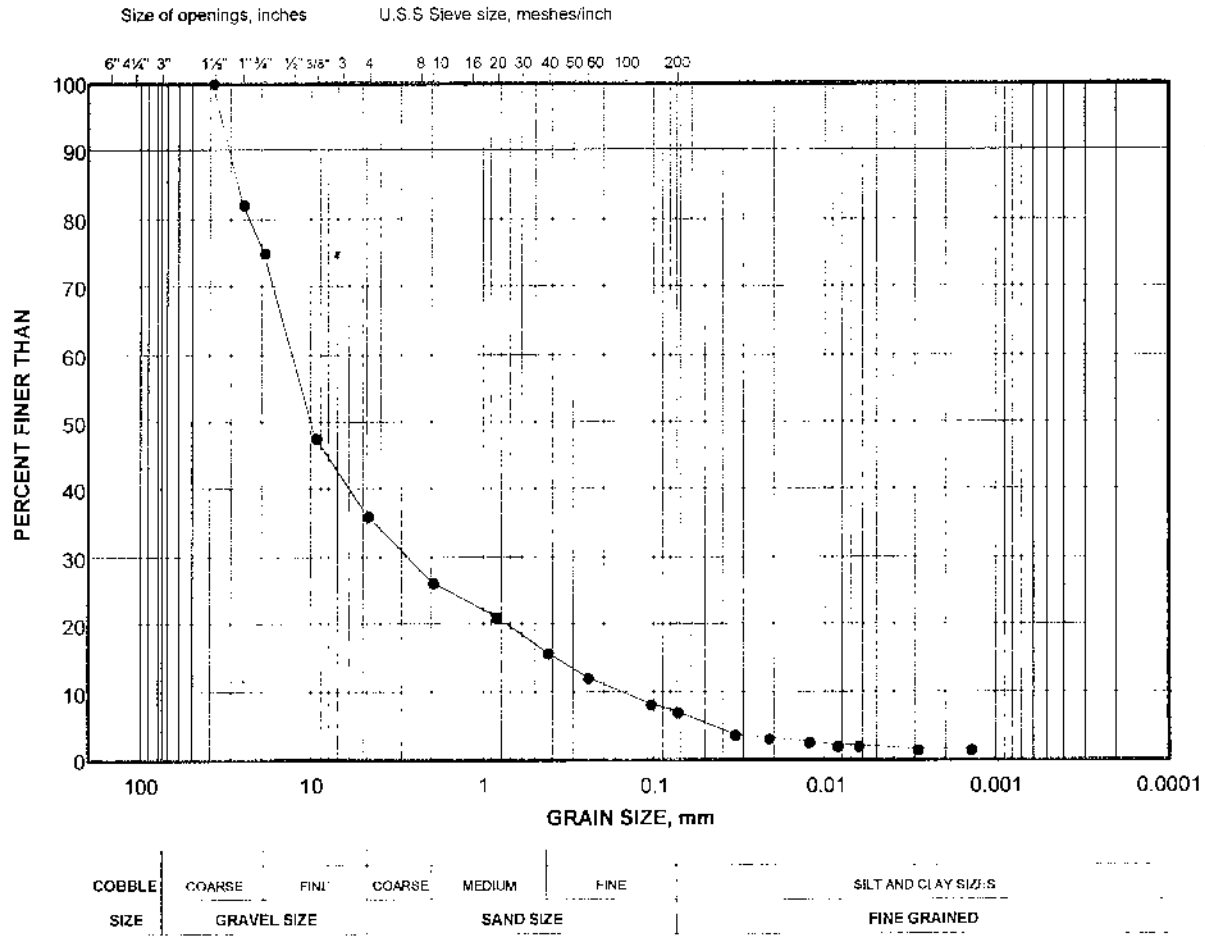
Checked By: RO

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	PLOW2-06	-	1.80 - 2.40

Project Number: 05-1112-010

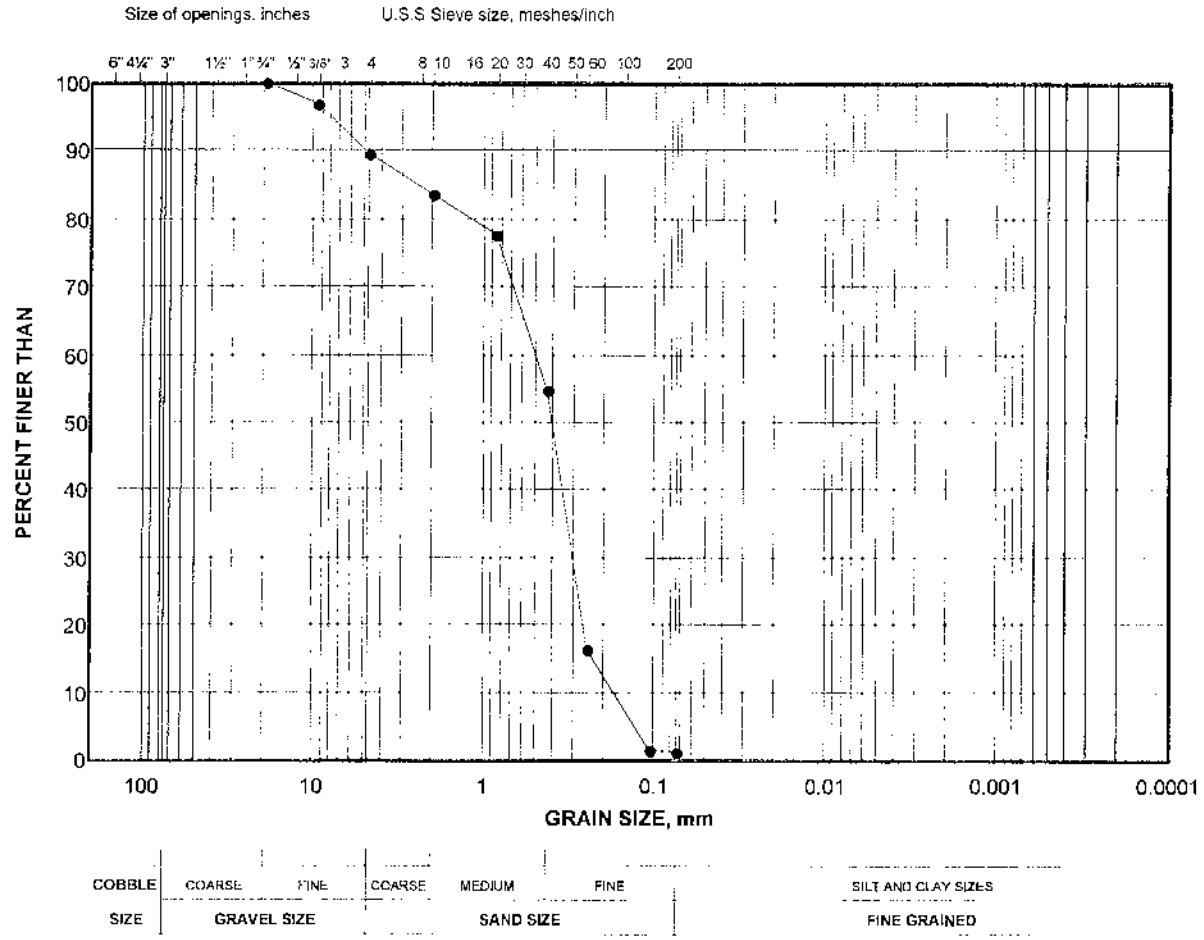
Checked By: RO

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	PLOW2-06	-	7.0 - 8.20

Project Number: 05-1112-010

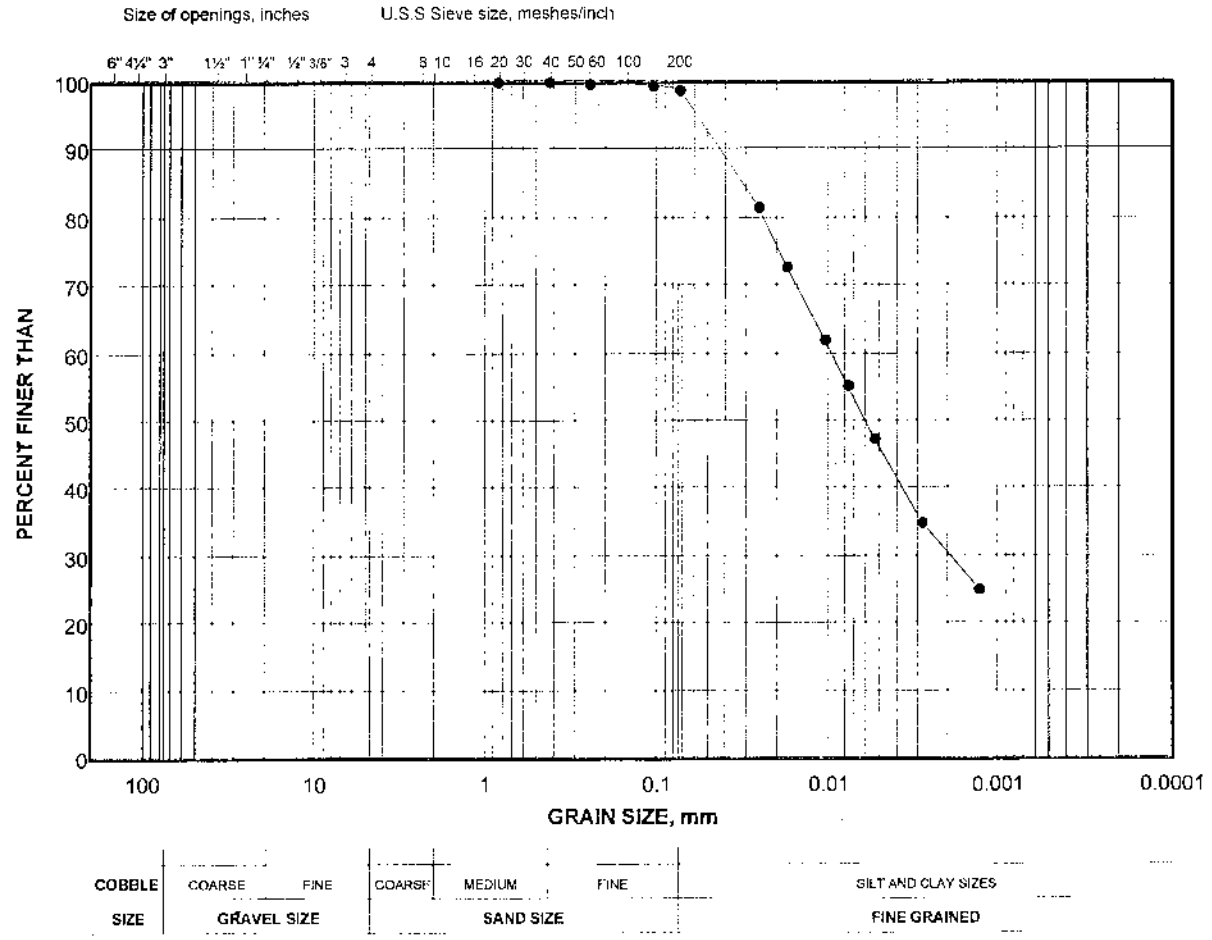
Checked By: 20

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	PLOW2-06	-	8.50 - 10.10

Project Number: 05-1112-010

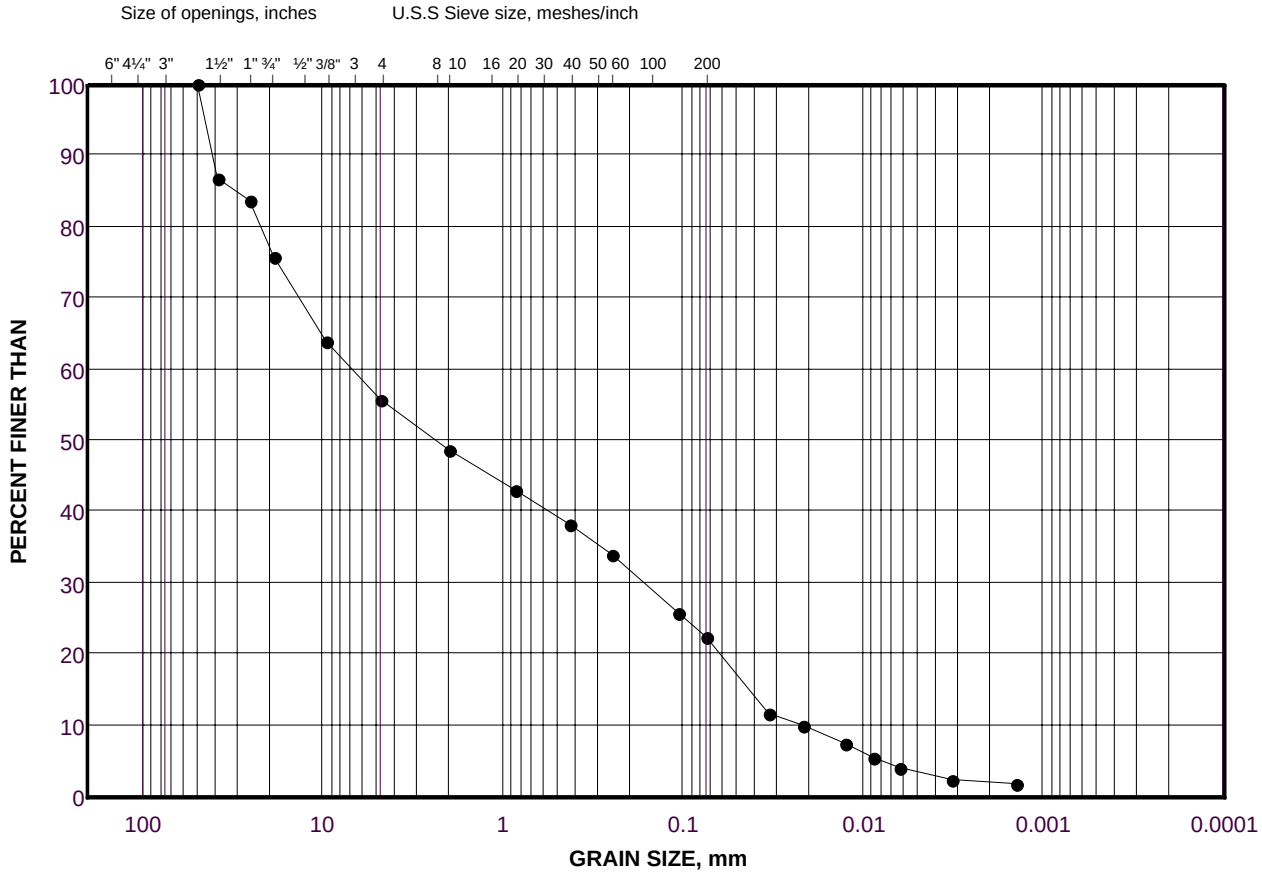
Checked By: _____

Golder Associates

Date: 24-Oct-06

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●		SMOW1A-08	3.90 - 4.20

Project Number: 05-1112-010

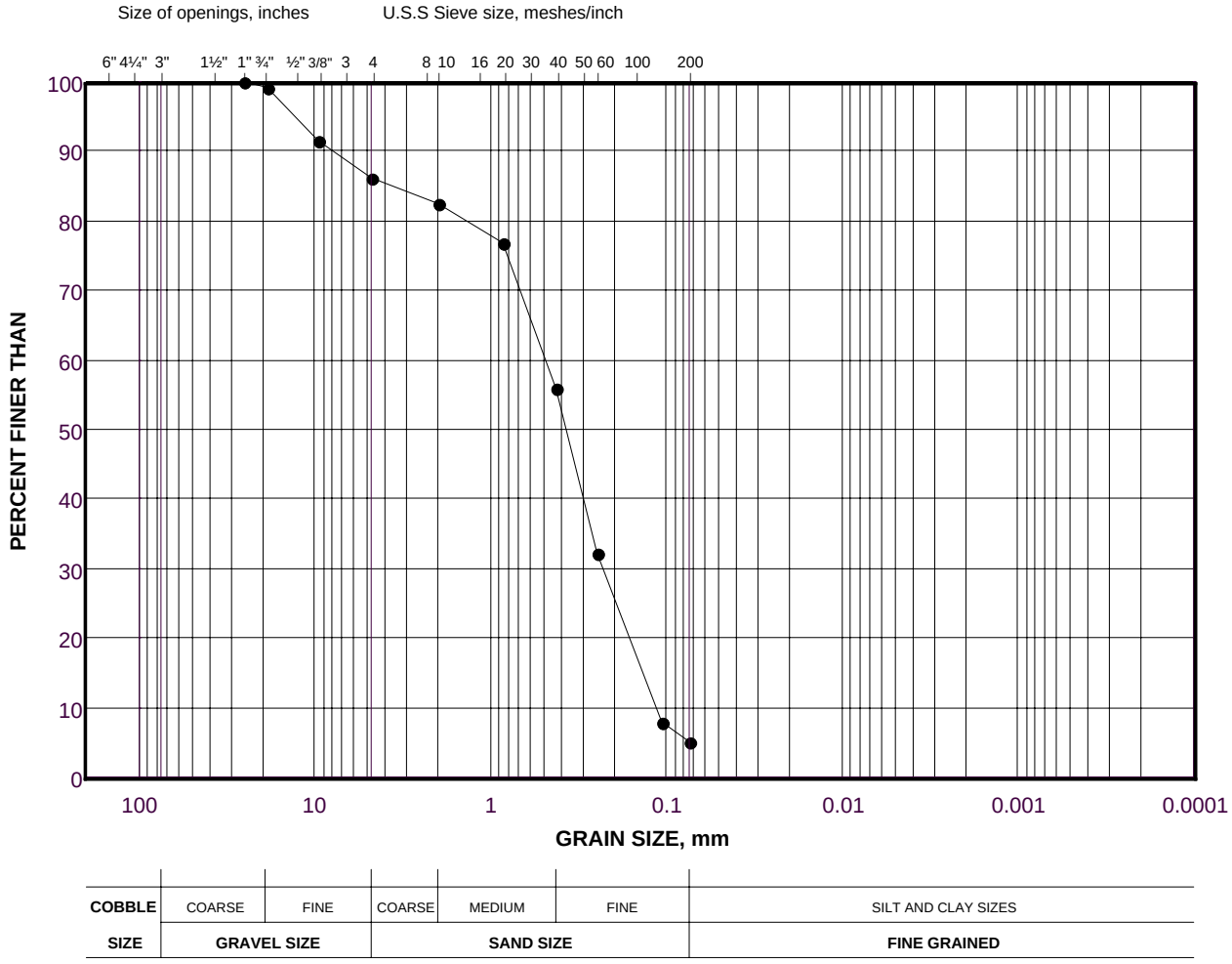
Checked By: _____

Golder Associates

Date: 31-Mar-08

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●		SMOW1A-08	9.40 - 10.60

Project Number: 05-1112-010

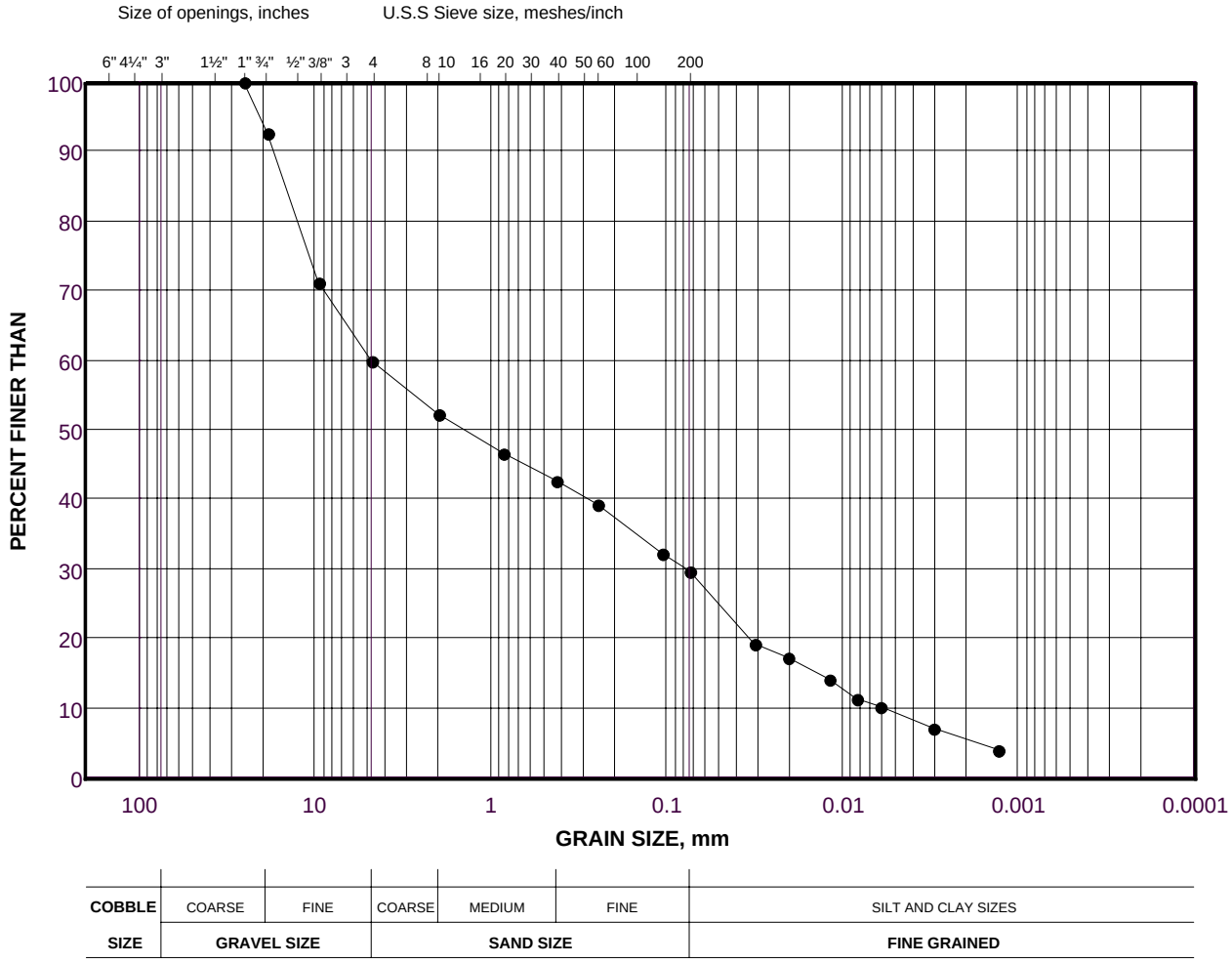
Checked By: _____

Golder Associates

Date: 31-Mar-08

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●		SMOW1A-08	17.00 - 18.00

Project Number: 05-1112-010

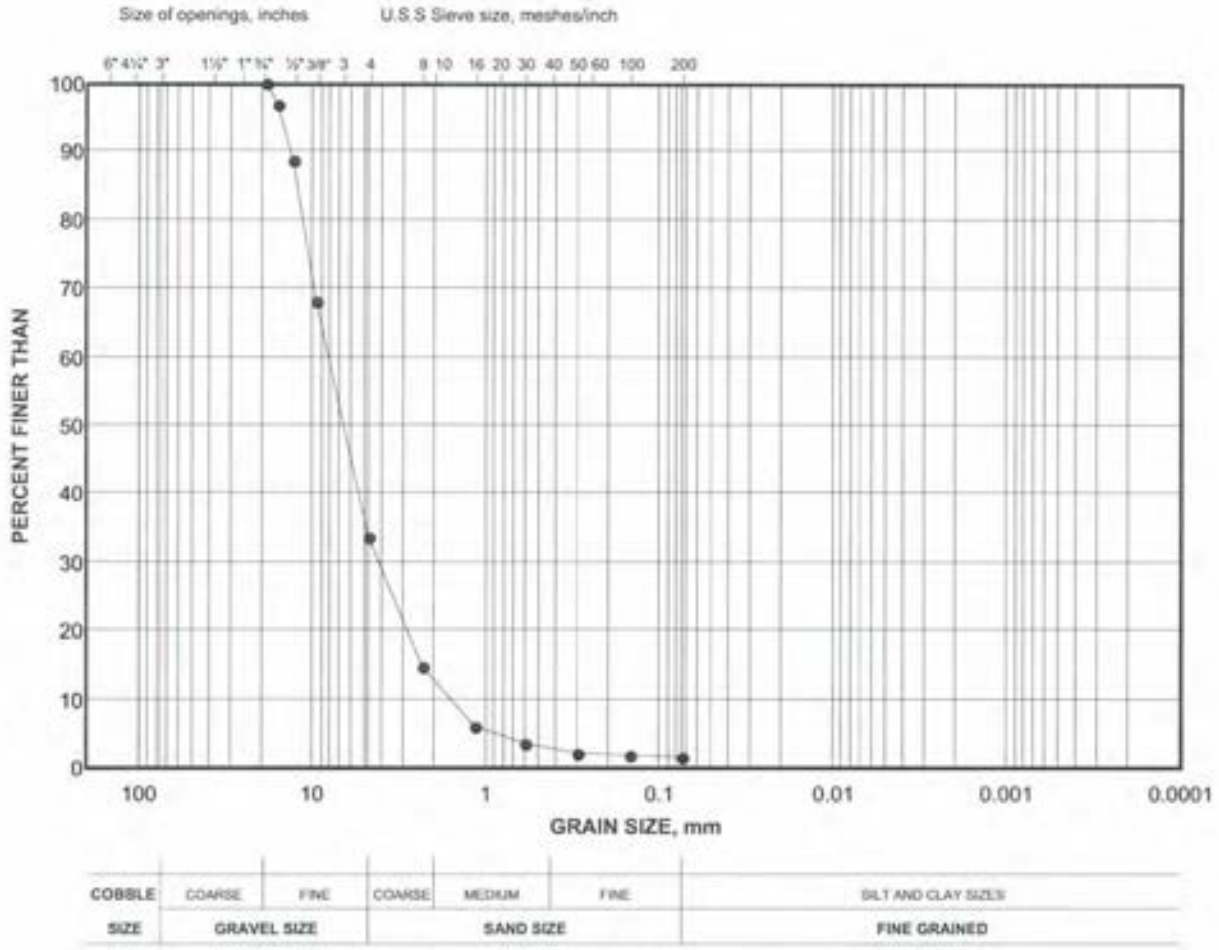
Checked By: _____

Golder Associates

Date: 31-Mar-08

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
●	NDOW1-08-E	E	17.0 - 27.0

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 09-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 1050.3(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
26.5mm	0.00	0.00	26.50	100.0
19.0mm	0.00	0.00	19.00	100.0
16mm	32.90	3.13	16.00	96.9
13.2mm	117.70	8.07	13.20	88.8
9.5mm	334.50	20.64	9.50	68.2
4.75mm	696.00	34.42	4.75	33.7
2.36mm	897.40	19.18	2.36	14.6
1.18mm	987.40	8.57	1.18	6.0
600µm	1015.90	2.71	0.60	3.3
300µm	1028.10	1.16	0.30	2.1
150µm	1033.20	0.49	0.15	1.6
75µm	1037.00	0.36	0.08	1.3
PAN	0.00	1.27	0.00	0.0

HYDROMETER BACK SIEVING

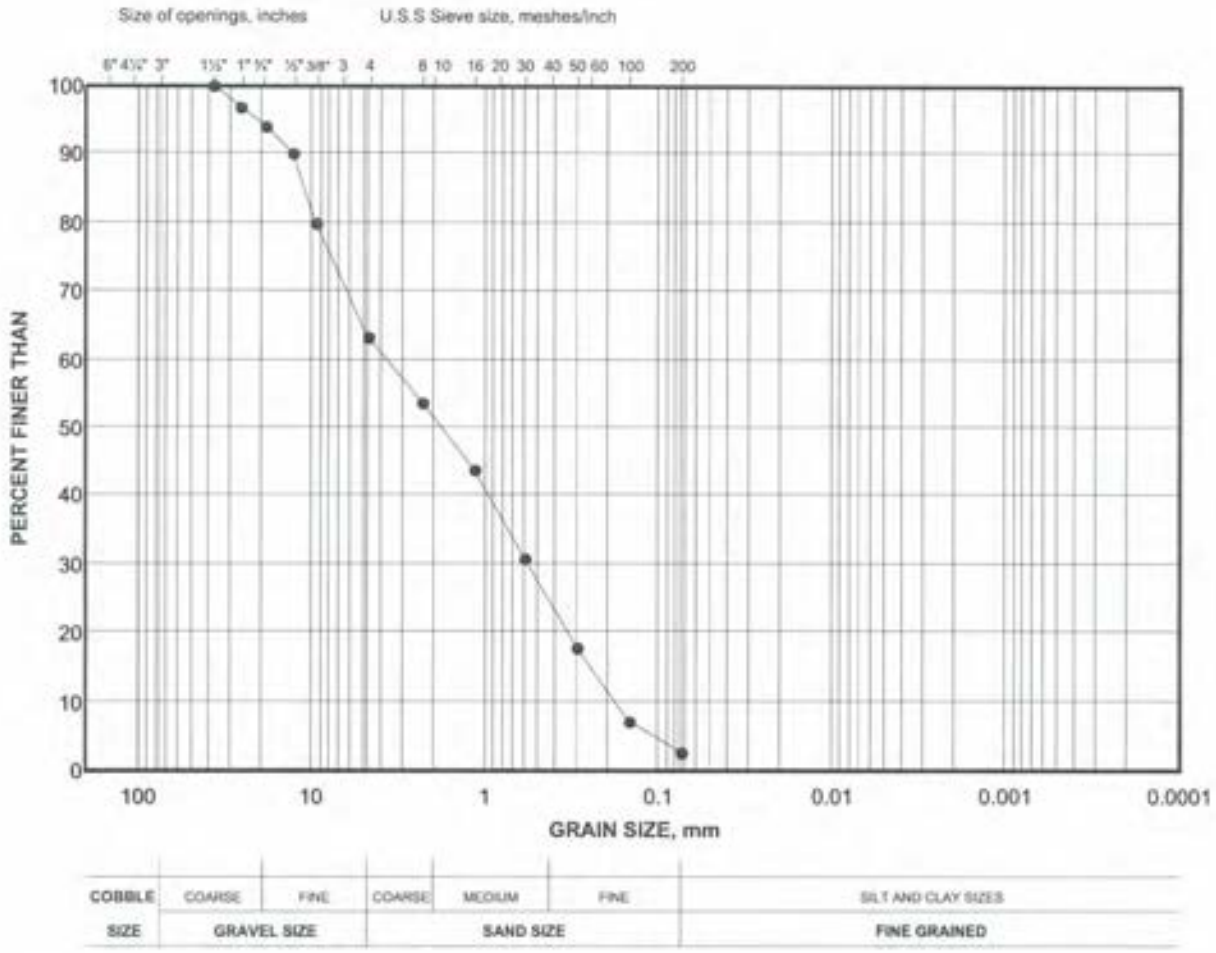
SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

Project Number	05-1112-010	Depth	27
Project Task	1900	Units	Imperial
	NDOW1-08-E	Testing Date	09/07/2009 4:05:03 PM
Sample Number	E	Tested By	Sieve - AS
Checked By	_____	LabID	09-134

Golder Associates

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
●	NDOWZ-08-D	D	46.0 - 56.0

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 09-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 1186.8(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
37.5mm	0.00	0.00	37.50	100.0
26.5mm	35.40	2.98	26.50	97.0
19.0mm	69.90	2.91	19.00	94.1
13.2mm	118.60	4.10	13.20	90.0
9.5mm	237.50	10.02	9.50	80.0
4.75mm	434.30	16.58	4.75	63.4
2.36mm	548.00	9.58	2.36	53.8
1.18mm	668.50	10.15	1.18	43.7
600µm	820.80	12.83	0.60	30.9
300µm	976.20	13.09	0.30	17.8
150µm	1102.40	10.63	0.15	7.1
75µm	1156.90	4.59	0.08	2.5
PAN	0.00	2.54	0.00	0.0

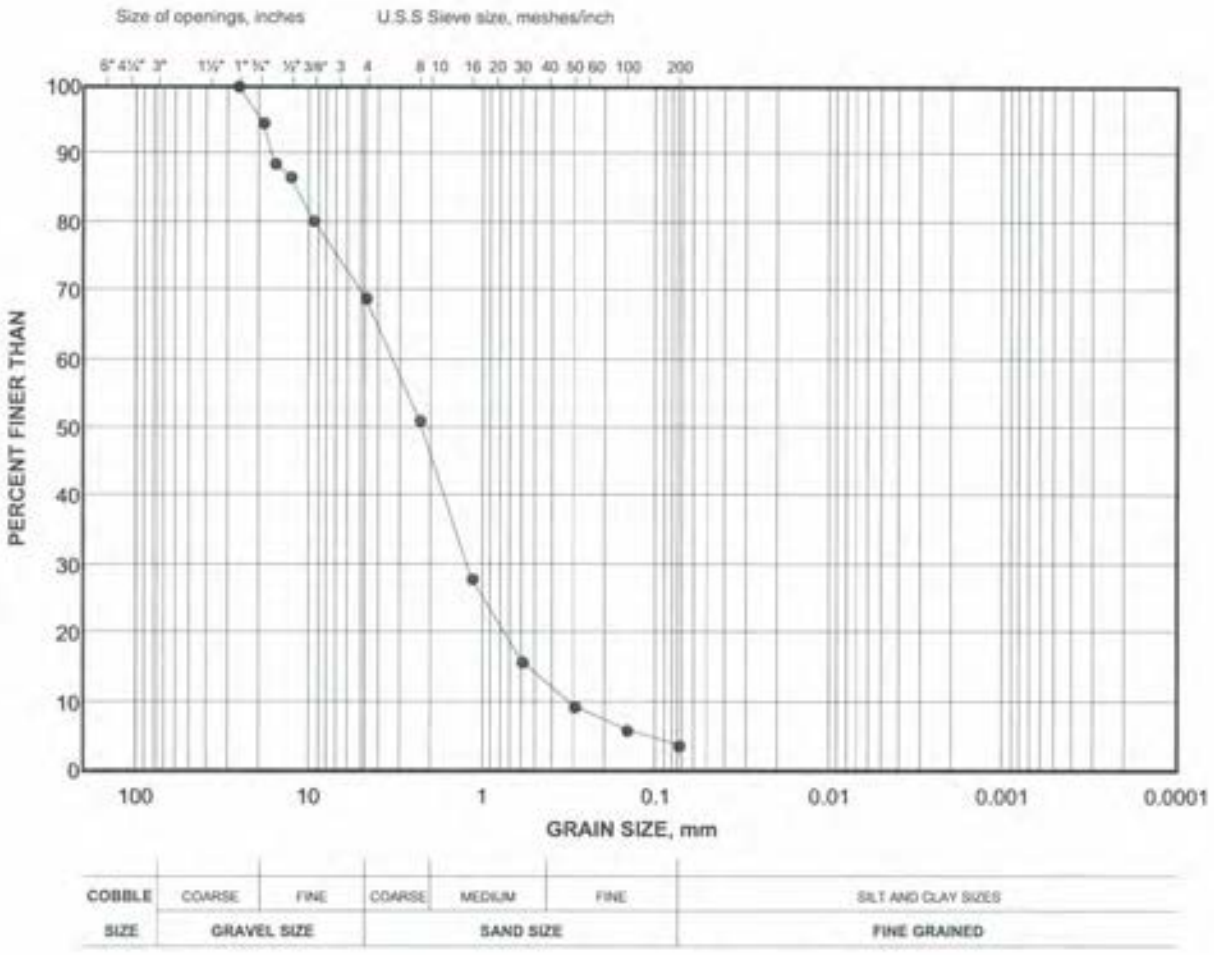
HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

Project Number	05-1112-010	Depth	56
Project Task	1900	Units	Imperial
	NDOWZ-08-D	Testing Date	09/07/2009 4:10:07 PM
Sample Number	D	Tested By	Sieve - AS
Checked By	_____	LabID	09-135

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
●	NDOWZ-08-E	E	10.0 - 15.0

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 09-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 663.9(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
26.5mm	0.00	0.00	26.50	100.0
19.0mm	35.60	5.36	19.00	94.6
16mm	75.60	6.03	16.00	88.6
13.2mm	87.90	1.85	13.20	86.8
9.5mm	130.80	6.46	9.50	80.3
4.75mm	205.60	11.27	4.75	69.0
2.36mm	325.30	18.03	2.36	51.0
1.18mm	478.40	23.06	1.18	27.9
600µm	558.40	12.05	0.60	15.9
300µm	601.80	6.54	0.30	9.3
150µm	625.40	3.55	0.15	5.8
75µm	639.60	2.14	0.08	3.7
PAN	0.00	3.66	0.00	0.0

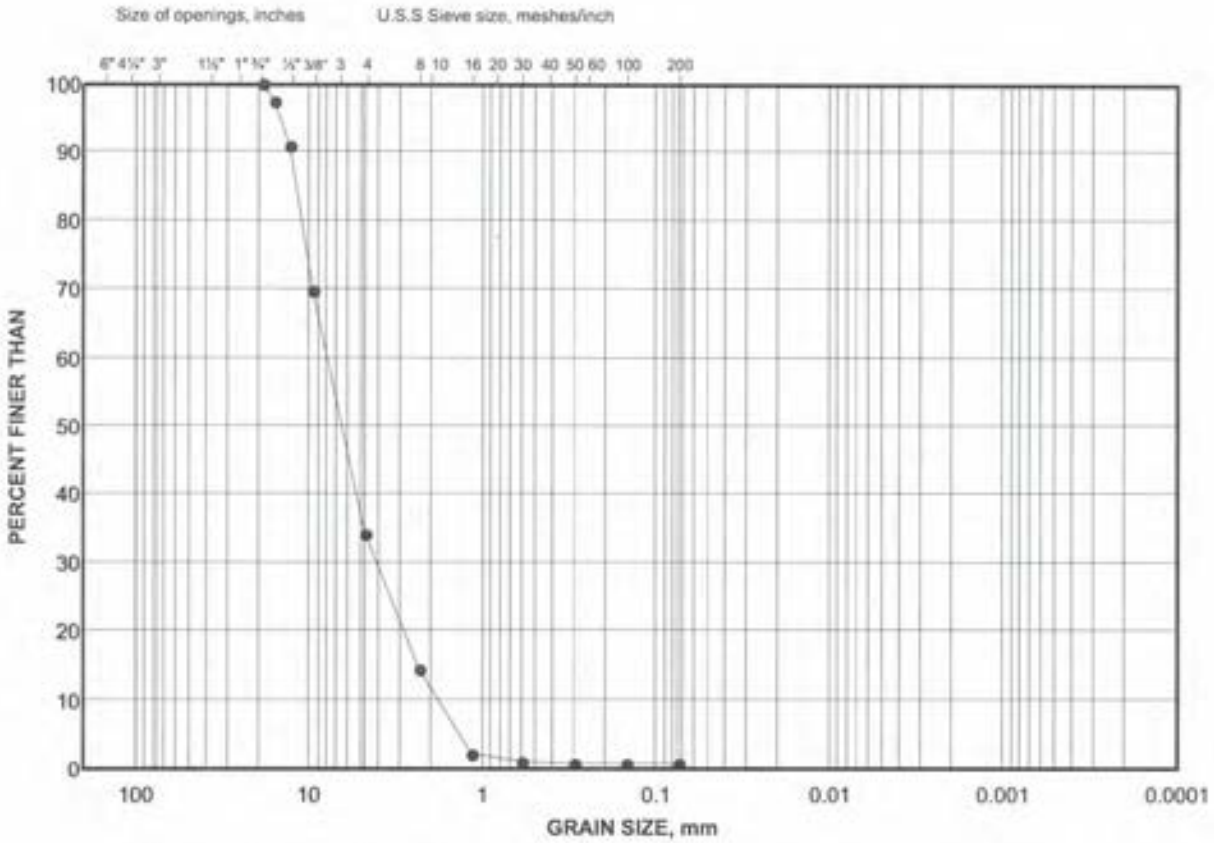
HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

Project Number	05-1112-010	Depth	15
Project Task	1900	Units	Imperial
	NDOWZ-08-E	Testing Date	09/07/2009 4:19:57 PM
Sample Number	E	Tested By	Sieve - AS
Checked By	_____	LabID	09-136

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
●	NDOWZ-08-D	D	

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 10-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 513.8(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
26.5mm	0.00	0.00	26.50	100.0
19.0mm	0.00	0.00	19.00	100.0
16mm	12.80	2.49	16.00	97.5
13.2mm	45.90	6.44	13.20	91.1
9.5mm	154.80	21.20	9.50	69.9
4.75mm	338.60	35.77	4.75	34.1
2.36mm	440.00	19.74	2.36	14.4
1.18mm	503.30	12.32	1.18	2.0
600µm	509.20	1.15	0.60	0.9
300µm	510.10	0.18	0.30	0.7
150µm	510.70	0.12	0.15	0.6
75µm	511.10	0.08	0.08	0.5
PAN	0.00	0.51	0.00	0.0

HYDROMETER BACK SIEVING

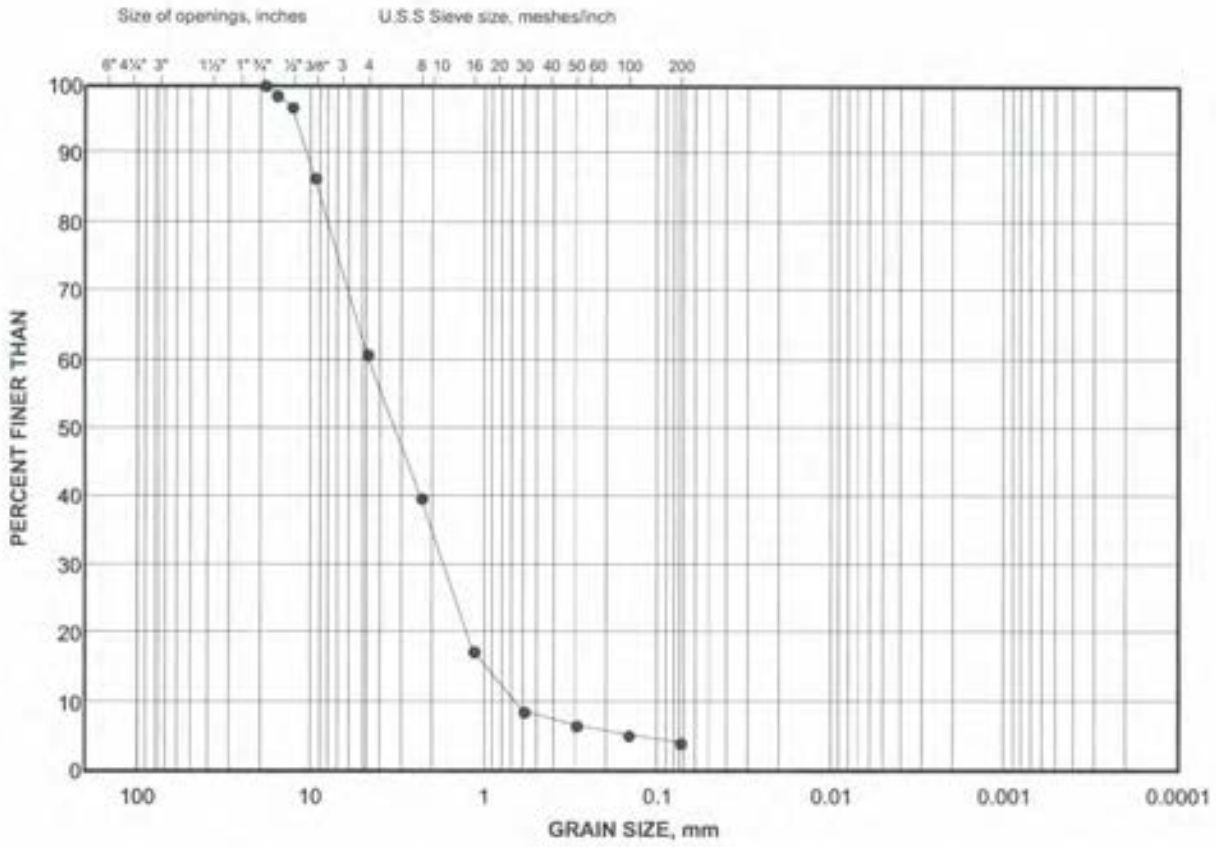
SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

Project Number	05-1112-010	Depth	
Project Task	1900	Units	Imperial
	NDOWZ-08-D	Testing Date	10/07/2009 4:34:34 PM
Sample Number	D	Tested By	Sieve - AS
Checked By	_____	LabID	09-137

Golder Associates

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
•	NDTW1-08-E	E	18.0 - 28.0

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 10-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 909.6(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
26.5mm	0.00	0.00	26.50	100.0
19.0mm	0.00	0.00	19.00	100.0
16mm	13.90	1.53	16.00	98.5
13.2mm	28.70	1.63	13.20	96.8
9.5mm	123.80	10.46	9.50	86.4
4.75mm	357.00	25.64	4.75	60.7
2.36mm	546.90	20.88	2.36	39.9
1.18mm	754.10	22.78	1.18	17.1
600µm	831.40	8.50	0.60	8.6
300µm	851.00	2.15	0.30	6.4
150µm	862.50	1.26	0.15	5.2
75µm	872.90	1.14	0.08	4.0
PAN	0.00	4.03	0.00	0.0

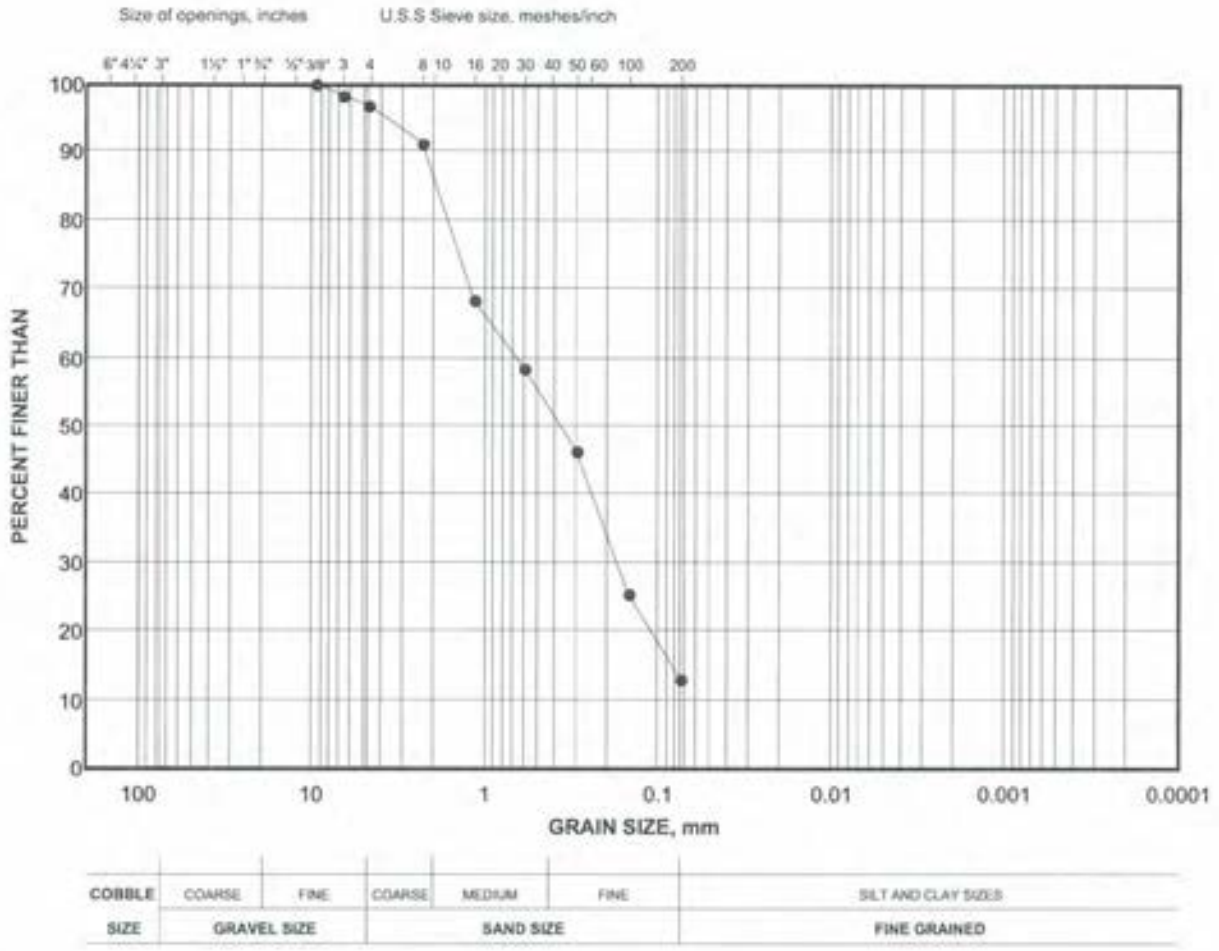
HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

Project Number	05-1112-010	Depth	28
Project Task	1900	Units	Imperial
	NDTW1-08-E	Testing Date	10/07/2009 9:28:20 AM
Sample Number	E	Tested By	Sieve - AS
Checked By	_____	LabID	09-138

GRAIN SIZE DISTRIBUTION

FIGURE



LEGEND

SYMBOL	MW	SAMPLE	DEPTH(ft)
•	NDTWI-08-D	D	48.0 - 58.0

Project Number: 05-1112-010 (1900)

Checked By: _____

Golder Associates

Date: 10-Jul-09

SOIL SIEVE ANALYSIS

Initial weight of dry sample = 418(g)

COARSE SIEVING

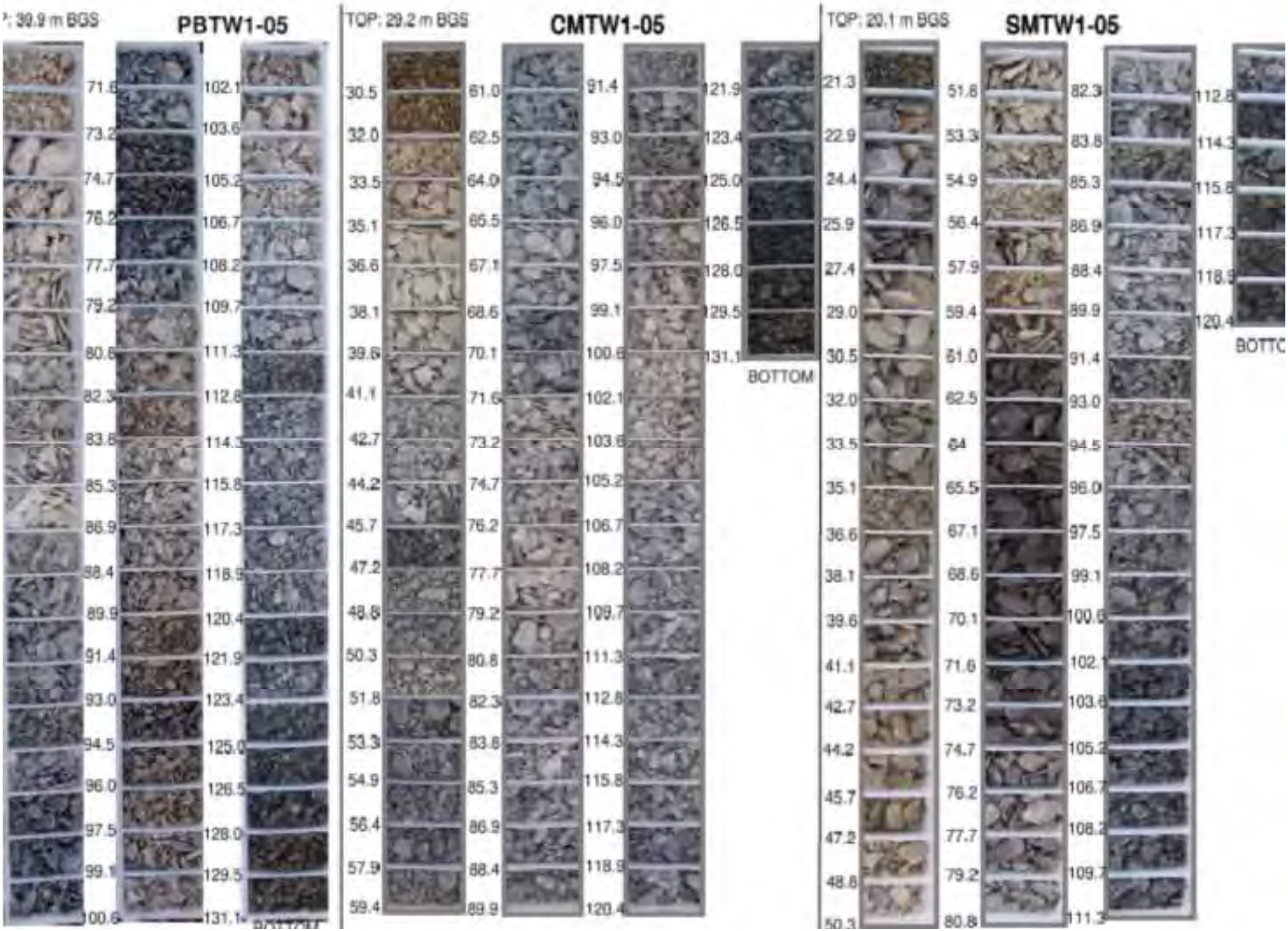
SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
19.0mm	0.00	0.00	19.00	100.0
16mm	0.00	0.00	16.00	100.0
13.2mm	0.00	0.00	13.20	100.0
9.5mm	0.00	0.00	9.50	100.0
6.7mm	6.70	1.60	6.70	98.4
4.75mm	12.70	1.44	4.75	97.0
2.36mm	36.70	5.74	2.36	91.2
1.18mm	132.10	22.82	1.18	68.4
600µm	173.40	9.88	0.60	58.5
300µm	223.90	12.08	0.30	46.4
150µm	312.30	21.15	0.15	25.3
75µm	363.20	12.18	0.08	13.1
PAN	0.00	13.11	0.00	0.0

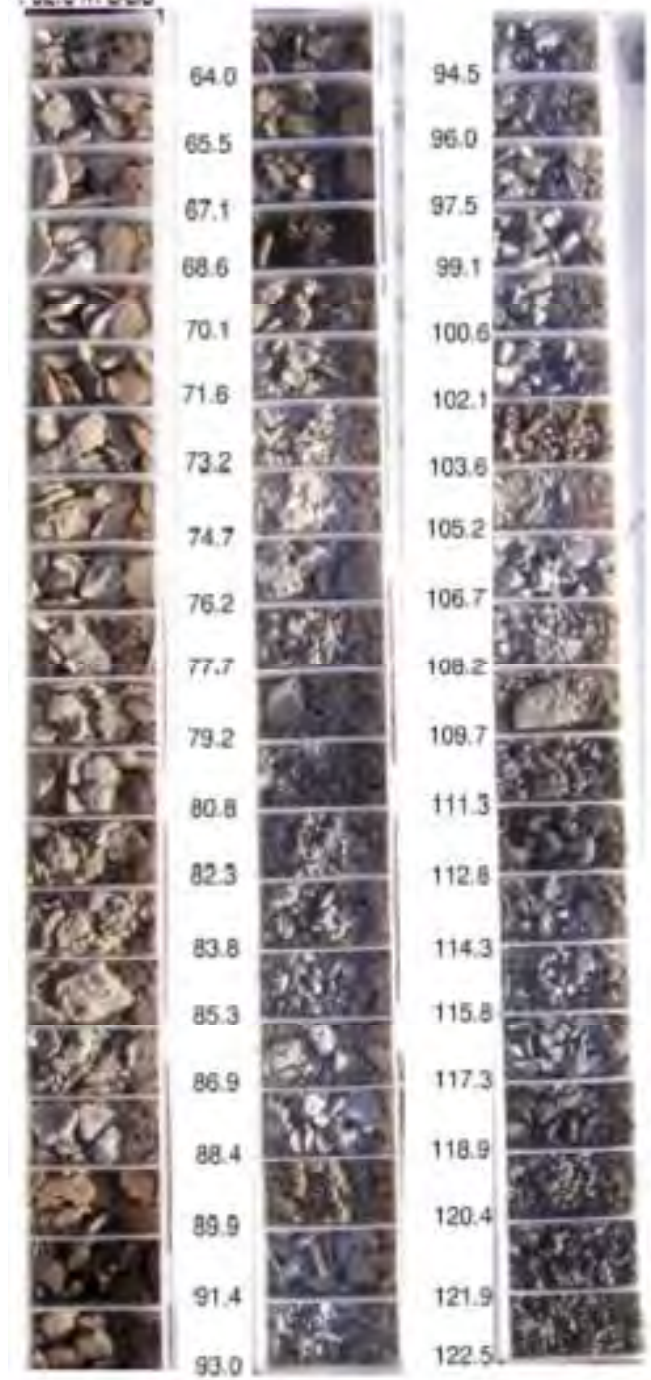
HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING

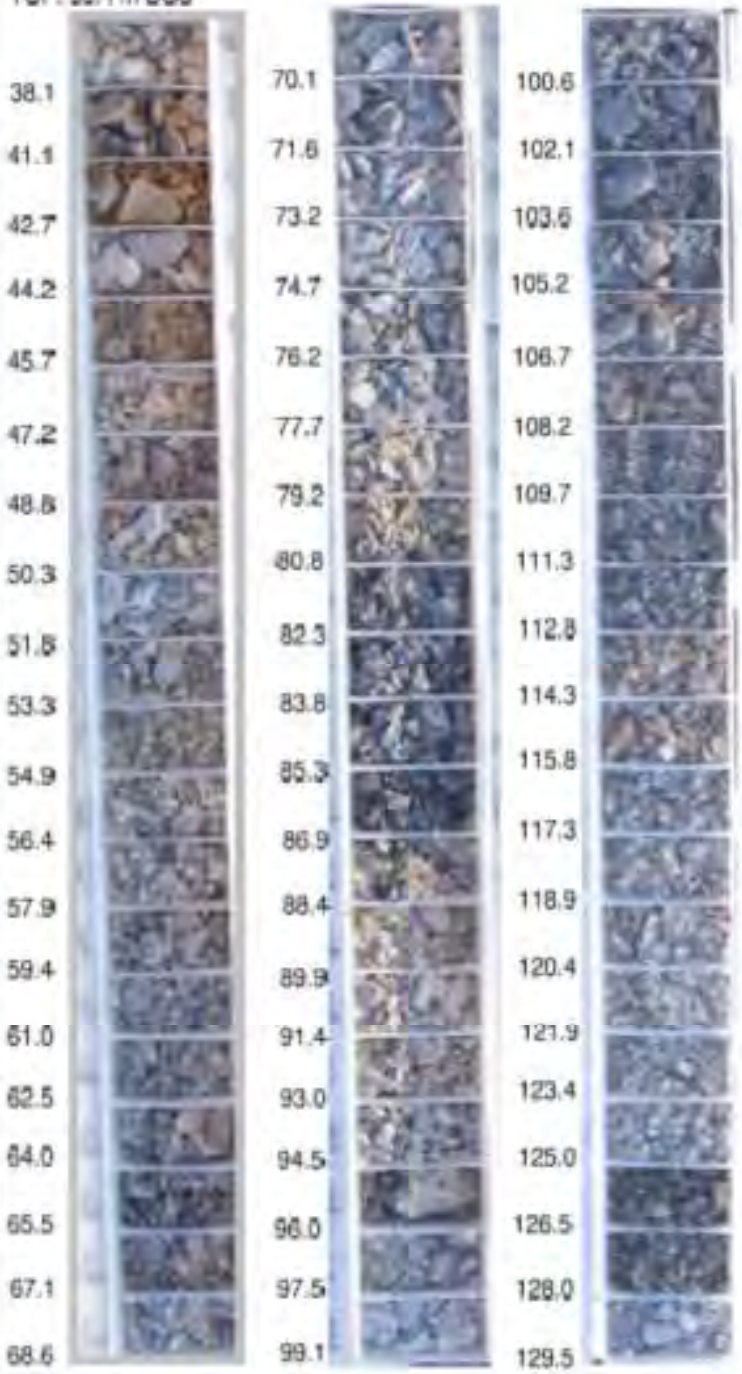
Project Number	05-1112-010	Depth	58
Project Task	1900	Units	Imperial
	NDTWI-08-D	Testing Date	10/07/2009 12:07:46 PM
Sample Number	D	Tested By	Sieve - AS
Checked By	_____	LabID	09-139

Golder Associates

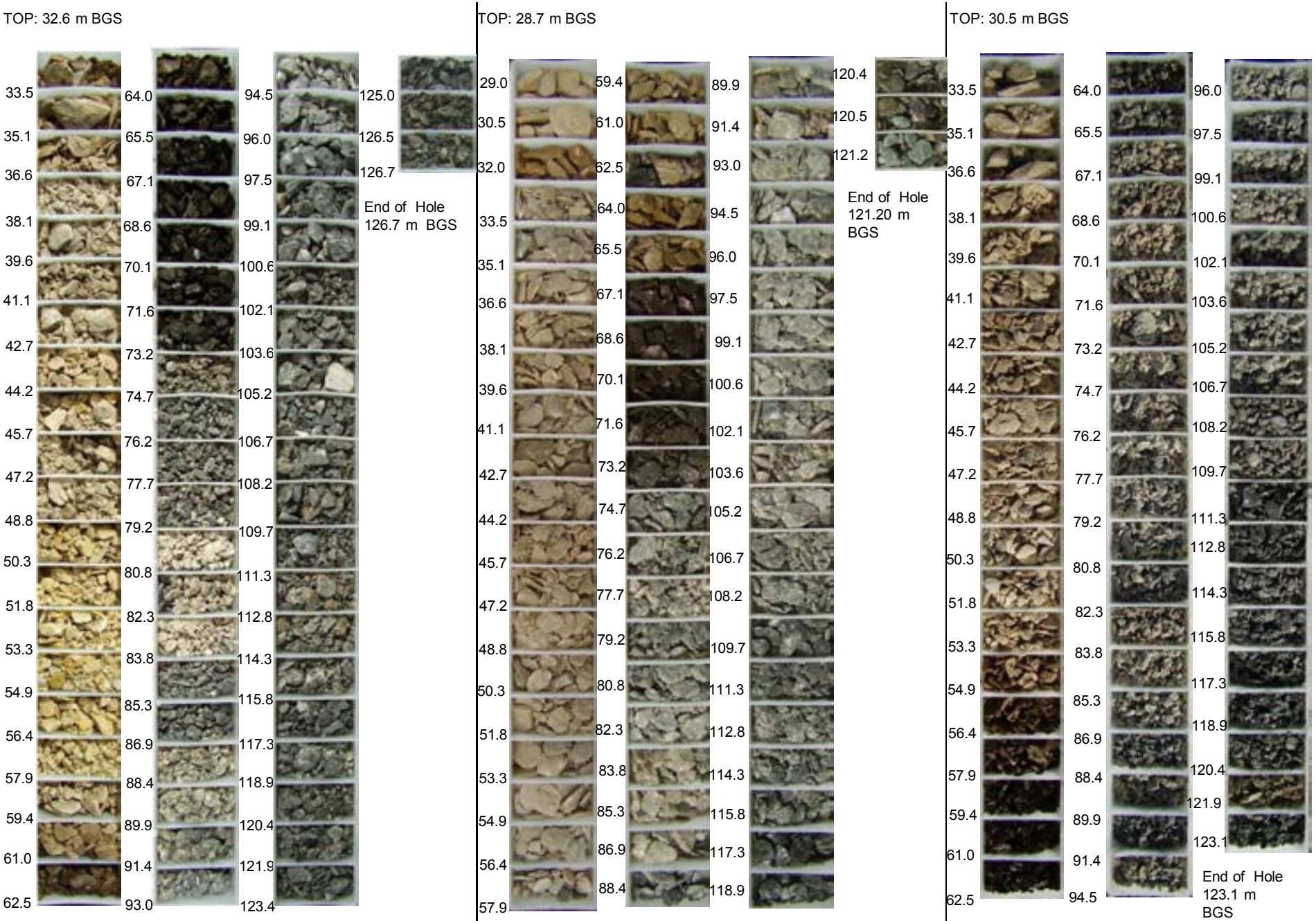

PBTW1-05
CMTW1-05
SMTW1-05
TOP: 29.2 m BGS
TOP: 20.1 m BGS
BOTTOM



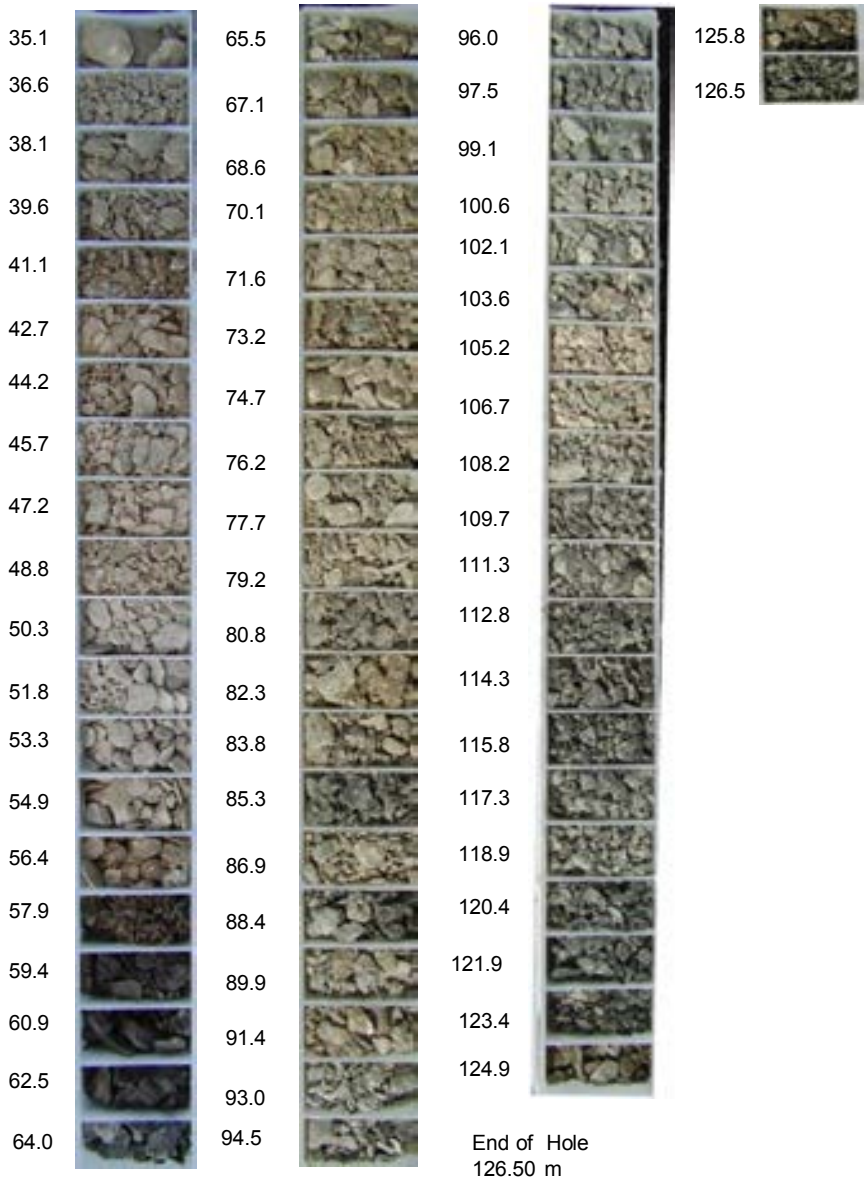
CMTW02-05



CMTW03-05

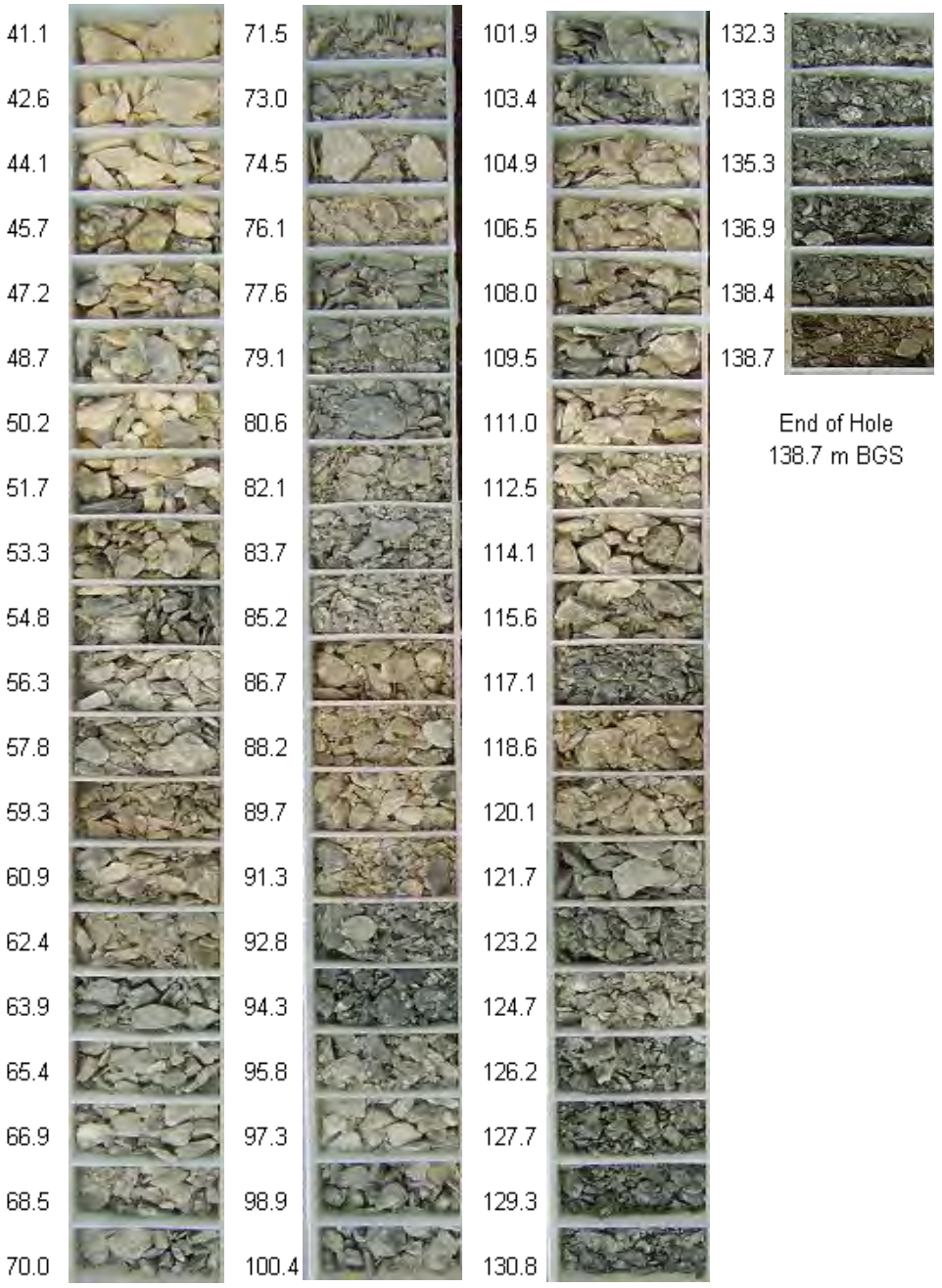

TOP: 32.6 m BGS
33.5
35.1
36.6
38.1
39.6
41.1
42.7
44.2
45.7
47.2
48.8
50.3
51.8
53.3
54.9
56.4
57.9
59.4
61.0
62.5
64.0
65.5
67.1
68.6
70.1
71.6
73.2
74.7
76.2
77.7
79.2
80.8
82.3
83.8
85.3
86.9
88.4
89.9
91.4
93.0
94.5
96.0
97.5
99.1
100.6
102.1
103.6
105.2
106.7
108.2
109.7
111.3
112.8
114.3
115.8
117.3
118.9
120.4
121.9
123.4
125.0
126.5
126.7
End of Hole
126.7 m BGS
CMOW1-06
TOP: 28.7 m BGS
29.0
30.5
32.0
33.5
35.1
36.6
38.1
39.6
41.1
42.7
44.2
45.7
47.2
48.8
50.3
51.8
53.3
54.9
56.4
57.9
59.4
61.0
62.5
64.0
65.5
67.1
68.6
70.1
71.6
73.2
74.7
76.2
77.7
79.2
80.8
82.3
83.8
85.3
86.9
88.4
89.9
91.4
93.0
94.5
96.0
97.5
99.1
100.6
102.1
103.6
105.2
106.7
108.2
109.7
111.3
112.8
114.3
115.8
117.3
118.9
120.4
120.5
121.2
End of Hole
121.20 m
BGS
CMOW2-06
TOP: 30.5 m BGS
33.5
35.1
36.6
38.1
39.6
41.1
42.7
44.2
45.7
47.2
48.8
50.3
51.8
53.3
54.9
56.4
57.9
59.4
61.0
62.5
64.0
65.5
67.1
68.6
70.1
71.6
73.2
74.7
76.2
77.7
79.2
80.8
82.3
83.8
85.3
86.9
88.4
89.9
91.4
94.5
96.0
97.5
99.1
100.6
102.1
103.6
105.2
106.7
108.2
109.7
111.3
112.8
114.3
115.8
117.3
118.9
120.4
121.9
123.1
End of Hole
123.1 m
BGS
CMOW3-06

TOP: 34.59m BGS



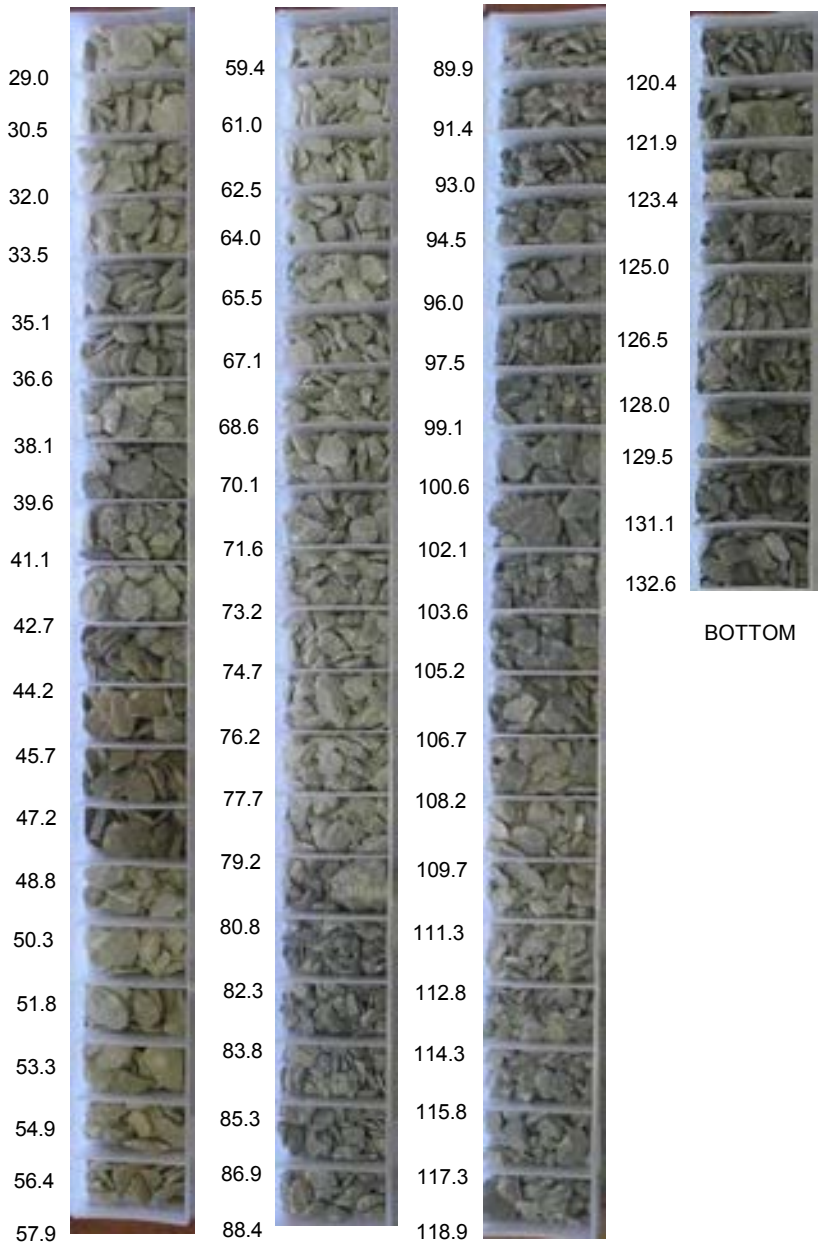
PBOW1-06

TOP: 39.9 m BGS



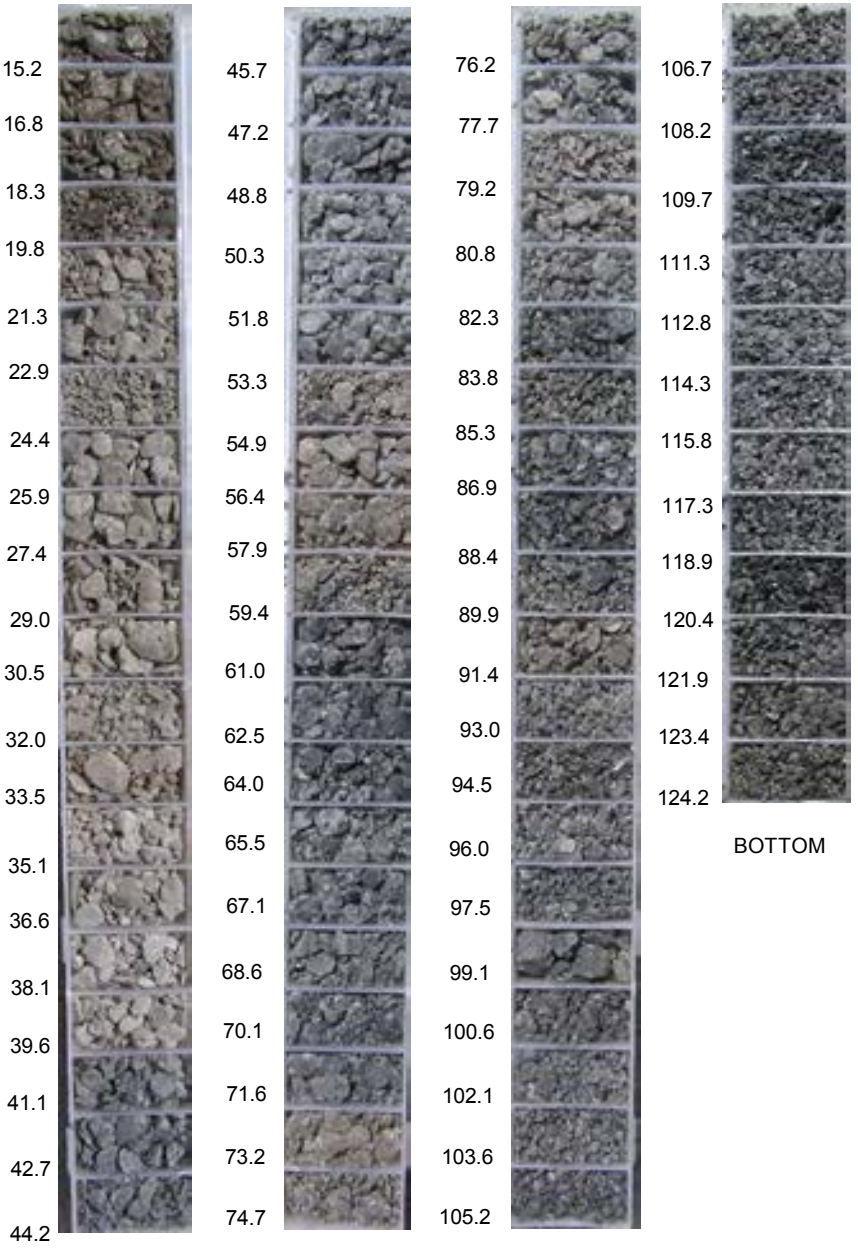
PBTW2-06

TOP: 27.4 m BGS



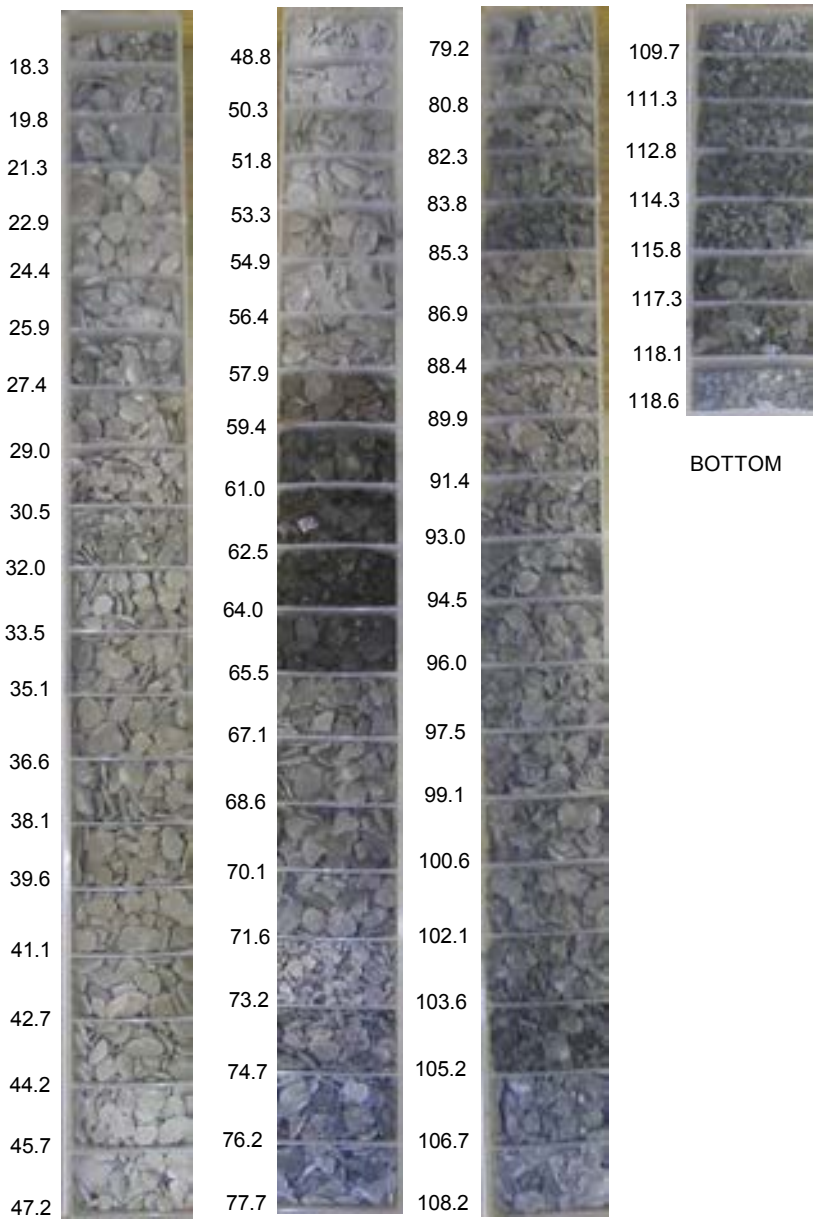
PBTW3-07

TOP: 14.2 m BGS



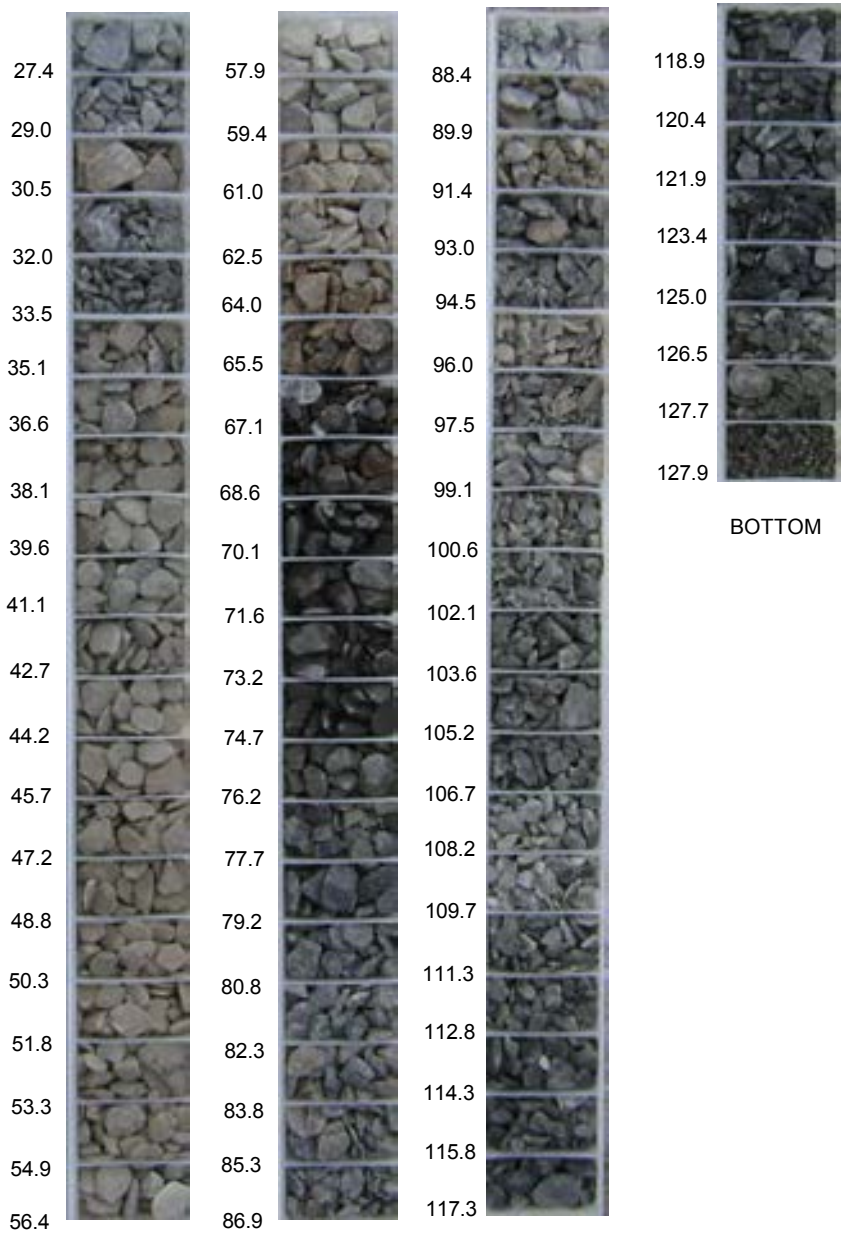
SMTW2-07

TOP: 16.8 m BGS

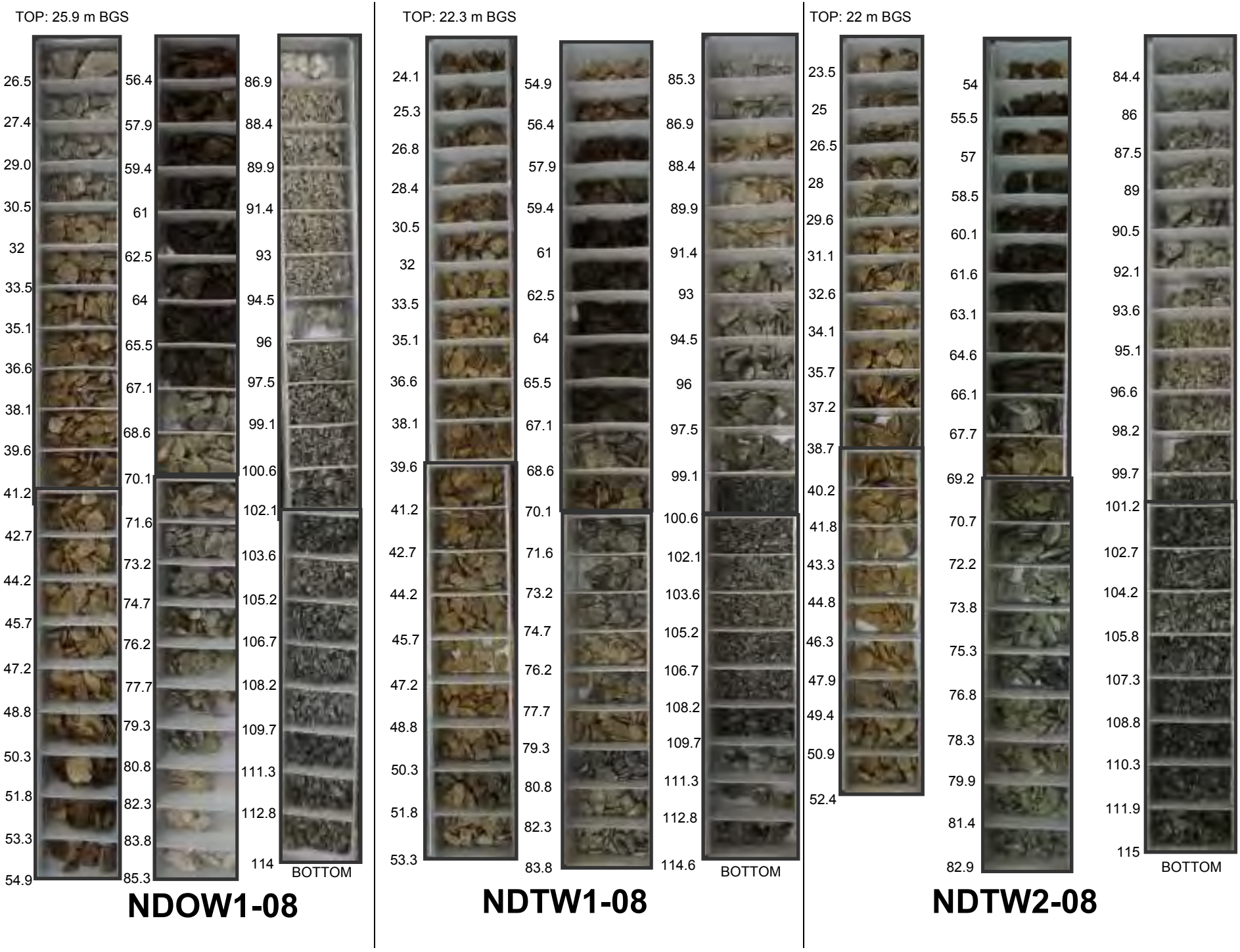


SMTW3-07

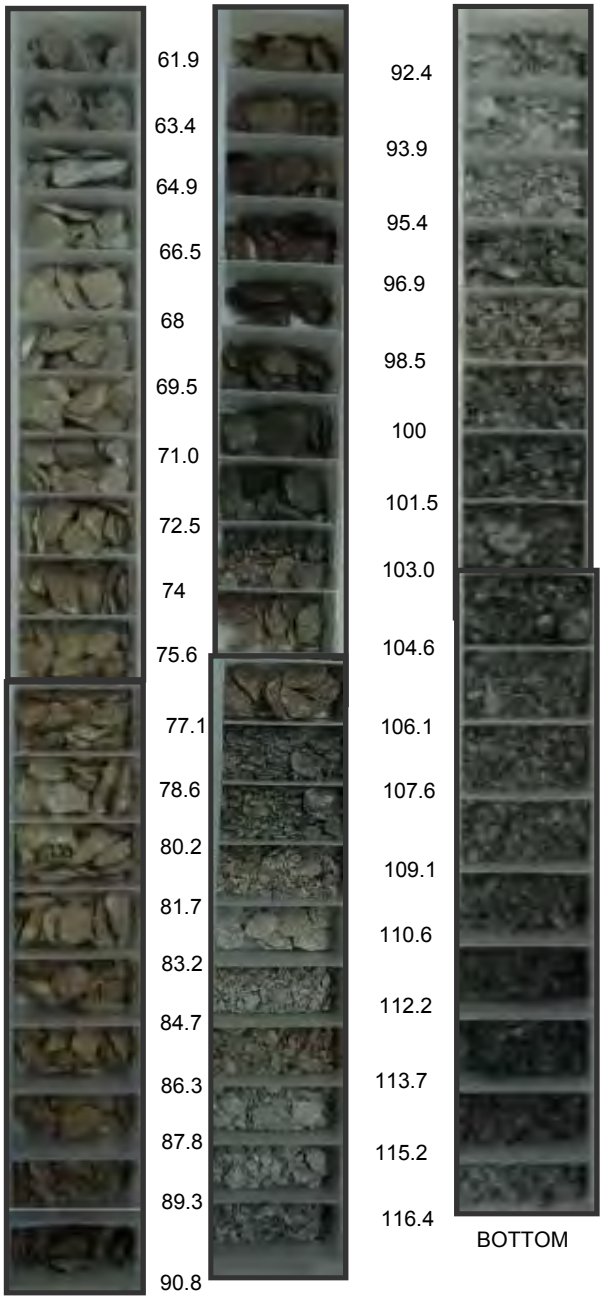
TOP: 25.9 m BGS



SMTW4-08


TOP: 25.9 m BGS
26.5
27.4
29.0
30.5
32
33.5
35.1
36.6
38.1
39.6
41.2
42.7
44.2
45.7
47.2
48.8
50.3
51.8
53.3
54.9
56.4
57.9
59.4
61
62.5
64
65.5
67.1
68.6
70.1
71.6
73.2
74.7
76.2
77.7
79.3
80.8
82.3
83.8
85.3
86.9
88.4
89.9
91.4
93
94.5
96
97.5
99.1
100.6
102.1
103.6
105.2
106.7
108.2
109.7
111.3
112.8
114
BOTTOM
NDOW1-08
TOP: 22.3 m BGS
24.1
25.3
26.8
28.4
30.5
32
33.5
35.1
36.6
38.1
39.6
41.2
42.7
44.2
45.7
47.2
48.8
50.3
51.8
53.3
54.9
56.4
57.9
59.4
61
62.5
64
65.5
67.1
68.6
70.1
71.6
73.2
74.7
76.2
77.7
79.3
80.8
82.3
83.8
85.3
86.9
88.4
89.9
91.4
93
94.5
96
97.5
99.1
100.6
102.1
103.6
105.2
106.7
108.2
109.7
111.3
112.8
114.6
BOTTOM
NDTW1-08
TOP: 22 m BGS
23.5
25
26.5
28
29.6
31.1
32.6
34.1
35.7
37.2
38.7
40.2
41.8
43.3
44.8
46.3
47.9
49.4
50.9
52.4
54
55.5
57
58.5
60.1
61.6
63.1
64.6
66.1
67.7
69.2
70.7
72.2
73.8
75.3
76.8
78.3
79.9
81.4
82.9
84.4
86
87.5
89
90.5
92.1
93.6
95.1
96.6
98.2
99.7
101.2
102.7
104.2
105.8
107.3
108.8
110.3
111.9
115
BOTTOM
NDTW2-08

TOP: 29.8 m BGS



NDOW2-08

Test Well Water Bearing Zones

Location	Well ID	Depth (mbgs)
Clemens Mill – Portuguese Club	CMTW1-05	60.9
		70.1
		79.5
		80.7
		85.3 to 86.9
		91.4
Clemens Mill – Cedarbrook Crt.	CMTW2-05	41.7
		80.7
		94.4 to 102.1
Clemens Mill – Burnett Ave.	CMTW3-05	71.9
		89.9 to 91.4
		96
		97.5 to 99.6
		101.4
Pinebush – Townline Road	PBTW1-05	30.7 to 37.8
		39.9 to 42.6
		65.2 to 65.5
		102.1 to 103.6
		106.6 to 115.8
Pinebush – Witmer Park	PBTW2-06	41.5
		94.5 to 96.0
		108.2 to 109.7
		111.3 to 112.8
		121.9 to 123.4
Pinebush - Can-Amera Pkwy	PBTW3-07	48.2
		60.1
		62.5 to 62.8
		78.6 to 79.6
		79.9 to 81.1
		90.8
		94.2 to 94.5
		99.7 to 100.3
Shades Mill – GRCA Land	SMTW1-05	23.1
		28.9
		60.9 to 91.4
Shades Mill - GRCA Headquarters	SMTW2-07	46 to 48
		53 to 56
		95 to 105
Shades Mill - 640 Clyde Road	SMTW3-07	77 to 78
		82 to 86
Shades Mill - GRCA Land	SMTW4-08	85 to 105

Table A2.1
Test Well Water Bearing Zones

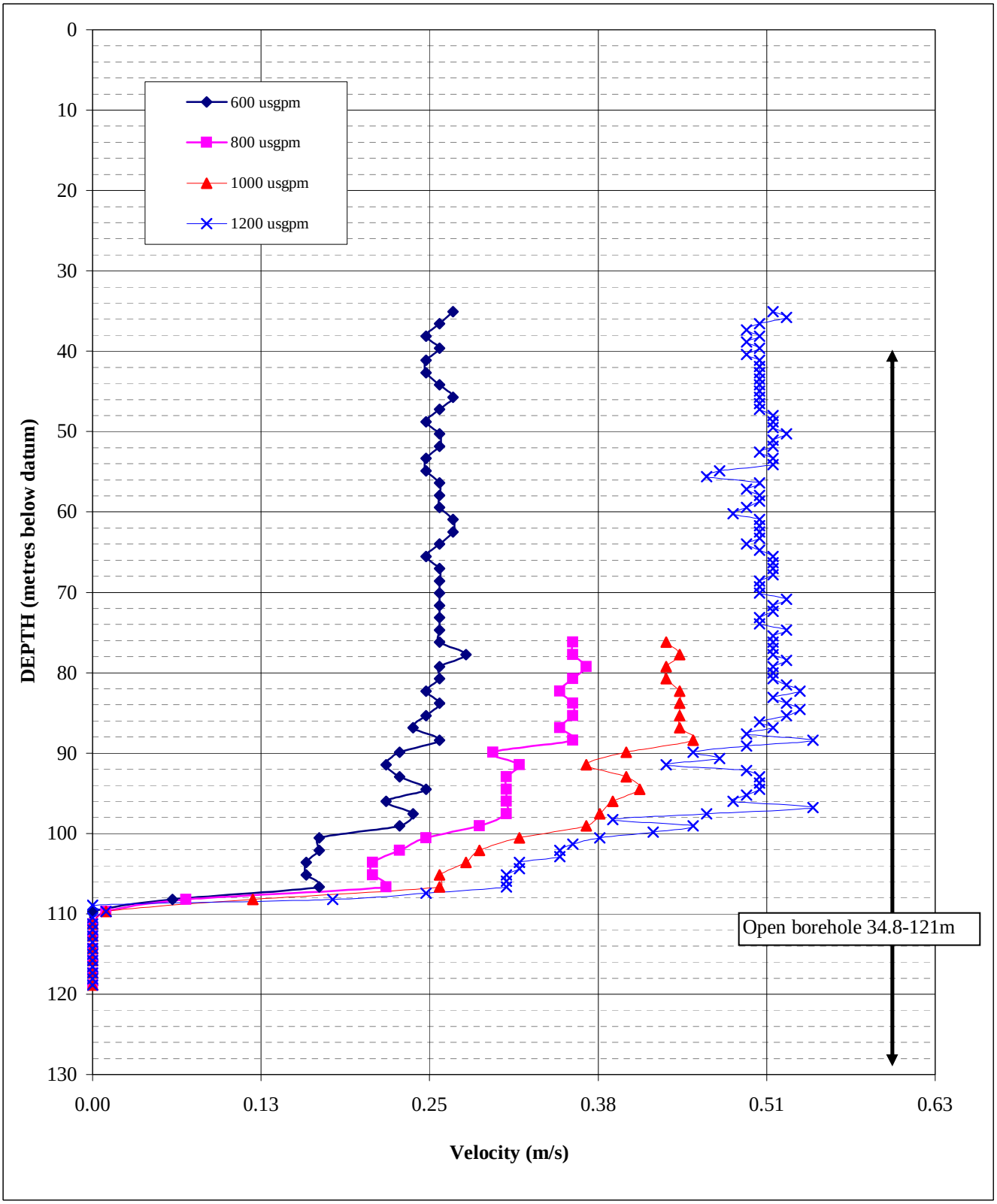
Location	Well ID	Depth (mbgs)
North Dumfries - Clyde Park	NDTW1-08	32.3
		34.7
		37.5
		40.2
		43.6
		46.3
		50.3 to 50.6
		61.0
		78.9 to 81.7
		88.7 to 91.1
		93.2 to 95.4
North Dumfries - Clyde Park	NDTW2-08	27.7
		32.3
		39
		42.4 to 43.9
		54.2 to 55.4
		66.4
		68.3
		70.7 to 71.0
		79.6
		87.7 to 90.5

NOTE: Water producing zones were determined from drill action, noticeable increases observed in water discharge, and by rough water discharge measurements.

Table A2.2
Bedrock Flow Interval Summary for Cambridge East Test Wells

Hydrostratigraphic Unit Description	Depth of Flow Intervals (mbgs) and % Flow Contribution (Approximate)									
	CMPW2-06	CMPW1-06	PBPW2-08	PBPW1-06	SMTW2-07	SMTW3-07	SMTW4-08	SM3-93	NDTW1-08	NDTW2-08
Guelph Formation	No Flow	No Flow	No Flow	No Flow	Low Flow	Low Flow	No Flow	No Flow	Low Flow	No Flow
Eramosa - Reformatory Quarry	No Flow	N/A	No Flow	N/A	NA	Low Flow	No Flow	No Flow	No Flow	No Flow
Eramosa - Vinemount	No Flow	N/A	N/A	N/A	NA	No Flow	No Flow	No Flow	No Flow	No Flow
Goat Island	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Upper Gasport	No Flow	70-90m (50% of Flow)	78-82m (30% of Flow)	No Flow	No Flow	Majority of Flow 75-85 m	No Flow	No Flow	No Flow	No Flow
Middle Gasport	98-112m (100% of Flow)	90-105m (50% of Flow)	90-105m (70% of Flow)	Majority 105-120m (100% of Flow)	Majority of Flow 90-105m	No Flow	Majority of Flow 90-110 m	Majority of Flow 93-100 m	Majority of Flow 92-100 m	Majority of Flow 88-95 m
Lower Gasport (including Rochester / Irondequoit / Rockway / Merritton Formations)	No Flow	No Flow	N/A	No Flow	No Flow	No Flow	No Flow	No Flow	Low Flow	No Flow

Notes:
Source: Dynamic Flow Profiling



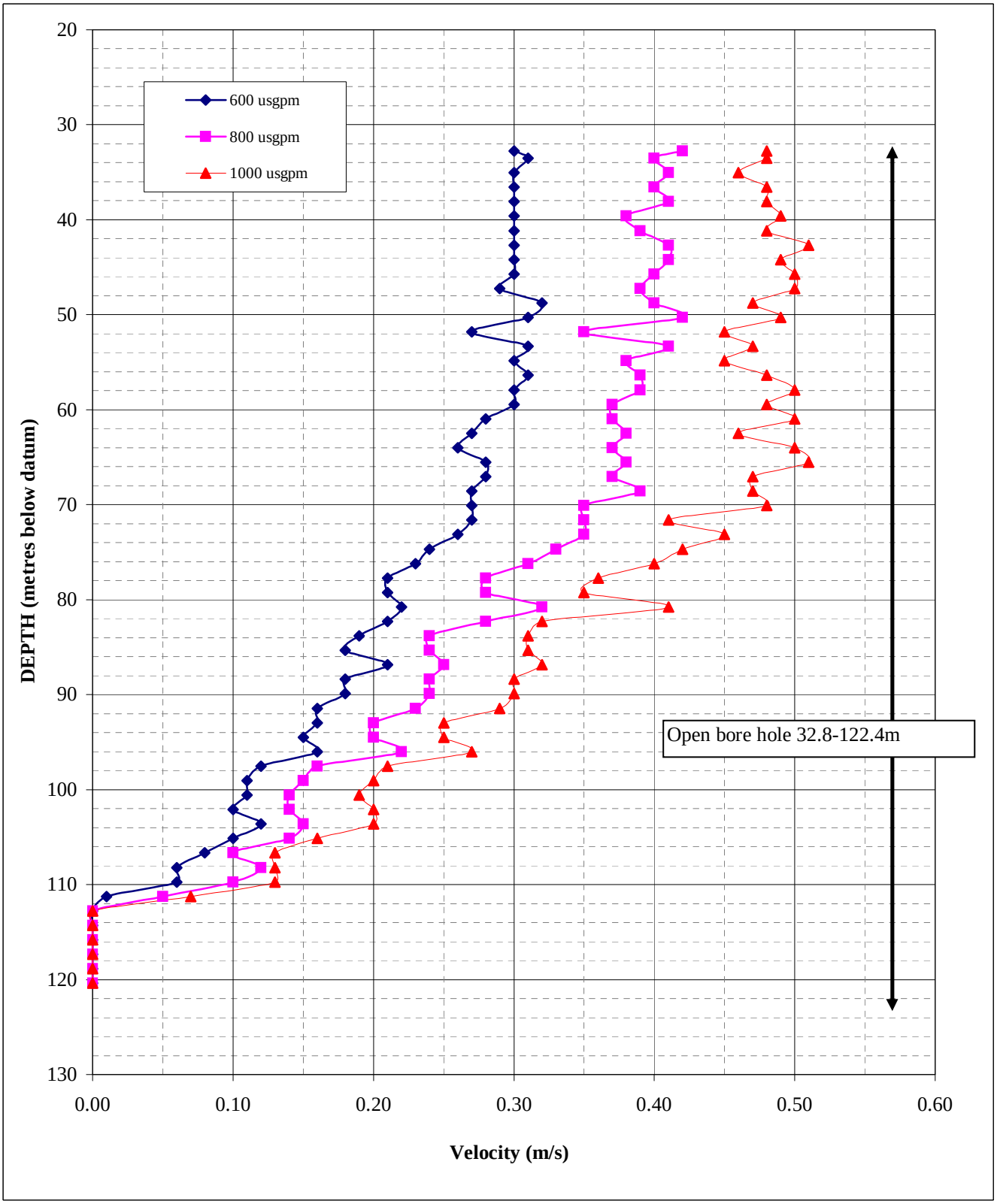
Notes:
Measurment point: Top of casing 0.70m above ground
Unable to collect data above 76m at 800 & 1000 usgpm steps due to binding of flow tool cable

REGION OF WATERLOO

Cedarbrook Well
Flow Distribution Profile
August 16, 2006

Lotowater **Figure 1**

Reference: 006-095 06/08/17



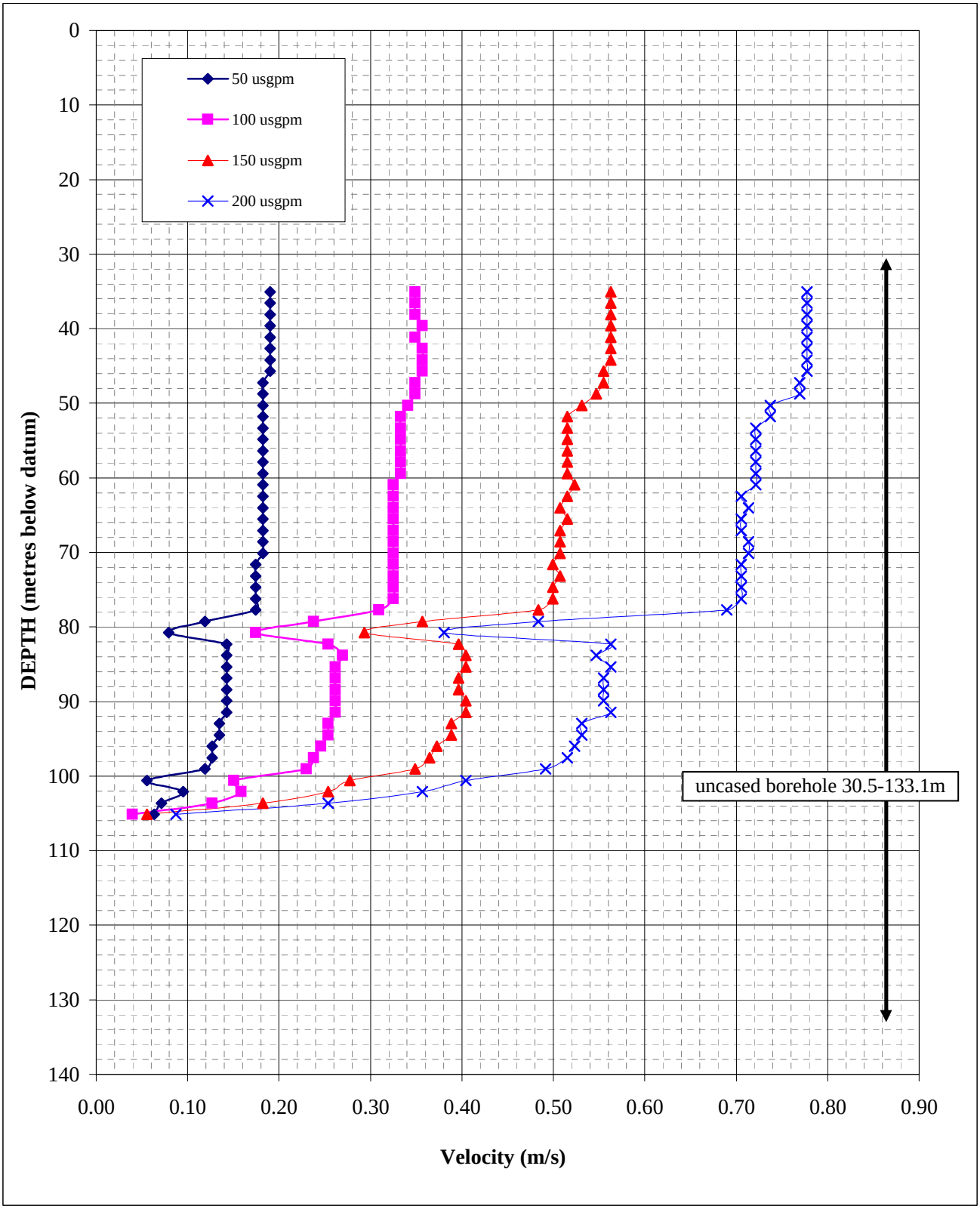
Notes:
Measurment Datum: Top of casing 0.50m above ground

REGION OF WATERLOO

Portuguese Club Well
Flow Distribution Profile
August 14, 2006

Lotowater **Figure 1**

Reference: 006-095 06/08/15



Notes:

Measurement point:
Approximate pump se Top of casing 0.90m above ground
Could not get tool below 105.1 m, possible bridge
Static water level = 7.43m btc

REGION OF WATERLOO

Can-America Pkwy Well
Flow Distribution Profile
February 6, 2008

Lotowater **Figure 1**

Reference: 006-105 08/02/07

Can-America Pkwy Well

006-105

Flow Rate:	3.15	L/s
	50	usgpm
Casing Diameter:	6	in (nominal)
	0.1524	m
Theoretical Max V:	0.17	m/s
Reference Elev:	Top of casing (0.90 m above ground)	
Botom of casing:	30.5	mbtc
TD:	133.1	mbtc

Test Start: 2/6/2008 11:30
Test Stop: 2/6/2008 13:30

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
345	105.15	0.06	37%
340	103.63	0.07	41%
335	102.10	0.10	55%
330	100.58	0.06	32%
325	99.06	0.12	69%
320	97.53	0.13	73%
315	96.01	0.13	73%
310	94.48	0.13	78%
305	92.96	0.13	78%
300	91.44	0.14	83%
295	89.91	0.14	83%
290	88.39	0.14	83%
285	86.86	0.14	83%
280	85.34	0.14	83%
275	83.82	0.14	83%
270	82.29	0.14	83%
265	80.77	0.08	46%
260	79.24	0.12	69%
255	77.72	0.17	101%
250	76.20	0.17	101%
245	74.67	0.17	101%
240	73.15	0.17	101%
235	71.62	0.17	101%
230	70.10	0.18	105%
225	68.58	0.18	105%
220	67.05	0.18	105%
215	65.53	0.18	105%
210	64.00	0.18	105%
205	62.48	0.18	105%
200	60.96	0.18	105%
195	59.43	0.18	105%
190	57.91	0.18	105%
185	56.39	0.18	105%
180	54.86	0.18	105%
175	53.34	0.18	105%
170	51.81	0.18	105%
165	50.29	0.18	105%
160	48.77	0.18	105%
155	47.24	0.18	105%
150	45.72	0.19	110%
145	44.19	0.19	110%
140	42.67	0.19	110%
135	41.15	0.19	110%
130	39.62	0.19	110%
125	38.10	0.19	110%
120	36.57	0.19	110%
115	35.05	0.19	110%

* Calibrated tool speed

Can-America Pkwy Well

006-105

Flow Rate:	6.31	L/s
	100	usgpm
Casing Diameter:	6	in (nominal)
	0.1524	m
Theoretical Max V:	0.35	m/s
Reference Elev:	Top of casing (0.90 m above ground)	
Botom of casing:	30.5	m
TD:	133.1	m

Test Start: 2/6/2008 13:30
Test Stop: 2/6/2008 15:30

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
345	105.15	0.04	11%
340	103.63	0.13	37%
335	102.10	0.16	46%
330	100.58	0.15	44%
325	99.06	0.23	66%
320	97.53	0.24	69%
315	96.01	0.25	71%
310	94.48	0.25	73%
305	92.96	0.25	73%
300	91.44	0.26	76%
295	89.91	0.26	76%
290	88.39	0.26	76%
285	86.86	0.26	76%
280	85.34	0.26	76%
275	83.82	0.27	78%
270	82.29	0.25	73%
265	80.77	0.17	50%
260	79.24	0.24	69%
255	77.72	0.31	89%
250	76.20	0.33	94%
245	74.67	0.33	94%
240	73.15	0.33	94%
235	71.62	0.33	94%
230	70.10	0.33	94%
225	68.58	0.33	94%
220	67.05	0.33	94%
215	65.53	0.33	94%
210	64.00	0.33	94%
205	62.48	0.33	94%
200	60.96	0.33	94%
195	59.43	0.33	96%
190	57.91	0.33	96%
185	56.39	0.33	96%
180	54.86	0.33	96%
175	53.34	0.33	96%
170	51.81	0.33	96%
165	50.29	0.34	99%
160	48.77	0.35	101%
155	47.24	0.35	101%
150	45.72	0.36	103%
145	44.19	0.36	103%
140	42.67	0.36	103%
135	41.15	0.35	101%
130	39.62	0.36	103%
125	38.10	0.35	101%
120	36.57	0.35	101%
115	35.05	0.35	101%

* Calibrated tool speed

Can-America Pkwy Well

006-105

Flow Rate:	9.46	L/s
	150	usgpm
Casing Diameter:	6	in (nominal)
	0.1524	m
Theoretical Max V:	0.52	m/s
Reference Elev:	Top of casing (0.90 m above ground)	
Botom of casing:	30.5	m
TD:	133.1	m

Test Start: 2/6/2008 15:30
Test Stop: 2/6/2008 17:30

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
345	105.15	0.06	11%
340	103.63	0.18	35%
335	102.10	0.25	49%
330	100.58	0.28	53%
325	99.06	0.35	67%
320	97.53	0.36	70%
315	96.01	0.37	72%
310	94.48	0.39	75%
305	92.96	0.39	75%
300	91.44	0.40	78%
295	89.91	0.40	78%
290	88.39	0.40	76%
285	86.86	0.40	76%
280	85.34	0.40	78%
275	83.82	0.40	78%
270	82.29	0.40	76%
265	80.77	0.29	57%
260	79.24	0.36	69%
255	77.72	0.48	93%
250	76.20	0.50	96%
245	74.67	0.50	96%
240	73.15	0.51	98%
235	71.62	0.50	96%
230	70.10	0.51	98%
225	68.58	0.51	98%
220	67.05	0.51	98%
215	65.53	0.52	99%
210	64.00	0.51	98%
205	62.48	0.52	99%
200	60.96	0.52	101%
195	59.43	0.52	99%
190	57.91	0.52	99%
185	56.39	0.52	99%
180	54.86	0.52	99%
175	53.34	0.52	99%
170	51.81	0.52	99%
165	50.29	0.53	102%
160	48.77	0.55	105%
155	47.24	0.56	107%
150	45.72	0.56	107%
145	44.19	0.56	108%
140	42.67	0.56	108%
135	41.15	0.56	108%
130	39.62	0.56	108%
125	38.10	0.56	108%
120	36.57	0.56	108%
115	35.05	0.56	108%

* Calibrated tool speed

Can-America Pkwy Well

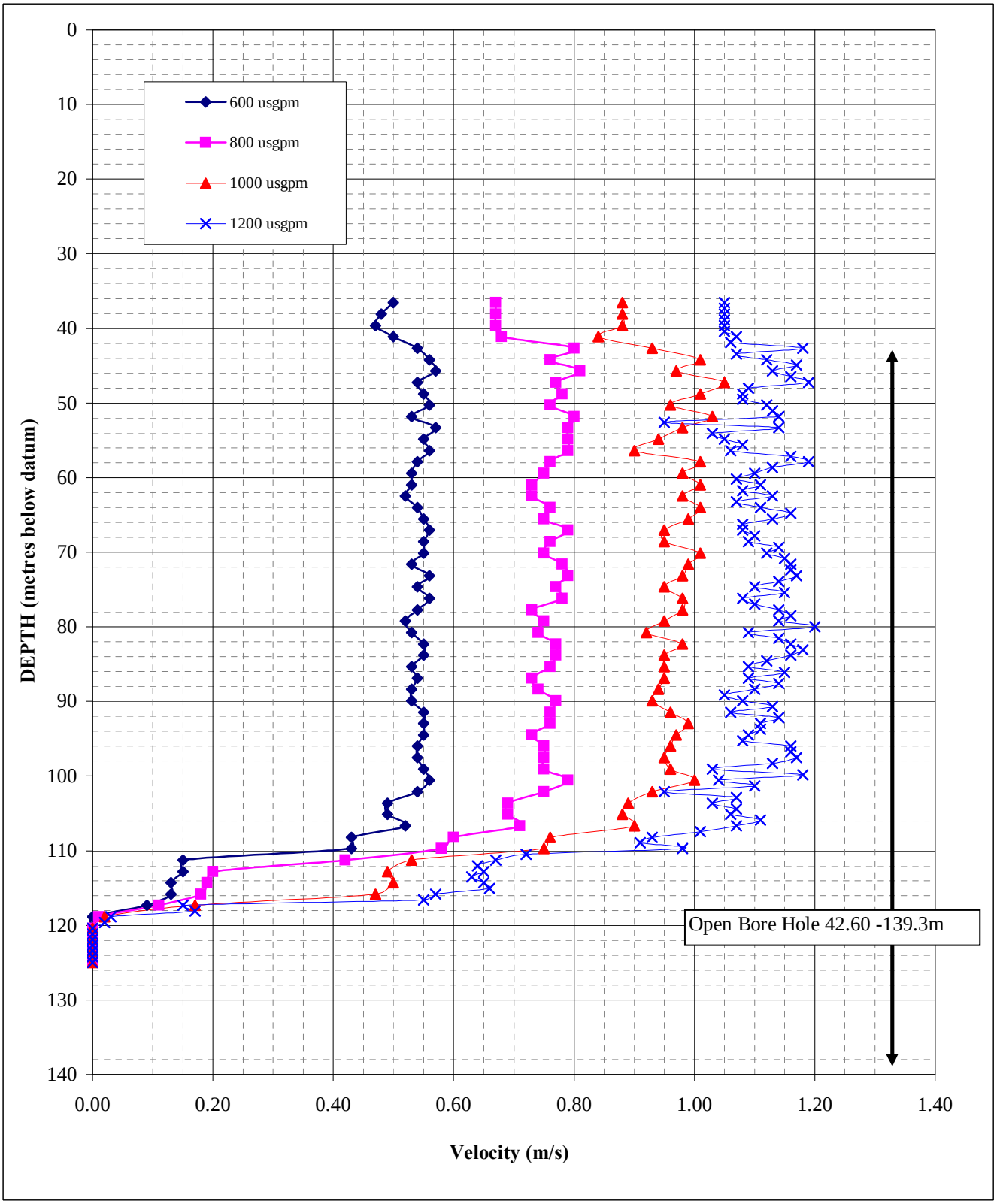
006-105

Flow Rate:	12.62	L/s
	200	usgpm
Casing Diameter:	6	in (nominal)
	0.1524	m
Theoretical Max V:	0.69	m/s
Reference Elev:	Top of casing (0.90 m above ground)	
Botom of casing:	30.5	m
TD:	133.1	m

Test Start:	2/6/2008 17:30
Test Stop:	2/6/2008 19:30

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
345	105.15	0.09	13%
340	103.63	0.25	37%
335	102.10	0.36	52%
330	100.58	0.40	58%
325	99.06	0.49	71%
320	97.53	0.52	74%
315	96.01	0.52	76%
310	94.48	0.53	77%
305	92.96	0.53	77%
300	91.44	0.56	81%
295	89.91	0.56	80%
290	88.39	0.56	80%
285	86.86	0.56	80%
280	85.34	0.56	81%
275	83.82	0.55	79%
270	82.29	0.56	81%
265	80.77	0.38	55%
260	79.24	0.48	70%
255	77.72	0.69	100%
250	76.20	0.71	102%
245	74.67	0.71	102%
240	73.15	0.71	102%
235	71.62	0.71	102%
230	70.10	0.71	103%
225	68.58	0.71	103%
220	67.05	0.71	102%
215	65.53	0.71	102%
210	64.00	0.71	103%
205	62.48	0.71	102%
200	60.96	0.72	104%
195	59.43	0.72	104%
190	57.91	0.72	104%
185	56.39	0.72	104%
180	54.86	0.72	104%
175	53.34	0.72	104%
170	51.81	0.74	107%
165	50.29	0.74	107%
160	48.77	0.77	111%
155	47.24	0.77	111%
150	45.72	0.78	112%
145	44.19	0.78	112%
140	42.67	0.78	112%
135	41.15	0.78	112%
130	39.62	0.78	112%
125	38.10	0.78	112%
120	36.57	0.78	112%
115	35.05	0.78	112%

* Calibrated tool speed



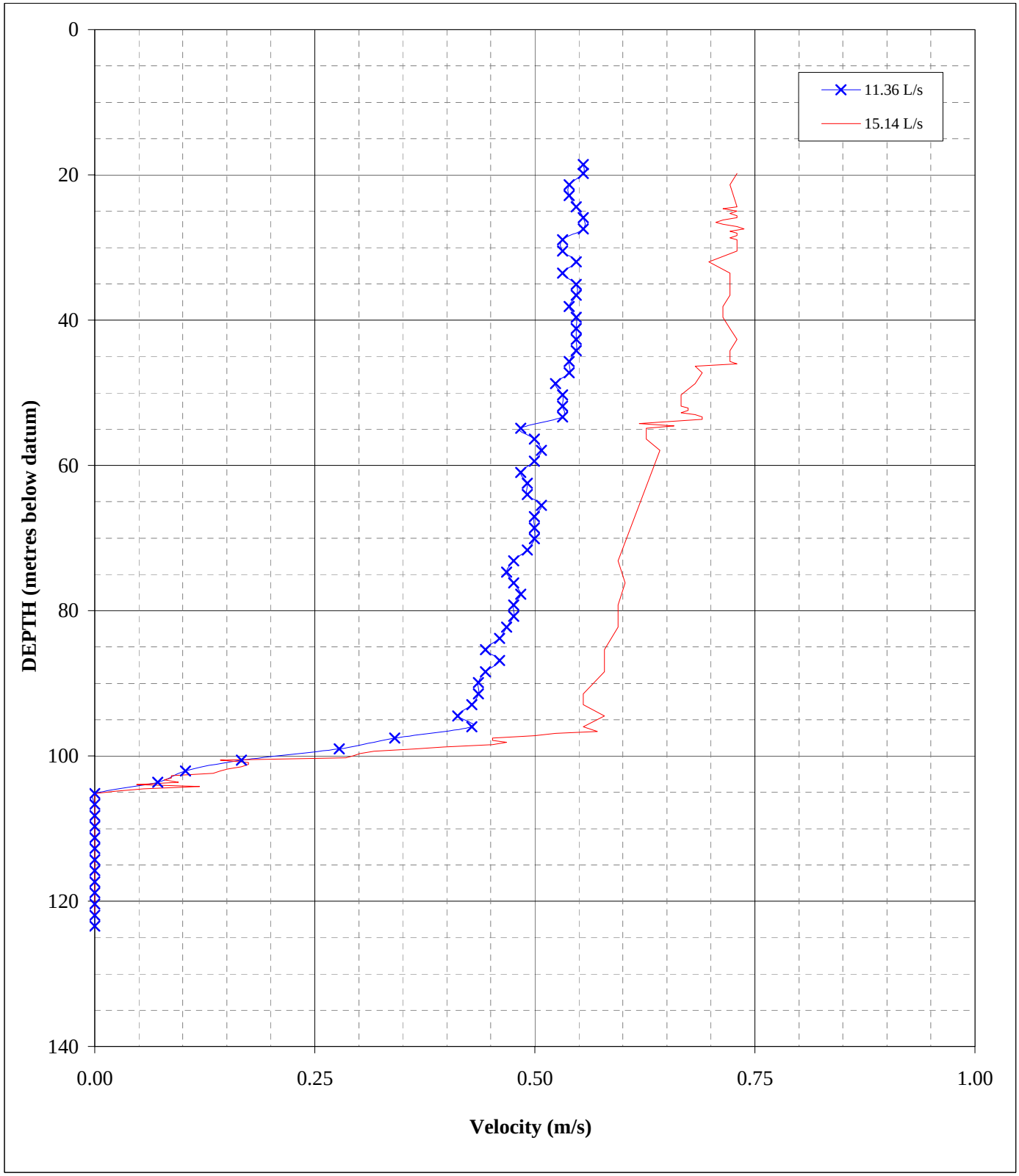
Notes:
Measurment point: Top of casing 0.54m above ground

REGION OF WATERLOO

Witmer Park Well
Flow Distribution Profile
August 10, 2006

Lotowater **Figure 1**

Reference: 006-095 06/08/14



Notes:

Date of Test: 9/18/2007
Measurement Point: top of casing
Well Diameter: 150 mm

REGION OF WATERLOO

East Cambridge

SM TW2-07

Lotowater Technical Services Inc. **Figure 1**

Reference: 006-105 07/09/20

Well Flow Profile

Project Number: 006-105
Well Name: SM TW2-07
Date Logged: 9/18/2007
Logged By: Nathan Schmitt
Measuring Point: top of casing
Flow Rate: 11.36 **L/s**
Casing Diameter: 150 **mm**
Theoretical Max V: 0.64 **m/s**
Test Start:
Test Stop:
Bottom of Casing: **m**
TD: 124.1 **m**
Pump inlet: 16.2 **m**
SWL: 5.8 **m**
PWL: **m**

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
405	123.44	0.00	0%
400	121.91	0.00	0%
395	120.39	0.00	0%
390	118.87	0.00	0%
385	117.34	0.00	0%
380	115.82	0.00	0%
375	114.29	0.00	0%
370	112.77	0.00	0%
365	111.25	0.00	0%
360	109.72	0.00	0%
355	108.20	0.00	0%
350	106.67	0.00	0%
345	105.15	0.00	0%
340	103.63	0.07	11%
335	102.10	0.10	16%
330	100.58	0.17	26%
325	99.06	0.28	43%
320	97.53	0.34	53%
315	96.01	0.43	67%
310	94.48	0.41	64%
305	92.96	0.43	67%
300	91.44	0.44	68%
295	89.91	0.44	68%
290	88.39	0.44	69%
285	86.86	0.46	72%
280	85.34	0.44	69%
275	83.82	0.46	72%
270	82.29	0.47	73%
265	80.77	0.48	74%
260	79.24	0.48	74%
255	77.72	0.48	75%
250	76.20	0.48	74%
245	74.67	0.47	73%
240	73.15	0.48	74%
235	71.62	0.49	76%
230	70.10	0.50	78%
225	68.58	0.50	78%
220	67.05	0.50	78%
215	65.53	0.51	79%
210	64.00	0.49	76%
205	62.48	0.49	76%
200	60.96	0.48	75%
195	59.43	0.50	78%
190	57.91	0.51	79%
185	56.39	0.50	78%
180	54.86	0.48	75%
175	53.34	0.53	83%
170	51.81	0.53	83%
165	50.29	0.53	83%
160	48.77	0.52	81%
155	47.24	0.54	84%
150	45.72	0.54	84%
145	44.19	0.55	85%
140	42.67	0.55	85%
135	41.15	0.55	85%
130	39.62	0.55	85%
125	38.10	0.54	84%
120	36.57	0.55	85%
115	35.05	0.55	85%
110	33.53	0.53	83%
105	32.00	0.55	85%
100	30.48	0.53	83%
95	28.95	0.53	83%
90	27.43	0.56	86%
85	25.91	0.56	86%
80	24.38	0.55	85%
75	22.86	0.54	84%
70	21.33	0.54	84%
65	19.81	0.56	86%
61	18.59	0.56	86%

* Calibrated tool speed

Tool calibration based on Mar 14, 2006 LTS pit calibration (Jeff Neuman

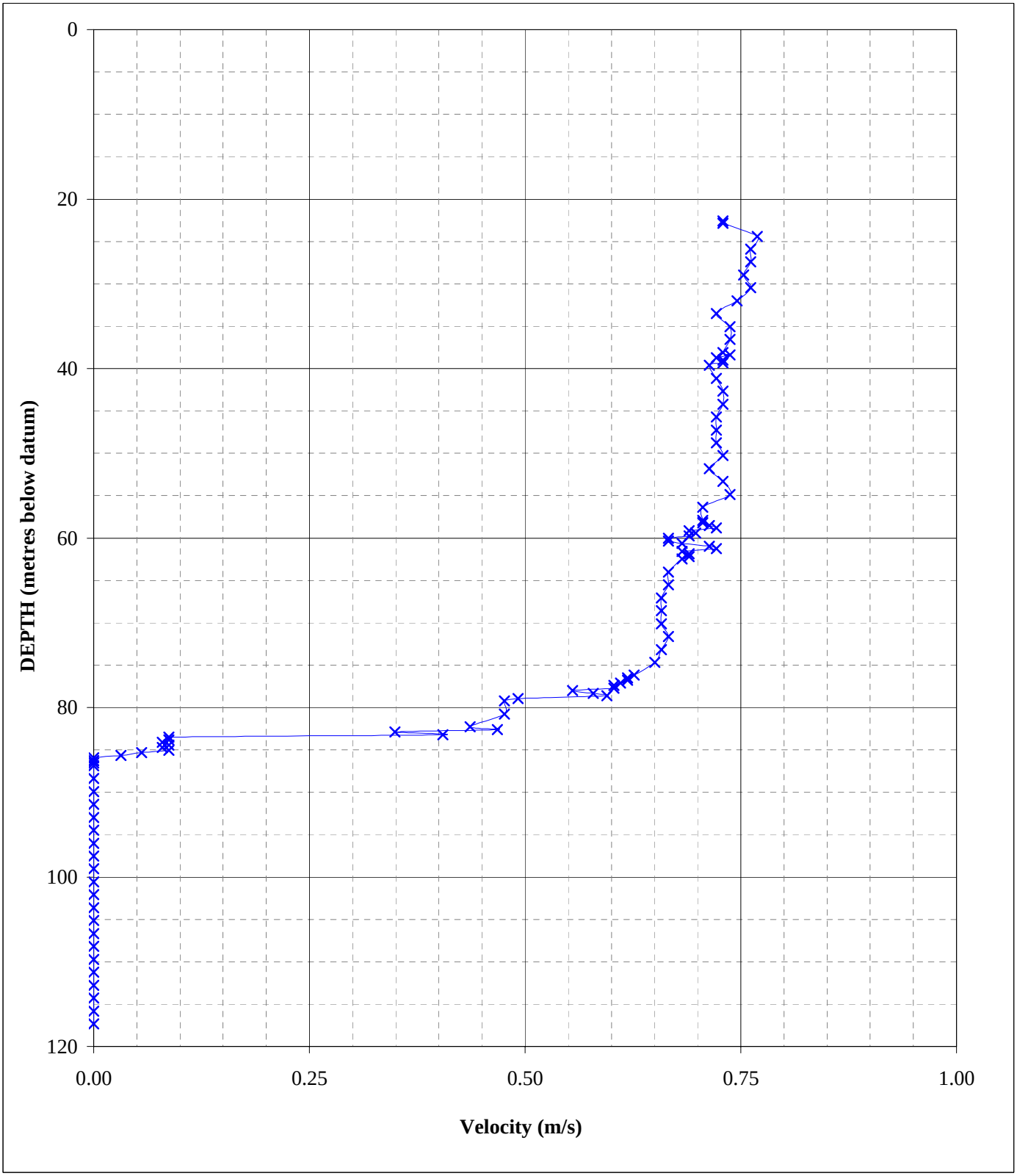
Well Flow Profile

Project Number:	006-105	
Well Name:	SM TW2-07	
Date Logged:	9/18/2007	
Logged By:	Nathan Schmitt	
Measuring Point:	top of casing	
Flow Rate:	15.14	**L/s**
Casing Diameter:	150	**mm**
Theoretical Max V:	0.86	**m/s**
Test Start:		
Test Stop:		
Bottom of Casing:		**m**
TD:	124.1	**m**
Pump inlet:	16.2	**m**
SWL:	5.8	**m**
PWL:		**m**

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
400	121.91	0.00	0%
390	118.87	0.00	0%
380	115.82	0.00	0%
370	112.77	0.00	0%
360	109.72	0.00	0%
350	106.67	0.00	0%
345	105.15	0.00	0%
344	104.85	0.02	3%
343	104.54	0.06	6%
342	104.24	0.12	14%
341	103.93	0.05	6%
340	103.63	0.10	11%
339	103.32	0.08	9%
338	103.02	0.09	10%
337	102.71	0.09	10%
336	102.41	0.13	16%
335	102.10	0.14	17%
334	101.80	0.15	18%
333	101.49	0.17	19%
332	101.19	0.17	20%
331	100.88	0.17	20%
330	100.58	0.14	17%
329	100.27	0.29	33%
328	99.97	0.29	34%
327	99.66	0.30	35%
326	99.36	0.32	37%
325	99.06	0.36	43%
324	98.75	0.40	46%
323	98.45	0.45	53%
322	98.14	0.47	55%
321	97.84	0.45	53%
320	97.53	0.45	53%
319	97.23	0.50	58%
318	96.92	0.52	61%
317	96.62	0.57	67%
316	96.31	0.56	66%
315	96.01	0.56	65%
310	94.48	0.58	68%
305	92.96	0.56	65%
300	91.44	0.56	65%
290	88.39	0.58	68%
280	85.34	0.58	68%
270	82.29	0.59	69%
260	79.24	0.59	69%
250	76.20	0.60	70%
240	73.15	0.59	69%
190	57.91	0.64	75%
185	56.39	0.63	73%
180	54.86	0.63	73%
179	54.56	0.66	77%
178	54.25	0.62	72%
177	53.95	0.66	77%
176	53.64	0.69	80%
175	53.34	0.69	80%
174	53.03	0.68	80%
173	52.73	0.67	78%
172	52.42	0.67	79%
171	52.12	0.67	79%
170	51.81	0.67	78%
169	51.51	0.67	78%
165	50.29	0.67	78%
160	48.77	0.68	80%
155	47.24	0.69	80%
152	46.33	0.68	80%
151	46.02	0.73	85%
150	45.72	0.72	84%
145	44.19	0.72	84%
140	42.67	0.73	85%
135	41.15	0.72	84%
130	39.62	0.71	83%
125	38.10	0.71	105%
120	36.57	0.72	106%
115	35.05	0.72	106%
110	33.53	0.72	106%
105	32.00	0.70	103%
100	30.48	0.73	107%
95	28.95	0.73	107%
94	28.65	0.72	106%
93	28.35	0.73	107%
92	28.04	0.73	107%
91	27.74	0.72	106%
90	27.43	0.74	108%
89	27.13	0.73	107%
88	26.82	0.71	105%
87	26.52	0.71	104%
86	26.21	0.71	105%
85	25.91	0.73	107%
84	25.60	0.73	107%
83	25.30	0.72	106%
82	24.99	0.73	107%
81	24.69	0.71	105%
80	24.38	0.73	107%
70	21.33	0.72	106%
65	19.81	0.73	107%

* Calibrated tool speed

Tool calibration based on Mar 14, 2006 LTS pit calibration (Jeff Neuma



Notes:

Date of Test: 9/20/2007
Measurement Point: top of casing
Flow Rate: 15.15 L/s

REGION OF WATERLOO

East Cambridge

SM TW3-07

Lotowater Technical Services Inc. **Figure 3**

Reference: 006-105 07/09/20

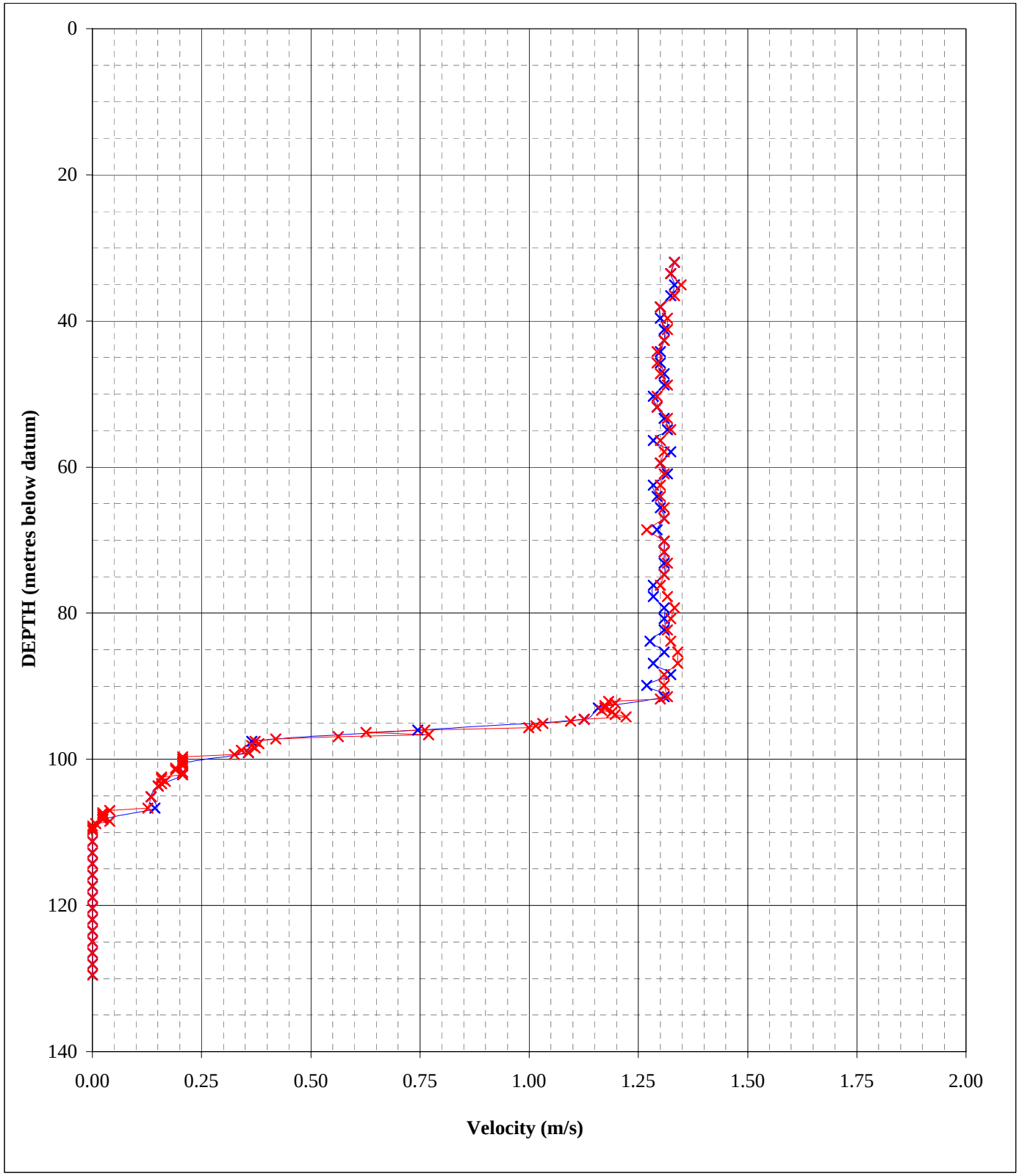
Well Flow Profile

Project Number:	006-105	
Well Name:	SM TW3-07	
Date Logged:	9/20/2007	
Logged By:	Nathan Schmitt	
Measuring Point:	top of casing	
Flow Rate:	15.15	**L/s**
Casing Diameter:	150	**mm**
Theoretical Max V:	0.86	**m/s**
Test Start:	15:00	
Test Stop:		
Bottom of Casing:		**m**
TD:		**m**
Pump inlet:		**m**
SWL:		**m**
PWL:		**m**

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
385	117.34	0.00	0%
380	115.82	0.00	0%
375	114.29	0.00	0%
370	112.77	0.00	0%
365	111.25	0.00	0%
360	109.72	0.00	0%
355	108.20	0.00	0%
350	106.67	0.00	0%
345	105.15	0.00	0%
340	103.63	0.00	0%
335	102.10	0.00	0%
330	100.58	0.00	0%
325	99.06	0.00	0%
320	97.53	0.00	0%
315	96.01	0.00	0%
310	94.48	0.00	0%
305	92.96	0.00	0%
300	91.44	0.00	0%
295	89.91	0.00	0%
290	88.39	0.00	0%
285	86.86	0.00	0%
284	86.56	0.00	0%
283	86.25	0.00	0%
282	85.95	0.00	0%
281	85.64	0.03	4%
280	85.34	0.06	6%
279	85.04	0.09	10%
278	84.73	0.08	9%
277	84.43	0.09	10%
276	84.12	0.08	9%
275	83.82	0.09	10%
274	83.51	0.09	10%
273	83.21	0.40	47%
272	82.90	0.35	41%
271	82.60	0.47	55%
270	82.29	0.44	51%
265	80.77	0.48	55%
260	79.24	0.48	55%
259	78.94	0.49	57%
258	78.63	0.59	69%
257	78.33	0.58	67%
256	78.02	0.56	65%
255	77.72	0.60	70%
254	77.42	0.60	70%
253	77.11	0.61	71%
252	76.81	0.62	72%
251	76.50	0.62	72%
250	76.20	0.63	73%
245	74.67	0.65	76%
240	73.15	0.66	77%
235	71.62	0.67	78%
230	70.10	0.66	77%
225	68.58	0.66	77%
220	67.05	0.66	77%
215	65.53	0.67	78%
210	64.00	0.67	78%
205	62.48	0.68	80%
204	62.18	0.69	80%
203	61.87	0.69	80%
202	61.57	0.68	80%
201	61.26	0.72	84%
200	60.96	0.71	83%
199	60.65	0.68	80%
198	60.35	0.67	78%
197	60.04	0.67	78%
196	59.74	0.69	80%
195	59.43	0.70	81%
194	59.13	0.69	80%
193	58.82	0.72	84%
192	58.52	0.71	83%
191	58.21	0.71	82%
190	57.91	0.71	82%
185	56.39	0.71	82%
180	54.86	0.74	86%
175	53.34	0.73	85%
170	51.81	0.71	83%
165	50.29	0.73	85%
160	48.77	0.72	84%
155	47.24	0.72	84%
150	45.72	0.72	84%
145	44.19	0.73	85%
140	42.67	0.73	85%
135	41.15	0.72	84%
130	39.62	0.71	83%
129	39.32	0.73	85%
128	39.01	0.73	85%
127	38.71	0.72	84%
126	38.40	0.74	86%
125	38.10	0.73	85%
120	36.57	0.74	86%
115	35.05	0.74	86%
110	33.53	0.72	84%
105	32.00	0.75	87%
100	30.48	0.76	89%
95	28.95	0.75	88%
90	27.43	0.76	89%
85	25.91	0.76	89%
80	24.38	0.77	90%
75	22.86	0.73	85%
74	22.55	0.73	85%

* Calibrated tool speed

Tool calibration based on Mar 14, 2006 LTS pit calibration (Jeff Neuman)



Notes:

Date of Test:	3/3/2008
Measurement Point:	top of casing
Flow Rate:	22.73 L/s
Well Diameter:	150 mm

REGION OF WATERLOO

East Cambridge

SMTW4-08

Lotowater Technical Services Inc. **Figure 1**

Reference: 006-105 08/03/04

Well Flow Profile

Project Number:	006-105	
Well Name:	SMTW4-08	
Date Logged:	3/3/2008	
Logged By:	Jeff Neuman	
Measuring Point:	Top of casing, 0.80m above ground surface	
Flow Rate:	22.73	**L/s**
Casing Diameter:	150	**mm**
Theoretical Max V:	1.29	**m/s**
Test Start:	13:00	
Test Stop:	14:00	
Bottom of Casing:	28.0	**m**
TD:	129.5	**m**
Pump inlet:	26.2	**m**
SWL:		**m**
PWL:		**m**

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
425	129.53	0.00	0%
420	128.01	0.00	0%
415	126.49	0.00	0%
410	124.96	0.00	0%
405	123.44	0.00	0%
400	121.91	0.00	0%
395	120.39	0.00	0%
390	118.87	0.00	0%
385	117.34	0.00	0%
380	115.82	0.00	0%
375	114.29	0.00	0%
370	112.77	0.00	0%
365	111.25	0.00	0%
360	109.72	0.00	0%
355	108.20	0.02	2%
350	106.67	0.14	11%
345	105.15	0.13	10%
340	103.63	0.15	12%
335	102.10	0.21	16%
330	100.58	0.21	16%
325	99.06	0.36	28%
320	97.53	0.36	28%
315	96.01	0.75	58%
310	94.48	1.13	88%
305	92.96	1.16	90%
300	91.44	1.31	102%
295	89.91	1.27	99%
290	88.39	1.32	103%
285	86.86	1.28	100%
280	85.34	1.31	102%
275	83.82	1.28	99%
270	82.29	1.31	102%
265	80.77	1.31	102%
260	79.24	1.31	102%
255	77.72	1.28	100%
250	76.20	1.28	100%
245	74.67	1.31	102%
240	73.15	1.31	102%
235	71.62	1.31	102%
230	70.10	1.31	102%
225	68.58	1.29	100%
220	67.05	1.31	102%
215	65.53	1.30	101%
210	64.00	1.29	100%
205	62.48	1.28	100%
200	60.96	1.32	102%
195	59.43	1.30	101%
190	57.91	1.32	103%
185	56.39	1.28	100%
180	54.86	1.32	102%
175	53.34	1.31	102%
170	51.81	1.29	100%
165	50.29	1.28	100%
160	48.77	1.31	102%
155	47.24	1.31	102%
150	45.72	1.30	101%
145	44.19	1.30	101%
140	42.67	1.31	102%
135	41.15	1.31	102%
130	39.62	1.30	101%
125	38.10	1.30	101%
120	36.57	1.32	103%
115	35.05	1.33	104%
110	33.53	1.32	103%
105	32.00	1.33	104%

* Calibrated tool speed

Tool calibration based on Mar 14, 2006 LTS pit calibration (Jeff Neuman)

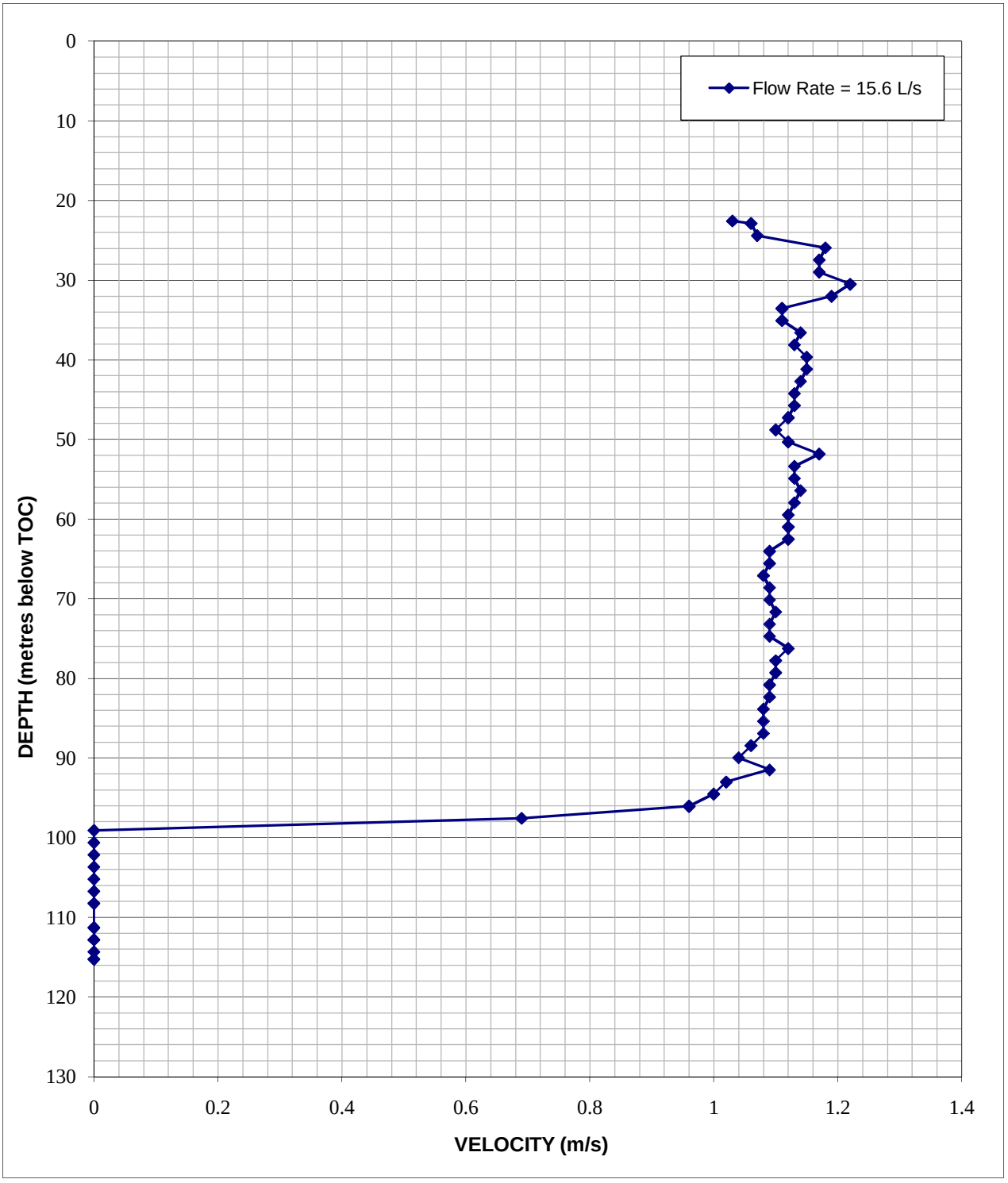
Well Flow Profile

Project Number:	006-105	
Well Name:	SMTW4-08	
Date Logged:	3/3/2008	
Logged By:	Jeff	
Measuring Point:	Top of casing, 0.80m above ground surface	
Flow Rate:	22.73	**L/s**
Casing Diameter:	150	**mm**
Theoretical Max V:	1.29	**m/s**
Test Start:	14:00	
Test Stop:	15:00	
Bottom of Casing:	28.0	**m**
TD:	129.5	**m**
Pump inlet:	26.2	**m**
SWL:		**m**
PWL:		**m**

Depth (ft)	Depth (m)	Velocity* (m/s)	% of Flow
425	129.53	0.00	0%
420	128.01	0.00	0%
415	126.49	0.00	0%
410	124.96	0.00	0%
405	123.44	0.00	0%
400	121.91	0.00	0%
395	120.39	0.00	0%
390	118.87	0.00	0%
385	117.34	0.00	0%
380	115.82	0.00	0%
375	114.29	0.00	0%
370	112.77	0.00	0%
365	111.25	0.00	0%
360	109.72	0.00	0%
359	109.42	0.00	0%
358	109.11	0.00	0%
357	108.81	0.01	1%
356	108.50	0.04	3%
355	108.20	0.02	2%
354	107.89	0.02	2%
353	107.59	0.02	2%
352	107.28	0.02	2%
351	106.98	0.04	3%
350	106.67	0.13	10%
345	105.15	0.13	10%
340	103.63	0.15	12%
339	103.32	0.16	12%
338	103.02	0.17	13%
337	102.71	0.16	12%
336	102.41	0.16	12%
335	102.10	0.21	16%
334	101.80	0.21	16%
333	101.49	0.19	15%
332	101.19	0.19	15%
331	100.88	0.21	16%
330	100.58	0.21	16%
329	100.27	0.21	16%
328	99.97	0.21	16%
327	99.66	0.21	16%
326	99.36	0.33	25%
325	99.06	0.36	28%
324	98.75	0.34	26%
323	98.45	0.37	29%
322	98.14	0.36	28%
321	97.84	0.38	30%
320	97.53	0.37	29%
319	97.23	0.42	33%
318	96.92	0.56	44%
317	96.62	0.77	60%
316	96.31	0.63	49%
315	96.01	0.76	59%
314	95.70	1.00	78%
313	95.40	1.02	79%
312	95.09	1.03	80%
311	94.79	1.09	85%
310	94.48	1.13	88%
309	94.18	1.22	95%
308	93.87	1.20	93%
307	93.57	1.19	92%
306	93.26	1.17	91%
305	92.96	1.17	91%
304	92.65	1.17	91%
303	92.35	1.20	93%
302	92.05	1.18	92%
301	91.74	1.30	101%
300	91.44	1.32	102%
295	89.91	1.31	102%
290	88.39	1.31	102%
285	86.86	1.34	104%
280	85.34	1.34	104%
275	83.82	1.32	103%
270	82.29	1.32	102%
265	80.77	1.32	103%
260	79.24	1.33	104%
255	77.72	1.32	102%
250	76.20	1.30	101%
245	74.67	1.31	102%
240	73.15	1.32	102%
235	71.62	1.31	102%
230	70.10	1.31	102%
225	68.58	1.27	99%
220	67.05	1.31	102%
215	65.53	1.31	102%
210	64.00	1.30	101%
205	62.48	1.30	101%
200	60.96	1.31	102%
195	59.43	1.30	101%
190	57.91	1.31	102%
185	56.39	1.30	101%
180	54.86	1.32	103%
175	53.34	1.32	102%
170	51.81	1.29	100%
165	50.29	1.29	100%
160	48.77	1.32	102%
155	47.24	1.30	101%
150	45.72	1.29	100%
145	44.19	1.29	100%
140	42.67	1.31	102%
135	41.15	1.32	102%
130	39.62	1.32	102%
125	38.10	1.30	101%
120	36.57	1.33	104%
115	35.05	1.35	105%
110	33.53	1.32	103%
105	32.00	1.33	104%

* Calibrated tool speed

Tool calibration based on Mar 14, 2006 LTS pit calibration (Jeff Neuman)



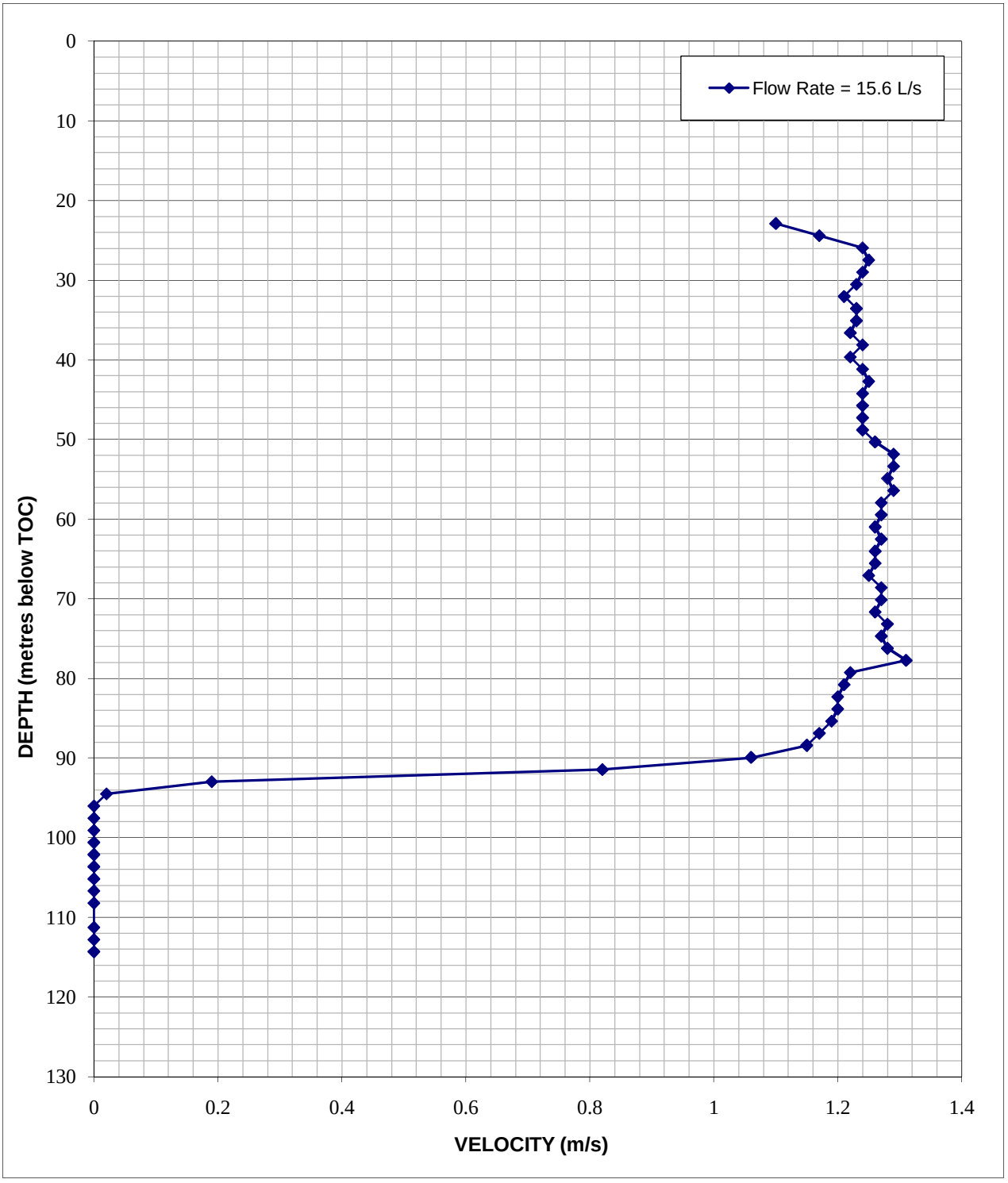
Notes:
Measurement point: Top of Casing
Test Date: October 20, 2008
Flow measurements taken by Gerrits Well Drilling Inc.

REGION OF WATERLOO

NDTW1-08 (Clyde Park)

Flow Distribution Profile

Project: 05-1112-010 08-01-2010



Notes:
Measurement point: Top of Casing
Test Date: October 16, 2008
Flow measurements taken by Gerrits Well Drilling Inc.

REGION OF WATERLOO

NDTW2-08 (Clyde Park)

Flow Distribution Profile

Project: 05-1112-010 08-01-2010

CMTW1-05

Ontario Ministry of the Environment

A023740 (and print number below)

A023740

Well Record

Regulation 903 Ontario Water Resources Act

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN ____ CON ____ LOT ____

[redacted]

Address of Well Location (County/District/Municipality): WATERLOO REGION

Township: CITY OF CAMBRIDGE

Lot: ____ Concession: ____

RR#/Street Number/Name: ____

City/Town/Village: ____

Site/Compartment/Block/Tract etc.: ____

GPS Reading: NAD 83 | Zone 17 | Easting 558408 | Northing 4805315 | Unit Make/Model: Garmin eTREX Venture | Mode of Operation: [X] Undifferentiated [ ] Differentiated, specify ____ | [ ] Averaged

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	clay	Stones		0	6'
Brown	Sand	Gravel	Coarse	6	30'
Grey	clay	Stones		30	40'
Grey	Clay			40	96'
Lt. Brown	Limestone			96	130'
				130	217'
				217	225'
				225	426'
				426	430'

Hole Diameter

Depth From (Ft.)	Depth To	Diameter
0	104'	9"
104'	430'	6"

Water Record

Water found at ___ Metres / Kind of Water

- ___ m | Fresh | Sulphur | Gas | Salty | Minerals | Other: ____
- ___ m | Fresh | Sulphur | Gas | Salty | Minerals | Other: ____
- ___ m | Fresh | Sulphur | Gas | Salty | Minerals | Other: ____

After test of well yield, water was

- [ ] Clear and sediment free
- [ ] Other, specify ____

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Ft.)	Depth To (Ft.)
Casing				
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.188"	0	104'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam ____	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	Slot No. ____		
No Casing or Screen				
	[X] Open hole		104'	430'

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level (Metres / Ft.)	Recovery Time min	Recovery Water Level (Metres / Ft.)
Pump intake set at - (metres)	Static Level	18'		
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reasoh.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Ft. Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	104'	Cement	

Method of Construction

[ ] Cable Tool [ ] Rotary (air) [ ] Diamond [ ] Digging
[X] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

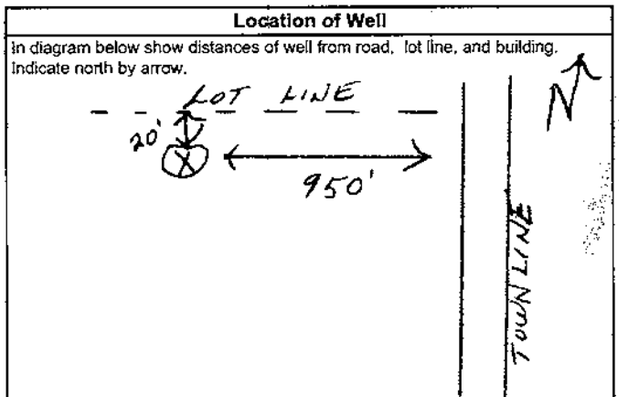
[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [ ] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

[X] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[ ] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Location of Well

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



Audit No. Z 41418

Date Well Completed: YYYY 2005 MM 08 DD 29

Was the well owner's information package delivered? [ ] Yes [ ] No

Date Delivered: YYYY ____ MM ____ DD ____

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED

Well Contractor's Licence No.: 1737

Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): LOSCH KIM

Well Technician's Licence No.: T0927

Signature of Technician/Contractor: X J. C. Davidson

Date Submitted: YYYY ____ MM ____ DD ____

Ministry Use Only

Data Source: ____

Contractor: 1737

Date Received: YYYY MAR 14 2006 MM ____ DD ____

Date of Inspection: YYYY ____ MM ____ DD ____

Remarks: ____

Well Record Number: ____

0506E (09/03) Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)
A 032285
A 032285

CMTW2-05

Well Record

Regulation 903 Ontario Water Resources Act

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Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: REGIONAL MUNICIPALITY OF | Last Name: WATERLOO
Mailing Address (Street Number/Name, RR, Lot, Concession): 150 FREDERICK ST. 4th FLOOR
County/District/Municipality: WATERLOO REGION | Township/City/Town/Village: KITCHENER
Province: Ontario | Postal Code: N2G 4J3 | Telephone Number (include area code): 519-575-4433
Address of Well Location (County/District/Municipality): WATERLOO REGION
Township: CITY OF CAMBRIDGE | Lot | Concession
RR#/Street Number/Name: CEDARBROOK CRES.
City/Town/Village: CAMBRIDGE | Site/Compartment/Block/Tract etc.
GPS Reading: NAD 83 | Zone 17 | Easting 558960 | Northing 4804456 | Unit Make/Model: Garmin ETREX VENTURE | Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	Fill	Stones		0'	8'
Brown	Gravel			8	107
Grey	Limestone			107	403

Hole Diameter

Depth From	Depth To	Diameter
0	111'	9"
111'	403'	6"

Water Record

Water found at	Kind of Water			
235'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:
298'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:
348'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:

After test of well yield, water was: [X] Clear and sediment free [ ] Other, specify
Chlorinated: [X] Yes [ ] No

Construction Record

Casing

Inside diam	Material	Wall thickness	Depth From	Depth To
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.188	0	113'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			

Screen

Outside diam	Material	Slot No.
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	

No Casing or Screen

[X] Open hole — 113 — 403

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

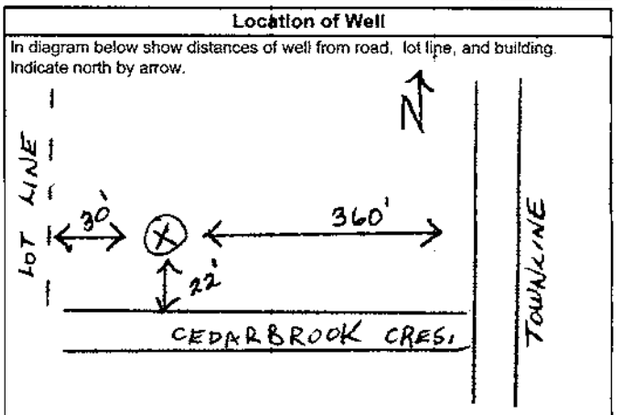
Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	111'	Cement Slurry	1 cu. metre

Location of Well

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



Method of Construction

[ ] Cable Tool [ ] Rotary (air) [ ] Diamond [ ] Digging
[X] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [ ] Not used
[ ] Irrigation [X] Municipal [ ] Cooling & air conditioning

Final Status of Well

[ ] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[ ] Observation well [X] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Audit No. Z 41436 | Date Well Completed: YYYY 2005 | MM 11 | DD 17
Was the well owner's information package delivered? [ ] Yes [ ] No | Date Delivered: YYYY | MM | DD

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED | Well Contractor's Licence No.: 1737
Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONTARIO N0G 2W0
Name of Well Technician (last name, first name): REAVIE GARY | Well Technician's Licence No.: T0156
Signature of Technician/Contractor: X J.C. Davidson | Date Submitted: YYYY 2005 | MM 12 | DD 31

Ministry Use Only
Data Source | Contractor: 1737
Date Received: MAR 14 2006 | Date of Inspection: YYYY | MM | DD
Remarks | Well Record Number

05082E (09/03) Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag No. (Put sticker and print number below) A 032284

A032284

CMTW3-05

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR, Lot, Concession)
REGIONAL MUNICIPALITY OF WATERLOO		150 FREDERICK ST. 4th FLOOR

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
WATERLOO REGION	KITCHENER	Ontario	N2G 4J3	519-575-4433

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
WATERLOO REGION	CITY OF CAMBRIDGE		

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
BURNETT ST.	CAMBRIDGE	

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	557558	4810518	Garmin eTREX Venture	[X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	Clay			0	6
Brown	Gravel		Fine	6	10
Brown	Fine Sand			10	20
Brown	Gravel	Silt		20	45
Grey	Clay			45	100
Grey	Gravel	Till, silt		100	113
Grey	Clay		Fine	113	116
	Limestone	Shale	Soft, Fractured	116	134
Grey	Limestone			134	470

Hole Diameter

Depth From	Depth To	Diameter (centimetres)
0	135'	9"
137	470'	6"

Water Record

Water found at ___ Ft. Kind of Water

320'	[ ] Fresh	[ ] Sulphur	[ ] Gas [ ] Salty [ ] Minerals [ ] Other:
323'	[ ] Fresh	[ ] Sulphur	[ ] Gas [ ] Salty [ ] Minerals [ ] Other:
337'	[ ] Fresh	[ ] Sulphur	[ ] Gas [ ] Salty [ ] Minerals [ ] Other:

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

Chlorinated [X] Yes [ ] No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Ft.)	Depth To (Ft.)
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.188	+2'	135
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			

Screen

Outside diam | [ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized | Slot No.

No Casing or Screen

[X] Open hole | 135 | 470

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Ft. Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	135'	Cement Slurry	

Method of Construction

[ ] Cable Tool [ ] Rotary (air) [ ] Diamond [ ] Digging
[X] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [ ] Not used
[ ] Irrigation [X] Municipal [ ] Cooling & air conditioning

Final Status of Well

[X] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[ ] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
DAVIDSON WELL DRILLING LIMITED	1737

Business Address (street name, number, city etc.)	
147 NORTH ST. WINGHAM, ONT.	N0G 2W0

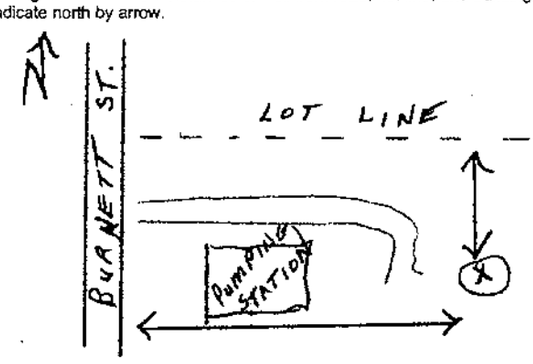
Name of Well Technician (last name, first name)	Well Technician's Licence No.
REAVIE GARY	T0156

Signature of Technician/Contractor: x D.C. Davidson

Date Submitted YYYY MM DD: 2005 12 31

Location of Well

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



Audit No. Z 41435

Date Well Completed YYYY MM DD: 2005 11 18

Was the well owner's information package delivered? [ ] Yes [ ] No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor: 1737

Date Received: MAR 14 2006 YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A 023738

A023738

PBTW1-05

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

WATERLOO REGION — RR#/Street Number/Name

CITY OF CAMBRIDGE — City/Town/Village

Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 558316 | Northing 4806881

Unit Make/Model: Garmin eTREX Venture

Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Metres)	Depth To (Metres)	Depth To (Ft.)
Brown	Clay	Stones		0	16'	
Grey	Clay	Stones		16	24'	
Grey	Gravel	Silt		24	63'	
Grey	Clay			63	101'	
Brown	Sand	Gravel		101	131'	
Grey	Limestone		Broken	131	140'	
				140	260'	
				260	428'	

Hole Diameter

Depth From (Metres)	Depth To (Metres)	Diameter (Centimetres)
0	140'	9"
140'	428'	6"

Water Record

Water found at (Metres)	Kind of Water			
143	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:
202	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:
356	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Salty	[ ] Minerals	[ ] Other:

After test of well yield, water was: [ ] Clear and sediment free [ ] Other, specify

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Metres)	Depth To (Metres)	Depth To (Ft.)
Casing					
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.188"	0	140'	
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized				
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized				
Screen					
Outside diam	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	Slot No.			
No Casing or Screen					
	[X] Open hole		140'	428'	

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level (Metres)	Recovery Time min	Recovery Water Level (Metres) (Ft.)
Pump intake set at - (metres)	Static Level	39'		
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

(Ft.) Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	140'	Cement	

Method of Construction

[ ] Cable Tool [ ] Rotary (air) [ ] Diamond [ ] Digging
[X] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [ ] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED — Well Contractor's Licence No.: 1737

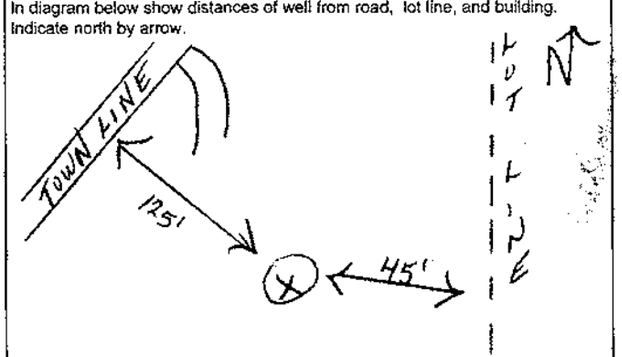
Business Address (street name, number, city etc.): 149 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): LOSCH KIM — Well Technician's Licence No.: T0927

Signature of Technician/Contractor: X J. C. Davidson — Date Submitted YYYY MM DD: 2005 12 31

Location of Well

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



Audit No. Z 41417

Date Well Completed YYYY MM DD: 2005 08 23

Was the well owner's information package delivered? [ ] Yes [ ] No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source — Contractor: 1737

Date Received YYYY MM DD: MAR 14 2006 — Date of Inspection YYYY MM DD

Remarks — Well Record Number

0506E (09/03) Contractor's Copy [X] Ministry's Copy [X] Well Owner's Copy [ ]

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A023735 / A023735

SMTW1-05

Well Record

Regulation 903 Ontario Water Resources Act

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Instructions for Completing Form

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- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name | City of Cambridge (City/Town/Village) | Site/Compartment/Block/Tract etc.

GPS Reading | NAD: 83 | Zone: 17 | Easting: 558465 | Northing: 4803583 | Unit Make/Model: Garmin eTrex Venture | Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
	Stones	Gravel		0	22'
	Silt	Sand, Gravel		22	43'
Grey	clay	Stones		43	66'
Brown	Limestone			66	196'
Dk. Brn.	Limestone			196	245'
Grey Blue	Limestone			245	390'
	Shale			390	395'

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0'	69'	9"
69'	395'	6"

Water Record

Water found at (Metres)	Kind of Water			
76'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Other:
	[ ] Salty	[ ] Minerals		
174'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Other:
	[ ] Salty	[ ] Minerals		
196'	[X] Fresh	[ ] Sulphur	[ ] Gas	[ ] Other:
	[ ] Salty	[ ] Minerals		

After test of well yield, water was: [ ] Clear and sediment free [ ] Other, specify

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Ft.)	Depth To (Ft.)
Casing				
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.188	0	69'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	Slot No.		
No Casing or Screen				
	[X] Open hole		69'	395'

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level (Metres)	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level	19'		
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Ft. Plugging and Sealing Record [X] Annular space [ ] Abandonment

Depth set at - (Metres) From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
69'	0'	Cement	

Method of Construction

[ ] Cable Tool [ ] Rotary (air) [ ] Diamond [ ] Digging
[X] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [ ] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

[X] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[ ] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED | Well Contractor's Licence No.: 1737

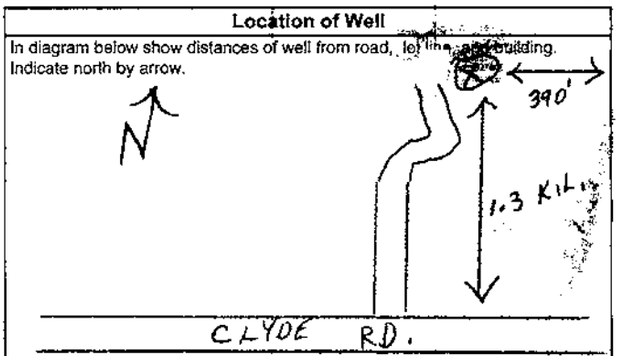
Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): LOSCH KIM | Well Technician's Licence No.: T0927

Signature of Technician/Contractor: X J. C. Davidson | Date Submitted YYYY MM DD: 2005 12 31

Location of Well

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



Audit No. Z 41416 | Date Well Completed YYYY MM DD: 2005 08 12

Was the well owner's information package delivered? [ ] Yes [ ] No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor: 1737

Date Received YYYY MM DD: MAR 14 2006 | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy [X] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag Number: A 026013 / A 026013

Well Record

Regulation 903 Ontario Water Resources Act

CMPW1-06

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Instructions for Completing Form

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- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	519-575-4550

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Region of Waterloo	Town of Cambridge	3	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Preston Tract

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	17558401	4805355	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
BROWN	SAND	BOULDERS		0	2.44
BROWN	SAND	SILT		2.44	11.58
GREY	SILT	SAND & CLAY		11.58	20.12
BROWN	SAND	CLAY & GRAVEL		20.12	22.86
GREY	CLAY	FRAGMENTED LIMESTONE		22.86	28.95
GREY/BROWN	LIMESTONE			28.95	121.92

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.0	48.26
6.0	121.92	30.48

Water Record

Water found at Metres	Kind of Water		
30.5 m	☒ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:
84.0 m	☒ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:
113 m	☒ Fresh	☐ Sulphur	☐ Gas ☐ Salty ☐ Minerals ☐ Other:

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
30.48	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.952	+0.45	32.31
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		32.31	121.92

Test of Well Yield

Pumping test method: pump

Pump intake set at - (metres) 32

Pumping rate - (litres/min) 3786

Duration of pumping 2 hrs + ____ min

Final water level end of pumping 27.34 metres

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth. 32 metres

Recommended pump rate. 3750 (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		8.72		
1		26.43	1	12.77
2		26.68	2	12.44
3		26.76	3	11.97
4		26.85	4	11.89
5		26.88	5	11.72
10		27.03	10	11.22
15		27.07	15	10.92
20		27.15	20	10.65
25		27.16	25	10.38
30		27.20	30	10.27
40		27.24	40	10.05
50		27.27	50	9.89
60		27.28	60	9.77

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	CEMENT	0.41

Method of Construction

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

Water Use

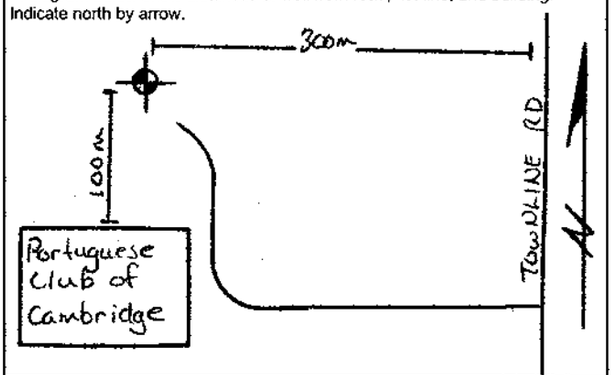
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☒ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 34704

Date Well Completed: 2006 05 24 (YYYY MM DD)

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

Date Delivered (YYYY MM DD)

Well Contractor/Technician Information

LUNNEY

Name of Well Contractor: GERRITS WELL DRILLING

Well Contractor's Licence No.: 3604

Business Address (street name, number, city etc.): RR #1 GRAND VALLEY

Name of Well Technician (last name, first name): GERRITS STEVE

Well Technician's Licence No.: T-2964

Signature of Technician/Contractor: X

Date Submitted (YYYY MM DD): 2006 12 19

Ministry Use Only

Data Source | Contractor

Date Received (YYYY MM DD) | Date of Inspection (YYYY MM DD)

Remarks | Well Record Number

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☒

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Ontario Ministry of the Environment

Well Tag Number: A026005 / A026005

CMPW2-06

Well Record

Regulation 903 Ontario Water Resources Act

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- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	519-575-4550

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Region of Waterloo	Town of Cambridge	1	10

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Galt Tract

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558962	4804448	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
BROWN	SAND	GRAVEL		0	7.62
BROWN	SAND	GRAVEL / BOULDERS		7.62	24.38
GREY	SILT	SAND / FRAGMENTED LIMESTONE LAYERS		24.38	32.61
GREY/BROWN	LIMESTONE		LAYERED	32.61	120.39
BLUE	SHALE			120.39	120.54

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6	46.26
6	120.54	30.48

Water Record

Water found at Metres	Kind of Water			
69.5 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty ☐ Minerals ☐ Other:
88 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty ☐ Minerals ☐ Other:
93.7 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty ☐ Minerals ☐ Other:

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

Chlorinated ☒ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
30.48	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.952	+0.60m	34.13
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.		
(	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

No Casing or Screen

☒ Open hole	34.13	120.54

Test of Well Yield

Pumping test method: pump

Pump intake set at - (metres) 34

Pumping rate - (litres/min) 4542

Duration of pumping 2 hrs + ____ min

Final water level end of pumping 9.11 metres

Recommended pump type. ☐ Shallow ☒ Deep

Recommended pump depth. 34 metres

Recommended pump rate. 3751 (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	2.93		
1	8.02	1	6.87
2	8.10	2	
3	8.32	3	6.54
4	8.38	4	6.33
5	8.42	5	6.13
10	8.52	10	5.60
15	8.63	15	5.28
20	8.69	20	5.03
25	8.72	25	4.88
30	8.77	30	4.66
40	8.85	40	4.54
50	8.90	50	4.42
60	8.95	60	4.33

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6	CEMENT	0.46

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

KUNKEY DIV OF

Name of Well Contractor: Gerrits Well Drilling Inc — Well Contractor's Licence No.: 3406

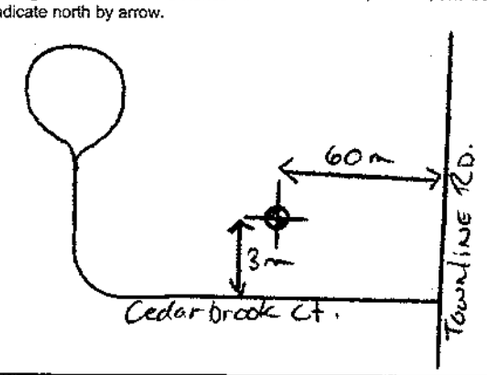
Business Address (street name, number, city etc.): RR#1 GRAND VALLEY

Name of Well Technician (last name, first name): GERRITS, STEVE — Well Technician's Licence No.: 7-2964

Signature of Technician/Contractor: X [signature] — Date Submitted: 2004 12 22

Location of Well

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



Audit No. Z 34701

Date Well Completed: YYYY MM DD

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received: YYYY MM DD | Date of Inspection: YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☒

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Ontario Ministry of the Environment

Well Tag Number: A026020

A026020

Well Record

Regulation 903 Ontario Water Resources Act

PBPW1-06

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- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	519-575-4550

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Region of Waterloo	Town of Cambridge	4	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Preston Tract

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558220	4806227	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand	Boulders		0	6.71
Grey	Sand	~~XXX~~Silt/Stones		6.71	28.95
Grey	Sand/Gravel	Limestone	Layered	28.95	41.15
Brown/Grey	Limestone		Layered	41.15	138.68

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.1	45.72
6.1	138.68	30.48

Water Record

Water found at ___ Metres	Kind of Water			
100 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty
☐ Minerals	☐ Other:			
102 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty
☐ Minerals	☐ Other:			
110 m	☒ Fresh	☐ Sulphur	☐ Gas	☐ Salty
☐ Minerals	☐ Other:			

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

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
30.48	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.952	+0.50	42.06
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		42.06	138.68

Test of Well Yield

Pumping test method: Pump

Pump intake set at - (metres): 42

Pumping rate - (litres/min): 4542

Duration of pumping: 2 hrs + ___ min

Final water level end of pumping: 21.76 metres

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 42 metres

Recommended pump rate: 3750 (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		15.80		
1	21.22		1	18.71
2	21.24		2	18.62
3	21.28		3	18.56
4	21.28		4	18.50
5	21.30		5	18.43
10	21.33		10	18.13
15	21.36		15	17.93
20	21.40		20	17.81
25	21.46		25	17.62
30	21.50		30	17.48
40	21.57		40	17.32
50	21.60		50	17.13
60	21.63		60	17.00

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.1	cement	0.56

Method of Construction

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

Water Use

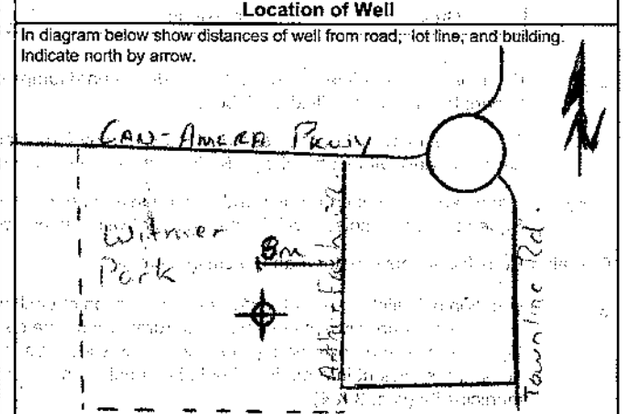
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☒ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 34680

Date Well Completed YYYY MM DD

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

Date Delivered YYYY MM DD

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Well Drilling Inc.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Gerrits, Steve	T 2964

Signature of Technician/Contractor: X [signature] Gerrits Drilling & Engineering Ltd

Date Submitted YYYY MM DD: 2006 12 11

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☒

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Ontario Ministry of the Environment

We A 032037 (t number below)

A032037

Well Record

Regulation 903 Ontario Water Resources Act

CMOW1ABC-06 page 1 of 3

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Waterloo		1	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Cambridge	Preston

GPS Reading: NAD 83 | Zone 17 | Easting 558729 | Northing 4805305 | Unit Make/Model: magellan | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Topsoil			0	1.82
	Sand	Silt, Gravel		1.82	9.14
Brown	Clay	Till		9.14	11.58
	Gravel	Sand		11.58	19.81
Grey	Clay			19.81	22.55
	Gravel			22.55	25.56
Grey	Clay			25.29	29.56
	Gravel			29.56	34.13
Brown	Limestone			34.13	38.1

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	6.4	22.86

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.556	0	35.0
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No. See Attached		
No Casing or Screen				
	☒ Open hole		35.0	126.79

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	Cement	0.14
		See Attached	

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Dunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

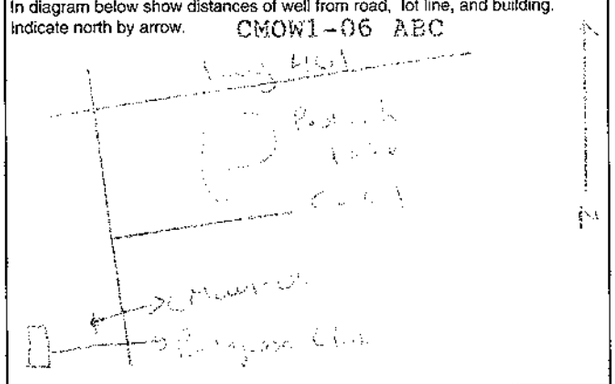
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. CMOW1-06 ABC



Audit No. Z 56817

Date Well Completed YYYY 2006 MM 05 DD 15

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

Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)

Well Record

Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
		Ontario		

Address of Well Location (County/District/Municipality)	Township	Lot	Concession

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading — NAD: 8 3 | Zone | Easting | Northing

Unit Make/Model

Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Grey	Limestone			38.1	42.97
Brown	Limestone			42.97	53.94
Grey	Limestone			53.94	54.86
Brown	Limestone			54.86	59.13
Grey	Limestone			59.13	61.26
Brown	Limestone		Hard, Dark	61.26	73.76
Grey	Limestone			73.76	79.55
Grey	Limestone		Light	79.55	81.07
				81.07	126.49

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Business Address (street name, number, city etc.)	
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Signature of Technician/Contractor X	Date Submitted YYYY MM DD

Location of Well

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

Audit No. Z 56818

Date Well Completed YYYY MM DD

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

Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)

Well Record

Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
		Ontario		

Address of Well Location (County/District/Municipality)	Township	Lot	Concession

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading | NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Green	Shale			126.49	126.79

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Business Address (street name, number, city etc.)	
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Signature of Technician/Contractor X	Date Submitted YYYY MM DD

Location of Well

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

Audit No. Z 56819

Date Well Completed YYYY MM DD

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

Date Delivered YYYY MM DD

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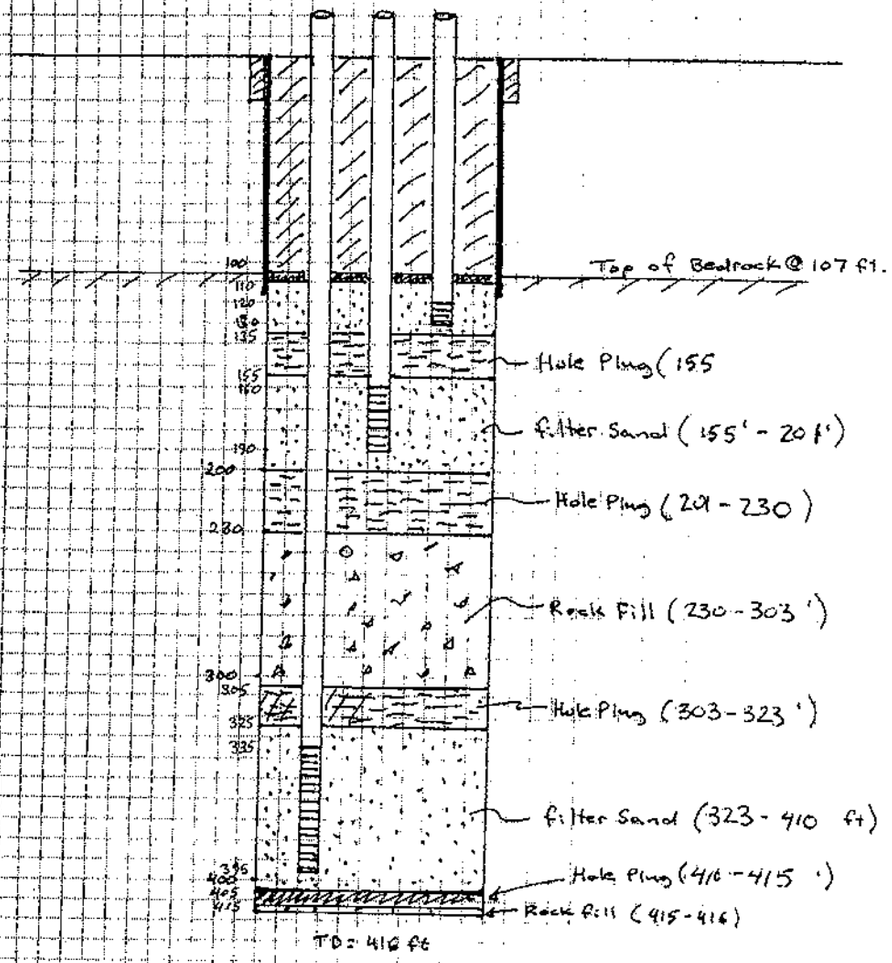
Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

SUBJECT: Jus Road - Cambridge E (MOW1-06)
Job No: 05-1112-010
Rel: 1000
Made by: R. IVANOFF
Reviewed:
Date: July 24 2006
Sheet: 1 of 1

Golder Associates

Observation Well Construction

Gmow1 - A B C - 06



Bottom to 415 → Rock fill
415 to 410 → Hole Plug
410 to 323 → filter Sand — Piezo 'A' Screen from 335' to 395 ft
323 to 303 → Hole Plug
303 to 230' → Rock Fill
230 to 201 → Hole Plug
201 to 155 → filter Sand — Piezo 'B' Screen from 160' to 190 ft.
155 to 135 → Hole Plug
135 to 110' → filter Sand — Piezo 'C' Screen from 120 to 130 ft.
110 to 107 → Hole Plug
107 to 0 → Bentonite Grout

30.52 0.62

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A032037

CMOW1D-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Waterloo		1	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Cambridge	XXXXXXXX Preston

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558729	4805305	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Topsoil			0	1.82
	Sand	Silt, Gravel, Bricks		1.82	9.14
Brown	Clay	Till		9.14	11.58
	Gravel	Sand		11.58	19.81
Grey	Clay			19.81	22.55
	Gravel			22.55	25.29
Grey	Clay			25.29	29.56
	Gravel			29.56	30.13
Grey	Limestone			30.13	33.52

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	33.52	15.3

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.588	0	30.17
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
6.0	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	30.02	33.07
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	27.6	Grout	0.45
27.6	29.1	Hole Plug	0.02
29.1	33.52	Sand	0.07

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

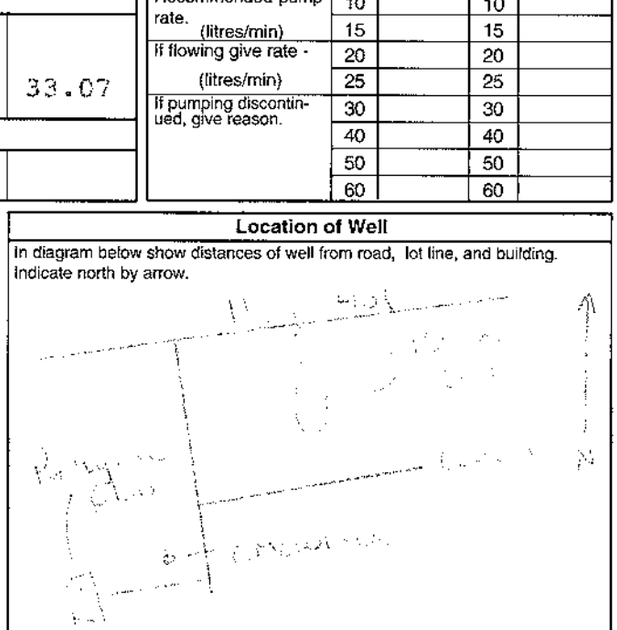
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD: 2006 11 22

Location of Well

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



Audit No.	Date Well Completed YYYY MM DD
Z 56837	2006 05 25
Was the well owner's information package delivered? ☐ Yes ☐ No	Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A032037

CMOW1E-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

Instructions for Completing Form

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- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of ~~Waterloo~~ Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Waterloo		1	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Cambridge	Preston

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558729	4805305	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Topsoil			0	1.82
Brown	Sand	Silt, Gravel		1.82	9.14
Brown	Clay	Till		9.14	11.58
	Gravel	Sand		11.58	17.06

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	17.06	15

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.635	0	14.02
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.	Depth From	Depth To (Metres)
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	14.02	17.06

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	10.97	Grout	0.18
10.97	12.50	Hole Plug	0.025
12.50	17.06	Sand	0.02

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

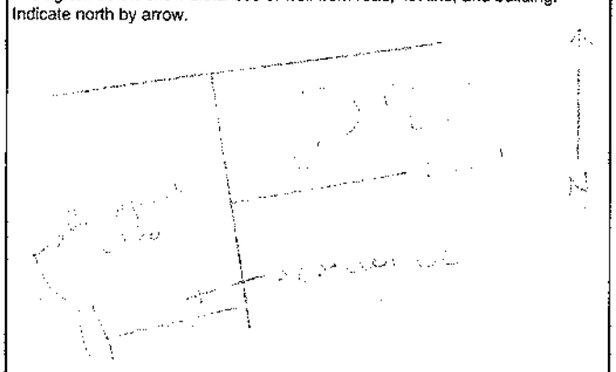
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted: YYYY MM DD

Location of Well

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



Audit No. Z 56838

Date Well Completed: YYYY 2006 MM 10 DD 17

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below) A032037

CMOWIF-06 **Well Record**

Regulation 903 Ontario Water Resources Act

page 1 of 1

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Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick ST.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Waterloo		1	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Cambridge	Preston

GPS Reading: NAD 83 | Zone 17 | Easting 558729 | Northing 4805305 | Unit Make/Model magellan | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Topsoil			0	1.82
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
	Sand	Silt, Gravel		1.82	7.62

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	7.62	15.07

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.568	0	4.57
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
6.0	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	4.57	7.62
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.57	3/8 Hole Plug	0.048
3.57	7.62	Sand	0.072

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

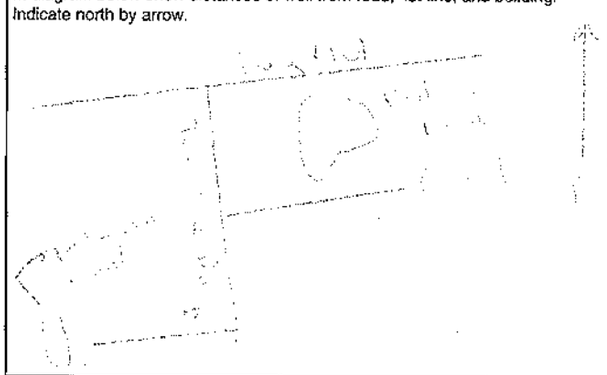
Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X [signature] Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 56839

Date Well Completed YYYY MM DD: 2006 05 17

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

Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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CMOW2ABC-06

Ontario Ministry of the Environment

Well number (below): A032035

A032036

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR, Lot, Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	4	

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Gore

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	17559592	4804169	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Black					
Black	Topsoil			0	0.304
Brown	Clay	Boulders		0.304	4.57
	Gravel	Sand, Boulders		4.57	16.76
	Sand			16.76	23.77
Grey	Gravel			23.77	28.34
Grey	Limestone			28.34	57.91
Brown	Limestone			57.91	*#.%!(
Grey	Limestone			83.52	121.00

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	6.4	22.86

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To
Casing				
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.556	0	29.565
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No. See Attached		
No Casing or Screen				
	☒ Open hole		29.565	121.00

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	Cement	0.14
		See Attached	

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

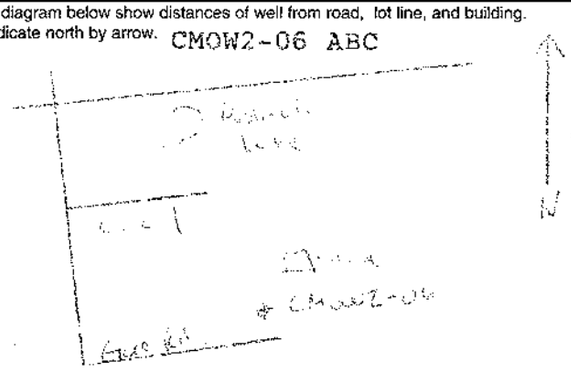
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X [signature] Gerrits Drilling & Eng. Ltd.

Date Submitted: YYYY 2006 MM 10 DD 12

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. CMOW2-06 ABC



Audit No. Z 56820

Date Well Completed: YYYY 2006 MM 06 DD 05

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

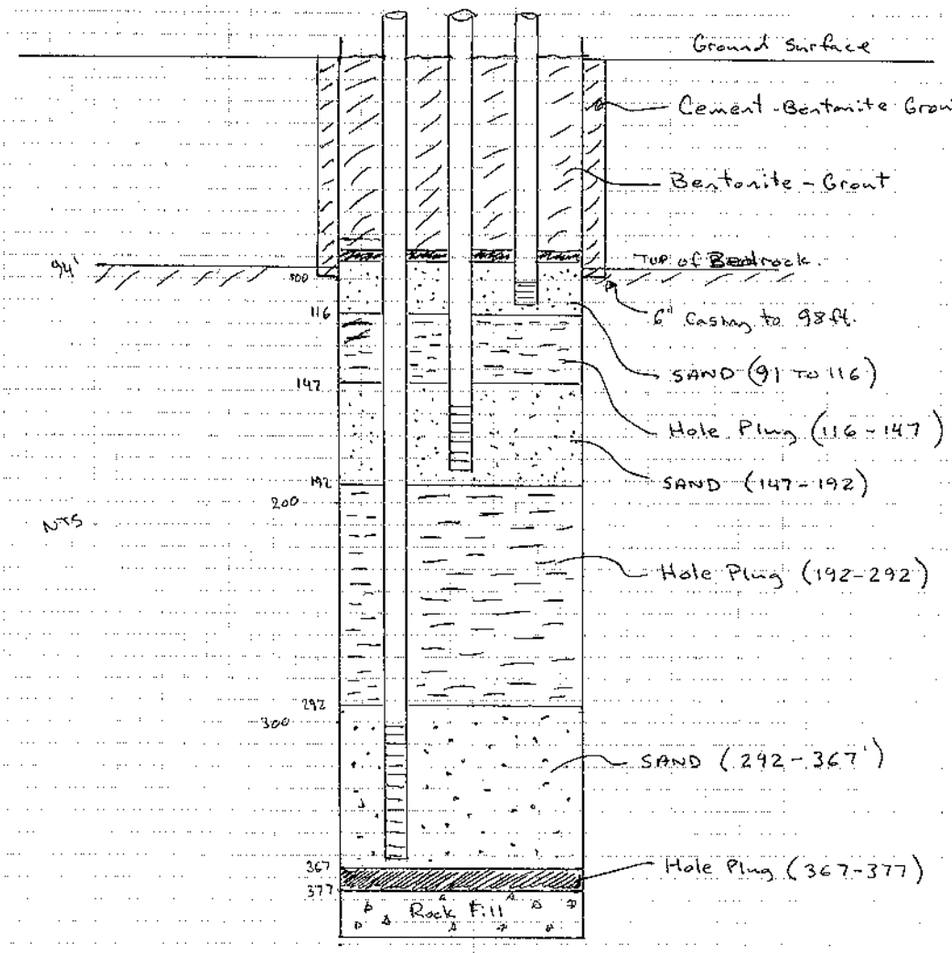
Cette formule est disponible en français

SUBJECT: Ins. RMOW Cambridge East CMOW2-06
Job No: 05 1112 010 1000 Ref.
Made by A. IVANOFF Reviewed
Date July 12, 2006 Sheet 1 of 1

Golder Associates

Observation Well Construction.

CMOW2 A B C -06



Bottom to 377 ft → Rock Fill
377 to 367' → Hole Plug
367' to 292' → filter Sand — Piezo 'A' Screen from 302 to 362 ft.
292' to 192' → Hole Plug
192' to 147' → filter Sand — Piezo 'B' Screen from 157 to 187 ft.
147' to 116' → Hole Plug
116' to 91' → filter Sand — Piezo 'C' Screen from 101 to 111 ft.
91 to 88' → Hole Plug
88 to 0 ft → Bentonite Grout

CMOW2D-06

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A032036

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	4	

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Gore

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559592	4804168	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Black	Topsoil			0	0.304
Brown	Clay	Boulders		0.304	4.57
	Gravel	Sand, Boulders		4.57	16.76
	Sand			16.76	28.95

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	28.97	17.6

Water Record

Water found at ___ Metres	Kind of Water
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.508	0	27.43
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
5.7		10	27.43	28.95
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	13.72	Hole Plug	0.215
13.72	24.09	Sand	0.162
24.09	25.91	Hole Plug	0.029
25.91	28.96	Sand	0.048

Method of Construction

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

Water Use

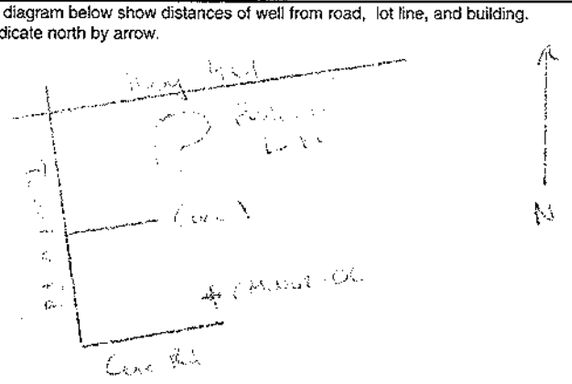
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☒ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 56831

Date Well Completed: 2006 06 16 (YYYY MM DD)

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

Date Delivered (YYYY MM DD)

Lunney

Well Contractor/Technician Information

Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 GRand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, B	T-353

Signature of Technician/Contractor: X

Date Submitted (YYYY MM DD)

Ministry Use Only

Data Source	Contractor
Date Received (YYYY MM DD)	Date of Inspection (YYYY MM DD)
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A032036

CMOW2E-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of WAterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	4	

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Gore

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559597	4804169	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Black	Topsoil			0 0	0.304
Brown	Clay	Boulders		0.304	4.57
	Gravel	Sand, Boulders		4.57	16.76

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	16.06	15.07

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.508	0	13.71
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	13.71	16.76
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	10.67	Grout	0.167
10.67	12.20	Hole Plug	0.024
12.20	16.77	Sand	0.072

Method of Construction

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

Water Use

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

Final Status of Well

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

Lunney

Well Contractor/Technician Information

Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

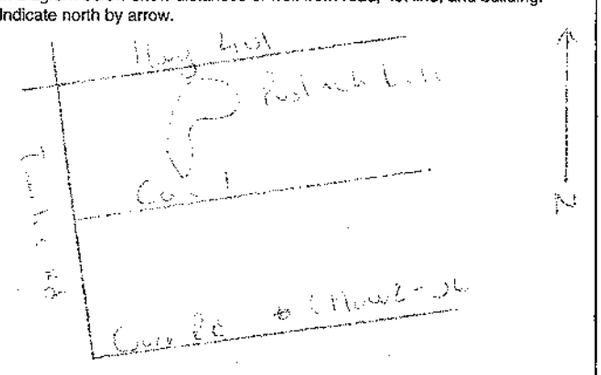
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted: YYYY MM DD

Location of Well

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



Audit No. Z 56832

Date Well Completed: YYYY MM DD — 2006 06 07

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

Cette formule est disponible en français

Ontario Ministry of the Environment

CMOW2F-06

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag Number (Place sticker and print number below): A032036

page 1 of 1

Instructions for Completing Form

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- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of WAterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	K Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	4	

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
		Gore

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559592	4804169	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Black	Topsoil			0	0.304
Brown	Clay	Boulders		0.304	7.62

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	16.06	7.67

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.508	0	4.57
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No. 10	4.57	7.62
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs + ___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.357	Hole PLug	0.072
3.573	7.62	Sand	0.048

Method of Construction

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

Water Use

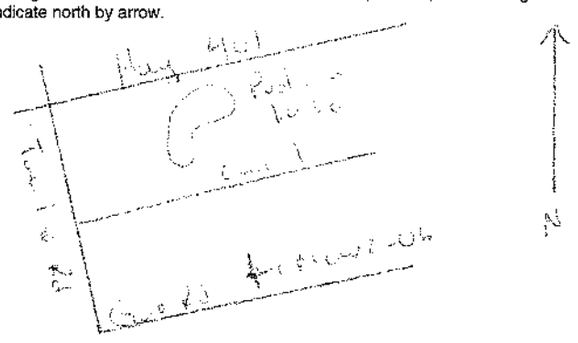
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☒ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 56833

Date Well Completed YYYY 2006 MM 0607 DD

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

Date Delivered YYYY MM DD

Well Contractor/Technician Information

Sunny Div. of

Name of Well Contractor: Gerrits Drilling & Eng. Ltd.

Well Contractor's Licence No.: 3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name): Morrison, H

Well Technician's Licence No.: T-353

Signature of Technician/Contractor: X

Date Submitted YYYY 2006 MM 06 DD 27

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (08/2006)

Well Owner's Copy

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CMOW3ABC-06

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Sticker below) A032038

A032038

page 1 of 1

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR, Lot, Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Waterloo		1	4

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Cambridge	

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	568918	4804867	Magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand			0	7.62
Brown	Sand	Gravel		7.62	12.19
	Gravel	Sand		12.19	34.13
Grey	Limestone		Broken	34.13	35.96
Grey	Limestone			35.96	56.38
Brown	LImestone			56.38	64.62
Grey	Limestone			64.62	91.44
Grey	Limestone		Hard, Dark Layers	91.44	121.61
Green	Shale			121.61	123.139

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.4	22.86

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.556	0	36.88
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		36.88	123.139

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs + ___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	Cement	0.14

Method of Construction

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

Water Use

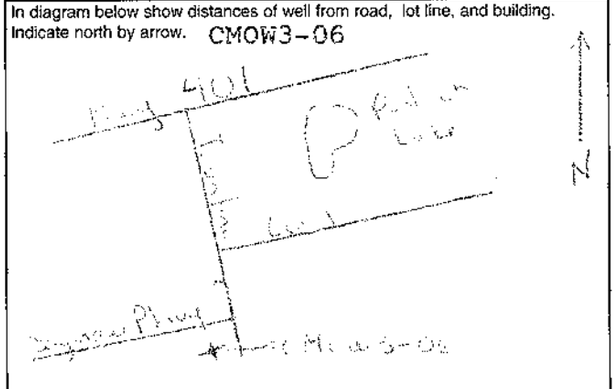
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. CMOW3-06



Audit No. Z 56821

Date Well Completed YYYY MM DD 2006 07 03

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

Date Delivered YYYY MM DD

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.)
RR#1 GRand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor
X Gerrits Drilling & Eng. Ltd.

Date Submitted YYYY MM DD 2006 11 27

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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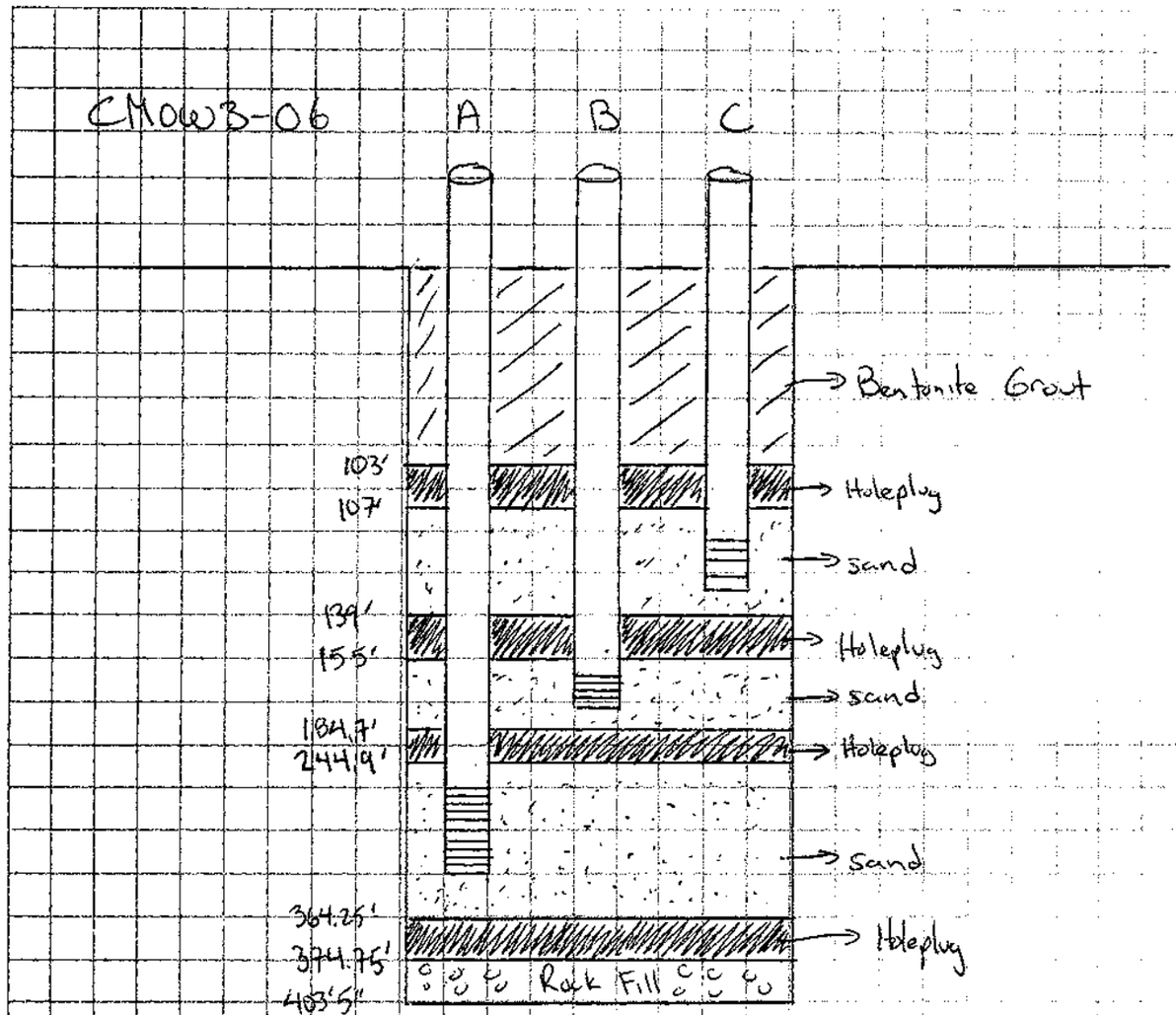
GERRITS WELL DRILLING INC.

Ground Water Exploration • Development • Testing

Date | File No. | Name

Project

CMOW3-06



A: Screen from 255' to 355'

B: Screen from 160' to 190'

C: Screen from 124' to 134'

All pipe and screen is 5.08 cm diameter PVC

Page of

Ontario Ministry of the Environment

Well T A026012 (number below)

A026012

PBOW1ABC-06

Well Record

Regulation 903 Ontario Water Resources Act

2

page 1 of XX

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington		2	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
	Puslinch	

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559285	4806066	Magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay			0	3.04
Brown	Sand	Boulders		3.04	6.09
Grey	Clay, Till	Silt		6.09	7.31
	Gravel			7.31	14.02
GRey	Clay			14.02	17.37
Grey	Sand	Gravel		17.37	30.48
Grey	Clay		Till	30.48	32.00
Brown	Limestone	Sand	Layers	32.00	34.44
Brown	Limestone			34.44	43.89

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.4	22.86

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.506	0	35.35
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No. See Attached		
No Casing or Screen				
	☒ Open hole		35.35	126.49

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

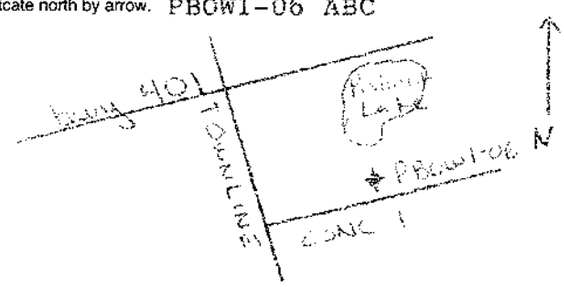
Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	Cement	0.14
		See Attached	

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. PBOW1-06 ABC



Method of Construction

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

Water Use

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

Final Status of Well

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

Audit No. Z 56822

Date Well Completed YYYY 2006 MM 06 DD 27

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

Date Delivered YYYY MM DD

Lunney Div. of

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below) A026012

Well Record

Regulation 903 Ontario Water Resources Act

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)	

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
		Ontario		

Address of Well Location (County/District/Municipality)	Township	Lot	Concession

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation:
	83					☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Grey	Limestone			43.89	54.55
Brown	Limestone			54.55	61.87
Grey	Limestone			61.87	125.57
Green	Shale			125.57	125.88
Grey	Shale			125.88	126.49

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.

Business Address (street name, number, city etc.)

Name of Well Technician (last name, first name)	Well Technician's Licence No.

Signature of Technician/Contractor	Date Submitted YYYY MM DD
X	

Location of Well

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

Audit No. Z 56823

Date Well Completed YYYY MM DD

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

Date Delivered YYYY MM DD

Ministry Use Only

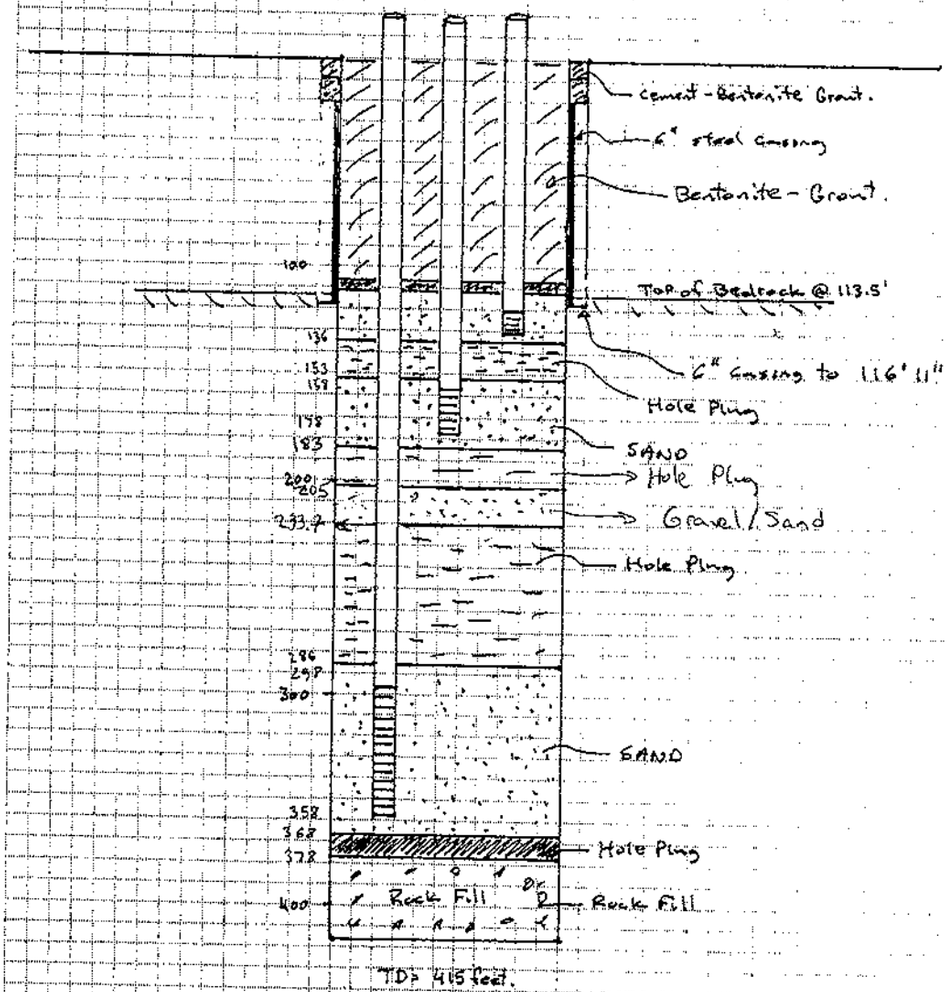
Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

SUBJECT: Jas-Rogow-Cambridge E. PBOW1-06
Job No: 05-1112-010
Ref (1000)
Made by A. IVANOFF
Reviewed
Date July 19, 2006
Sheet 1 of 1

Golder Associates

Observation Well Construction

PBOW1 - A B C - 06



Bottom to 378 → Rock Fill

378 ft to 368 ft → Hole Plug

368 to 386 ft → filter Sand — Piezo 'A' Screen from 298 to 358 ft

286 to 233.7 ft → Hole Plug

233.7 to 205 ft → Gravel/Sand

205 to 183 ft → Hole Plug

183 to 153 ft → filter Sand — Piezo 'B' Screen from 158 to 178 ft.

153 to 136 ft → Hole Plug

136 to 111 ft → filter sand — Piezo 'C' Screen from 121 to 131 ft.

111 to 108 ft → Hole Plug

108 to 0 ft → Bentonite Grout

PBOW1D-06

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below) A026012

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	2	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559285	4806066	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay			0	3.048
Brown	Sand	Boulders		3.048	6.096
Grey	Clay, Till	Silt		6.096	7.31
	Gravel			7.31	14.02
Grey	Clay			14.02	17.37
GRey	Sand	Gravel		17.37	30.48
	Gravel			30.48	35.35

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	35.35	17.52

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.635	0	32.30
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	32.30	35.35
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.66	Hole Plug	0.057
3.66	20.12	Grout	0.258
20.12	29.87	Sand	0.153
29.87	31.39	Hole Plug	0.024
31.39	38.35	Sand	0.062

Method of Construction

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

Water Use

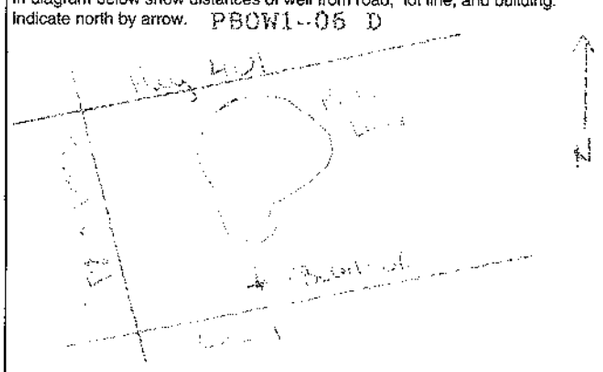
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. PBOW1-05 D



Audit No. Z 56826

Date Well Completed 2006 07 19 (YYYY MM DD)

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

Date Delivered YYYY MM DD

Lunney

Well Contractor/Technician Information Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 GRand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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PBOWIE-06

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag Number (Place sticker and print number below)
A026012

page 1 of 1

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	2	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559285	4806066	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay			0	3.04
Brown	Sand	Boulders		3.04	6.096
Grey	Clay, Till	Silt		6.096	7.315
	Gravel			7.315	14.02
Grey	Clay			14.02	17.37
Grey	Sand	Gravel		17.37	22.86

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	22.86	7.67

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.635	0	19.81
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	19.81	22.86
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

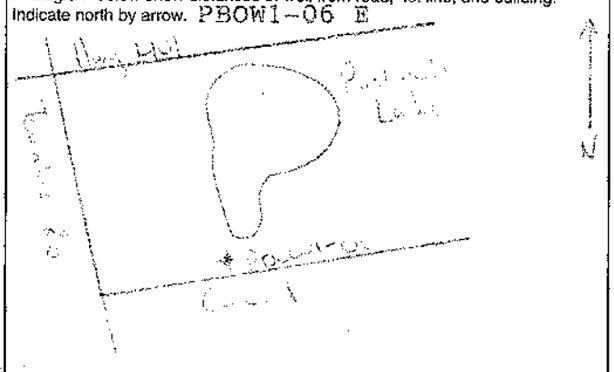
Pumping test method	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	10.97	Grout	0.17
10.97	19.8	Holeplug	0.138
19.81	22.86	Sand	0.048

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. PBOWI-06 E



Method of Construction

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

Water Use

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

Final Status of Well

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

Audit No. Z 56827

Date Well Completed: YYYY 2006 MM 07 DD 13

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

Date Delivered YYYY MM DD

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits M Drilling & Eng. Ltd	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted: YYYY | MM 11 | DD 22

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below) A026012

PBOWIF-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	2	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	559285	4806066	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay			0	3.04
Brown	Sand	Boulders		3.04	6.96
Grey	Clay	Till		6.96	7.31
	Gravel			7.31	11.27

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	11.27	17.50

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.635	0	8.22
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No. 10	8.22	11.27
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	5.18	Grout	* 0.081
5.18	7.62	Hole Plug	0.038
7.62	11.37	Sand	0.058

Method of Construction

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

Water Use

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

Final Status of Well

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

Lumley Div. of

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

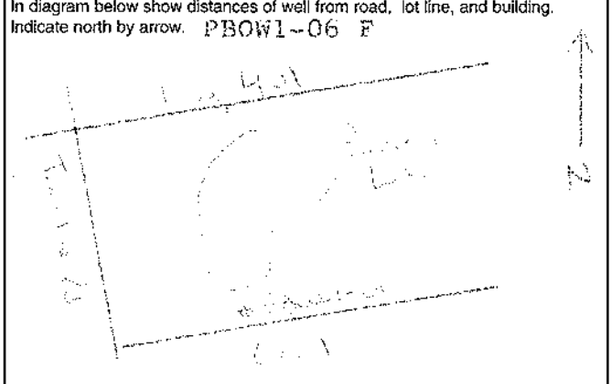
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. PBOWI-06 F



Audit No. Z 56825

Date Well Completed YYYY MM DD: 2006 07 19

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

Date Delivered YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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PBOW2ABC-06

Ontario Ministry of the Environment

We A026006 (t number below)

A026006

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 2

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	1	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 558534 | Northing 4806920 | Unit Make/Model magellan | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Sand	Clay, Stones		0	3.05
Brown	Clay			3.05	6.096
Brown	Sand			6.096	9.144
Brown	Clay	Gravel, Sand		9.144	10.66
Grey	Sand	Gravel	Coarse	10.66	12.192
Grey	Sand	Silt	Fine	12.192	19.81
Grey	Clay	Sand		19.81	21.33
Grey	Sand	Gravel		21.33	23.47
Grey	Sand	Gravel, Silt		23.47	29.26

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.4	22.86

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
15.24	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.506	0	37.795
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	See Attached

No Casing or Screen

	Depth From	Depth To (Metres)
☒ Open hole	37.795	128.93

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.4	Cement	0.14
		See Attached	

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Gunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

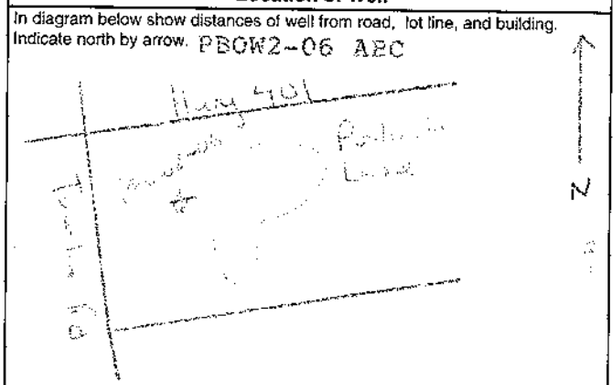
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted: YYYY 2006 MM 11 DD 17

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. PBOW2-06 ABC



Audit No. Z 56814

Date Well Completed: YYYY 2006 MM 07 DD 31

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)

Well Record

Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name | Last Name | Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality | Township/City/Town/Village | Province: Ontario | Postal Code | Telephone Number (include area code)

Address of Well Location (County/District/Municipality) | Township | Lot | Concession

RR#/Street Number/Name | City/Town/Village | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Gravel		Coarse	29.26	35.66
Grey/Brown	Limestone			35.66	54.25
Grey	Limestone			54.25	62.48
Grey/Brown	Limestone			62.48	66.44
Grey	Limestone			66.44	81.38
Brown	Limestone			81.38	82.29
Grey	Limestone			82.29	109.12
Grey/Brown	Limestone			109.12	112.77
Grey	Limestone			112.77	127.40

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)

Water Record

Water found at ___ Metres / Kind of Water

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

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

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

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

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor | Well Contractor's Licence No.

Business Address (street name, number, city etc.)

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

Signature of Technician/Contractor
X

Date Submitted YYYY MM DD

Location of Well

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

Audit No. Z 56815

Date Well Completed YYYY MM DD

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

Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)

Well Record

Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name | Last Name | Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality | Township/City/Town/Village | Province: Ontario | Postal Code | Telephone Number (include area code)

Address of Well Location (County/District/Municipality) | Township | Lot | Concession

RR#/Street Number/Name | City/Town/Village | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Green	Shale			127.40	128.32
Brown	Shale			128.32	128.93

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor | Well Contractor's Licence No.

Business Address (street name, number, city,etc.)

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

Signature of Technician/Contractor
X

Date Submitted YYYY MM DD

Location of Well

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

Audit No. Z 56816 | Date Well Completed YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☐ No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (08/2006)

Well Owner's Copy

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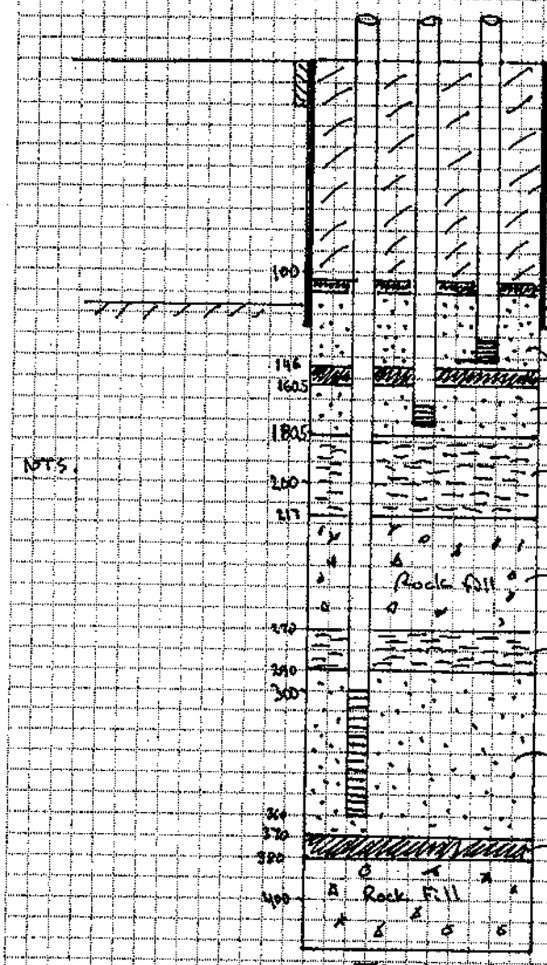
SUBJECT: IWS PBOW-Cambridge PBOW2-06
Job No: 05-1112-010 (1000)
Ref:
Made by: A. Devine Rev'd
Date: July 31/2006
Sheet 1 of

Golder Associates

Revised Aug 1, 2006

Observation Well Construction

PBOW 2 - 'A' 'B' 'C' - 06



NTS.

Bottom to 380' → Rock fill
380' to 370 ft → Hole Plug
370' to 290 ft → filter Sand Piezo 'A' Screen from 300 to 360 ft
290' to 270 ft → Hole Plug
270 to 217 ft → Rock fill
217 to 180.5 ft → Hole Plug
180.5 to 160.5 ft → filter Sand Piezo 'B' Screen from 166 to 176 ft
160.5 to 146 ft → Hole Plug
146 to 110 ft → filter Sand Piezo 'C' Screen from 131' to 141 ft.
110' to 108 ft → Hole Plug
108 to 0 ft → Bentonite Grout

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A026606

PBOW2D-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 2

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	1	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558534	4806920	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand	Clay, Stones		0	3.05
Brown	Clay			3.05	6.09
Brown	Sand			6.09	9.14
Brown	Clay	Gravel, Sand		9.14	10.66
Grey	Sand	GRavel	Coarse	10.66	12.192
Grey	Sand	Silt	Fine	12.19	19.81
Grey	Clay	Sand		19.81	21.33
Grey	Sand			21.33	28.04
	Gravel			28.04	35.61

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	36.27	17.7

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.588	0	33.22
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	33.22	36.27
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.05	Hole Plug	0.05
3.05	24.08	Grout	0.34
24.08	31.70	Hole Plug	0.12
31.70	36.27	Sand	0.07

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunney Div. of

Name of Well Contractor	Well Contractor's Licence No.
Cerrita Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

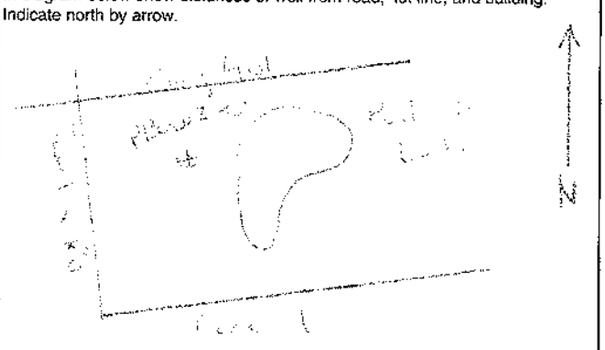
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Location of Well

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



Audit No.	Date Well Completed YYYY MM DD	Was the well owner's information package delivered?	Date Delivered YYYY MM DD
Z 56836	2006 07 19	☐ Yes ☐ No	

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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Ontario Ministry of the Environment

PBOW2E-06

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

Well Tag Number (Place sticker and print number below) A026006

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only MUN CON LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G 4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
	Puslinch	1	I

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558594	4806920	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand	Clay, Stones		0	3.048
Brown	Clay			3.048	6.09
Brown	Sand			6.09	9.14
Brown	Clay	Gravel, Sand		9.14	10.66
Grey	Sand	Gravel	Coarse	10.66	12.19
Grey	Sand	Silt	Fine	12.19	19.81
Grey	Clay	Sand		19.81	21.33
Grey	Sand			21.33	28.04

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	28.04	17.50

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.588	0	24.99
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam		Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	24.99	28.04
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.05	Hole Plug	0.05
3.05	20.7	Grout	0.29
20.7	21.9	Hole Plug	0.02
21.9	28.04	Sand	0.10

Method of Construction

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

Water Use

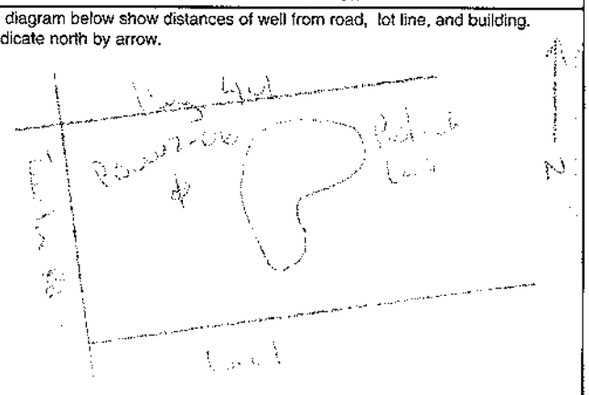
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☒ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 56835

Date Well Completed YYYY MM DD: 2006 06 17

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

Date Delivered YYYY MM DD

Lunny div. of

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, M	T-353

Signature of Technician/Contractor: X

Date Submitted YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

Cette formule est disponible en français

PBOW2F-06

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag Number (Place sticker and print number below): A026006

page 1 of 1

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
Region of Waterloo		150 Fredrick St.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	Kitchener	Ontario	N2G4J3	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Wellington	Puslinch	1	1

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	558534	4806920	magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Sand	Clay, Stones		0	3.05
Brown	XX Clay			3.05	6.096
Brown	Sand			6.096	9.14
Brown	Clay	Gravel, Sand		9.14	10.66
Grey	Sand	Gravel	Coarse	10.66	12.192
Grey	Sand	Silt		12.192	17.068

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	17.06	17.7

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
5.1	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	0.588	0	14.02
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.		
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	10	14.02	17.060

No Casing or Screen: ☐ Open hole

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	10.97	Grout	0.18
10.97	12.49	Hole Plug	0.025
12.49	17.06	Sand	0.07

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Lunny Div. of

Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (street name, number, city etc.): RR#1 Grand Valley

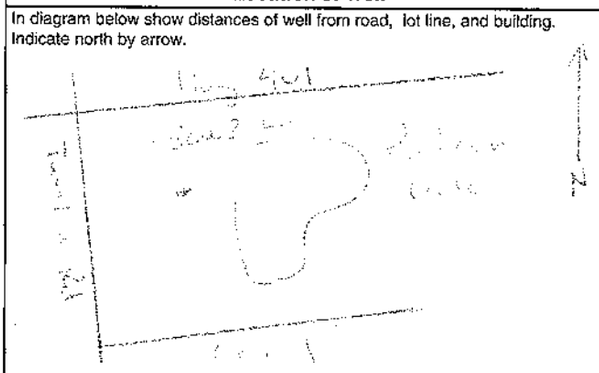
Name of Well Technician (last name, first name)	Well Technician's Licence No.
Morrison, H	T-333

Signature of Technician/Contractor: X

Date Submitted: YYYY MM DD

Location of Well

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



Audit No. Z 56834

Date Well Completed: YYYY 2006 MM 07 DD 26

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

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
Date Received YYYY MM DD	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (08/2006)

Well Owner's Copy

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PLOW1-06

Ontario

Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Sticker or Plate Number below): A 053780

A 053780

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name | Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality | Township/City/Town/Village | Province: Ontario | Postal Code | Telephone Number (include area code)

Address of Well Location (County/District/Municipality) | Township | Lot | Concession

RR/Street Number/Name: HOLINCH LAKE | City/Town/Village: CAMBRIDGE | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83, Easting, Northing | Unit Make/Model | Mode of Operation: Undifferentiated / Differentiated, specify | Averaged

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BRN	SAND	GRAVEL	LOOSE	0	0.6
BRN	SAND	GRAVEL	SATURATED	0.6	10.7

N43°23' 39"
080° 53

Hole Diameter

Depth From	Depth To	Diameter (centimetres)
0	10.7	10

Water Record

Water found at ___ Metres | Kind of Water: Fresh / Salty / Sulphur / Mineral / Gas / Other

___ m | Fresh / Salty / Sulphur / Mineral / Gas / Other

___ m | Fresh / Salty / Sulphur / Mineral / Gas / Other

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

Chlorinated: Yes / No

Construction Record

Material	Wall thickness centimetres	Depth From	Depth To
Casing			
Steel / Fibreglass / Plastic / Concrete / Galvanized	0.25	0	9.14
Steel / Fibreglass / Plastic / Concrete / Galvanized			
Steel / Fibreglass / Plastic / Concrete / Galvanized			
Screen			
Steel / Fibreglass / Plastic / Concrete / Galvanized	Slot No. 10	9.14	10.7
No Casing or Screen			
Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping (metres)	3		3	
Recommended pump type: Shallow / Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

Annular space / Abandonment

Depth set at - From	Depth set at - To	Material used (neat cement slurry) etc.	Volume Placed (cubic metres)
0	0.6	CONCRETE	
0.6	8.5	BENTONITE	
8.5	10.7	SILICA SAND	

Method of Construction

Cable Tool / Rotary (conventional) / Rotary (reverse) / Rotary (air) / Boring / Diamond / Jetting / Driving / Digging / Other: DIRECT PUSH

Water Use

Domestic / Stock / Irrigation / Industrial / Commercial / Municipal / Public Supply / Not used / Cooling & air conditioning / Other: MONITORING WELL

Final Status of Well

Water Supply / Observation well / Test Hole / Replacement well / Alteration (Construction) / Abandoned, (Other) / Unfinished / Dewatering / Abandoned, Insufficient Supply / Abandoned, Poor Quality

Well Contractor and Well Technician Information

Name of Well Contractor: STRATA SOIL SAMPLING | Well Contractor's Licence No: 7091

Business Address (street name, number): 147 WEST BEAVER CREEK, RICHMOND HILL

Name of Well Technician (last name, first name): DRAPER, TIG | Well Technician's Licence No: 1-3318

Signature of Technician/Contractor: X | Date Submitted: 2006 / 10 / 18

Location of Well

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

Audit No: Z 54897 | Date Well Completed: 2006 / 8 / 14

Was the well owner's information package delivered? Yes / No | Date Delivered: ____ / ____ / ____

Ministry Use Only

Data Source: Contractor | Date Received: ____ / ____ / ____ | Date of Inspection: ____ / ____ / ____

Remarks | Well Record Number

0506E (09/03) Copy / Ministry's Copy / Well Owner's Copy

Cette formule est disponible en français

9202648

Ontario Ministry of the Environment

Well T... A 053781 (number below)

A053781

Well Record

Regulation 903 Ontario Water Resources Act

page of

Instructions for Completing Form:

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- All Sections must be completed to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completion of this application can be directed to the Water Well Management Coordinator at 416-235-6203
- **All metric measurements** shall be **reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name | Mailing Address (Street Number/Name, RR,Lot,Concession)

County/District/Municipality | Township/City/Town/Village | Province: Ontario | Postal Code | Telephone Number (include area code)

Address of Well Location (County/District/Municipality) | Township | Lot | Concession

RR/Street Number/Name: 6825 CONCESSION | City/Town/Village: CAMBRIDGE | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation: Undifferentiated / Differentiated, specify | Abandoned

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BRN	GRAVEL	SAND	LOOSE	0	0.6
BRN	GRAVEL/SAND		SATURATED	0.6	12

N43°24.175'
W080°16.023

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	12	10

Water Record

Water found at ___ Metres | Kind of Water: Fresh / Salty / Sulphur / Minerals / Gas / Other

Water found at ___ Metres | Kind of Water: Fresh / Salty / Sulphur / Minerals / Gas / Other

Water found at ___ Metres | Kind of Water: Fresh / Salty / Sulphur / Minerals / Gas / Other

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

Chlorinated: Yes / No

Construction Record

Material	Wall thickness centimetres	Depth From	Depth To
Casing			
Steel / Fibreglass / Plastic / Concrete / Galvanized	0.25	0	10.6
Steel / Fibreglass / Plastic / Concrete / Galvanized			
Steel / Fibreglass / Plastic / Concrete / Galvanized			
Screen			
Steel / Fibreglass / Plastic / Concrete / Galvanized — Slot No. 10		10.6	12
No Casing or Screen			
Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type: Shallow / Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

Annular space / Abandonment

Depth set at - Metres From	To	Material and type (e.g. neat cement slurry) etc.	Volume Placed (cubic metres)
0	0.6	CONCRETE	
0.6	9	BRN GRAVEL	
9	12	SILICA SAND	

Method of Construction

Cable Tool / Rotary (conventional) / Rotary (reverse) / Rotary (air) / Air percussion / Boring / Diamond / Jetting / Driving / Digging / Other: DRIVE POINT

Water Use

Domestic / Stock / Irrigation / Industrial / Commercial / Municipal / Public Supply / Not used / Cooling & air conditioning / Other: MONITORING WELL

Status of Well

Water Supply / Observation well / Test Hole / Recharge well / Abandoned, insufficient supply / Abandoned, poor quality / Abandoned, unsuitable use / Unfinished / Dewatering / Replacement well / Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: STRATA SOIL DRILLING | Well Contractor's Licence No.: 1041

Business Address (street name, number): 177 WEST BEAVER CREEK, RICHMOND HILL

Name of Well Technician (last name, first): DRAPER, TREVOR | Well Technician's Licence No.: T-3318

Signature of Technician/Contractor: X | Date Submitted: 2006 09 21

Location of Well

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

C-7221
215926

Audit No. Z 54898 | Date Well Completed: 2006 09 01 | Date Delivered

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

Ministry Use Only

Data Source | Contractor

Date Received | Date of Inspection

Remarks | Well Record Number

0506E (08/03) White: Copy / Ministry's Copy / Well Owner's Copy

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9202648 #3 of 5

PROJECT: 05-1112-010(1000)

LOCATION: N 4806671.4 ,E 559066.4

BOREHOLE LOG OF: PLOW2-06

SHEET 1 OF 1

DATUM: Geodetic

DRILLING DATE: August 18 and 22, 2006

DRILL RIG: Direct Push with Continuous Scope

DRILLING CONTRACTOR: Strata Soil Sampling Inc.

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
0	GROUND SURFACE		303.96			C B A
	SANDY SILT, trace gravel		0.00 304.76			
	GRAVEL and fine SAND, little silt		1.20 303.53			
	GRAVEL and medium to coarse-grained SAND		2.43 302.31			
5	Fine to medium grained SAND, some fine gravel		3.65 300.02			
	Fine grained SAND and SILT		5.94 299.11			
	Fine to medium grained SAND, little gravel		6.85 297.43			
	SILTY CLAY		8.84			
10	CLAY		295.91			
	Fine CLAYEY SAND		10.21			
	Medium grained SAND and GRAVEL		293.76			
	END OF BOREHOLE		12.20			
15						
20						
25						
30						
35						
40						
45						
50						

3m

8.2m

12.5

C-7221
2159826

DEPTH SCALE
1 : 250

Golder Associates

LOGGED: JLH
CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

Ontario Ministry of the Environment

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A053781

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 3

Well Owner's Information

First Name | Last Name / Organization: Region of Waterloo | E-mail Address | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): 150 Fredrick St 7th Floor | Municipality: Waterloo | Province: ON | Postal Code: N2J4J3 | Telephone No. *(inc. area code)*: 5197554452

Well Location

Address of Well Location (Street Number/Name): Puslinch Lake 6525 conc. 1 | Township: ~~[illegible]~~ Puslinch | Lot: 2 | Concession: 1

County/District/Municipality: ~~[illegible]~~ Wellington | City/Town/Village: ~~[illegible]~~ Cambridge | Province: Ontario | Postal Code: N0B2J0

UTM Coordinates: Zone | Easting | Northing | Municipal Plan and Sublot Number | Other

NAD 83 | 17 | 559081 | 4806673

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Abandonment of 1.5" PUC Well		PLOW2-06-A			
4" surface casing removed			Bentonite chips	12.10	0.5
Well tag was missing			native soil	0.5	0.0

All measurements from ground level

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ ~~[illegible]~~ ☐ Dewatering ☐ Livestock ☐ Test Hole ☒ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
	See attached			

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
	See attached			

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☒ Abandoned, other, specify not needed ☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

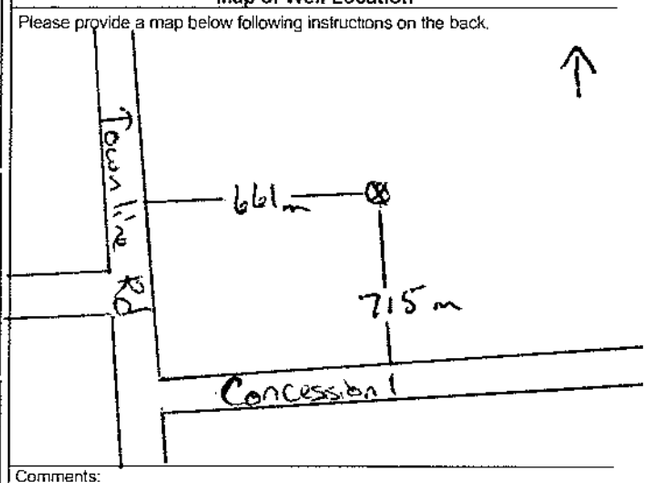
Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Well Initiatives Ltd | Well Contractor's Licence No.: 7221

Business Address (Street Number/Name): 15 Townline Rd, Orangeville | Municipality:

Province: ON | Postal Code: L9W3R4 | Business E-mail Address: info@wellinitatives.com

Bus. Telephone No. *(inc. area code)*: 5198468289 | Name of Well Technician (Last Name, First Name): Gratt, Dwayne

Well Technician's Licence No.: 2752 | Signature of Technician and/or Contractor | Date Submitted: 2012/11/13

Well owner's information package delivered: ☐ Yes ☒ No | Date Package Delivered: | Date Work Completed: 2012/11/08

Ministry Use Only

Audit No. Z159326

MAY 22 2013

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Ontario — Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*: No Tag

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Measurements recorded in: [x] Metric [ ] Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Region of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
150 Fredrick St. 7th Floor	Waterloo	ON	N2J4J3	5197544522

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
6525 conc. 1	Puslinch	2	1

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	~~Puslinch~~ Cambridge	Ontario	N0B2J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	559028	4820663		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Abandonment of 1.5" PVC well PLOW2-06-B				
	4" surface casing removed		Bentonite chips	6.72	0.5
			Native soil	0.5	0.0

All measurements from ground level

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, *specify*

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [x] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
	See Attached			

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
	See Attached			

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[ ] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[x] Abandoned, other, *specify* not used
[ ] Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, *specify*
Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, *specify*
Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

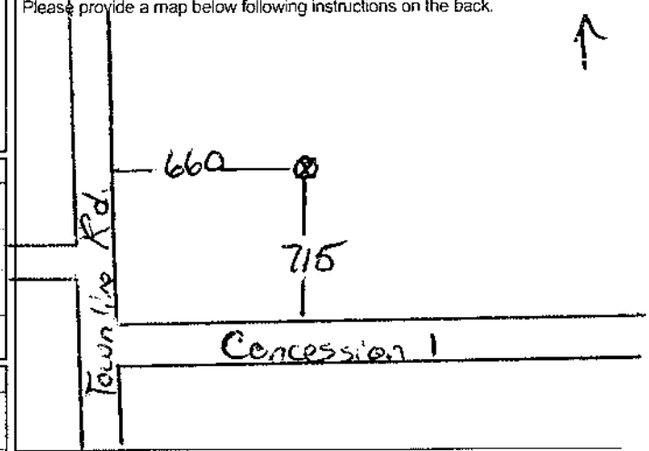
Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Well Initiatives Ltd	7221

Business Address (Street Number/Name)	Municipality
15 Townline Rd Orangeville	

Province	Postal Code	Business E-mail Address
ON	L9W3R4	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5198468289	Croft Darryn

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2253		12/11/13

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[ ] Yes [ ] No		2012/08

Ministry Use Only

Audit No. Z159327

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Ministry's Copy

9202648

BOREHOLE LOG OF: PLOW2-06

PROJECT 05-1112-010(1000)

LOCATION N 4805571 4 E 559066 4

DRILLING DATE: August 18 and 22, 2006

DRILL RIG: Direct Push with Continuous Scope

DRILLING CONTRACTOR: Strata Soil Sampling Inc.

SHEET 1 OF 1

DATUM: Geodetic

DEPTH SCALE METRES	DESCRIPTION	SYMBOLIC LOG	ELEV DEPTH (m)	GEOPHYSICAL RECORD: GAMMA (cps) 20 40 60 80	GEOPHYSICAL RECORD: CONDUCTIVITY (mS/m) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION
0	GROUND SURFACE		305.06			C B A
	SANDY SILT, trace gravel		0.00 304.76			
	GRAVEL and fine SAND, little silt		1.20 303.53			
	GRAVEL and medium to coarse-grained SAND		2.43 302.31			
5	Fine to medium grained SAND, some fine gravel		3.85 300.02			
	Fine grained SAND and SILT		5.94 299.11			
	Fine to medium grained SAND, little gravel		6.85 297.43			
	SILTY CLAY		8.64			
	CLAY		295.91			
10	Fine CLAYEY SAND		10.21			
	Medium grained SAND and GRAVEL		293.76			
	END OF BOREHOLE		12.20			
15						
20						
25						
30						
35						
40						
45						
50						

C-7221
2159327

DEPTH SCALE
1 250

Golder Associates

LOGGED: JLH
CHECKED: AI

MIS-HYD 003 05-1112-010.GPJ GAL-MISS.GDT 4/23/07

Ontario | Ministry of the Environment

Well Tag Number (Place sticker and print number below): A046077

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only: MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name: Cedarbrook Ct. | City/Town/Village: Cambridge | Lot | Concession | Site/Compartment/Block/Tract etc.

Cedarbrook Ct. Cambridge.

GPS Reading: NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brn.	Sand	Silt.	Soil	0	3.1
Grey	Silt	Sand	Saturated	3.1	

N43° 37. 245'
W079° 31. 894'

Hole Diameter

Depth From (Metres)	Depth To (Metres)	Diameter (Centimetres)
0	7.32	8.9

Water Record

Water found at ___ Metres / Kind of Water

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

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

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From	Depth To (Metres)
3.81	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.25	0	5.79
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.		
4.06	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	10	5.79	7.32

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs + ___ min	2		2	
Final water level end of pumping# ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	0.3	Concrete Casing	
0.3	5.49	Bentonite	
5.49	7.32	Sand	

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: Strater Soil Sampling | Well Contractor's Licence No.: 7241

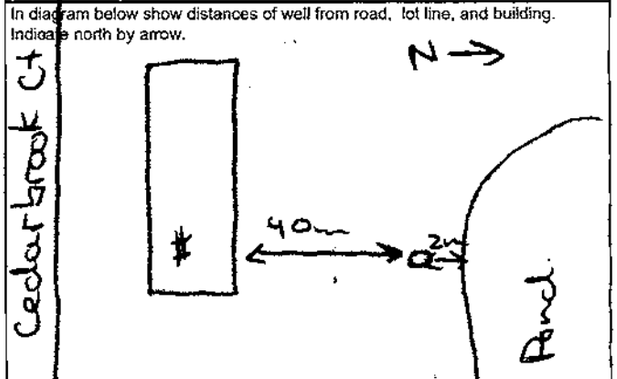
Business Address (street name, number, city etc.): 147 West Beaver Creek

Name of Well Technician (last name, first name): FENELUS, John | Well Technician's Licence No.: T-3069

Signature of Technician/Contractor: X [signature] | Date Submitted YYYY MM DD: 2006/08/22

Location of Well

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



Audit No. Z 51852 | Date Well Completed YYYY MM DD: 2006 08 22

Was the well owner's information package delivered? ☐ Yes ☐ No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor 7241

Date Received OCT 12 2006 YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

PBTW3-07

Ontario Ministry of the Environment

Well Tag No. (F [illegible] Print Below) A 051738
A051738

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
Region of Waterloo			

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St.	Kitchener	ON	N2G 4J3	

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Can Amera parkway			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Cambridge	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	557515	4805868		magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	Sand			0	7.6
Grey	Silt	SAnd, stones		7.6	13.1
Brown	Sand	Gravel	Dry	13.1	23.7
Brown	Gravel	Limestone	Coarse, broken, wet	23.7	27.2
rown/Black/Grey	Limestone	Dolostone	Layered	27.2	132.6
Green	Shale			132.6	133.2

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	6.2	Cement ~~grout~~	0.31
		~~See Attached~~	
		Hole diameter 25.4cm	

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☒ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, specify

Water Use

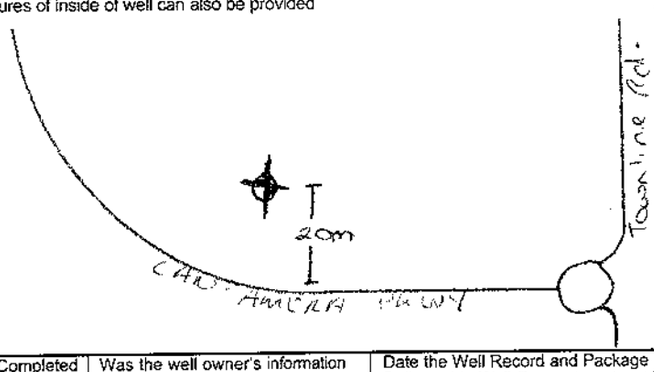
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Status of Well

☐ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☒ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, specify
☐ Recharge Well ☐ Abandoned, other, specify

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2008/02/29	☒ Yes ☐ No	mailed 2008/03/4

Well Contractor and Well Technician Information

Lunney

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (Street No./Name, number, RR)	Municipality
RR# 1 Grand Valley	

Province	Postal Code	Business E-mail Address
ON	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Gerrits, Steve

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
2964	[signature]	2008/3/10

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method: pump

Pump intake set at (Metres):

Pumping rate (Litres/min): 909

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping (Metres): 17.66

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: ____ Metres

Recommended pump rate (Litres/min): 909

If flowing give rate (Litres/min):

Draw Down Time (Min)	Water Level (Metres)	Recovery Time (Min)	Water Level (Metres)
Static Level	7.45	Static Level	
1	16.13	1	12.76
2	16.27	2	12.37
3	16.41	3	12.15
4	16.51	4	11.94
5	16.84	5	11.78
10	17.35	10	11.24
15	17.17	15	10.76
20	17.20	20	10.52
25	17.31	25	10.23
30	17.35	30	10.03
40	17.38	40	9.68
50	17.39	50	9.43
60	17.40	60	9.20

Water Details

Water found at Depth		Kind of Water
27	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
30	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
102	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used	Screen Used
☐ Galvanized	☐ Galvanized
☒ Steel	☐ Steel
☐ Fibreglass	☐ Fibreglass
☐ Plastic	☐ Plastic
☐ Concrete	☐ Concrete

No Casing and Screen Used
☒ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres): ~~xxxx~~ 15.71 cm
Depth of the Hole (Metres): 133.2
Wall Thickness (Metres): 0.477
Inside Diameter of the Casing (Metres): 15.24 cm
Depth of the Casing (Metres): 29.35

Ministry Use Only

Audit No.	Well Contractor No.
z75932	
Date Received (yyyy/mm/dd)	Date of Inspection (yyyy/mm/dd)
Remarks	

0506E (11/2006) **Well Owner's Copy**

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SMTW2ABC-07

Ontario Ministry of the Environment

Well Tag No. (Affix Barcode Below) A 051739

A051739

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
Region of Waterloo			

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St.	Kitchener	ON	N2G4J3	

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
400 Clyde Road			

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	CAmbridge	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	557700	4802625		magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	Sand	gravel, boulders		0	14.17
Grey/Brown	Limestone			14.17	119.48
Grey	Limestone	Shale	Layered	119.48	123.9
Green	Shale			123.90	124.2

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	5.3	Cement (hole dia. 25.4cm)	0.18
		See Attached	

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☒ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, specify

Water Use

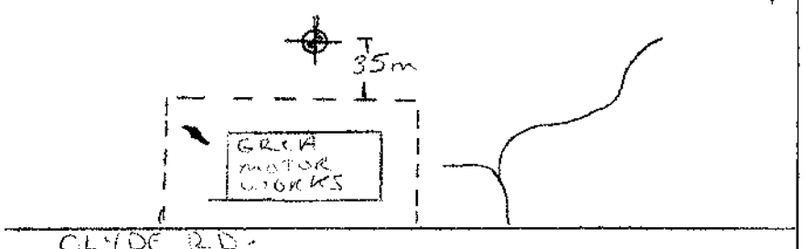
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Status of Well

☐ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☒ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, specify
☐ Recharge Well ☐ Abandoned, other, specify

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method: pump

Pump intake set at (Metres): 17.30

Pumping rate (Litres/min): 909

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping (Metres): 17.30

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 17.30 Metres

Recommended pump rate (Litres/min): 909

If flowing give rate (Litres/min):

Draw Down Time (Min)	Water Level (Metres)	Recovery Time (Min)	Water Level (Metres)
Static Level	5.70	Static Level	17.30
1	15.09	1	12.94
2	15.17	2	12.70
3	15.23	3	12.51
4	15.28	4	12.36
5	15.36	5	12.24
10	15.54	10	11.76
15	15.75	15	11.33
20	15.84	20	11.12
25	15.87	25	10.85
30	15.95	30	10.65
40	16.19	40	10.28
50	16.34	50	9.94
60	16.49	60	9.68

Water Details

Water found at Depth		Kind of Water
47	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
55	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
98	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized
☒ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☒ Plastic
☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres): 15.24

Depth of the Hole (Metres): 124.20

Wall Thickness (Metres): 0.00556

Inside Diameter of the Casing (Metres): 15.24

Depth of the Casing (Metres): 16.76

Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2008/02/29	☒ Yes ☐ No	mailed 2008/03/4

Well Contractor and Well Technician Information

Lunney

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (Street No./Name, number, RR)	Municipality
RR#1 Grand Valley	

Province	Postal Code	Business E-mail Address
ON	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Gerrits, Steve

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
2964		

Ministry Use Only

Audit No.	Well Contractor No.
z 75931	
Date Received (yyyy/mm/dd)	Date of Inspection (yyyy/mm/dd)
Remarks	

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Ontario Ministry of the Environment

Well Tag No. (Affix Sticker and/or Print Below) A051678

A051678

SMTW3ABC-07

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
Region of Waterloo			

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St	Kitchener	ON	N2G 4I3	

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Wellington			

County/District/Municipality	City/Town/Village	Province	Postal Code
400 Clyde Road	Cambridge	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	558422	4802867		magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	Sand	STones		0	10.36
Brown	Sand	gravel,silt	coarse	10.36	17.98
Grey/Brown	Limestone			17.98	111.55
Grey	Limestone	Shale	Layered	111.55	118.11
Green	Shale			118.11	118.41

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
XX	XXX	Hole diameter 25.4cm	
0	5.4	Cement	0.19
		See Attached	

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☒ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, *specify* _____

Water Use

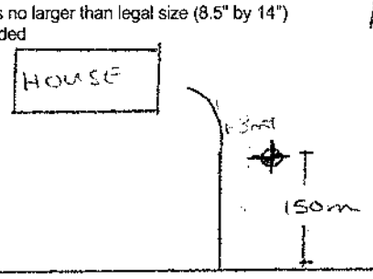
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Status of Well

☐ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☒ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, *specify* _____
☐ Recharge Well ☐ Abandoned, other, *specify* _____

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



CLYDE RD.

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method: pump

Pump intake set at (Metres): 20.6

Pumping rate (Litres/min): 909

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping (Metres): 9.18

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 20.6 Metres

Recommended pump rate (Litres/min): 909

If flowing give rate (Litres/min):

Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level	4.0	Static Level	9.73
1	8.31	1	8.71
2	8.31	2	8.63
3	8.34	3	8.58
4	8.36	4	8.55
5	8.39	5	8.51
10	8.49	10	8.33
15	8.59	15	8.16
20	8.65	20	8.08
25	8.72	25	7.97
30	8.79	30	7.88
40	8.91	40	7.73
50	9.08	50	7.59
60	9.18	60	7.48

Water Details

Water found at Depth		Kind of Water
58	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
72	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
77	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized
☒ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☒ Plastic
☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres): 15.24

Depth of the Hole (Metres): 118.41

Wall Thickness (Metres): 0.00556

Inside Diameter of the Casing (Metres): 0.1524

Depth of the Casing (Metres): 22.86

Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2007/02/27	☒ Yes ☐ No	2008/03/14

Well Contractor and Well Technician Information

Lunney

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (Street No./Name, number, RR)	Municipality
RR#1 GRand Valley	

Province	Postal Code	Business E-mail Address
ON	LON 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	GErrits, Steve

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
2964		2008/03/14

Ministry Use Only

Audit No.	Well Contractor No.
z75930	
Date Received (yyyy/mm/dd)	Date of Inspection (yyyy/mm/dd)

Remarks

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Ontario Ministry of the Environment

Well Tag No. A056884

A056884

SM3ABC-07

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
Region of Waterloo			

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St	Kitchener	ON	N2G 4I3	

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Shade's Mill Conservation Area			

County/District/Municipality	City/Town/Village	Province	Postal Code
		Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	557935	4803411		magellan	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
			Previously drilled 150mm diameter well.		

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
		See attached drill hole record.	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, specify

Water Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Status of Well

☐ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, specify
☐ Recharge Well ☐ Abandoned, other, specify

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method

Pump intake set at (Metres)

Pumping rate (Litres/min)

Duration of pumping hrs + min

Final water level end of pumping (Metres)

Recommended pump type ☐ Shallow ☐ Deep

Recommended pump depth Metres

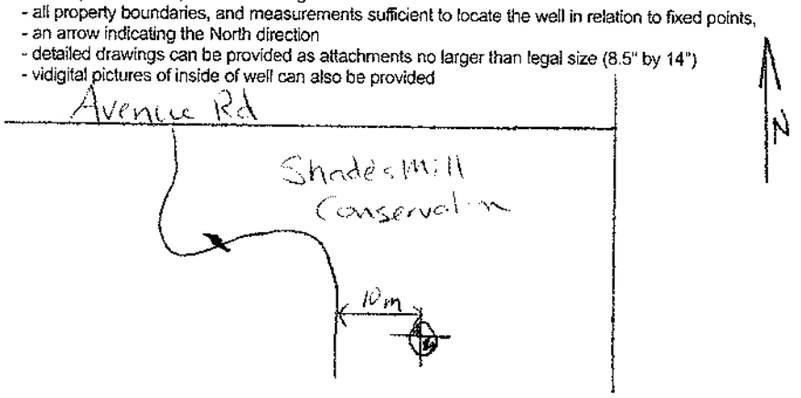
Recommended pump rate (Litres/min)

If flowing give rate (Litres/min)

	Draw Down		Recovery	
	Time (Min)	Water Level (Metres)	Time (Min)	Water Level (Metres)
Static Level			Static Level	
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Water Details

Water found at Depth	Kind of Water
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth	Kind of Water
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth	Kind of Water
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2008/03/3	☒ Yes ☐ No	mailed 2008/03/6

Casing Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

Screen Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres)

Depth of the Hole (Metres)

Wall Thickness (Metres)

Inside Diameter of the Casing (Metres)

Depth of the Casing (Metres)

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (Street No./Name, number, RR)	Municipality
RR#1 Grand Valley	

Province	Postal Code	Business E-mail Address
ON	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Gerrits, Steve

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
2964		

Ministry Use Only

Audit No.	Well Contractor No.
Z75934	
Date Received (yyyy/mm/dd)	Date of Inspection (yyyy/mm/dd)
Remarks	

0506E (11/2006)

Well Owner's Copy

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Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Can Amera 12 inch

W A071516 (I/or Print Below)

A071516

PBPW2-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Region of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Fredrick Street	Kitchener	ON	N2G4J3	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
	Cambridge	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	557517	4806888		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand		Dry	0	10.67
Brown	Sand	Gravel	Wet	10.67	26.82
Brown/Grey	Limestone/Dolostone Layers			26.82	128.02

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.7	Cement	1.52

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [X] Test Hole [ ] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
~~45.72~~ XXXX				
30.48	STeel	0.952	+0.55	29.26
30.48	Open Hole		29.26 XX	128.02

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

[ ] Water Supply
[ ] Replacement Well
[X] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[ ] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth	Kind of Water	
11 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify
71 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify
88 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.7	45.72
6.7	128.02	31.43

Results of Well Yield Testing

After test of well yield, water was:
[X] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 28.3m

Pumping rate (l/min / GPM): 2273.0

Duration of pumping: 72 hrs + 0 min

Final water level end of pumping (m/ft): 15.72

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 28.3

Recommended pump rate (l/min / GPM): 2273.0

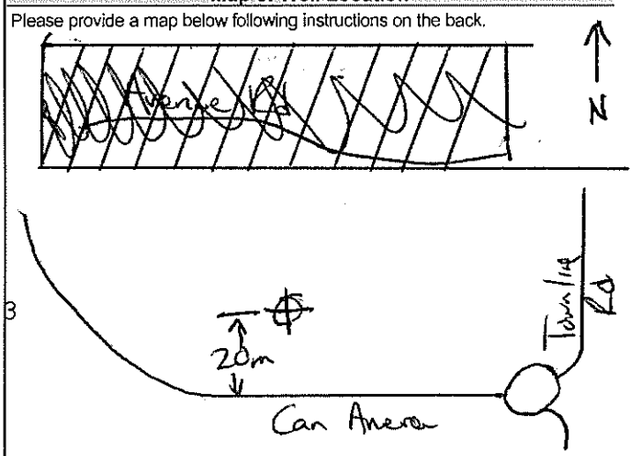
Well production (l/min / GPM): uk

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	7.03		
1	10.65	1	12.27
2	11.23	2	11.73
3	11.66	3	11.41
4	12.04	4	11.12
5	12.21	5	10.90
10	12.53	10	10.18
15	12.92	15	9.94
20	13.15	20	9.52
25	13.32	25	9.32
30	13.46	30	9.16
40	13.68	40	8.92
50	13.86	50	8.71
60	14.02	60	8.56

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Engineering Ltd.	3406

Business Address (Street Number/Name)	Municipality	Province	Postal Code
2151 10th Line, R.R. #1	Ayr	Ontario	N0B 1G0

Bus. Telephone No. (inc. area code) | Name of Well Technician (Last Name, First Name)

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2964		2008 05 08

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[X] Yes [ ] No	2008 05 08	2008 05 08

Ministry Use Only

Audit No. Z 100520

Received MAR 04 2010

Ontario Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below)
A 051677
A051677

SMTW4-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

[redacted]

400 Clyde Rd

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington		Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	658975	4803262	magellan		☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	Sand	Stones		0	16.76
Grey	Silt	Sand		16.76	22.25
Brown	Clay	Sand & Limestone	Layered	22.25	24.99
Grey/Brown	Limestone	Dolostone	Layered	24.99	127.71
Green	Shale			127.11	128.02

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	6.1	Cement(hole dia. 25.4cm)	0.20

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☒ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, specify

Water Use

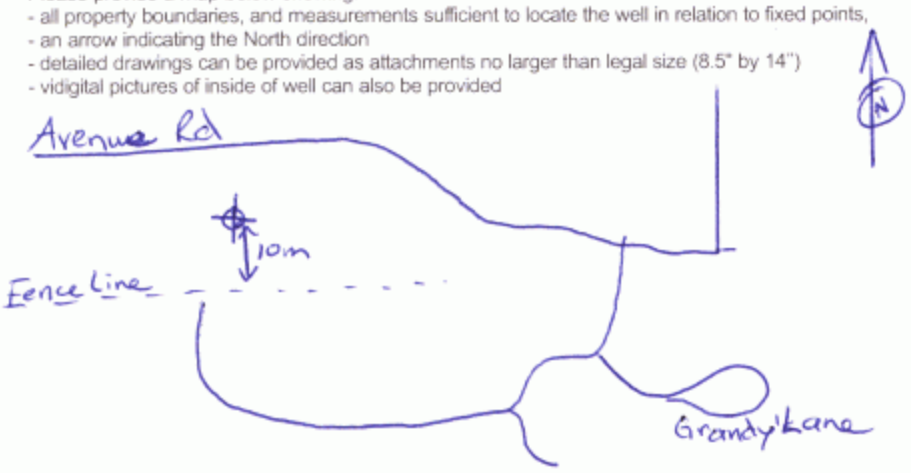
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☒ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Status of Well

☐ Water Supply ☐ Dewatering Well ☒ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, specify
☐ Recharge Well ☐ Abandoned, other, specify

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2008/02/29	☒ Yes ☐ No	mailed 2008/03/4

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd	3406

Business Address (Street No./Name, number, RR)	Municipality
RR#1 Grand Valley	

Province	Postal Code	Business E-mail Address
ON	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Gerrits, Steve

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
2964	Gerrits, Steve	2008/03/4

0506E (11/2006)

Ministry's Copy

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method: pump

Pump intake set at (Metres): 26.8

Pumping rate (Litres/min): 909

Duration of pumping: 2 hrs + 0 min

Final water level end of pumping (Metres): 7.61

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 26.8 Metres

Recommended pump rate (Litres/min): 909

If flowing give rate (Litres/min):

Draw Down Time (Min)	Water Level (Metres)	Recovery Time (Min)	Water Level (Metres)
Static Level	4.62	Static Level	7.61
1	7.20	1	6.03
2	7.30	2	5.98
3	7.33	3	5.93
4	7.24	4	5.89
5	7.26	5	5.85
10	7.30	10	5.79
15	7.33	15	5.73
20	7.35	20	5.69
25	7.37	25	5.66
30	7.38	30	5.63
40	7.40	40	5.57
50	7.43	50	
60	7.46	60	

Water Details

Water found at Depth		Kind of Water	
29	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals	Not Tested
106	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals	Not Tested
	Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals	

Casing Used

☐ Galvanized
☒ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

No Casing and Screen Used

☒ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres): 15.71
Depth of the Hole (Metres): 128.02
Wall Thickness (Metres): 0.477
Inside Diameter of the Casing (Metres): 15.24
Depth of the Casing (Metres): 28.04

Ministry Use Only

Audit No.	Well Contractor No.
z 75933	
Date Received (yyyy/mm/dd)	**Date of Inspection (yyyy/mm/dd)**
APR 17 2009	

Remarks

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Ontario Ministry of the Environment

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. A 073946

A 073946

SMOW1C-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Regional Municipality of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St. 4th Floor	Kitchener	ON	N2G4J3	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Shade's Mills Conservation Area - 450 Avenue Rd.			

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Cambridge	Ontario	N1R5S4

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	558765	4803481		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	SILT	sand, gravel, clay, cobbles	Till, sandy silt	0	3.81
Brown	Sandy silt to silty sand	gravel, clay, boulders	compact, wet to saturated.	3.81	5.79

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0.0	3.05	Bentonite	
3.05	5.79	Sand	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify HSA

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.0	PVC	0.4	+0.4	4.27

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6.1	PVC	010	4.27	5.79

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	5.79	25

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
All-Terrain Drilling Ltd.	1112

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
3-661 Colby Dr.	Waterloo	ON	N2V1C2	allterrain@golden.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5198868810	Grant Don	3311		2008 05 30

Comments: Shallow Well SMOW1A-08

Well owner's information package delivered: ☐ Yes ☒ No

Date Package Delivered: ~~Y Y Y Y~~ ~~M M~~ ~~D D~~

Date Work Completed: 2008 02 14

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Audit No. Z 80390

Received

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Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (P) **A 073947** — A073947

SMOW1A-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Regional Municipality of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St. 4th Floor	Kitchener	ON	N2G4J3	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Shade's Mills Conservation Area - 450 Avenue Road			

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Cambridge	Ontario	N1R5S4

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	558965	4803481		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	SILT	sand, gravel, clay, cobbles	TILL, sandy silt	0	3.81
Brown	Sandy silt to silty sand	gravel, clay, boulders	compact, wet to saturated	3.81	9.45
Brown	Sand	gravel, cobbles, gravel	fine to med., loose, saturated	9.45	10.97
Brown	CLAYEY SILT		very, stiff, till	10.97	11.43
Brown	SAND	gravel, silt, clay	loose, fine to medium	11.43	13.72
Brown/Grey	GRAVEL	cobbles	saturated	13.72	14.94
Grey	SAND, SILT	gravel, clay	fine sand/silt, saturated	14.94	16.92
Grey	SAND	silt, gravel, cobbles, clay	dense, saturated	16.92	19.05
Brown	BEDROCK		fractured	19.05	19.96

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0.0	16.15	Bentonite	
16.15	19.96	Sand	

Method of Construction

[ ] Cable Tool [X] Diamond [ ] Public [ ] Commercial [ ] Not used

[ ] Rotary (Conventional) [ ] Jetting [ ] Domestic [ ] Municipal [ ] Dewatering

[ ] Rotary (Reverse) [ ] Driving [ ] Livestock [ ] Test Hole [X] Monitoring

[ ] Boring [ ] Digging [ ] Irrigation [ ] Cooling & Air Conditioning

[ ] Air percussion [ ] Industrial

[X] Other, *specify* HSA 6¼" [ ] Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.0	PVC	.4	+0.4	16.92

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6.1	PVC	010	16.92	19.96

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, *specify*
[ ] Other, *specify*

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
	[ ]	[ ] Fresh [ ] Untested	
	[ ]	[ ] Fresh [ ] Untested	
	[ ]	[ ] Fresh [ ] Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0.0	7.62	25
7.62	19.96	13

Results of Well Yield Testing

After test of well yield, water was: [ ] Clear and sand free [ ] Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

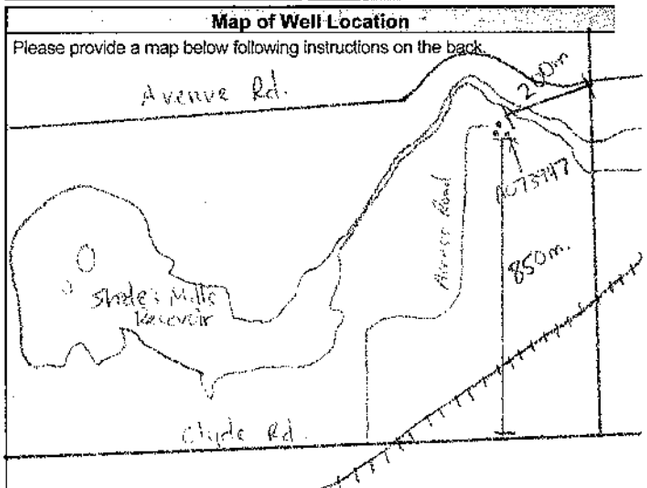
Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
All-Terrain Drilling Ltd.	1129

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
3-661 Colby Dr.	Waterloo	ON	N2V1C2	allterrain@golden.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5198868810	Grant, Don	5511		2008/05/30

Comments: Deep well SMOW1A-08

Well owner's information package delivered: [ ] Yes [X] No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2008/02/14

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Audit No. Z 80373

Received

Well Owner's Copy

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Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. A 073948

A 073948

SMOW1B-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Regional Municipality of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick St. 4th Floor	Kitchener	ON	N2G4J3	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Shade's Mills Conservation Area - 450 Avenue Road			

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Cambridge	Ontario	N1R5S4

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	558965	4803481		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Silt	Sand gravel, clay, cobbles	Till, sandy silt	0	3.81
Brown	Sandy Silt to Silty Sand	gravel, clay, boulders	compact, wet to saturated	3.81	9.45
Brown	Sand	gravel, cobbles,	fine to med.; loose, saturated	9.45	10.97
Brown	clayey silt		very stiff, till	10.97	11.43
Brown	Sand	gravel, silt, clay	loose, fine to medium	11.43	12.19

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	8.53	Bentonite	
8.53	12.19	Sand	

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[X] Other, specify HSA

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.0	PVC	.4	0	8.99

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6.1	PVC	010	8.99	12.04

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth (m/ft)	[ ] Gas	Kind of Water: [ ] Fresh [ ] Untested [ ] Other, specify
Water found at Depth (m/ft)	[ ] Gas	Kind of Water: [ ] Fresh [ ] Untested [ ] Other, specify
Water found at Depth (m/ft)	[ ] Gas	Kind of Water: [ ] Fresh [ ] Untested [ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0.0	12.19	25.0

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
All-Terrain Drilling Ltd	1129

Business Address (Street Number/Name)	Municipality
3-661 Colby Dr.	Waterloo

Province	Postal Code	Business E-mail Address
ON	N2V1C2	allterrain@golden.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5198868810	Grant Don

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3311		2008/03/20

Comments: Intermediate SMOW1A-08

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[ ] Yes [X] No		2008/02/15

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Audit No. Z 80391

Received

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Figure 1: Proposed Multi-level Observation Well Site
Cambridge, Ontario



A073946
A073947
A073948

17 558965E
4803481 N

Access Route
Along 6ft wide walking trail

Proposed Observation Well Site

NDTW1ABC-08

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A051729

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	North Dumfries	6	10

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	CLyde	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	562345	4804320		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	See Audit #Z93603				

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
		SEE ATTACHED	

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
	SEE ATTACHED			

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
SEE ATTACHED				

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min-/ GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED

Amends Audit Z 93603

Comments: Package Mailed 2008/10/21

Well Contractor and Well Technician Information

Business Name of Well Contractor: Gerrits Drilling & Engineering Ltd.
Well Contractor's Licence No.: 3406
Business Address (Street Number/Name): 215154 10th Line, R.R. #1
Municipality: Grand Valley, Ontario
Province: L0N 1G0
Postal Code:
Business E-mail Address:
Bus. Telephone No. *(inc. area code)*:
Name of Well Technician (Last Name, First Name): Steve Gerrits
Well Technician's Licence No.: 2964
Signature of Technician and/or Contractor: [signature] Gerrits Drilling Eng Ltd
Date Submitted: 2008 12 17

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2008 10 21

Date Work Completed: 2008 12 17

Ministry Use Only

Audit No. Z 93634

APR 14 2009

Received

0506E (12/2007)

Ministry's Copy

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Golder Associates
Mississauga, Ontario, Canada

PROJECT No.	REV.
SCALE	
DATE Nov 25/08	
DESIGN AbI	
CHECK	
REVIEW	
TITLE Multi-Level Piezometer Installation for well NDTW1-08	
PROJECT TITLE N. Dumfries Ins Project	SHEET No. 1

APR 14 2009

Ground Surface

Bentonite Grout

STEEL casing ⌀ 6"

Hole Plug: 70 to 74 ft.

Filter Sand
74 to 100 ft.

C' screen: 85 to 95 ft

Hole Plug: 100 to 138 ft

Filter Sand: 138 to 175 ft.

B' screen: 145 to 170 ft.

Hole Plug
175 to 253 ft.

Filter Sand
253 to 328 m

A' screen: 260 to 320 ft.

Hole Plug.
328 to 376 ft.

TD: 376 ft.

Bottom of Casing
@ 79 ft (24.1 m)

0-70'	Bentonite Grout
70-74	Hole Plug
74-100	Filter Sand
100-138	Hole Plug
138-175	Filter Sand
175-253	Hole Plug
253-328	Filter Sand
328-376	Hole Plug

Piezo 'A' Screen from 260 to 320 ft.

Piezo 'B' Screen from 145 to 170 ft.

Piezo 'C' Screen from 85 to 95 ft.

70'
90'
110'
130'
150'
170'
190'
210'
230'
250'
270'
290'
310'
330'
350'
370'

138

C-3406 2536.34

NDTW2-08

Ontario

A 051702

Well Record

Regulation 903 Ontario Water Resources Act

[redacted]

Clay	Loam		0	0.10
	Coarse Gravel and Sand		0.50	7.52
	Coarse Gravel and Sand with some silt		7.52	14.02
Loose Hard Clay	Soft Silt Trace Gravel	Flow	14.02	20.12
	Limestone		20.12	21.95
Red/Green Shale			21.95	115.00

Annular Space

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed (cft)
0	0.1	Cement	0.785

Results of Well Yield Testing

Time	Water Level	Time	Water Level
Static	0.14		
1	3.65	1	1.31
1	3.43	1	1.31
1	3.47	1	1.48
1	3.49	1	1.47
1	3.47	1	1.46
1	3.13	1	1.29
1	3.73	1	1.33
1	3.19	1	1.28
1	3.75	1	1.26
1	3.80	1	1.29
1	3.86	1	1.28
1	3.83	1	1.15
1	3.84	1	1.14

Method of Construction

Well Use

Construction Record - Casing

Depth From	Depth To	Diameter	Wall Thickness	Material
15.0	Steel	0.617	+0.72	21.46
15.0	Open Hole		21.98	115.42

Status of Well

Construction Record - Screen

Water Levels

Depth (ft)	Date	Method of Measurement
13.4	[redacted]	Other method
96.4	[redacted]	Other method

Water Details

Depth From	Depth To	Estimated Flow Rate (GPM)
0	0.1	25.0
0.1	115.00	15.0

Well Contractor and Well Technician Information

Business Name of Well Contractor: Depths Drilling & Eng. Ltd

Well Contractor's Licence No.: 7084

Business Address (Street Number/Name): 4981 Dysart Valley

Province: ON

Postal Code: L5M 1H8

Name of Well Technician (Last, First): Steve Depths

Well Technician's Licence No.: 7705

Date Package Delivered: 2009 11 18

Minister's Report

Ministry Use Only

Audit No. Z 93581

Date Received: APR 17 2009

Well Tag No. (Barcode): A051702

Date Work Completed: 2009 10 16

Comments: NDTW2-08

Ontario — Ministry of the Environment

Measurements recorded in: ☒ Metric ☐ Imperial

Well — A071564 (Print Below) A071564

NDPW1-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Regional Municipality of Waterloo		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 Frederick Street	Kitchener	ON	N2G 4J3	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	North Dumfries	6	10

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Clyde	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	562222	4804076		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand	Gravel		0	12.80
Grey	Silt	Sand & Clay		12.80	19.82
Red	Clay			19.82	21.64
Brown/Grey	Limestone/Dolostone layers			21.64	106.68

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	21.64	Portland Cement	3.09
0	24.68	Portland Cement	0.841

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☒ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
40	Steel	0.09	+.25	21.64
30.48	Steel	0.09	+.60	24.68
30.48	open hole		24.68	106.6

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth	Kind of Water	
27 (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, specify
48 (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, specify
84 (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	21.64	61.0
21.64	24.7	41.0
24.7	106.68	30.5

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 21.64

Pumping rate (l/min / GPM): 4320

Duration of pumping: 68 hrs + 0 min

Final water level end of pumping (m/ft): 10.15

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 21.64

Recommended pump rate (l/min / GPM): 4320

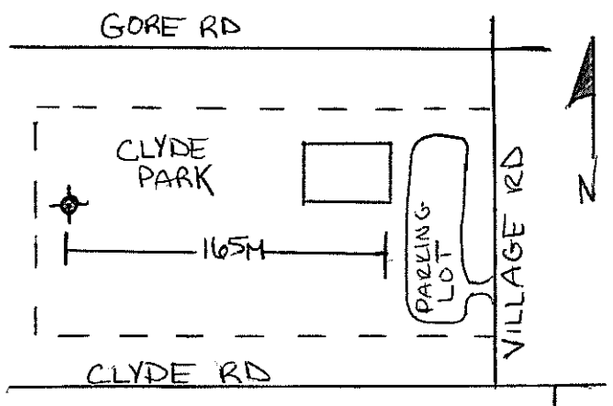
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	6.42		5.12
1		1	5.04
2		2	4.90
3	7.29	3	4.88
4	7.29	4	4.76
5	7.29	5	4.70
10	7.36	10	4.45
15	7.335	15	4.28
20	7.36	20	4.16
25	7.38	25	4.45
30	7.40	30	3.95
40	7.46	40	3.78
50	7.51	50	3.65
60	7.55	60	3.55

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Package mailed 2009/01/15

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Eng. Ltd.	3406

Business Address (Street Number/Name)	Municipality
RR#1 Grand Valley	

Province	Postal Code	Business E-mail Address
ON	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Gerrits, Steve

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2964		2009 01 16

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2009 01 15	2009 01 15

Ministry Use Only

Audit No. Z 93630

MAR 04 2010 Received

Gore/Village Deep Multi Level

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (or Print Below) A 051658 A051658

NDOW1ABC-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	North DUmfries	6	10

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Clyde	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	562264	4840742		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam			0	0.31
Brown	Sand	Gravel		0.31	9.06
Brown	Sand	Silt		9.06	15.00
Brown	Gravel	Sand		15.00	19.06
Brown	Clay			19.06	22.81
Brown	Gravel	CLay	Broken Rock	22.81	26.71
Brown	Limestone		Bedrock	26.71	116.56
Green	SHale			116.56	116.87

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.56	Bentonite SLurry	0.22

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.24	Steel	.188	+.45	27.34
15.24	Open Hole		27.34	116.87

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth	Kind of Water	Gas	Other, specify
40.0 (m/ft)	[ ] Fresh [X] Untested	[ ] Gas	
110.62 (m/ft)	[ ] Fresh [X] Untested	[ ] Gas	
(m/ft)	[ ] Fresh [ ] Untested	[ ] Gas	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.56	25.4
6.56	27.34	16.81
27.34	116.87	15.24

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft) monitor well - not tested

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached

Comments: Package Mailed 2008/11/15

Well Contractor and Well Technician Information

Business Name of Well Contractor: **Gerrits Drilling & Engineering Ltd.**
Well Contractor's Licence No.: 3406

Business Address (Street Number/Name): **215154 10th Line, R.R.#1**
Municipality: **Grand Valley, Ontario L0N 1G0**

Province | Postal Code | Business E-mail Address

Bus. Telephone No. (inc. area code) | Name of Well Technician (Last Name, First Name): Steve Gerrits

Well Technician's Licence No.: 2964
Signature of Technician and/or Contractor: GW Drill & Eng Ltd
Date Submitted: 2008 11 15

Well owner's information package delivered: [X] Yes [ ] No

Date Package Delivered: 2008 11 15

Date Work Completed: 2008 11 14

Ministry Use Only

Audit No. Z 93629

Received APR 14 2009

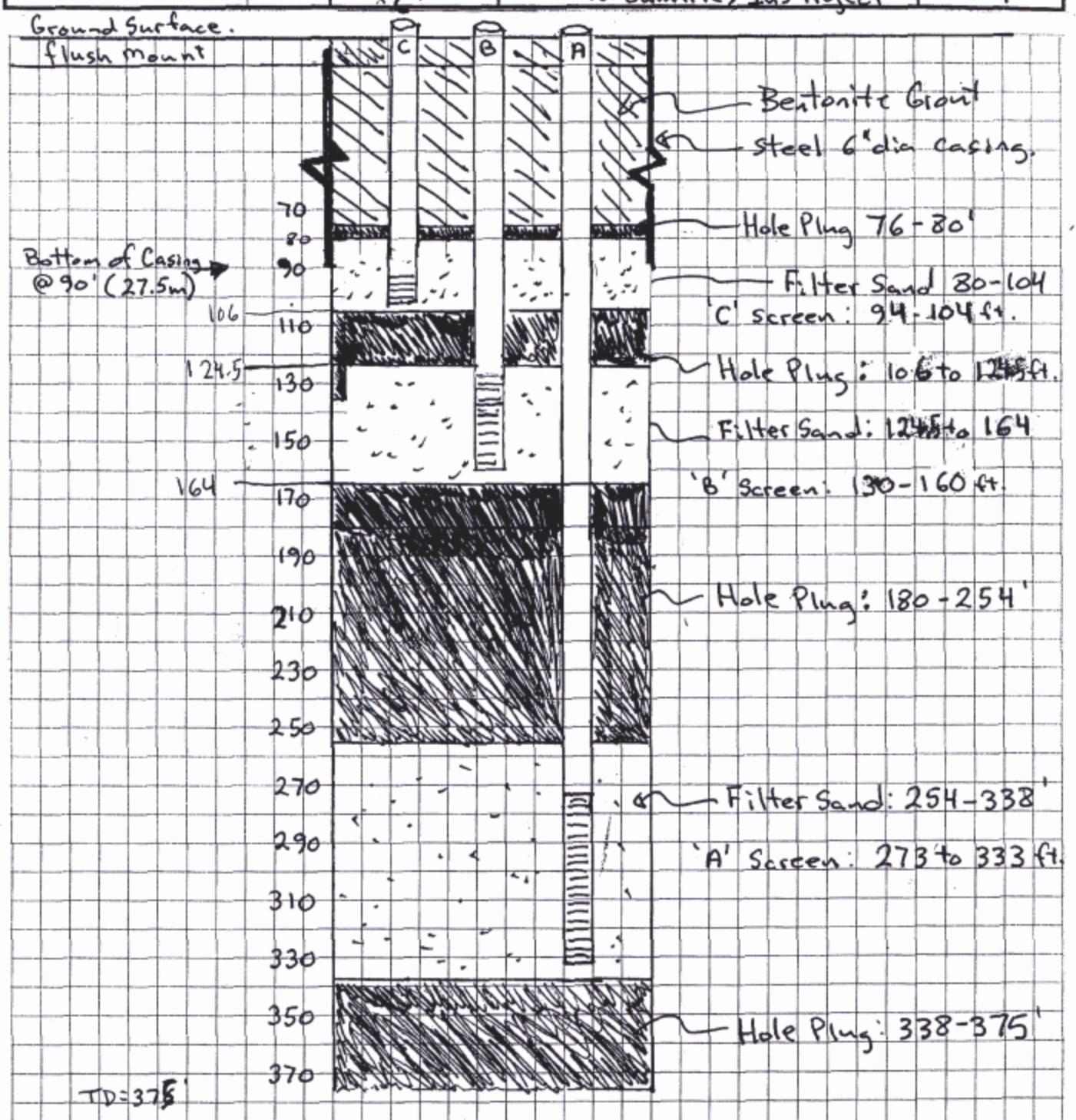
0506E (12/2007)

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Golder Associates
Mississauga, Ontario, Canada

SCALE		TITLE Multi-Level Piezometer Installation for well NDOW1-08	
DATE Dec 3, 2008			
DESIGN ADI			
CHECK Gord / V. Maya			
PROJECT No.	REV.	PROJECT TITLE N. Dumfries Ius Project	SHEET No. 1
REVIEW AC			



0-76 Bentonite Grout
76-80 Hole Plug.
80-106 Filter Sand
106-124.5 Hole Plug.
124.5-164 Filter Sand
164-254 Hole Plug.
254-338 Filter Sand
338-375 Hole Plug.

Piezo 'A' screen from 273 to 333 ft
Piezo 'B' screen from 130 to 160 ft
Piezo 'C' screen from 94 to 104 ft.

APR 14 2009

C-3406
293629

Gore/Village 57ft monitor

NDOW1D-08

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Or Print Below)
A 051650
A051650

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)

Township: North Dumfries | Lot: 6 | Concession: 10

County/District/Municipality: Waterloo

City/Town/Village: Clyde

Province: Ontario | Postal Code:

UTM Coordinates: NAD 8 3 | Zone: 17 | Easting: 562260 | Northing: 4804727

Municipal Plan and Sublot Number:

Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam			0	0.31
Brown	Sand	Gravel		0.31	9.06
Brown	Sand	Silt		9.06	15.00
Brown	Gravel	Sand		15.00	17.50

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.56	Bentonite SLurry	0.21

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping: ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

MONITOR WELL
NOT TESTED

Method of Construction

[ ] Cable Tool
[X] Rotary (Conventional)
[ ] Rotary (Reverse)
[ ] Boring
[ ] Air percussion
[ ] Other, specify
[ ] Diamond
[ ] Jetting
[ ] Driving
[ ] Digging

Well Use

[ ] Public
[ ] Domestic
[ ] Livestock
[ ] Irrigation
[ ] Industrial
[ ] Other, specify
[ ] Commercial
[ ] Municipal
[ ] Test Hole
[ ] Cooling & Air Conditioning
[ ] Not used
[ ] Dewatering
[X] Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	Sch 40	+.55	14.375

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	10	14.37	17.5

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
15.62	[ ] Fresh [X] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	17.5	16.81

Map of Well Location

Please provide a map below following instructions on the back.

See Attached

Comments: Package Mailed 2008/10/30

Well Contractor and Well Technician Information

Business Name of Well Contractor: Gerrits Drilling & Engineering Ltd.
Well Contractor's Licence No.: X 3406

Business Address (Street Number/Name): 215154 10th Line, R.R. #1
Municipality: Grand Valley, Ontario L0N 1G0

Province | Postal Code | Business E-mail Address

Bus. Telephone No. (inc. area code)

Name of Well Technician (Last Name, First Name): Steve Gerrits

Well Technician's Licence No.: 2964

Signature of Technician and/or Contractor: Gerrits Drill & Eng Ltd

Date Submitted: 2008 10 30

Well owner's information package delivered: [X] Yes [ ] No

Date Package Delivered: 2008 10 30

Date Work Completed: 2008 10 29

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Audit No. Z 93627

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Gore/Village 28ft Monitor

NDOW1E-08

Ontario Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well T: A 051653 (Print Below)
A051653

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	North Dumfries	6	10

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Clyde	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	562269	4940746		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam			0	0.31
Brown	Sand	Gravel		0.31	8.75

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	6.56	Bentonite Slurry	0.063

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, *specify*

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
5.25	Plastic	Sch 40	0	5.625

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5.25	Plastic	10	5.625	8.75

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, *specify*
[ ] Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
7.81	[ ] Fresh [X] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	8.75	16.81

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? [X] Yes [ ] No

MONITOR WELL NOT TESTED

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED

Comments:
Package Mailed 2008/11/18

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Engineering Ltd.	3406

Business Address (Street Number/Name)	Municipality
215154 10th Line, R.R. #1 Grand Valley, Ontario L0N 1G0	

Province	Postal Code	Business E-mail Address

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Steve Gerrits

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2964	[signature]	2008 11 18

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[X] Yes [ ] No	2008 11 18	2008 11 17

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Audit No. Z 93628

APR 14 2009

Received

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Multi-Level -- XXXX Golf Course

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Plate below) A 051707 / A051707

NDOW2ABC-08 Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name) | Township: North DUmfries | Lot: 5 | Concession: 10

County/District/Municipality: Waterloo | City/Town/Village: Clyde | Province: Ontario | Postal Code:

UTM Coordinates: NAD 8 3 | Zone: 17 | Easting: 561216 | Northing: 4803776 | Municipal Plan and Sublot Number: | Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam			0	3.04
Brown	Sand	Gravel		3.04	4.26
Brown	Gravel	Sand, Clay		4.26	10.97
Brown	Sand			10.97	22.55
Brown	Gravel			22.55	26.21
Grey XXXXX Brown	Limestone		Broken Rock	26.21	31.08
XGrey	Limestone		Bedrock	31.08	115.82
Green	Shale			115.82	116.43

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.4	Bentonite SLurry	0.22

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.24	Steel	.188	+0.5	31.69
	Open Hole		31.69	116.43

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth	Kind of Water	
43.28 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify
66.14 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify
98.8 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.4	25.4
6.4	31.69	15.7
31.69	116.43	15.2

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM): MONITOR WELL NOT TESTED

Duration of pumping: ___ hrs + ___ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED

Comments: XX X Package Mailed 2008/12/11

Well Contractor and Well Technician Information

Business Name of Well Contractor: Gerrits Drilling & Engineering Ltd.
Well Contractor's Licence No.: 3406
Business Address (Street Number/Name): 215154 10th Line, R.R. #1
Municipality:
Grand Valley, Ontario L0N 1G0
Province | Postal Code | Business E-mail Address
Bus. Telephone No. (inc. area code)
Name of Well Technician (Last Name, First Name): Steve Gerrits
Well Technician's Licence No.: 2964
Signature of Technician and/or Contractor
Date Submitted: 2008 Y 12 M 11 D

Well owner's information package delivered: [X] Yes [ ] No
Date Package Delivered: 2008 Y 12 M 11 D
Date Work Completed: 2008 Y 12 M 10 D

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Audit No. Z 93633
Received APR 14 2009

0506E (12/2007)

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Golder Associates Mississauga, Ontario, Canada	SCALE	TITLE NDOW2ABC - Piezo Installation Golf Course
	DATE Dec 15/08	
	DESIGN ADI	
	CHECK	
PROJECT No. / REV.	REVIEW M.	PROJECT TITLE North Dumfries / SHEET No. 1/2

NDOW2 ABC-08 Construction

0 – 90 ft	Bentonite Grout
90 - 98 ft	Hole Plug
98 - 134.5 ft	filter Sand
134.5 - 157.5 '	Hole Plug
157.5 - 197	Filter Sand
197 - 270	Hole Plug
270 - 355	Filter Sand
355 - 382	Hole Plug
382 ft End of Hole	

Piezo 'A' 285 to 345 ft.

Piezo 'B' 165 to 190 ft.

Piezo 'C' 111 to 129 ft.

APR 14 2009

C-3406
293633

Golf Course 102ft Monitor

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well A051726 (Print Below)
A051726

NDOW2D-08

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)

Township: North Dumfries

Lot: 5

Concession: 10

County/District/Municipality: Waterloo

City/Town/Village: Clyde

Province: Ontario

Postal Code

UTM Coordinates: NAD 83 Zone 17 Easting 561231 Northing 4803771

Municipal Plan and Sublot Number

Other

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam	Gravel		0	3.12
Brown	Sand	Gravel		3.12	4.37
Brown	Gravel	Sand, Clay		4.37	11.25
Brown	Sand			11.25	23.12
Brown	Gravel			23.12	26.87
Grey	Limestone		Broken	26.87	31.87

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6.56	Bentonite Slurry	0.23

Method of Construction

- [ ] Cable Tool
- [X] Rotary (Conventional)
- [ ] Rotary (Reverse)
- [ ] Boring
- [ ] Air percussion
- [ ] Other, specify
- [ ] Diamond
- [ ] Jetting
- [ ] Driving
- [ ] Digging

Well Use

- [ ] Public
- [ ] Domestic
- [ ] Livestock
- [ ] Irrigation
- [ ] Industrial
- [ ] Other, specify
- [ ] Commercial
- [ ] Municipal
- [ ] Test Hole
- [ ] Cooling & Air Conditioning
- [ ] Not used
- [ ] Dewatering
- [X] Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	Sch 40	+0.50	28.75

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	10	28.75	31.87

Status of Well

- [ ] Water Supply
- [ ] Replacement Well
- [ ] Test Hole
- [ ] Recharge Well
- [ ] Dewatering Well
- [X] Observation and/or Monitoring Hole
- [ ] Alteration (Construction)
- [ ] Abandoned, Insufficient Supply
- [ ] Abandoned, Poor Water Quality
- [ ] Abandoned, other, specify
- [ ] Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
29.68	[ ] Fresh [X] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.56	25.4
6.56	28.75	16.8
28.75	31.87	16.8

Results of Well Yield Testing

After test of well yield, water was:
- [ ] Clear and sand free
- [ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.

See Attached

Comments: Package Mailed 2008/11/15

Well Contractor and Well Technician Information

Business Name of Well Contractor: Gerrits Drilling & Engineering Ltd.

Well Contractor's Licence No.: 3406

Business Address (Street Number/Name): 215154 10th Line, R.R. #1

Municipality: Grand Valley, Ontario

Province: L0N 1G0

Postal Code

Business E-mail Address

Bus. Telephone No. (inc. area code)

Name of Well Technician (Last Name, First Name): Steve Gerrits

Well Technician's Licence No.: 2964

Signature of Technician and/or Contractor

Date Submitted: 2008 11 15

Well owner's information package delivered: [X] Yes [ ] No

Date Package Delivered: 2008 11 15

Date Work Completed: 2008 11 14

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Audit No. Z 93626

APR 14 2009

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Golf course 15ft Monitor

Ontario — Ministry of the Environment

Measurements recorded in: X Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below)
A 051705
A051705

Well Record

Regulation 903 Ontario Water Resources Act

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	North Dumfries	5	10

County/District/Municipality	City/Town/Village	Province	Postal Code
Waterloo	Clyde	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	561218	4803775		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Loam			0	3.12
Brown	Sand	Gravel		3.12	4.37
Brown	Gravel	Clay, Sand		4.37	4.68

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	3.12	Bentonite ~~XXXXX~~	0.063

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	Sch 40	+.55	3.12

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5.25	Plastic	10	3.12	4.68

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	
3.12	☐ Fresh ☒ Untested	☐ Gas ☐ Other, specify
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, specify
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	4.68	16.81

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

MONITOR WELL NOT TESTED

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.

See Attached

Comments:
Package Mailed ~~X~~2008/11/12

Well Contractor and Well Technician Information

Business Name of Well Contractor
Gerrits Drilling & Engineering Ltd.

Well Contractor's Licence No.
3406

Business Address (Street Number/Name)
2155A 10th Line, R.R. #1

Municipality

Grand Valley, Ontario L0N 1G0

Province | Postal Code | Business E-mail Address

Bus. Telephone No. (inc. area code)

Name of Well Technician (Last Name, First Name)
Steve Gerrits

Well Technician's Licence No.
2964

Signature of Technician and/or Contractor
Gerrits Drilling & Eng Ltd

Date Submitted
2008/11/12

Well owner's information package delivered
☒ Yes ☐ No

Date Package Delivered
2008/11/12

Date Work Completed
2008/11/11

Ministry Use Only

Audit No. Z 93625

Received APR 14 2009

0506E (12/2007)

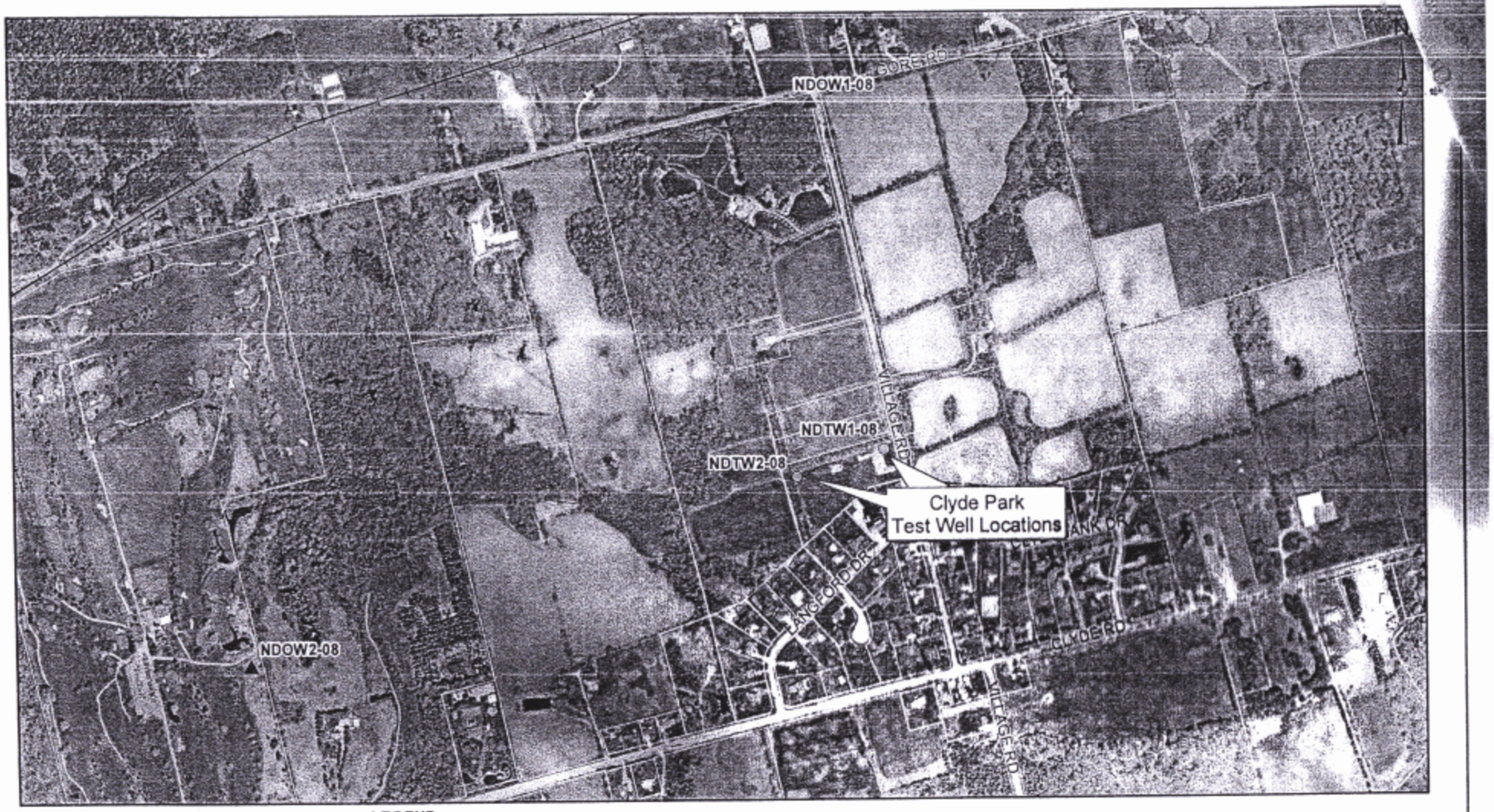
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APR 14 2009

C-3406
293625

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Phase1900\proposed_well_locations.mxd





LEGEND

- ▲ New Deep Monitoring Well Nest
- ◉ Test Well
- Railway
- Watercourse, Permanent
- Parcel Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003, Region of Waterloo 2005
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2008
Datum: NAD83 Projection: UTM Zone 17

0 50 100 200 300 400
Meters

PROJECT: MUNICIPALITY OF WATERLOO IUS PROJECT

TITLE: CLYDE TEST WELL LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:10,000	REV. 0
DESIGN	CC	01 Jun. 2005		
GIS	KS	21 Oct. 2008		
CHECK	AJ	21 Oct. 2008		
REVIEW		22 Jul. 2009		

FIGURE: 1

Ontario Ministry of the Environment

NDOW3AB-08

Well Tag No. for Master Well *(Place Sticker and/or Print Below)*

A 077561

Master Well Record for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Master Well Owner's and Land Owner's Information

First Name	Last Name	E-mail Address
REGIONAL MUNICIPALITY	OF WATERLOO	

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
150 FREDERICK ST	WATERLOO	ON	N2G4J3	5195754400

Location and Construction of the Master Well in the Cluster

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
	PUSLINCH	7	9

County/District/Municipality	City/Town/Village	Province	Postal Code
~~PUSLINCH~~ WATERLOO	CLYDE	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	562603	4803606	GARMIN	ETREX	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
BROWN	TOPSOIL		LOOSE	0	.9
BROWN	SILT	SAND	DENSE	.9	3.9
BROWN	STONES	SILT	TO ROWS	3.9	8.5
GREY	SHALE	SILT	DENSE	8.5	9

Hole Details

Depth (Metres) From	Depth (Metres) To	Diameter (Centimetres)
0	9	10

Water Use

☐ Public ☐ Industrial ☐ Not used ☐ Other, *specify*
☐ Domestic ☐ Commercial ☐ Dewatering
☐ Livestock ☐ Municipal ☒ Monitoring
☐ Irrigation ☐ Test Hole ☐ Cooling & Air Conditioning

Method of Construction

☐ Cable Tool ☐ Air Percussion ☐ Digging
☐ Rotary (Conventional) ☐ Diamond ☐ Boring
☐ Rotary (Reverse) ☐ Jetting ☐ Other, *specify*
☐ Rotary (Air) ☒ Driving

Status of Well

☐ Test Hole ☐ Abandoned, Insufficient Supply
☐ Replacement Well ☐ Abandoned, Poor Water Quality
☐ Dewatering Well ☒ Other, *specify* MONITORING.
☐ Alteration (Construction) ☐ Abandoned, other, *specify*

Construction Details

Inside Diameter (Centimetres)	Material (steel, plastic, fibreglass, concrete, galvanized)	Wall Thickness	Depth (Metres) From	Depth (Metres) To
2.54	PLASTIC		0	9

No Casing and Screen Used

Open Hole ☐ Yes ☐ No

Static Water Level Test

_____ Metres

Screen

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Concrete ☒ Plastic

Outside Diameter (Centimetres)	Slot No.
3.3	10

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	Depth Set at (Metres) To	Type of Sealant Used (Material and Type)	Volume Used (Cubic Metres)
0	7	3/8 BENTONITE CHIP	<1
7	9	SAND	<1

Water Details

Water found at Depth	Kind of Water
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Disinfected ☐ Yes ☐ No If no, provide reason:

Date Master Well Completed *(yyyy/mm/dd)* 2008/11/19

Cluster Information *(Please also fill out the additional Cluster Well Information for Well Construction for each parcel of land and cluster.)*

Total Wells in Cluster	Please indicate Number of Cluster Well Information Log Sheets Submitted
2	1
Total Wells on this Property: 2	

Location of Well Cluster

Detailed Map must be provided as an attachment no larger than legal size (8.5" x 14"). Sketches are not allowed.

☒ Check box to confirm detailed map is provided as per Section 11.1 (3)

Consent to release additional information concerning the cluster to the Director upon request

Signature of Technician/Contractor [redacted] Date *(yyyy/mm/dd)*

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CMT ENG INC	7166

Business Address (Street No./Name, number, RR)	Municipality
1011 INDUSTRIAL CRES UNIT 1	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2M0	CMT@GOLDEN.NET

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5196995775	DAVIES BRAD

Well Technician's Licence No.	Signature of Technician	Date Submitted *(yyyy/mm/dd)*
3458	[signature]	2008/11/19

Audit No.	Well Contractor No.
M 01126	

Date Received *(yyyy/mm/dd)*	Date of Inspection *(yyyy/mm/dd)*
NOV 24 2008	

Remarks

1992 (11/2006)

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Ontario

Ministry of the Environment

Well Tag No. for Master Well *(Print Well Tag No.)*
A077561

Cluster Well Information for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Property Owner's Information

First Name	Last Name	Mailing Address (Street No./Name, RR)	Municipality
REGIONAL MUNICIPALITY OF	WATERLOO	150 FREDERICK ST	WATERLOO

Province	Postal Code	E-mail Address	Telephone No. (inc. area code)
ON	N2G 4J3		5195754400

Cluster Well Information

Address of Well Location (Street Number/Name, RR)	Lot	Concession	Township	County/District/Municipality
	7	9	PUSLINCH	WATERLOO

City/Town/Village	Province	Postal Code	GPS Unit Make	Model	Unit Mode of Operation
CLYDE	Ontario		GARMIN	ETREX	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify:

[redacted]

Signature of Technician/Contractor | Date *(yyyy/mm/dd)*

Well # on Sketch	UTM Coordinates Zone	Easting	Northing	Full Depth of Hole (metres)	Hole Diameter (cm)	Method of Construction	Casing Material	Casing Length (metres)	Screen Interval (metres) From	To	Annular Space Sealant Used	Static Water Level (metres)	Abandonment Sealant Used	Comments	Date of Completion *(yyyy/mm/dd)*
	17	562603	4803606	9	10	DRIVING	PLASTIC	7.6	7.6	9	BENTONITE CHIP				2008/11/18
	17	562599	4803607	3	10	DRIVING	PLASTIC	1.5	1.5	3	BENTONITE CHIP				2008/11/18

Well Contractor and Well Technician Information

Business Name of Well Contractor	Business Address (Street Number/Name, RR)	Municipality	Province
CMT ENG. INC	1011 INDUSTRIAL CRES UNIT 1	WATERLOO	ON

Postal Code	Business Telephone No. *(inc. area code)*	Well Contractor's Licence No.	Business E-mail Address
N0B 2M0	5196995775	7366	CMT@GOLDEN.NET

Name of Well Technician (First Name, Last Name)	Well Technician's Licence No.	Date Submitted *(yyyy/mm/dd)*	Signature of Technician
BRAD DAVIES	3458	2008/11/19	

Date 1st Well in Cluster Constructed *(yyyy/mm/dd)*	Date Last Well in Cluster Constructed *(yyyy/mm/dd)*
2008/11/18	2008/11/18

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Date Received *(yyyy/mm/dd)*	Date Inspected *(yyyy/mm/dd)*
NOV 24 2008	
Audit No. C 02064	**Remarks** M01126

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Ontario Ministry of the Environment

NDOW4AB-08

Well Tag No. for Master Well *(Place Sticker and/or Print Below)*

A 077558

Master Well Record for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Master Well Owner's and Land Owner's Information

First Name	Last Name	E-mail Address
REGIONAL	MUNICIPALITY OF WATERLOO	

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 FREDERICK	WATERLOO	ON	N2J 4J3	5195754400

Location and Construction of the Master Well in the Cluster

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
	PUSLINCH	6	10

County/District/Municipality	City/Town/Village	Province	Postal Code
WATERLOO	CLYDE	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	562045	4810392	GARMIN	ETREX	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
BROWN	TOPSOIL		LOOSE	0	.8
BROWN	SILT	SAND	LAYARD	.8	3.3
BROWN	STONES	SILT	POROUS	3.3	6.7

Hole Details

Depth (Metres) From	Depth (Metres) To	Diameter (Centimetres)
0	6.7	10

Water Use

☐ Public ☐ Industrial ☐ Not used ☐ Other, specify
☐ Domestic ☐ Commercial ☐ Dewatering
☐ Livestock ☐ Municipal ☒ Monitoring
☐ Irrigation ☐ Test Hole ☐ Cooling & Air Conditioning

Method of Construction

☐ Cable Tool ☐ Air Percussion ☐ Digging
☐ Rotary (Conventional) ☐ Diamond ☐ Boring
☐ Rotary (Reverse) ☐ Jetting ☐ Other, specify
☐ Rotary (Air) ☒ Driving

Status of Well

☐ Test Hole ☐ Abandoned, Insufficient Supply
☐ Replacement Well ☐ Abandoned, Poor Water Quality
☐ Dewatering Well ☒ Other, specify MONITORING
☐ Alteration (Construction) ☐ Abandoned, other, specify

Construction Details

Inside Diameter (Centimetres)	Material (steel, plastic, fibreglass, concrete, galvanized)	Wall Thickness	Depth (Metres) From	Depth (Metres) To
2.54	PLASTIC		0	6.7

No Casing and Screen Used

Open Hole ☐ Yes ☐ No

Static Water Level Test

____ Metres

Screen

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Concrete ☒ Plastic

Outside Diameter (Centimetres)	Slot No.
3.3	10

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	Depth Set at (Metres) To	Type of Sealant Used (Material and Type)	Volume Used (Cubic Metres)
0	.3	CEMENT	<1
.3	4.5	3/8 BENTONITE CHIP	<1
4.5	6.7	SAND	<1

Water Details

Water found at Depth	Kind of Water
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Disinfected ☐ Yes ☐ No If no, provide reason:	Date Master Well Completed (yyyy/mm/dd)

Cluster Information *(Please also fill out the additional Cluster Well Information for Well Construction for each parcel of land and cluster.)*

Total Wells in Cluster	Please indicate Number of Cluster Well Information Log Sheets Submitted
2	1
Total Wells on this Property	
2	

Location of Well Cluster

Detailed Map must be provided as an attachment no larger than legal size (8.5" x 14"). Sketches are not allowed.

☒ Check box to confirm detailed map is provided as per Section 11.1 (3)

Consent to release additional information concerning the cluster to the Director upon request

[redacted]

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No
CMT ENG INC	7366

Business Address (Street No./Name, number, RR)	Municipality
1011 IDUSTRIAL CRES UNIT 1	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2M0	CMT@GOLDEN.NET

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196995775	DAVIES BRAD.

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
3458		2008/11/19.

Audit No.	Well Contractor No.
M 01125	
Date Received (yyyy/mm/dd) NOV 24 2008	**Date of Inspection (yyyy/mm/dd)**
Remarks	

1992 (11/2006)

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Ontario

Ministry of the Environment

Well Tag No. for Master Well *(Print Well Tag No.)*
A 077558

Cluster Well Information for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Property Owner's Information

First Name	Last Name	Mailing Address (Street No./Name, RR)	Municipality
REGIONAL	MUNICIPALITY OF WATERLOO	150 FREDERICK ST.	WATERLOO

Province	Postal Code	E-mail Address	Telephone No. (inc. area code)
ON	N2G 4J3		5195754400

Cluster Well Information

Address of Well Location (Street Number/Name, RR)	Lot	Concession	Township	County/District/Municipality
	6	10	PUSLINCH	WATERLOO

City/Town/Village	Province	Postal Code	GPS Unit Make	Model	Unit Mode of Operation
CLYDE	Ontario		GARMIN	ETREX	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify:

[redacted]

Signature of Technician/Contractor | Date *(yyyy/mm/dd)*

Well # on Sketch	UTM Coordinates Zone	Easting	Northing	Full Depth of Hole (metres)	Hole Diameter (cm)	Method of Construction	Casing Material	Casing Length (metres)	Screen Interval (metres) From	To	Annular Space Sealant Used	Static Water Level (metres)	Abandonment Sealant Used	Comments	Date of Completion *(yyyy/mm/dd)*
	17	562045	4803924	6.7	10	DRIVING	PLASTIC	5.1	5.1	6.7	BENTONITE 3/8 CHIP				2008/11/18
		562044	4803922	2.4	10	DRIVING	PLASTIC	.9	.9	2.4	↓				2008/11/18

Well Contractor and Well Technician Information

Business Name of Well Contractor	Business Address (Street Number/Name, RR)	Municipality	Province
CMT ENG INC	1011 INDUSTRIAL CRES UNIT 1	WATERLOO	ON

Postal Code	Business Telephone No. *(inc. area code)*	Well Contractor's Licence No.	Business E-mail Address
N0B 2M0	5196995775	7366	CMT@GOLDEN.NET

Name of Well Technician (First Name, Last Name)	Well Technician's Licence No.	Date Submitted *(yyyy/mm/dd)*	Signature of Technician
BUD DAVIES	3458	2008/11/19	

Date 1st Well in Cluster Constructed *(yyyy/mm/dd)*	Date Last Well in Cluster Constructed *(yyyy/mm/dd)*
2008/11/15	2008/11/18

Ministry Use Only

Date Received *(yyyy/mm/dd)*	Date Inspected *(yyyy/mm/dd)*
NOV 24 2008	
Audit No. C 02063	**Remarks** M01125

1991 (11/2006)

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Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **A 077560**

NDOW5-08

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	REGIONAL MUNICIPALITY OF WATERLOO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
150 FREDERICK ST.	WATERLOO	ON	N2G4J3	5195754400

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	PUSLINCH	9	10

County/District/Municipality	City/Town/Village	Province	Postal Code
WATERLOO	CLYDE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	563378	4805013		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	TOPSOIL		LOOSE	0	.9
BROWN	SILT	SAND	LOOSE	.9	3

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	.2	CEMENT	<1
.2	1.2	3/8 BENTONITE CHIP	<1
1.2	3	SAND	<1

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☒ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☒ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
~~9.14~~	~~PLASTIC~~	~~.34~~	~~+/-.9~~	~~1.5~~
9.14	PLASTIC	.34	+/-.9	1.5

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
2.54	PLASTIC	10	1.5	3

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☒ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, *specify*
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	3	4

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

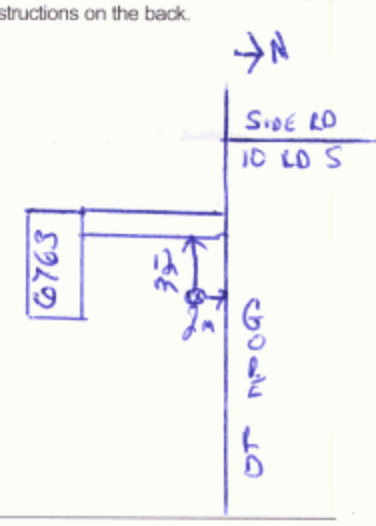
Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CMT ENG INC.	7366

Business Address (Street Number/Name)	Municipality
1011 INDUSTRIAL CRES UNIT 1	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2M0	CMT@GOLDEN.NET

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196995775	DAVIES BUD.

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3458		2008/11/18

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered

Date Work Completed 2008/11/18

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Audit No. Z 82304

NOV 24 2008

Received

0506E (12/2007)

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ATTACHMENT A3

Permits to Take Water (PTTWs)

Ministry of the Environment
West-Central Region
Technical Support Section
Water Resources
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Telephone: (905) 521-7839

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
Ressources en eau
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Téléphone : (905) 521-7839

Ontario

September 8, 2005

The Regional Municipality of Waterloo
150 Frederick Street
Kitchener, Ontario, N2G 4J3
Canada

RE: 8 Wells (Pinebush Well A and B, Clemens Mill Well B, C, D and E, Shades Mill Well A and B)
Permit Number 6223-6ERJQG

Att: Eric Hodgins

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated July 18, 2005 and signed by Eric Hodgins.

This permit expires on July 30, 2006.

Please reference Table A for the permitted rates and amounts. **Monitoring is now a requirement, please reference Sections 3 and 4 for the water taking and monitoring conditions.**

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

P. Odom

Paul Odom

Supervisor, Water Resources
West Central Region

File Storage Number: AP28 WAWA

Ministry of the Environment

Ministère de l'Environnement

Ontario

PERMIT TO TAKE WATER
Pumping Test
NUMBER 5220-6EXQKY

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

The Regional Municipality of Waterloo
150 Frederick Street
Kitchener, Ontario, N2G 4J3
Canada

For the water taking from: 8 drilled wells (Pinebush Wells A and B, Clemens Mill Wells B, C, D and E, Shades Mill Wells A and B)

Located at:

In road allowance in front of 2310 Townline Road
Cambridge, Regional Municipality of Waterloo

100 Arthur Fach Drive (Witmer Park)
Cambridge, Regional Municipality of Waterloo

870 Townline Road
Cambridge, Regional Municipality of Waterloo

Road Allowance behind 60 Cedarbrook Court
Cambridge, Regional Municipality of Waterloo

Adjacent to 922 Stonebrook Road
Cambridge, Regional Municipality of Waterloo

Behind 808 Burnett Avenue
Cambridge, Regional Municipality of Waterloo

360 - 640 Clyde Road
Cambridge, Regional Municipality of Waterloo

1062 Clyde Road
North Dumfries, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 5220-6EXQKY including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 July 18, 2005 and signed by Eric Hodgins, 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 **July 30, 2006.** 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 Water Category	Max Rate per Minute (litres)	Max Number of Hrs Taken per Day	Max Taken per Day (litres)	Max Number Days Taken	Zone / Easting / Northing
1	Pinebush Well A Add: In road allowance in front of 2310 Townline Road	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558301 4806882
2	Pinebush Well B Add: 100 Arthur Fach Drive (Wismer Park)	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558217 4806239
3	Clemens Mill Well B Add: 870 Townline Road	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558433 4805290
4	Clemens Mill Well C Add: Road Allowance behind 60 Cedarbrook Court	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558855 4804462
5	Clemens Mill Well D Add: Adjacent to 922 Stonebrook Road	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558524 4804114
6	Clemens Mill Well E Add: Behind 808 Burnett Avenue	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 557555 4805183
7	Shades Mill Well A Add: 360 - 840 Clyde Road	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 558564 4803507
8	Shades Mill Well B Add: 1062 Clyde Road	Well Drilled	Pumping Test	Miscellaneous	1,000	12	720,000	3	17 560006 4803466
						Total Taking:	5,760,000		

3.3 Each pumping test shall be limited to a maximum duration of 12 hours not to exceed the stated maximum rate of 1,000 litres per minute (220 IGPM) as indicated in Table A

above.

4. Monitoring

4.1 Notification to Well Owners
Prior to commencement of each pumping test, the Permit Holder shall identify all wells within the area of the anticipated potential cone of influence, or within 1km of the test site, whichever is greater. At least 24 hours prior to beginning each 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
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.

5.3 Siltation control measures shall be installed at the discharge site(s) and shall be sufficient to control the volumes. Continuous care shall be taken to properly maintain the siltation control devices.

5.4 Local residents who have domestic wells within 1km of the pumping well must be made aware

of the potential of well interference as the result of this testing.

5.5 Temporary water supplies must be provided to those well users whose wells are affected by the taking.

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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 Director, Section 34
Ministry of Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 8th day of September, 2005.

Paul Odom
Director, Section 34
Ontario Water Resources Act, R.S.O. 1990

Ministry of the Environment
West-Central Region
Technical Support Section
Water Resources
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Telephone: (905) 521-7640

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
Ressource en eau
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Téléphone : (905) 521-7640

Ontario

July 27, 2006

The Regional Municipality of Waterloo
6th Floor - 150 Frederick Street
Kitchener, Ontario
N2G 4J3

RE: Cambridge East IUS test wells
City of Cambridge
Regional Municipality of Waterloo
Permit Number 5514-6S3QNG

Dear Sir/Madam:

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated May 9, 2006 and signed by Jim Robinson.

This Permit expires on May 1, 2007.

Please reference Table A for the permitted rates and amounts. **Monitoring is now a requirement under Ontario Regulation 387/04, please reference that Regulation and Section 4 of this Permit for monitoring requirements.**

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

P. Odom

Paul Odom
West Central Region

File Storage Number: AP28 CAWA

Ontario

Ministry of the Environment

Ministère de l'Environnement

PERMIT TO TAKE WATER
Ground Water
NUMBER 5514-6S3QNG

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

The Regional Municipality of Waterloo
6th Floor - 150 Frederick Street
Kitchener, Ontario
N2G 4J3

For the water taking from: Three Drilled Wells (CMPW01-06, CMPW02-06 and PBPW01-06)

Located at: Municipal Road Allowance behind 60 Cedarbrook Court
Cambridge, Regional Municipality of Waterloo

870 Townline Road
Cambridge, Regional Municipality of Waterloo

Road Allowance in front of 2310 Townline Road
Cambridge, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 5514-6S3QNG including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 May 9, 2006 and signed by Jim Robinson, 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.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **May 1, 2007**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	CMPW01-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558433 4805290
2	CMPW02-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558955 4804462
3	PBPW01-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558301 4806882
						Total Taking:	16,353,000		

3.3 The Permit is valid between the date of issue and May 1, 2007 for a total of 40 days.

4. Monitoring

4.1 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document "Addendum - Test Well Installations and Monitoring Program Category 3 Permit to Take Water Application for Long Term Pumping Tests, Cambridge East- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1000)), dated July 20, 2006.

4.2 The Permit Holder shall initiate stream flow and surface water level monitoring, at least daily, for one week prior to the start-up of the pumping test and should continue, at least daily, for two weeks following the cessation of pumping. Spot measurements and continuous flow monitoring and temperature data should be collected at the locations identified in the Addendum - "Test Well Installations and Monitoring Program Category 3 Permit to Take Water Application for Long Term Pumping Tests, Cambridge East- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010(1000)), dated July 20, 2006.

4.3 The Permit Holder shall monitor daily water takings using a flow meter installed on each test production well. In addition, the dates, times, pumping rates and amount taken shall be recorded. A log book of the pumping dates, rates and duration of water taking and all monitoring data recorded (unless data loggers are used) must be kept on site for the duration og the pumping test and monitoring for inspection by Ministry of the Environment staff. The water taking records shall be submitted to the Director as stipulated by O. Reg. 387/04.

4.4 This Permit only allows the taking of the ground water for pumping test purposes and does not approve directly or indirectly the discharge of any contaminants into the natural environment or the Region of Waterloo municipal sewer system.

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 For Groundwater Takings

If 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 so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act*, Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
2300 Yonge Street, Suite 1700
Toronto, Ontario M4P 1E4

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 27th day of July, 2006.

P. Odom

Paul Odom
Director, Section 34
Ontario Water Resources Act, R.S.O. 1990

Schedule A

This Schedule "A" forms part of Permit To Take Water 5514-6S3QNG, dated July 27, 2006.

Ministry of the Environment
West-Central Region
Technical Support Section
Water Resources
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Telephone: (905) 521-7640

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
Ressource en eau
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Téléphone : (905) 521-7640

Ontario

September 7, 2006

The Regional Municipality of Waterloo
6th Floor - 150 Frederick Street
Kitchener, Ontario
N2G 4J3

RE: Cambridge East IUS test wells
City of Cambridge
Regional Municipality of Waterloo
Permit Number 0458-6TDH4X

Dear Sir/Madam

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated May 9, 2006 and signed by Jim Robinson. This permit amends and supercedes Permit to Take Water No. 5514-6S3QNG issued on July 27, 2006.

This Permit expires on May 1, 2007.

Please reference Table A for the permitted rates and amounts. **Monitoring is now a requirement under Ontario Regulation 387/04, please reference that Regulation and Section 4 of this Permit for monitoring requirements.**

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

P. Odom

Paul Odom
Supervisor, Water Resources
West Central Region

Ministry of the Environment

Ministère de l'Environnement

Ontario

AMENDED PERMIT TO TAKE WATER
Ground Water
NUMBER 0458-6TDH4X

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

The Regional Municipality of Waterloo
6th Floor - 150 Frederick Street
Kitchener, Ontario
N2G 4J3

For the water taking from: Three Drilled Wells (CMPW01-06, CMPW02-06 and PBPW01-06)

Located at: Municipal Road Allowance behind 60 Cedarbrook Court
Cambridge, Regional Municipality of Waterloo

870 Townline Road
Cambridge, Regional Municipality of Waterloo

100 Arthur Fach Drive (Witmer Park)
Cambridge, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 0458-6TDH4X including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

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

the *Environmental Protection Act*, and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **May 1, 2007**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	CMPW01-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558433 4805290
2	CMPW02-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558955 4804462
3	PBPW01-06	Well Drilled	Pumping Test	Miscellaneous	3,785	24	5,451,000	40	17 558301 4806882
						Total Taking:	16,632,000		

3.3 The Permit is valid between the date of issue and May 1, 2007 for a total of 40 days.

4. Monitoring

4.1 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document "Addendum - Test Well Installations and Monitoring Program Category 3 Permit to Take Water Application for Long Term Pumping Tests, Cambridge East- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1000)), dated July 20, 2006.

4.2 The Permit Holder shall initiate stream flow and surface water level monitoring, at least daily, for one week prior to the start-up of the pumping test and should continue, at least daily, for two weeks following the cessation of pumping. Spot measurements and continuous flow monitoring and temperature data should be collected at the locations identified in the Addendum - "Test Well Installations and Monitoring Program Category 3 Permit to Take Water Application for Long Term Pumping Tests, Cambridge East- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010(1000)), dated July 20, 2006.

4.3 The Permit Holder shall monitor daily water takings using a flow meter installed on each test production well. In addition, the dates, times, pumping rates and amount taken shall be recorded. A log book of the pumping dates, rates and duration of water taking and all monitoring data recorded (unless data loggers are used) must be kept on site for the duration og the pumping test and monitoring for inspection by Ministry of the Environment staff. The water taking records shall be submitted to the Director as stipulated by O. Reg. 387/04.

4.4 This Permit only allows the taking of the ground water for pumping test purposes and does not approve directly or indirectly the discharge of any contaminants into the natural environment or the Region of Waterloo municipal sewer system.

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 For Groundwater Takings

If 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 so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act*, Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
2300 Yonge Street, Suite 1700
Toronto, Ontario M4P 1E4

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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 Permit cancels and replaces Permit Number 5514-6S3QNG, issued on 2006/07/27.

Dated at Hamilton this 7th day of September, 2006.

P. Odom

Paul Odom
Director, Section 34
Ontario Water Resources Act, R.S.O. 1990

Schedule A

This Schedule "A" forms part of Permit To Take Water 0458-6TDH4X, dated September 7, 2006.

Ministry of the Environment
West-Central Region
Technical Support Section
Water Resources
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Telephone: (905) 521-7640

Ministère de l'Environnement
Direction régionale du Centre -Ouest
Secteur du Soutien Technique
Ressource en eau
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Téléphone : (905) 521-7640

Ontario

September 17, 2007

The Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario
N2G 4J3

RE: Cambridge East Additional Testing - IUS Project
City of Cambridge
Regional Municipality of Waterloo
Permit Number 8518-76HNTQ

Dear Sir/Madam:

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated June 25, 2007 and signed by Jim Robinson.

This Permit expires on December 31, 2007.

Please reference Table A for the permitted rates and amounts. **Monitoring is now a requirement under Ontario Regulation 387/04, please reference that Regulation and Section 4 of this Permit for monitoring requirements.**

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

P. Odom

Paul Odom
West Central Region

File Storage Number: AP28 CAWA

Ministry of the Environment

Ministère de l'Environnement

Ontario

PERMIT TO TAKE WATER
Ground Water
NUMBER 8518-76HNTQ

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

The Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario, N2G 4J3

For the water taking from: Five drilled wells (SMTW2-07, SMPW1-07, SMTW3-07, PBTW3-07, PBPW2-07)

Located at: Lot 5, Concession 12, North Dumfries
Cambridge, Regional Municipality of Waterloo

Lot 3, Concession 12, North Dumfries
Cambridge, Regional Municipality of Waterloo

Lot 3, Concession 3 Beasley's Lower Block
Cambridge, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 8518-76HNTQ including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 June 25, 2007 and signed by Jim Robinson, 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.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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, 2007**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	SMTW2-07 Lot: 5, Con: 12, North Dumfries	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	6	17 557671 4802642
2	SMPW1-07 Lot: 5, Con: 12, North Dumfries	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	6	17 558417 4802866
3	SMTW3-07 Lot: 3, Con: 12, North Dumfries	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	6	17 557469 4805901
4	PBTW3-07 Lot: 3, Con: 3 Beasley's Lower Block	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	6	17 557469 4805901
5	PBPW2-07 Lot: 3, Con: 3 Beasley's Lower Block	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	6	17 557671 4802642
						Total Taking:	32,731,200		

3.3 Notwithstanding the individual numbers of days identified in Table A, water taking under the authorization of this Permit may occur simultaneously but shall only occur for a maximum total of 15 days between the date of issue and December 31, 2007.

3.4 Notwithstanding Table A, water taking under the authorization of this permit shall not occur at wells SMPW1-07, PBTW3-07 and PBPW2-07 until water well records for these three proposed wells are submitted to the Director and receipt of thoses records is acknowledged.

4. Monitoring

4.1 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document "Addendum A - Additional Information Regarding Monitoring Program, Category 2 Permit to Take Water Application for Pumping Tests, Cambridge East Additional Testing- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1010), dated August 23, 2007.

4.2 The Permit Holder shall measure water levels on a continuous basis in the private well located at 6518 Gore Road, Puslinch, Ontario, subject to the owner's permission. The water levels shall be monitored prior to, during and two weeks after completion of the

pumping test in Clyde Road Area.

4.3 The Permit Holder shall monitor daily water takings using a flow meter installed on each test and production well. In addition, the dates, times, pumping rates and amount taken shall be recorded. A log book of the pumping dates, rates and duration of water taking and all monitoring data record (unless data loggers are used) must be kept on site for inspection by Ministry of the Environment staff during water taking. The water taking records shall be submitted to the Director by January 31, 2008.

4.4 The Permit only allows the taking of the ground water for pumping test purpose and does not approve directly or indirectly the discharge of any contaminants into the natural environment or the Region of Waterloo/municipal sewer system.

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 For Groundwater Takings
If 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 so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
2300 Yonge Street, Suite 1700
Toronto, Ontario M4P 1E4

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 17th day of September, 2007.

P. Odom

Paul Odom
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule "A" forms part of Permit To Take Water 8518-76HNTQ, dated September 17, 2007.

Ontario

Ministry of the Environment

Ministère de l'Environnement

PERMIT TO TAKE WATER
Ground Water
NUMBER 3311-7AYQF9

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

The Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario, N2G 4J3

For the water taking from: Three drilled wells (PBTW3-07, PBPW2-08, SMTW4-08)

Located at: Lot 2, Concession 12, N. Dumfries
Cambridge, Regional Municipality of Waterloo

Lot 3, Concession Beasley's Lower Block
Cambridge, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 3311-7AYQF9 including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 January 9, 2008 and signed by Jim W. Robinson, 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.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **July 31, 2008**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Can-Amera Well #PBTW3-07	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,547,000	6	17 557469 4805901
2	Can-Amera Well #PBPW2-08	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,547,000	6	17 557469 4805901
3	Shades Mill Well #SMTW4-08	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,547,000	6	17 557469 4805901
						Total Taking:	6,547,000		

3.3 Notwithstanding the individual numbers of days identified in Table A, water taking under the authorization of this Permit shall not occur simultaneously and the taking is for a maximum total of 8 days between the date of issue and July 31, 2008.

3.4 Notwithstanding Table A, water taking under the authorization of this permit shall not occur at wells PBPW2-08 and SMTW4-08 until water well records (draft) for these two proposed wells are submitted to the Director and receipt of thoses records is acknowledged.

4. Monitoring

4.1 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document “Category 2 Permit to Take Water for Pumping Tests: 2008 Cambridge East Additional Testing- IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1010)), dated January 7, 2008.

4.2 The Permit Holder shall measure water levels on a continuous basis in the private well located at 6518 Gore Road, Puslinch, Ontario, subject to the owner's permission. The water levels shall be monitored prior to, during and two weeks after completion of the pumping test at Well #SMTW4-08.

4.3 The Permit Holder shall monitor daily water takings using a flow meter installed on each test and production well. In addition, the dates, times, pumping rates and amount taken shall be recorded. A log book of the pumping dates, rates and duration of water taking

and all monitoring data record (unless data loggers are used) must be kept on site for inspection by Ministry of the Environment staff during water taking. The water taking records shall be submitted to the Director by December 31, 2008.

4.4 The Permit only allows the taking of the ground water for pumping test purpose and does not approve directly or indirectly the discharge of any contaminants into the natural environment or the Region of Waterloo/municipal sewer system.

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 For Groundwater Takings

If 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 so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
2300 Yonge Street, Suite 1700
Toronto, Ontario M4P 1E4

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 22nd day of January, 2008.



Paul Odom
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule “A” forms part of Permit To Take Water 3311-7AYQF9, dated January 22, 2008.

Ministry of the Environment
West-Central Region
Technical Support Section
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Tel: (905) 521-7640

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Tél:(905) 521-7640

Ontario

October 9, 2008

Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario
N2E 4J3

Dear Sir/Madam:

RE: 1220 Village Rd
North Dumfries, Regional Municipality of Waterloo
Permit Number [redacted]

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated September 26, 2008 and signed by Jim Robinson.

This Permit expires on November 30, 2008. Authorized rates and amounts are indicated on Table A.

Ontario Regulation 387/04 requires all water takers to report daily water taking amounts to the WTRS electronic database at: http://www.ene.gov.on.ca/envision/water/pttw.htm , **if no water is taken in that year then that information must also be entered. Please reference that Regulation and Section 4 of this Permit for monitoring requirements.**

Please also note Condition 1.4 specifically indicates that this Permit is not transferable to another party. If the property is sold or the taking is to be used by another party, they will need to apply for their own Permit, as this Permit will not be valid. Any queries regarding a change in owner/operator should be made to the Permit to Take Water Evaluator at the above address.

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

Carl Slater

Carl Slater
Manager
West Central Region

File Storage Number: AP28 NDWA

Ontario

Ministry of the Environment
Ministère de l'Environnement

PERMIT TO TAKE WATER
Pumping Test
NUMBER [redacted]

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

Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario
N2E 4J3

For the water taking from: Two drilled bedrock wells
(Well NDTW1/08 and Well NDTW2/08)

Located at: 1220 Village Rd
North Dumfries, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 3808-7K9PSS including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means Regional Municipality of Waterloo.

(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 September 26, 2008 and signed by Jim Robinson, 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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **November 30, 2008**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken:	Zone/ Easting/ Northing:
1	Well NDTW1/08	Well Drilled	Pumping Test	Miscellaneous	2,271	8	1,090,000	2	17 562390 4804121
2	Well NDTW2/08	Well Drilled	Pumping Test	Miscellaneous	2,271	8	1,090,000	2	17 562232 4803970
						Total Taking:	2,180,000		

3.3 Notwithstanding the individual numbers of days identified in Table A, water taking under the authorization of this Permit shall not occur simultaneously and the taking is for a maximum total of 16 hours between the date of issue and November 30, 2008.

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.

4.3 The Permit Holder shall implement the monitoring plan outlined in the document "Category 2 Permit to Take Water for Pumping Tests: North Dumfries Testing Program - RMOW IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1900), dated September 25, 2008.

4.4 The Permit Holder shall monitor daily water takings using a flow meter installed on each test and production well. In addition, the dates, times, pumping rates and amount taken

shall be recorded. A log book of the pumping dates, rates and duration of water taking and all monitoring data record (unless data loggers are used) must be kept on site for inspection by Ministry of the Environment staff during water taking. The water taking records shall be submitted to the Director by December 31, 2008.

4.5 The Permit only allows the taking of the ground water for pumping test purpose and does not approve directly or indirectly the discharge of any contaminants into the natural environment.

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

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.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 9th day of October, 2008.

Carl Slater

Carl Slater
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Ministry of the Environment
West-Central Region
Technical Support Section
Water Resources Unit
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Tel: (905) 521-7817

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
Projet de l'amélioration continue
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Tél:(905) 521-7817

Ontario

December 15, 2008

The Regional Municipality of Waterloo
7th Floor - 150 Frederick St
Kitchener, Ontario
N2G 4J3

Dear Sir/Madam

RE: 1220 Village Road, Clyde
North Dumfries, Regional Municipality of Waterloo
Permit Number 2860-7MCMMT

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water dated November 13, 2008 and signed by Jim Robinson.

This Permit expires on February 28, 2009. Authorized rates and amounts are indicated on Table A.

Ontario Regulation 387/04 requires all water takers to report daily water taking amounts to the WTRS electronic database at: http://www.ene.gov.on.ca/envision/water/pttw.htm **, if no water is taken in that year then that information must also be entered. Please reference that Regulation and Section 4 of this Permit for monitoring requirements.**

Please also note Condition 1.4 specifically indicates that this Permit is not transferable to another party. If the property is sold or the taking is to be used by another party, they will need to apply for their own Permit, as this Permit will not be valid. Any queries regarding a change in owner/operator should be made to the Permit to Take Water Evaluator at the above address.

Take notice that in issuing this Permit to Take Water, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.
Yours truly,

L-a Cornacchio

Lou-Ann Cornacchio
Water Supervisor (A)
West Central Region

File Storage Number: AP28 NOWA

Ontario

Ministry of the Environment
Ministère de l'Environnement

PERMIT TO TAKE WATER
Pumping Test
NUMBER 2860-7MCMMT

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

The Regional Municipality of Waterloo
7th Floor - 150 Frederick St
Kitchener, Ontario, N2G 4J3
Canada

For the water taking from: One bedrock well (NDPW1-08)

Located at: 1220 Village Road, Clyde
North Dumfries, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 2860-7MCMMT including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 November 13, 2008 and signed by Jim Robinson, 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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **February 28, 2009**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken:	Zone/ Easting/ Northing:
1	Well NDPW1-08	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	7	17 562222 4804076
						Total Taking:	6,546,240		

3.3 Notwithstanding the Maximum Number of Days Taken identified in Table A, the taking is for a total of less than 7 days (not consecutive) between the date of issue and February 28, 2009.

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.

4.3 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document "Category 2 Permit to Take Water for Pumping Test: North Dumfries Testing Program - RMOW IUS Project ", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1900)), dated November 10, 2008.

4.4 The Permit Holder shall measure water levels on a continuous basis in the private well located at 6518 Gore Road, Puslinch, Ontario, subject to the owner's permission. The water levels shall be monitored prior to, during and two weeks after completion of the pumping test.

4.5 In addition to the requirements imposed by section 9 of O. Reg. 387/04, and as authorized by subsection 34(6) of the *Ontario Water Resources Act* , the Permit Holder shall do the following: maintain a record of all water takings that includes the date, times, rates and total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit; keep all required records current and available at or near the site of the taking; and produce those records for the inspection of a Provincial Officer immediately upon his or her request.

4.6 The Permit only allows the taking of the ground water for pumping test purpose and does not approve directly or indirectly the discharge of any contaminants into the natural environment.

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

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.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 17th day of December, 2008.

Lou-Ann Cornacchio
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Ontario

Ministry of the Environment
Ministère de l'Environnement

PERMIT TO TAKE WATER
Pumping Test
NUMBER 5351-7VBNWA

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

The Regional Municipality of Waterloo
150 Frederick St
Kitchener, Ontario, N2G 4J3
Canada

For the water taking from: Well NDPW1-08
Located at: Lot 6, Concession 10
North Dumfries, Regional Municipality of Waterloo

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 Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 5351-7VBNWA including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Regional Municipality of Waterloo.

(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 July 17, 2009 and signed by Amy Domaratzki, 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 any authority of the Ministry, a Director, or a Provincial Officer, including the authority 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 **November 30, 2009**. 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. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken:	Zone/ Easting/ Northing:
1	NDPW1-08	Well Drilled	Pumping Test	Miscellaneous	4,546	24	6,546,240	7	17 562222 4804076
						Total Taking:	6,546,240		

3.3 Notwithstanding the Maximum Number of Days of Taking identified in Table A, the taking is for a total of less than 7 days (not consecutive) between the date of issue and November 30, 2009.

3.4 The Permit only allows the taking of the ground water for pumping test purposes and does not approve directly or indirectly the discharge of excess groundwater or any contaminants into the natural environment.

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.

4.3 In addition to the requirements imposed by section 9 of O. Reg. 387/04, and as authorized by subsection 34(6) of the *Ontario Water Resources Act* , the Permit Holder shall do the following: maintain a record of all water takings that includes the date, times, rates and total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit; keep all required records current and available at or near the site of the taking; and produce those records for the inspection of

a Provincial Officer immediately upon his or her request.

4.4 The Permit Holder shall implement the ground and surface water monitoring plan outlined in the document "Category 2 Permit to Take Water for Pumping Test: North Dumfries Testing Program - RMOW IUS Project", prepared by Golder Associates Ltd. (Reference: 05-1112-010 (1900)), dated July 13, 2009.

4.5 The Permit Holder shall measure water levels on a continuous basis in a private well located at 6518 Gore Road, Puslinch, Ontario, subject to the owner's permission. The water levels shall be monitored prior to, during and two weeks after completion of the pumping test.

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

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.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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 and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the 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;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5

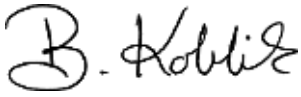
AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

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***

Dated at Hamilton this 27th day of August, 2009.

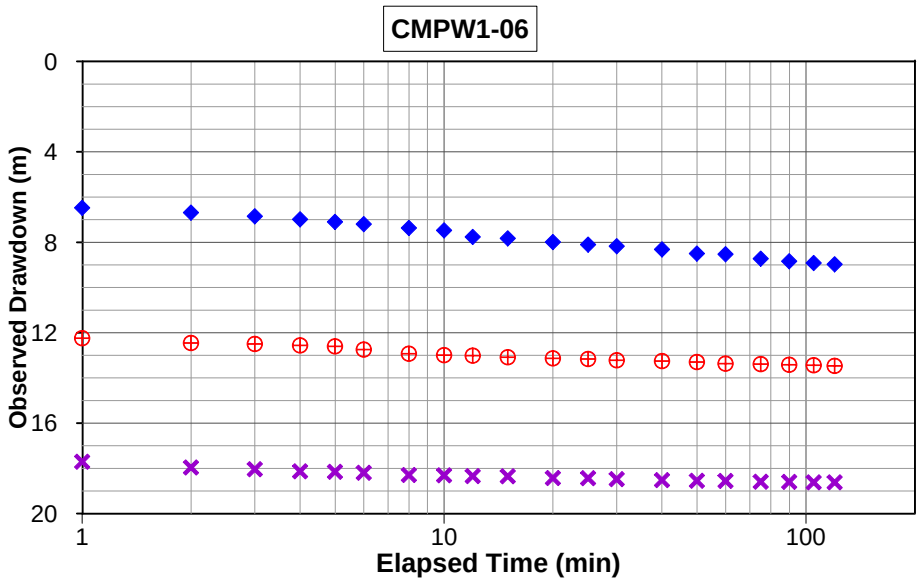


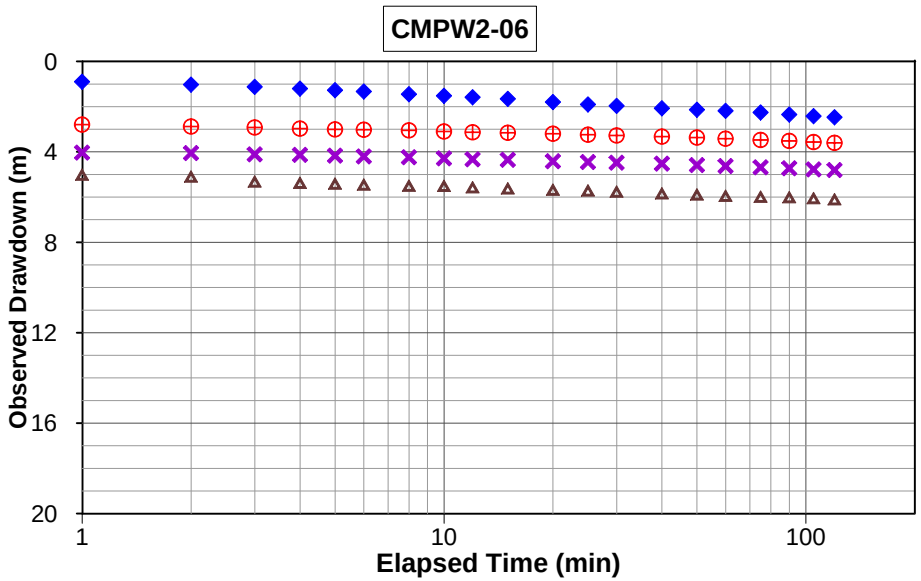
Belinda Koblik
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

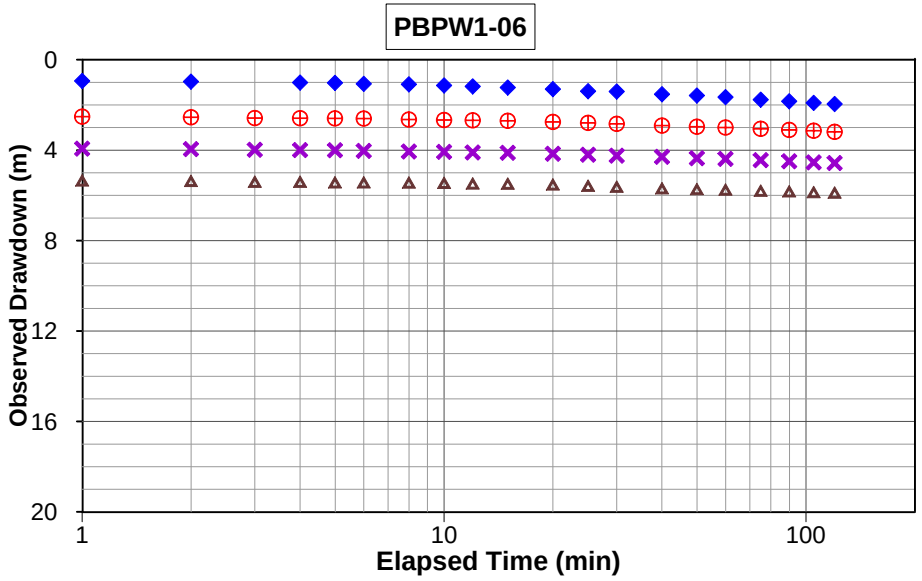
ATTACHMENT A4

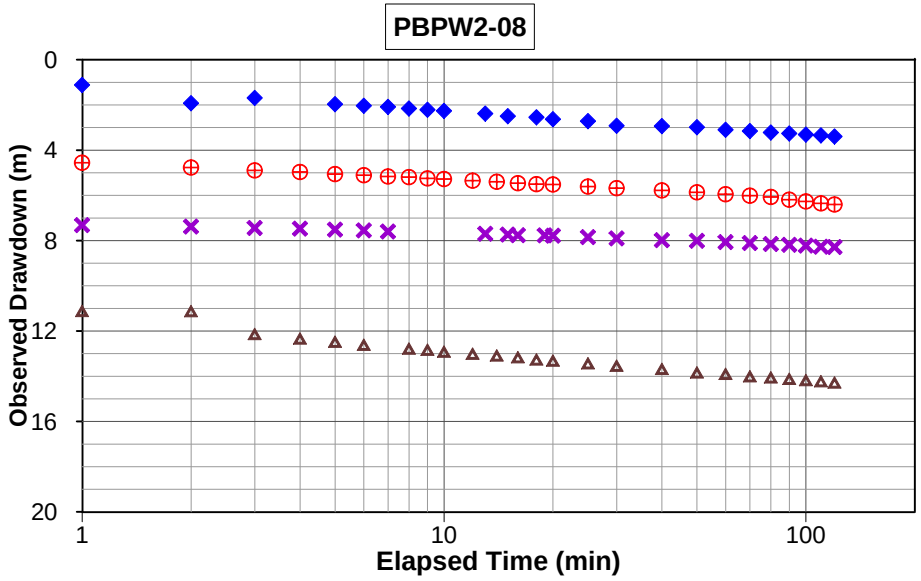
Step Testing

- Drawdown Versus Elapsed Time Plots
- Aqtesolv Analyses









NOTES
1) Step testing of CMPW1-06, CMPW2-06 and PBPW1-06 took place between June to August 2006. PBPW2-08 was step tested on April 30, 2008.
2) Step test rates for PBPW2-08 were as follows: Step 1 at 1,637 m³/day, Step 2 at 2,455 m³/day, Step 3 at 3,633 m³/day and Step 4 at 5,237 m³/day

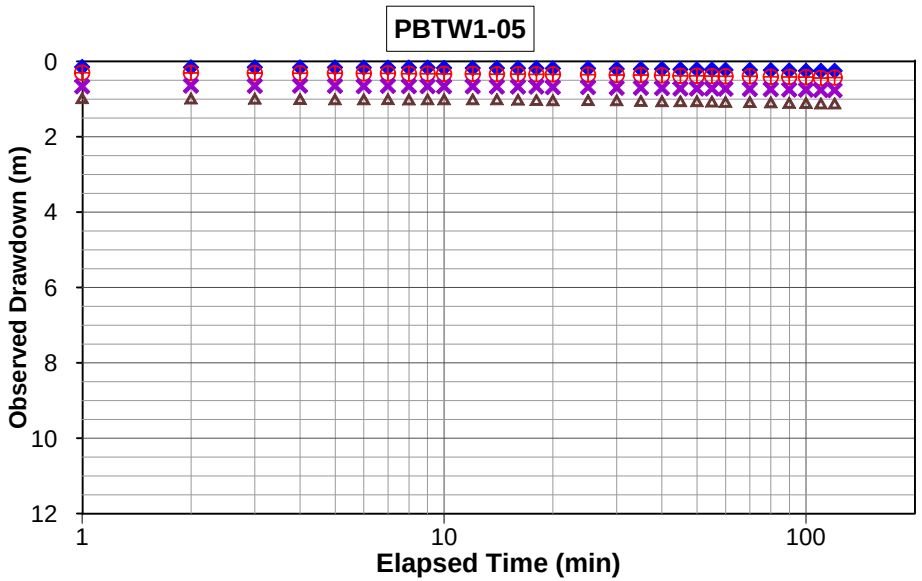
◆ Step 1 - 3,633 m³/day
⊕ Step 2 - 4,377 m³/day
✕ Step 3 - 5,447 m³/day
△ Step 4 - 6,540 m³/day

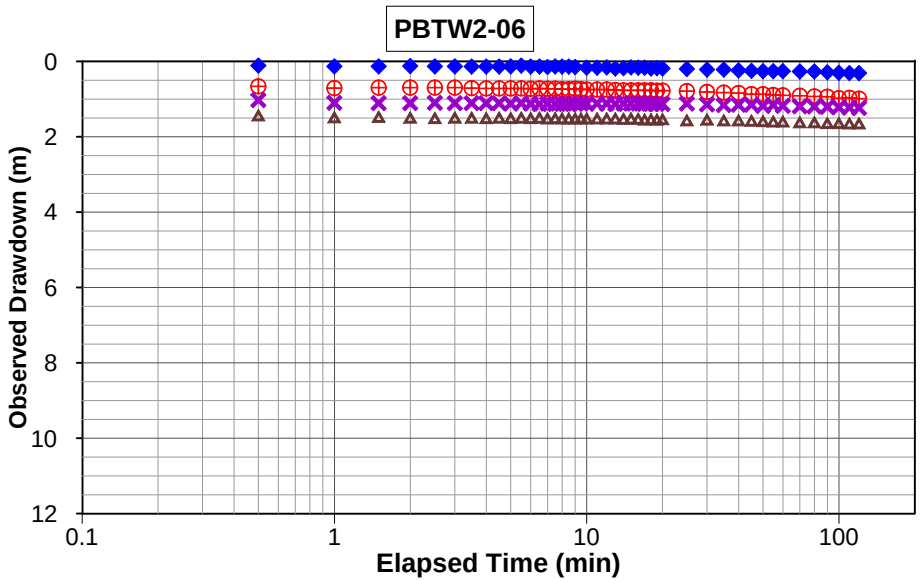
Cambridge East Water Supply Class EA

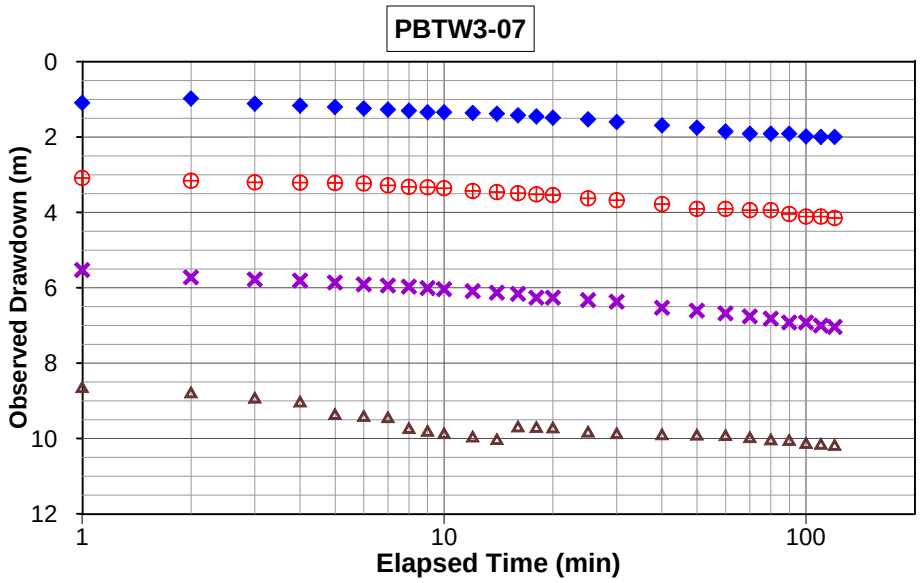
Test Production Well Step Test Results - Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4.1







NOTES
1) The step test at PBTW1-05 took place on Sept 15, 2005. The step test at PBTW2-06 occurred on June 7 2006, while the PBTW3-07 step test was on Feb 6, 2008
2) Step 4 at PBTW2-06 was at a rate of 1,257 m³/day (14.5 L/s).

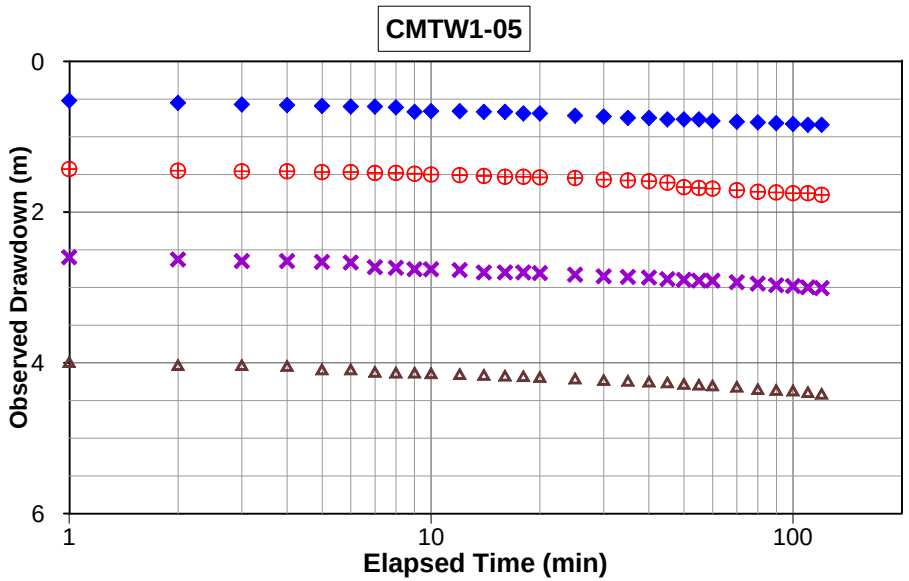
◆ Step 1 - 327 m³/day
✕ Step 3 - 982 m³/day
⊕ Step 2 - 655 m³/day
△ Step 4 - 1,309 m³/day

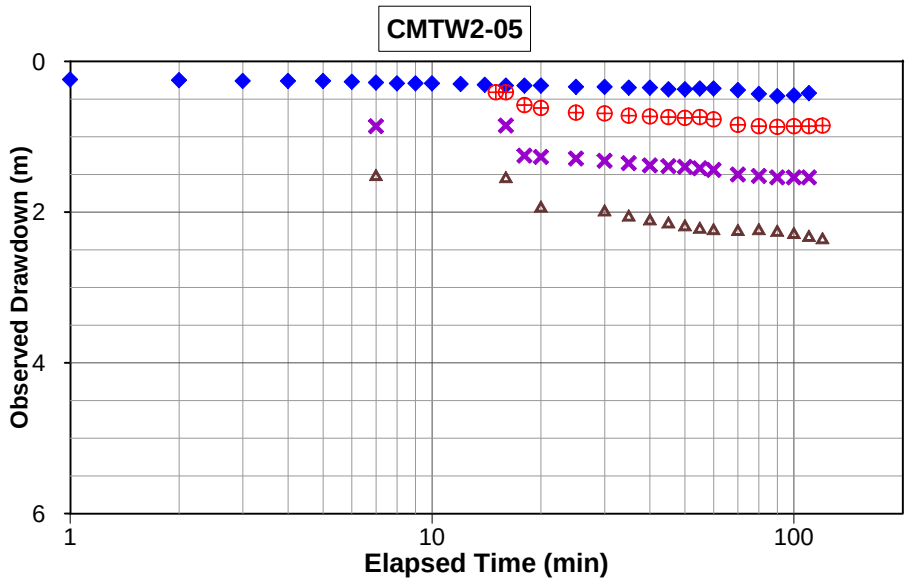
Cambridge East Water Supply Class EA

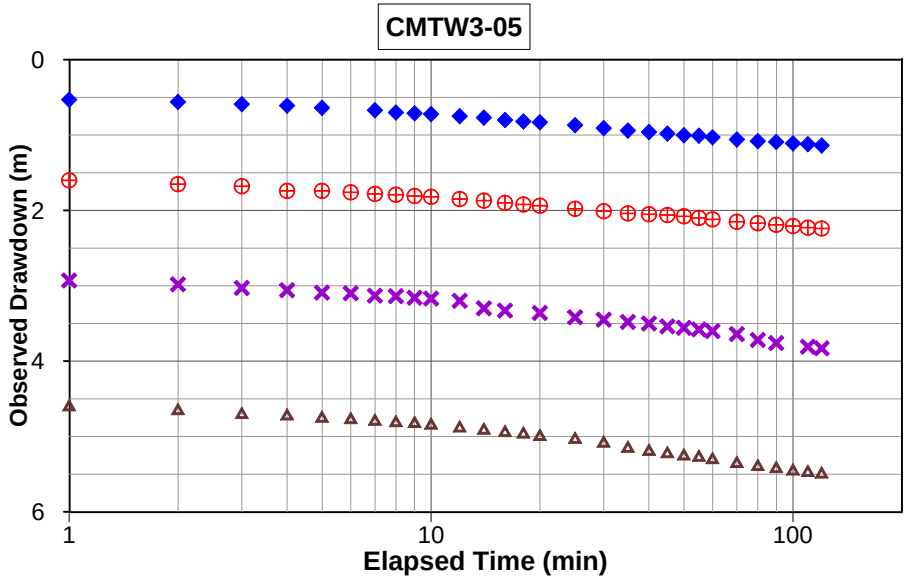
Pinebush
Step Test Results - Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4.2







NOTE:
1) The step test at CMTW1-05 took place on Sept 13, 2005. The step tests at CMTW2-05 and CMTW3-05 occurred on Nov 18 and 23, 2005, respectively

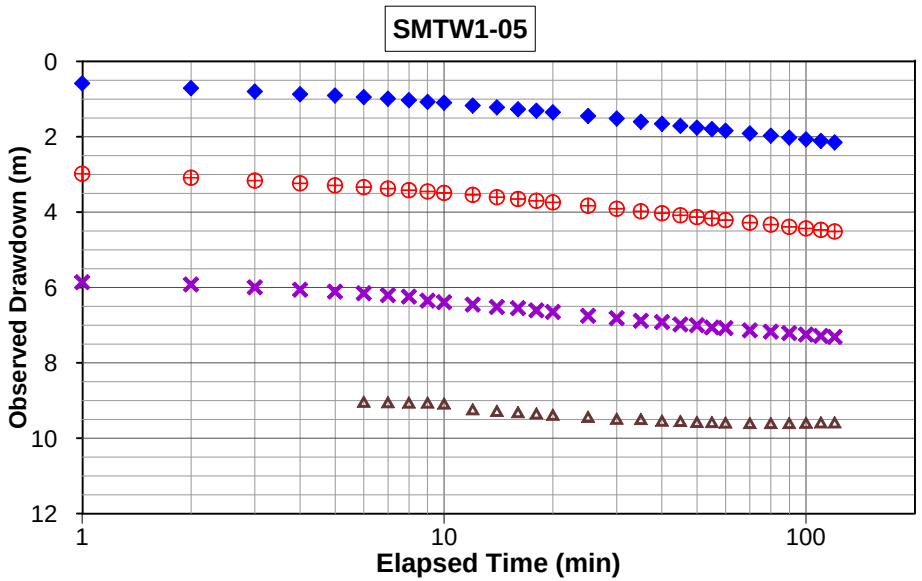
◆ Step 1 - 327 m³/day
⊕ Step 2 - 655 m³/day
× Step 3 - 982 m³/day
△ Step 4 - 1,309 m³/day

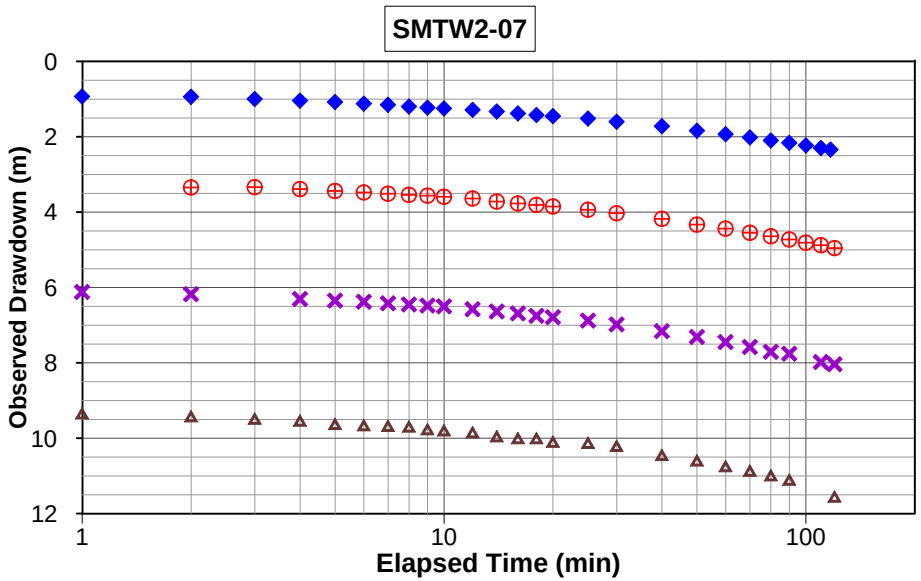
Cambridge East Water Supply Class EA

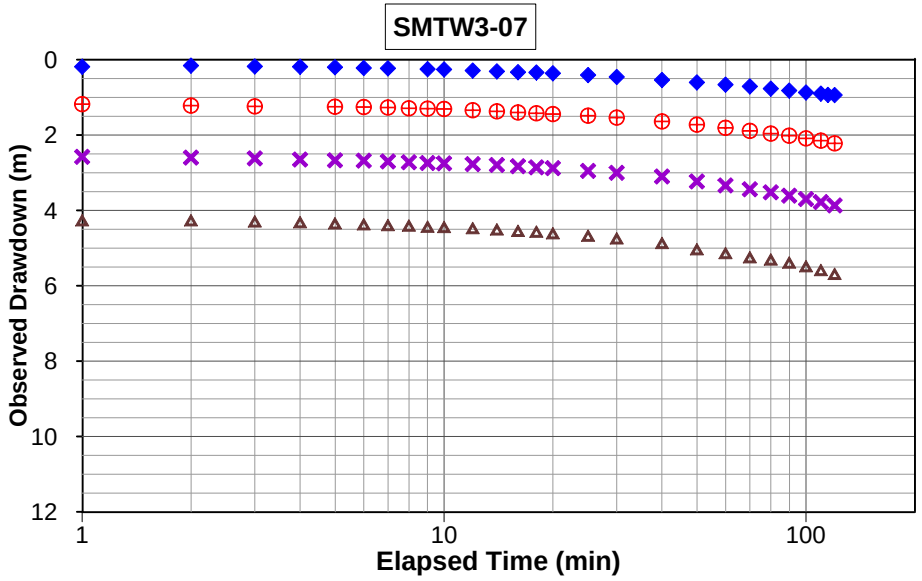
Clemens Mills Step Test Results - Drawdown Versus Log Time

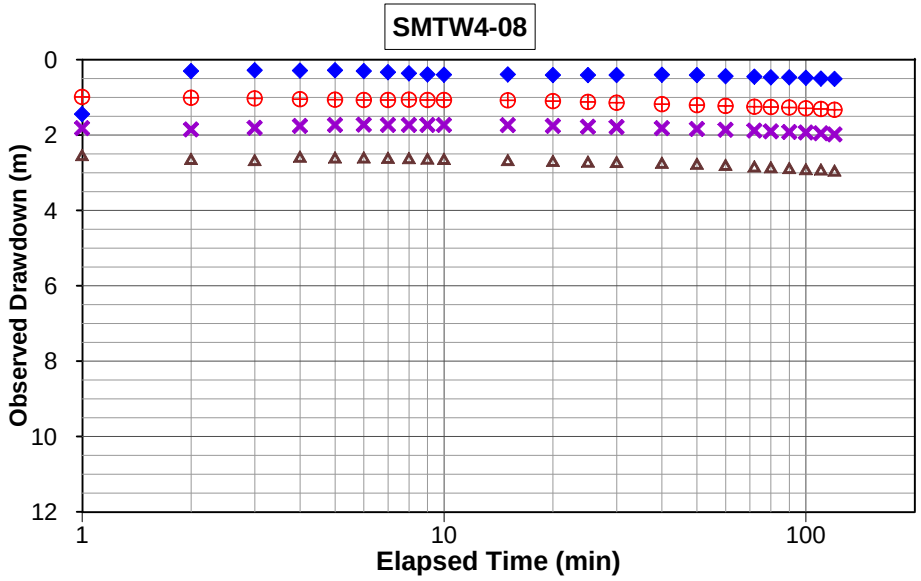
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4.3









NOTE:
1) The step test at SMTW1-05 took place on Sept 19, 2005. The step tests at SMTW2-07 and SMTW3-07 occurred on Sept 18 and 20, 2007, respectively. The test at SMTW4-08 was conducted on Feb 27, 2008.

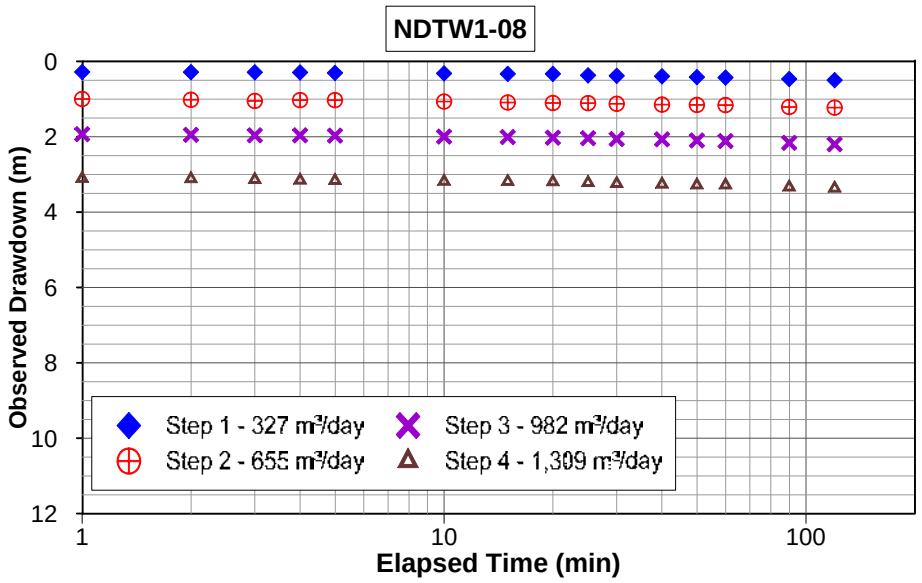
◆ Step 1 - 327 m³/day
⊕ Step 2 - 655 m³/day
✕ Step 3 - 982 m³/day
△ Step 4 - 1,309 m³/day

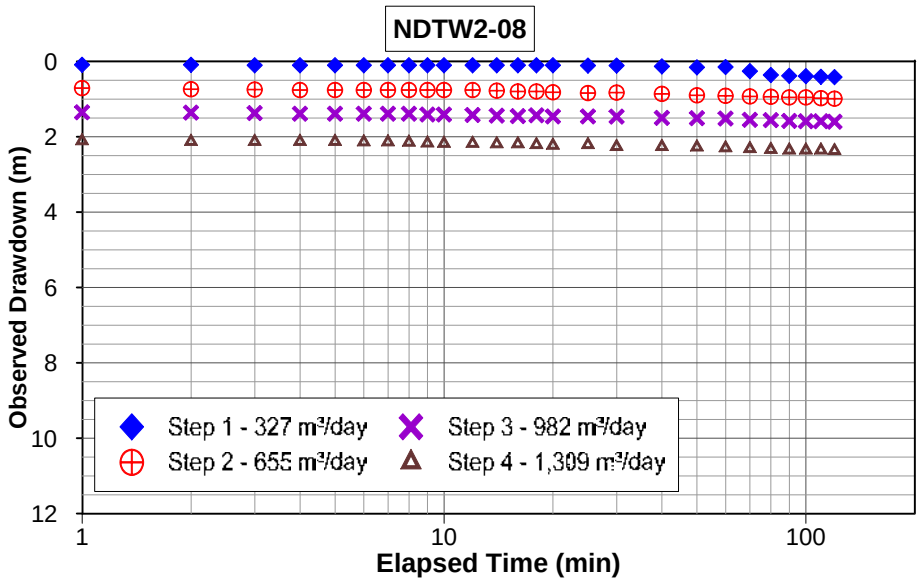
Cambridge East Water Supply Class EA

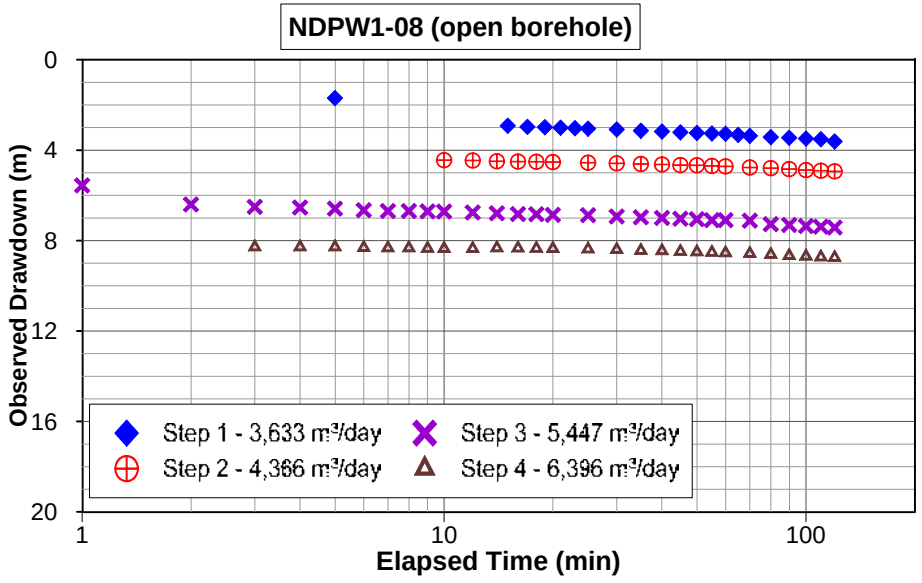
Shades Mills
Step Test Results - Drawdown Versus Log Time

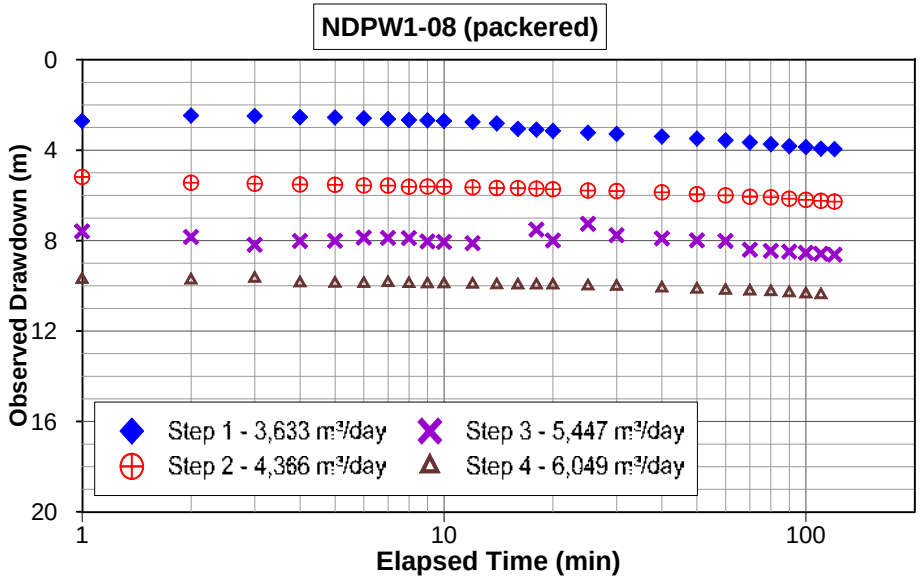
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4.4









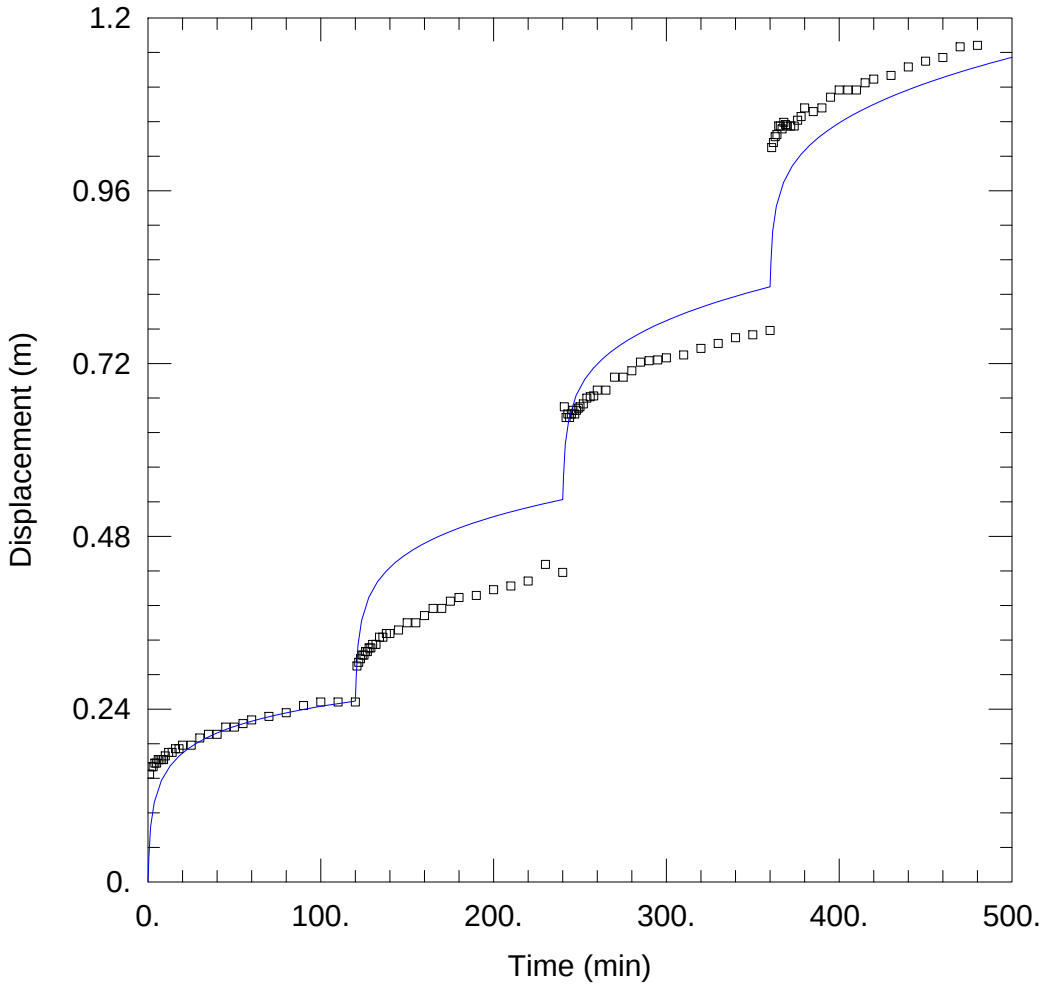
NOTES
1) The step test at NDTW1-08 and NDTW2-08 took place on Oct 16 and 20, 2005, respectively. The first step test at NDPW1-08 took place on Jan 15, 2009 on an open borehole. The second NDPW1-08 test was on Sept 23, 2009 on a packered borehole open over the Gasport formation.
2) Step 4 at NDPW1-08 in January was at a rate of 6,396 m³/day (74 L/s) and at a rate of 6,049 m³/day (74 L/s) in September

Cambridge East Water Supply Class EA

Clyde
Step Test Results - Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A4.5



PBTW1-05 (STEP TEST)

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\PBTW1-05.aqt
Date: 04/20/16 Time: 14:42:21

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Pinebush (Townline Roundabout)
Test Well: PBTW1-05
Test Date: 15 September 2005

AQUIFER DATA

Saturated Thickness: 85.6 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PBTW1-05	558317.2	4806856.7

Observation Wells

Well Name	X (m)	Y (m)
PBTW1-05	558317.2	4806856.7

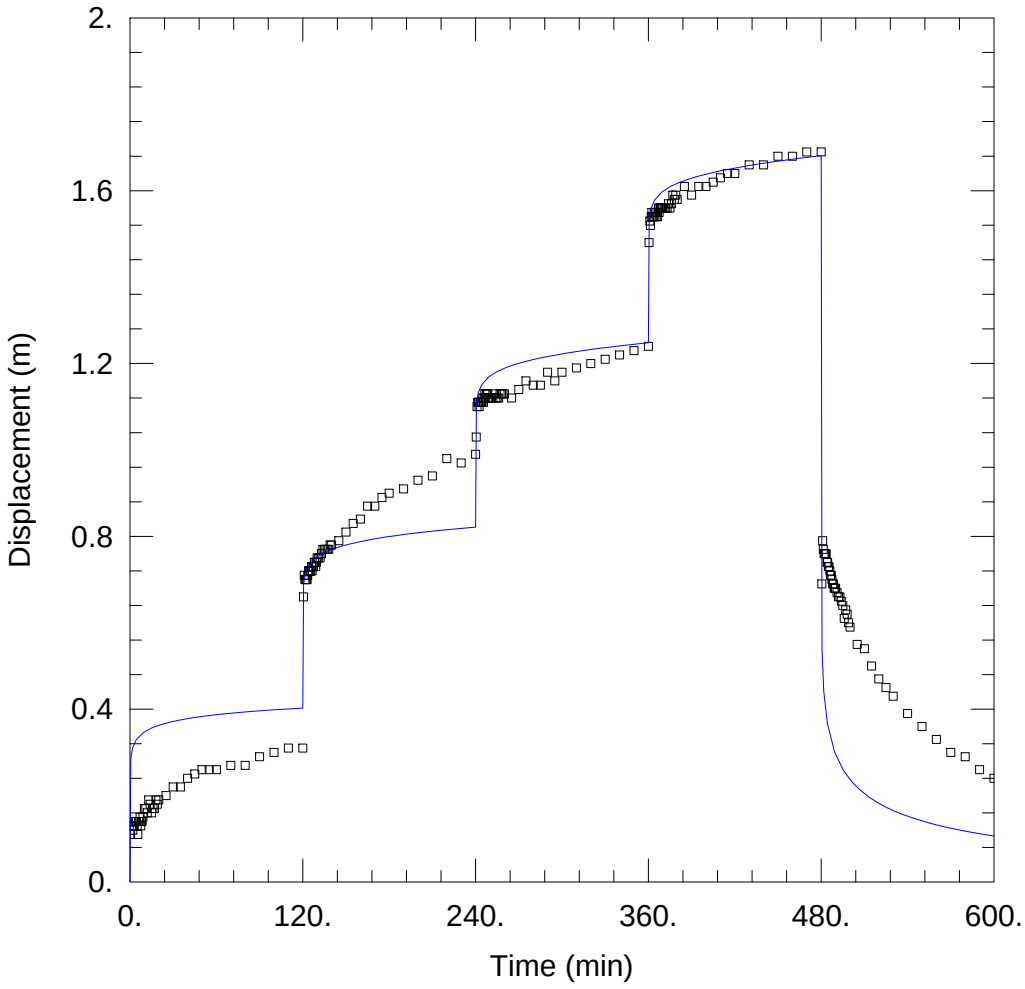
SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 645.6 m^2/day
Sw = -7.378
P = 2.

S = 1.6E-5
C = 0. min^2/m^5

Figure A4.7



PBTW2-06 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\PBTW2-06.aqt
Date: 04/20/16 Time: 14:40:33

PROJECT INFORMATION

Company: Golder
Client: RMOW
Project: 05-1112-010)
Location: Pinebush
Test Well: PBTW2-06
Test Date: June 7, 2006

AQUIFER DATA

Saturated Thickness: 96. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PBTW2-06	558219.6	4806227.2

Observation Wells

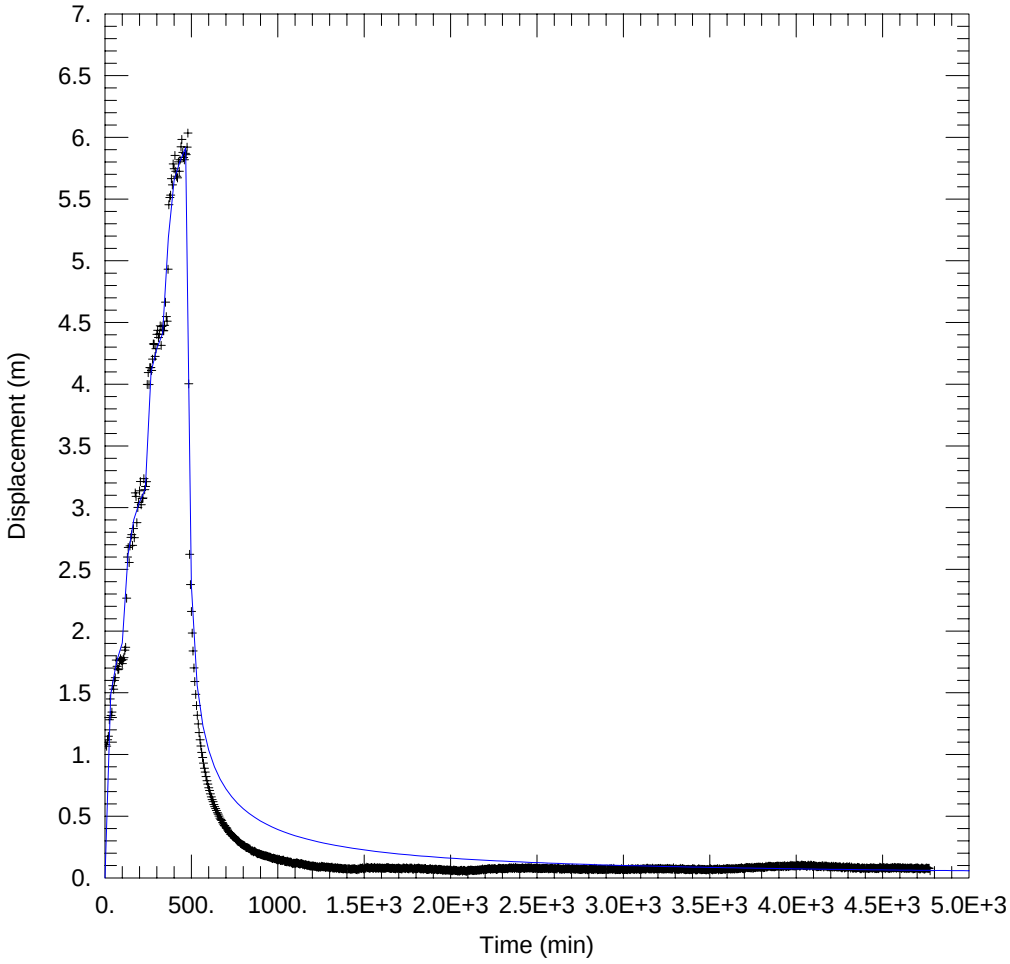
Well Name	X (m)	Y (m)
PBTW2-06	558219.63	4806227.2

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 1173.3 m^2/day
Sw = 0.
P = 2.

S = 0.0005
C = 0. min^2/m^5



PBPW1-06 STEP TEST (THEIS)

PROJECT INFORMATION

Company: Golder Associates Ltd.
Client: Region of Waterloo
Project: 05-1112-010
Location: Cambridge
Test Well: PBPW2-06
Test Date: August 16, 2006

AQUIFER DATA

Saturated Thickness: 96.62 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PBPW1-06	558217.221	4806229.103

Observation Wells

Well Name	X (m)	Y (m)
+ PBPW1-06	558217.221	4806229.103

SOLUTION

Aquifer Model: Confined

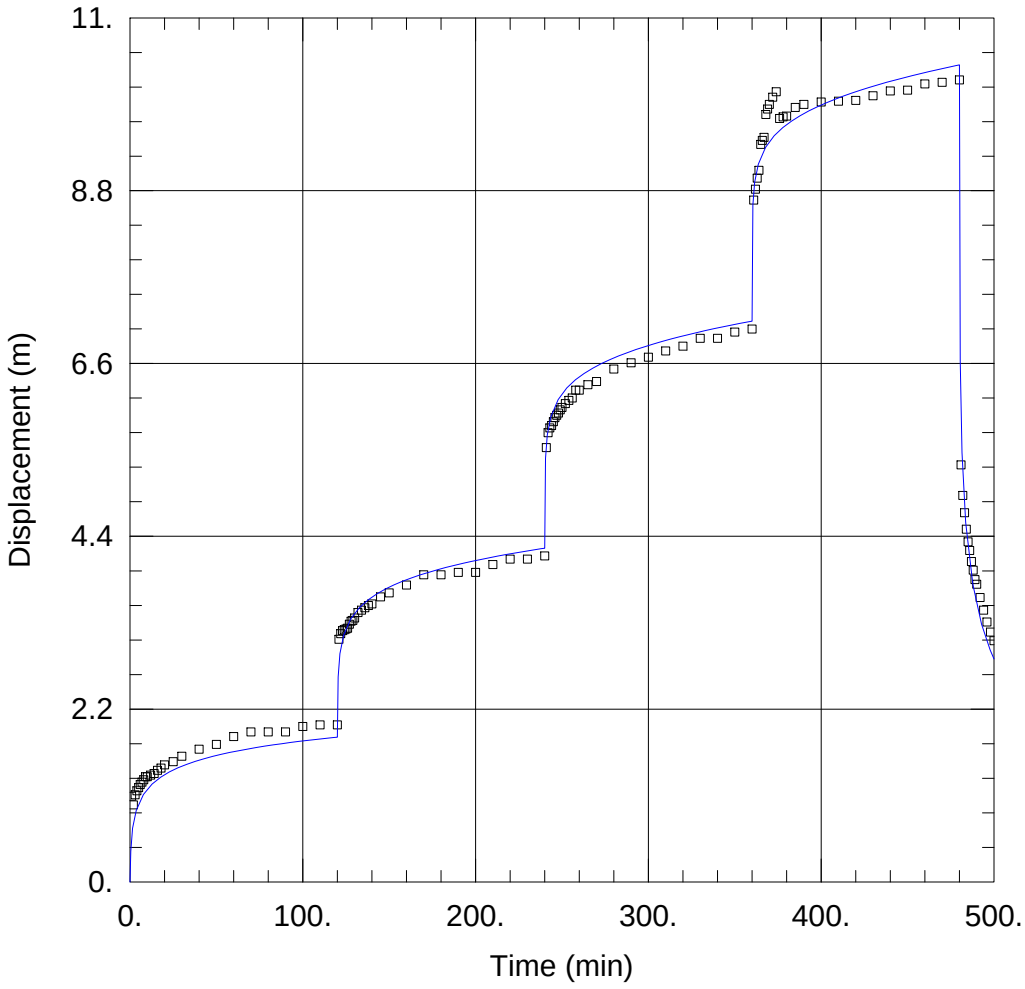
Solution Method: Theis (Step Test)

T = 688. m^2/day
Sw = -8.062
P = 2.

S = 1.6E-5
C = 0.1229 min^2/m^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. m/min

$s(t) = -0.2079Q + 0.1229Q^{2.}$
W.E. = 707.% (Q from last step)



PBTW3-07 STEP TEST

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010 (1010)
Location: Clemens Mill (Can Amera)
Test Well: PBTW3-07
Test Date: February 6, 2008

AQUIFER DATA

Saturated Thickness: 103.5 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PBTW3-07	557466.3	4805907.7

Observation Wells

Well Name	X (m)	Y (m)
PBTW3-07	557466.3	4805907.7

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 97.75 m^2/day
Sw = -6.97
P = 2.

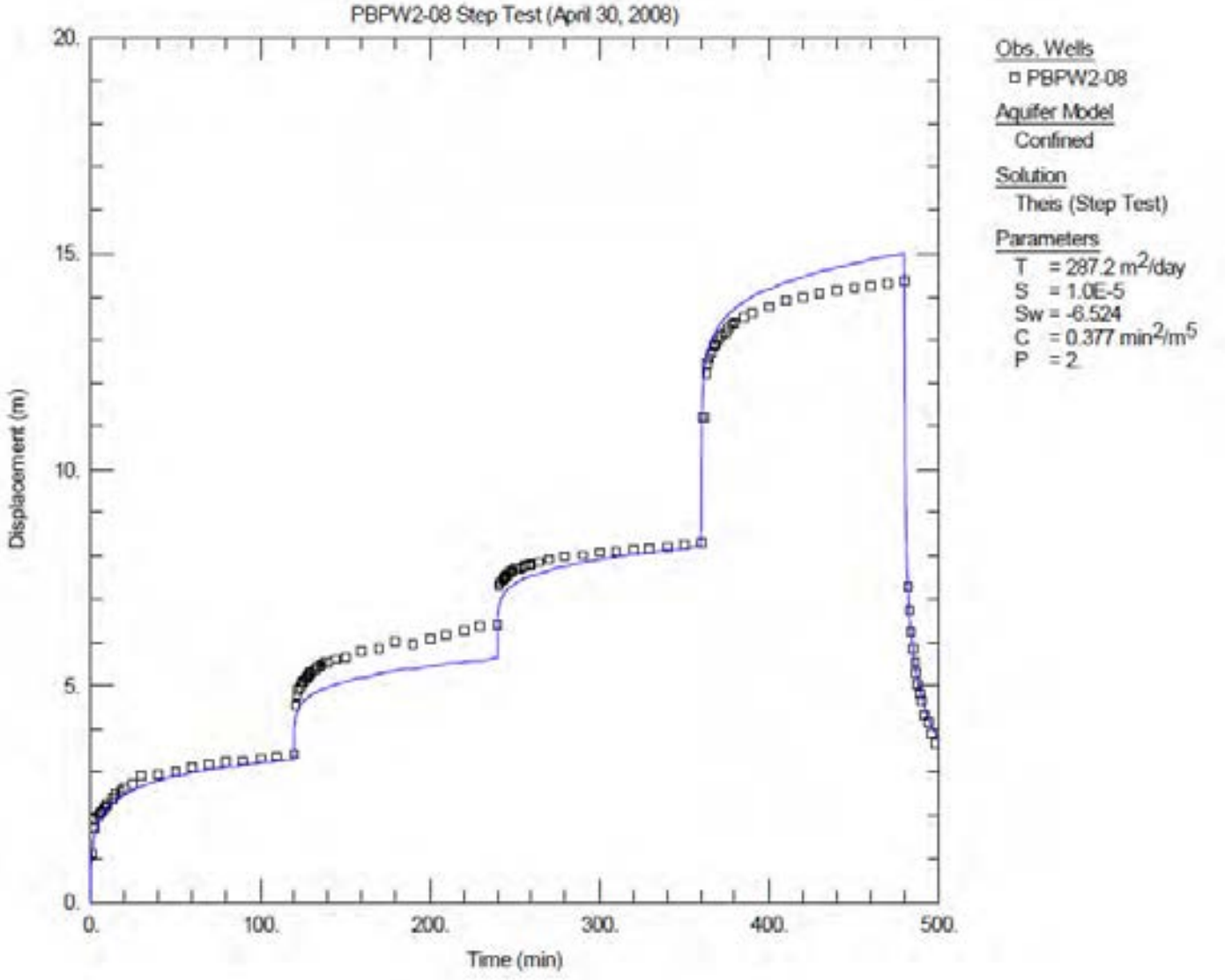
S = 5.699E-6
C = 3.626 min^2/m^5

Step Test Model: Jacob-Rorabaugh

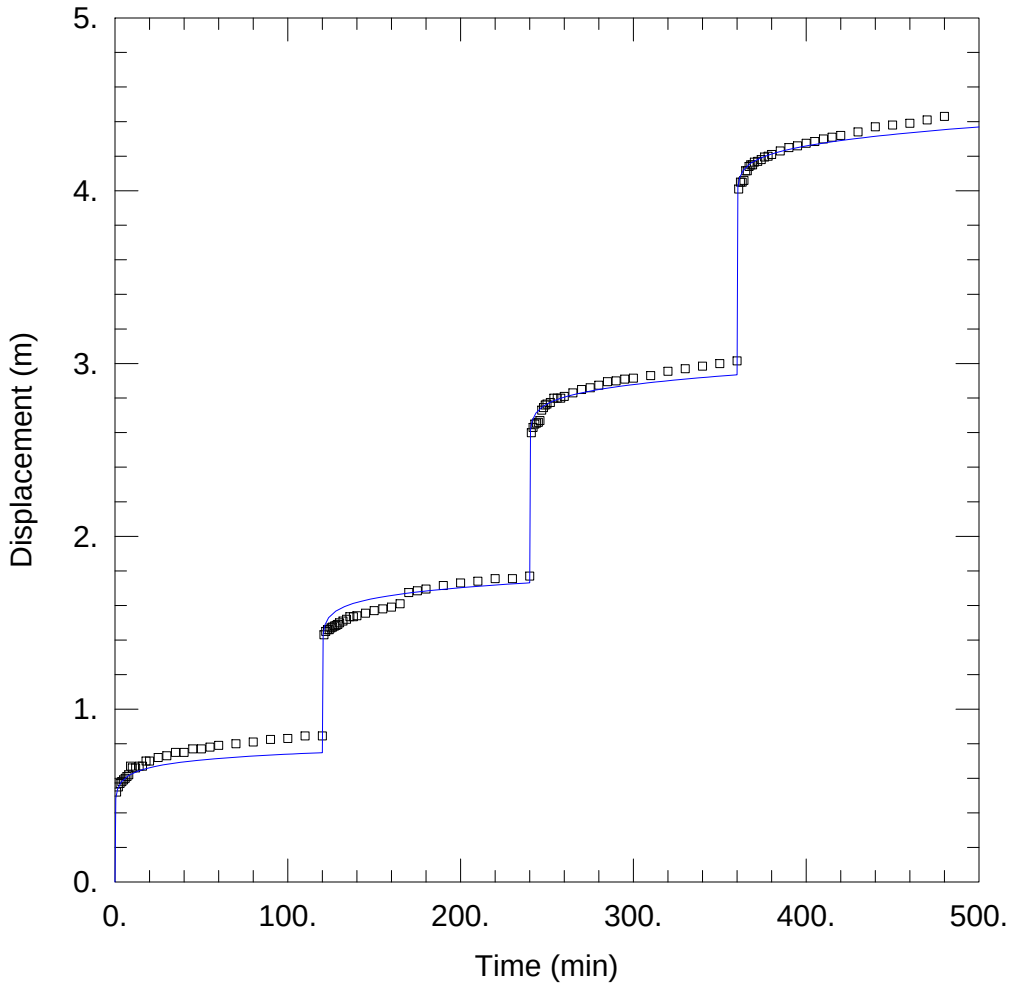
$s(t) = 1.646Q + 3.626Q^{2.}$

Figure A4.10

$S = 10^{-5}$, $C = 0.377\ \text{min}^2/\text{m}^5 \rightarrow T = 287\ \text{m}^2/\text{d}$, $S_w = -6.52$



Analysis by Christopher J. Neville
S.S. Papadopulos & Associates, Inc
February 23, 2011



CMTW1-05 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\CMTW1-05.aqt
Date: 04/21/16 Time: 13:55:38

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Clemens Mills (Portuguese Club
Test Well: CMTW1-05
Test Date: Sept 13, 2005

AQUIFER DATA

Saturated Thickness: 95.7 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
CMTW1-05	558402.6	4805356.3

Observation Wells

Well Name	X (m)	Y (m)
CMTW1-05	558402.6	4805356.3

SOLUTION

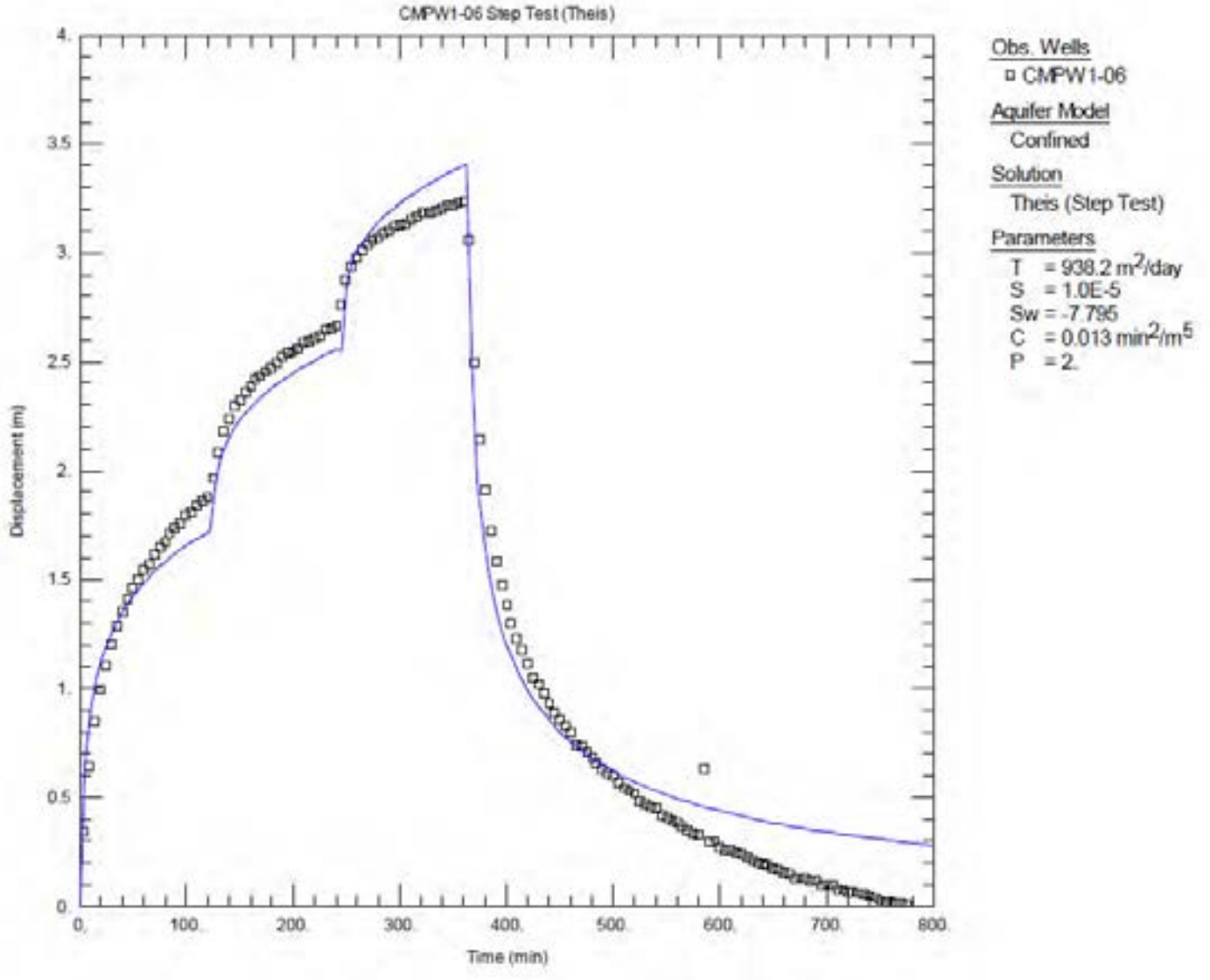
Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 535. m^2/day
Sw = -5.956
P = 2.

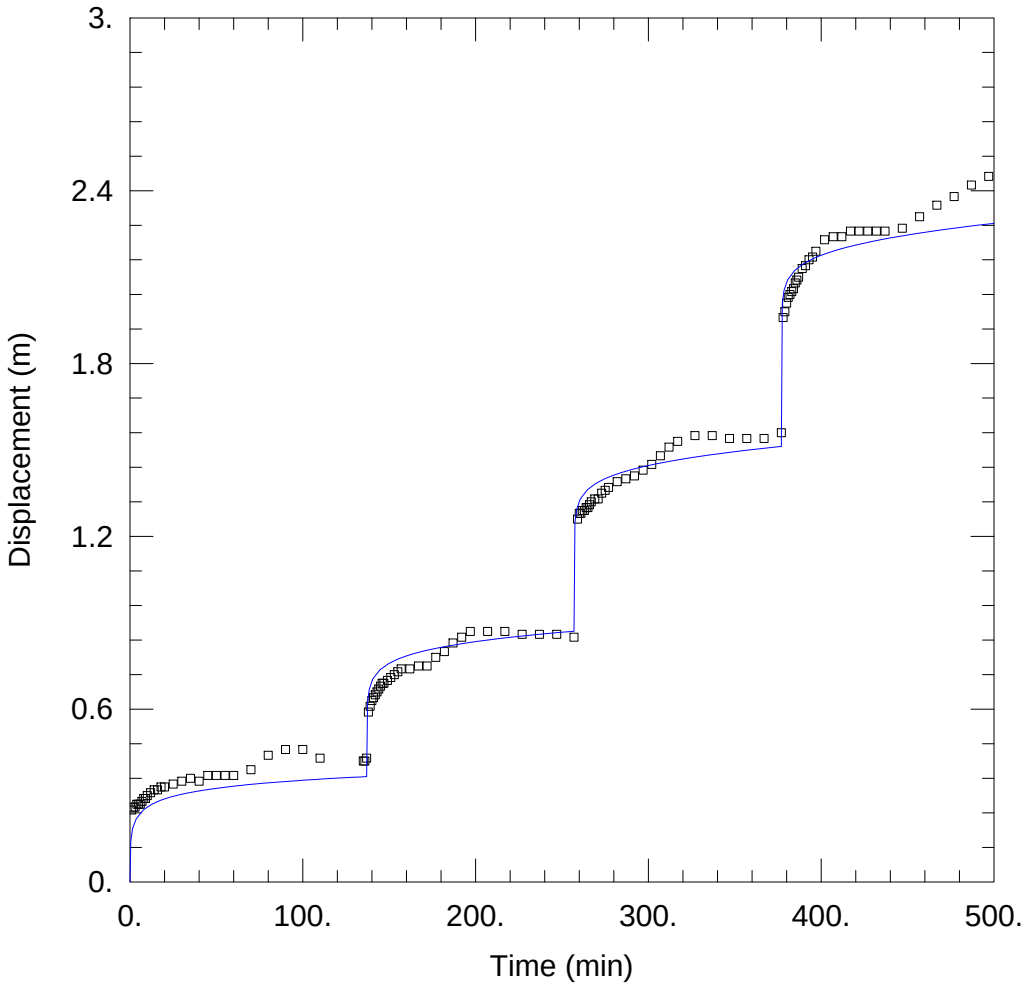
S = 1.915E-7
C = 1.949 min^2/m^5

Figure A4.12

$S = 10^{-5}$, $C = 0.013$ min^2/m^5 $\rightarrow$ $T = 940$ m^2/d, $S_w = -7.80$



Analysis by Christopher J. Neville
S.S. Papadopulos & Associates, Inc
February 23, 2011



CMTW2-05 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\CMTW2-05.aqt
Date: 04/21/16 Time: 14:08:42

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Clemens Mill (Cedarbrook Crt)
Test Well: CMTW2-05
Test Date: Nov. 18, 2005

AQUIFER DATA

Saturated Thickness: 87.3 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
CMTW2-05	558964.4	4804452.2

Observation Wells

Well Name	X (m)	Y (m)
▫ CMTW2-05	558964.4	4804452.2

SOLUTION

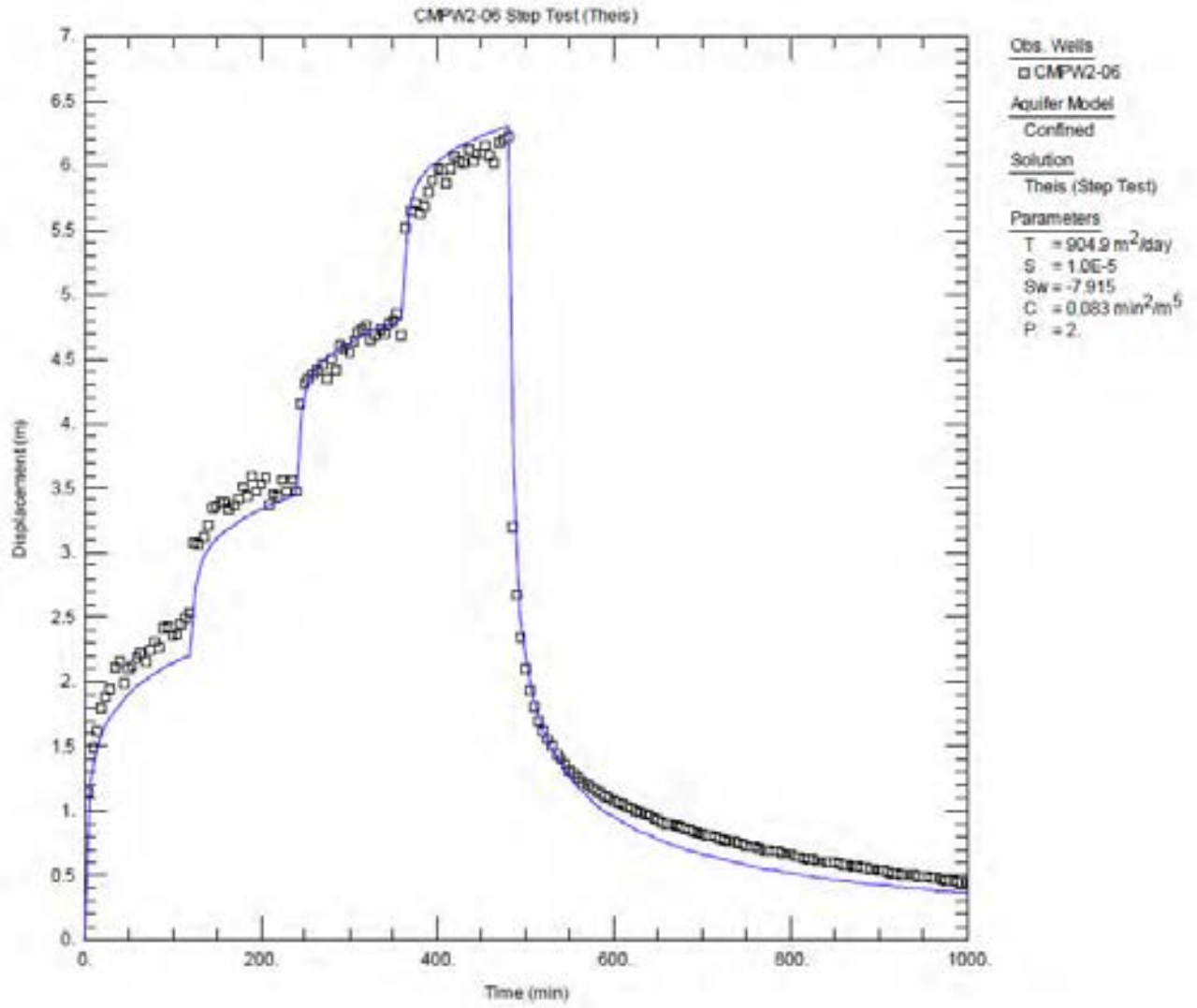
Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 645. m^2/day
Sw = -6.822
P = 2.

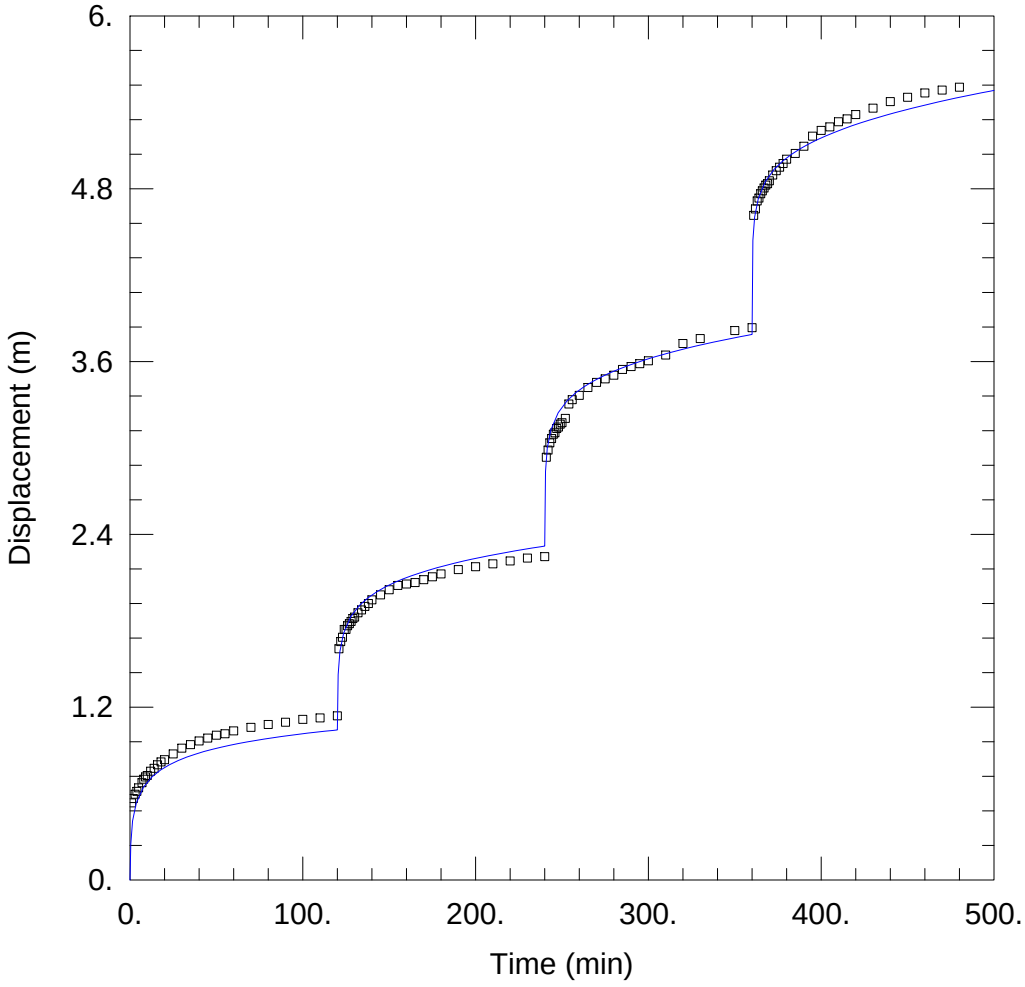
S = 1.427E-5
C = 1.153 min^2/m^5

Figure A4.14

$S = 10^{-5}$, $C = 0.083$ min^2/m^5 $\rightarrow$ $T = 905$ m^2/d, $S_w = -7.92$



Analysis by Christopher J. Neville
S.S. Papadopulos & Associates, Inc
February 23, 2011



CMTW3-05 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\CMTW3-05.aqt
Date: 04/21/16 Time: 14:16:26

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Clemens Mill (Burnett Ave)
Test Well: CMTW3-05
Test Date: Nov 23, 2005

AQUIFER DATA

Saturated Thickness: 97.5 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
CMTW3-05	557559.9	4805180.6

Observation Wells

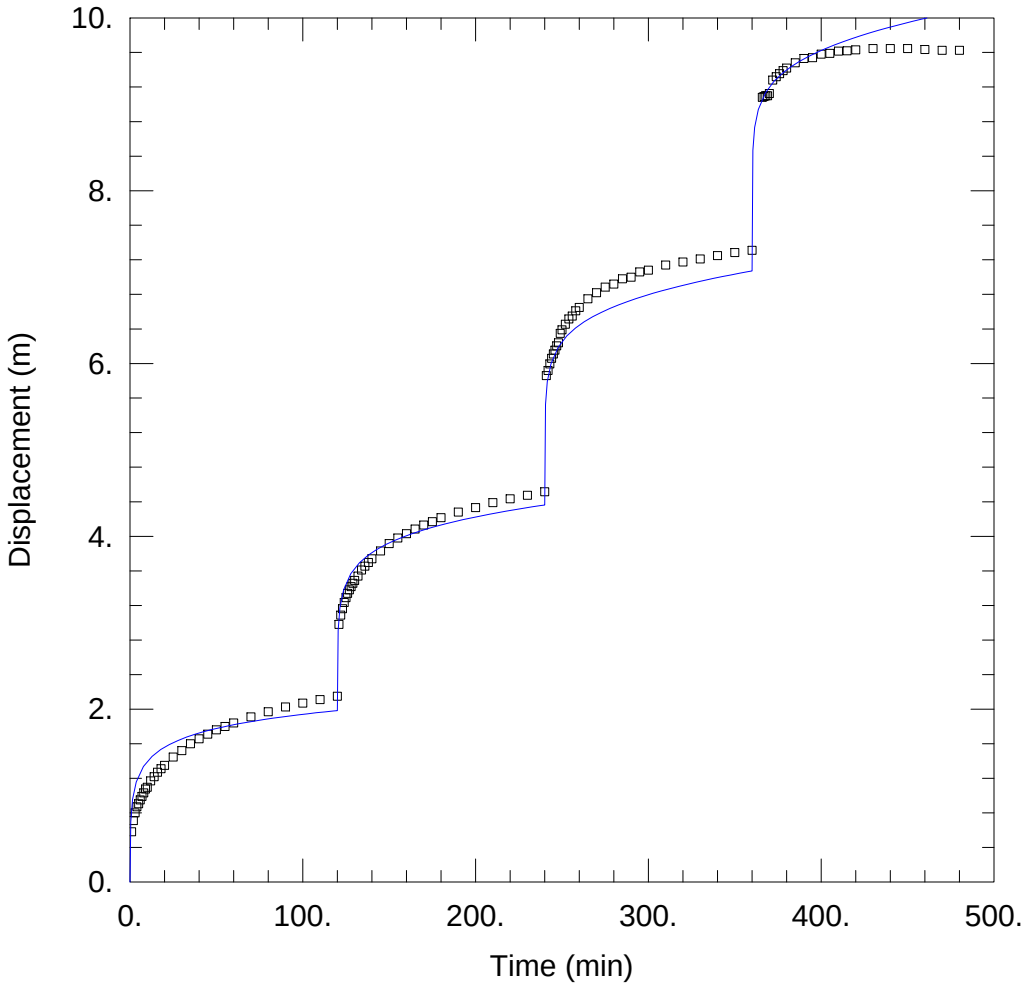
Well Name	X (m)	Y (m)
▫ CMTW3-05	557559.9	4805180.6

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 178.8 m^2/day
Sw = -7.891
P = 2.

S = 1.0E-6
C = 1.303 min^2/m^5



SMTW1-05

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\SMTW1-05.aqt
Date: 04/21/16 Time: 14:25:00

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Shades Mill
Test Well: SMTW1-05
Test Date: Sept 8, 2005

AQUIFER DATA

Saturated Thickness: 160.5 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
SMTW1-05	0	0

Observation Wells

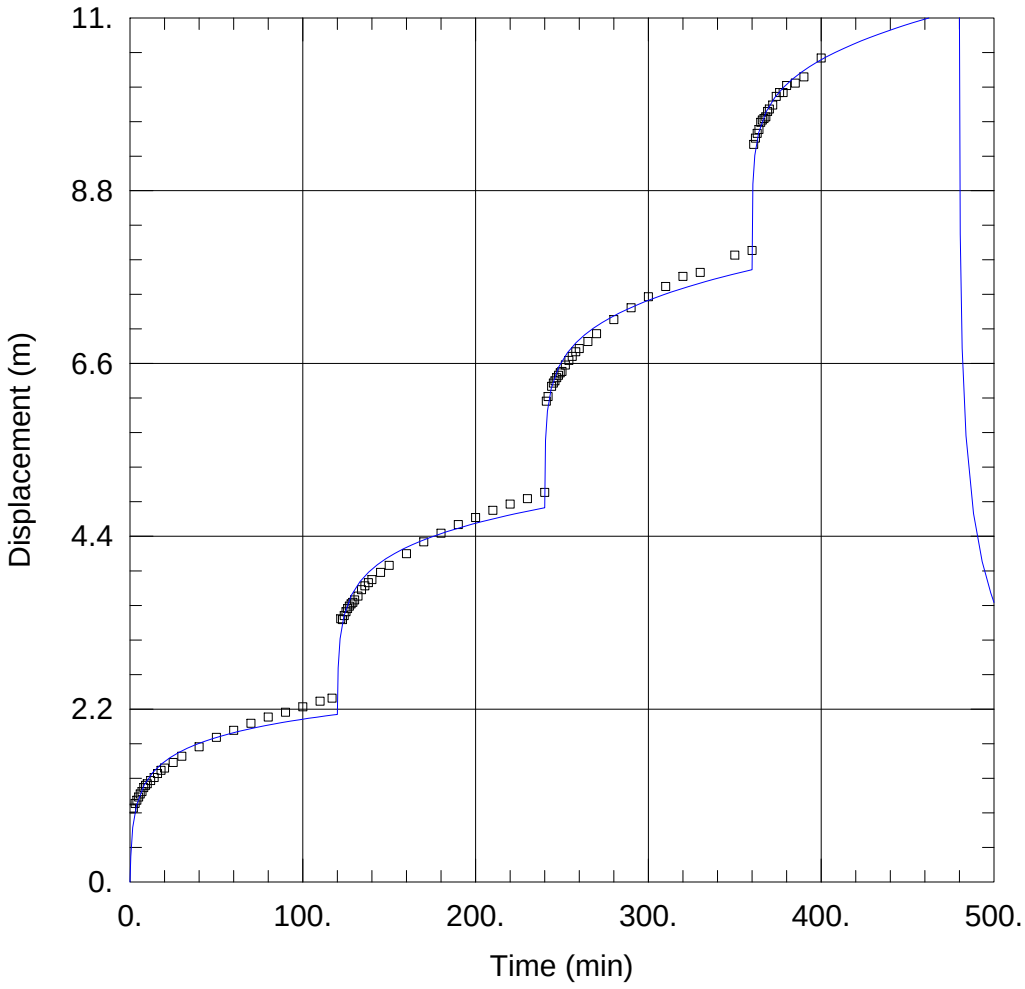
Well Name	X (m)	Y (m)
SMTW1-05	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 110. m^2/day
Sw = -4.606
P = 2.

S = 0.0001328
C = 2.259 min^2/m^5



SMTW2-07 STEP TEST

PROJECT INFORMATION

Company: Golder Associates Ltd
Client: RMOW
Project: 05-1112-010
Location: Shades Mill
Test Well: SMTW2-07
Test Date: September 18, 2007

AQUIFER DATA

Saturated Thickness: 105. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
SMTW2-07	557668.7	4802637.6

Observation Wells

Well Name	X (m)	Y (m)
SMTW2-07	557668.7	4802637.6

SOLUTION

Aquifer Model: Confined

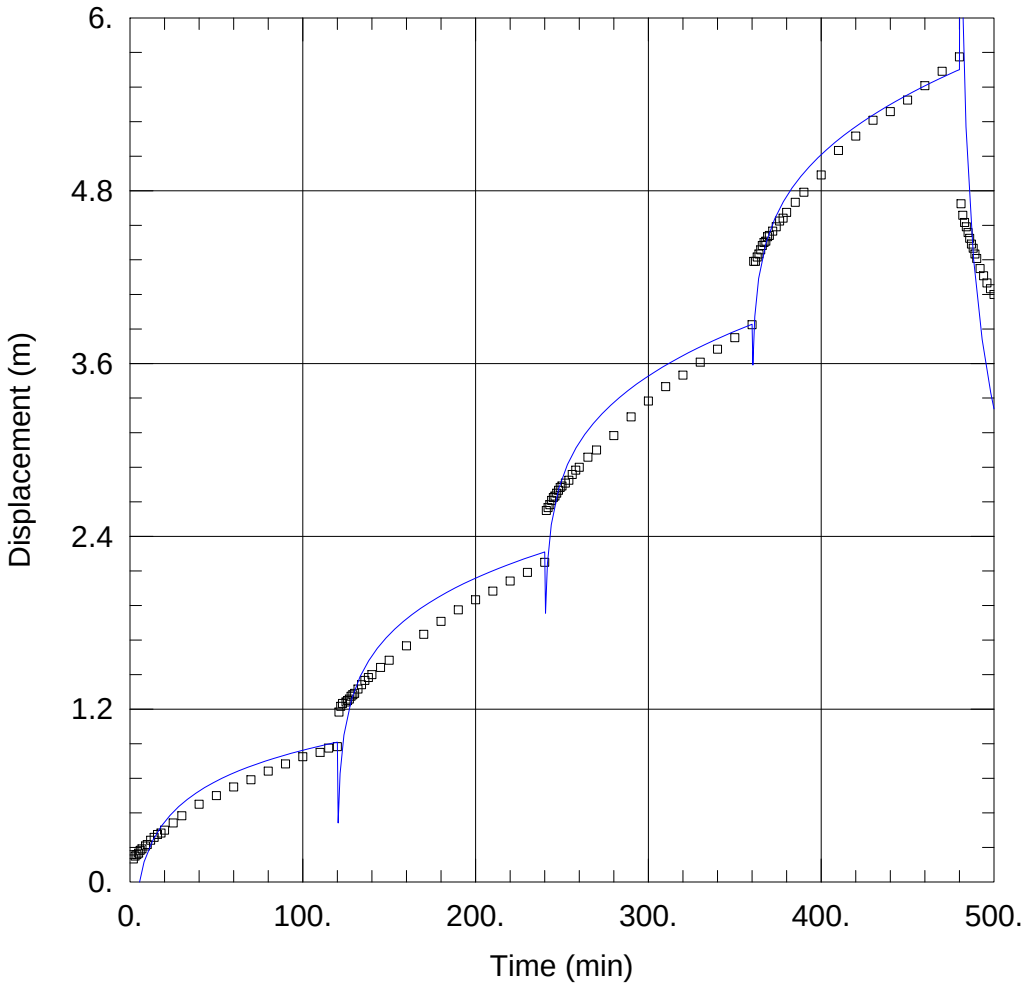
Solution Method: Theis (Step Test)

T = 78. m^2/day
Sw = -5.295
P = 2.

S = 0.0001617
C = 2.553 min^2/m^5

Step Test Model: Jacob-Rorabaugh

$s(t) = 1.738Q + 2.553Q^{2.}$



SMTW3-07 STEP TEST

PROJECT INFORMATION

Company: Golder Associates Ltd
Client: RMOW
Project: 05-1112-010
Location: Shades Mill
Test Well: SMTW3-07
Test Date: September 20, 2007

AQUIFER DATA

Saturated Thickness: 92. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
SMTW3-07	0	0

Observation Wells

Well Name	X (m)	Y (m)
SMTW3-07	0	0

SOLUTION

Aquifer Model: Confined

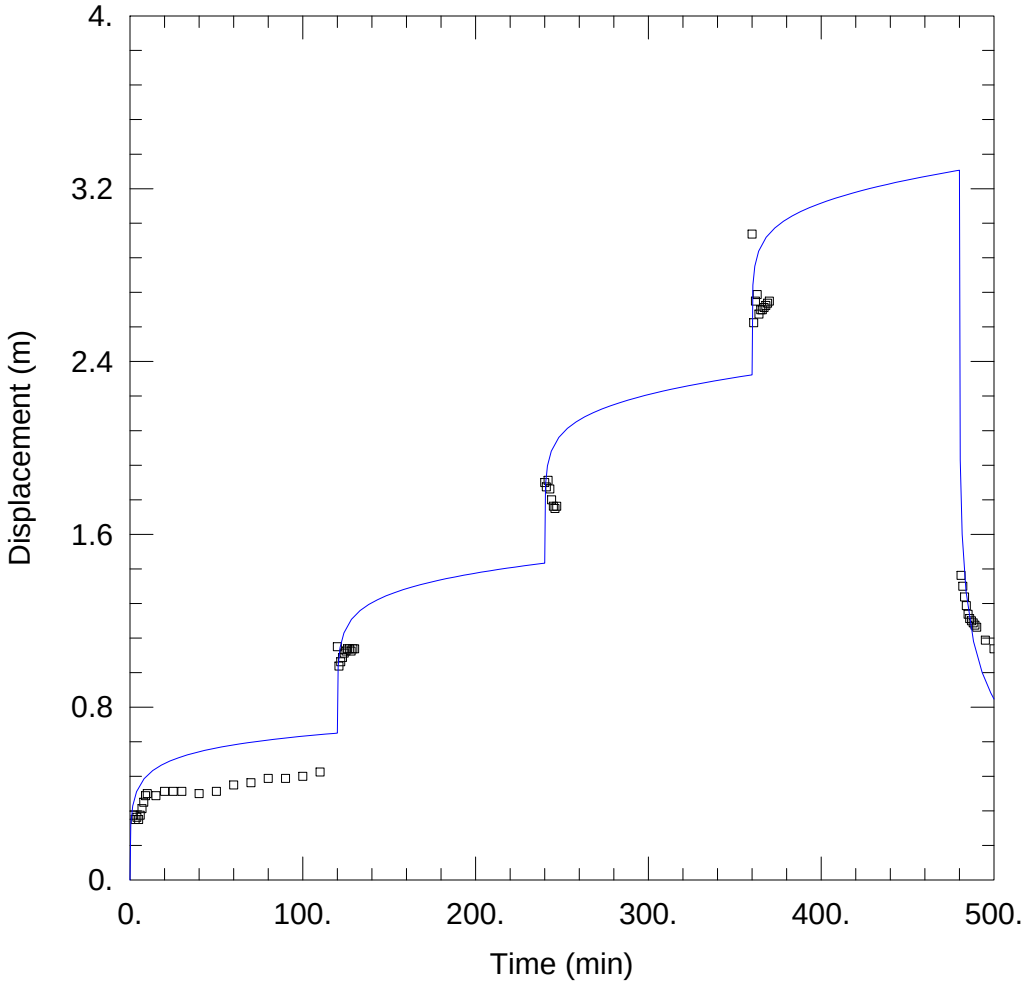
Solution Method: Theis (Step Test)

T = 84.49 m^2/day
Sw = -7.1
P = 2.

S = 0.0001
C = 1.303 min^2/m^5

Step Test Model: Jacob-Rorabaugh

$s(t) = -2.532Q + 1.303Q^{2.}$



SMTW4-08 STEPTEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\SMTW4-08.aqt
Date: 04/20/16 Time: 22:37:49

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010
Location: Cambridge
Test Well: SMTW4-08
Test Date: February 29, 2009

AQUIFER DATA

Saturated Thickness: 102. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
SMTW4-08	559023	4803334.5

Observation Wells

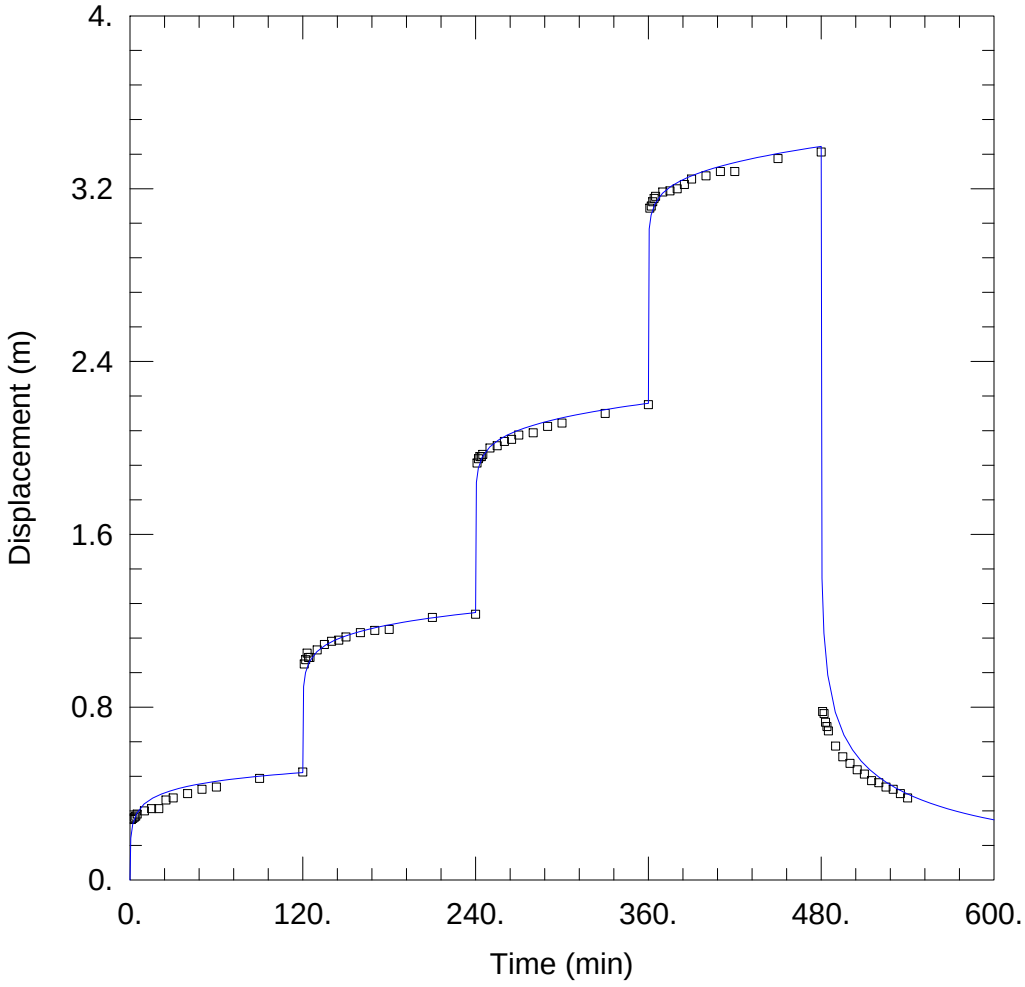
Well Name	X (m)	Y (m)
SMTW4-08	559023	4803334.5

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 333. m^2/day
Sw = -6.236
P = 2.

S = 1.0E-5
C = 0.51 min^2/m^5



NDTW1-08 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\NDTW1-08.aqt
Date: 04/21/16 Time: 23:16:39

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010 (1900)
Location: North Dumfries Park
Test Well: NDTW1-08
Test Date: October 20, 2008

AQUIFER DATA

Saturated Thickness: 82.5 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
NDTW1-08	562366.8	4804125.2

Observation Wells

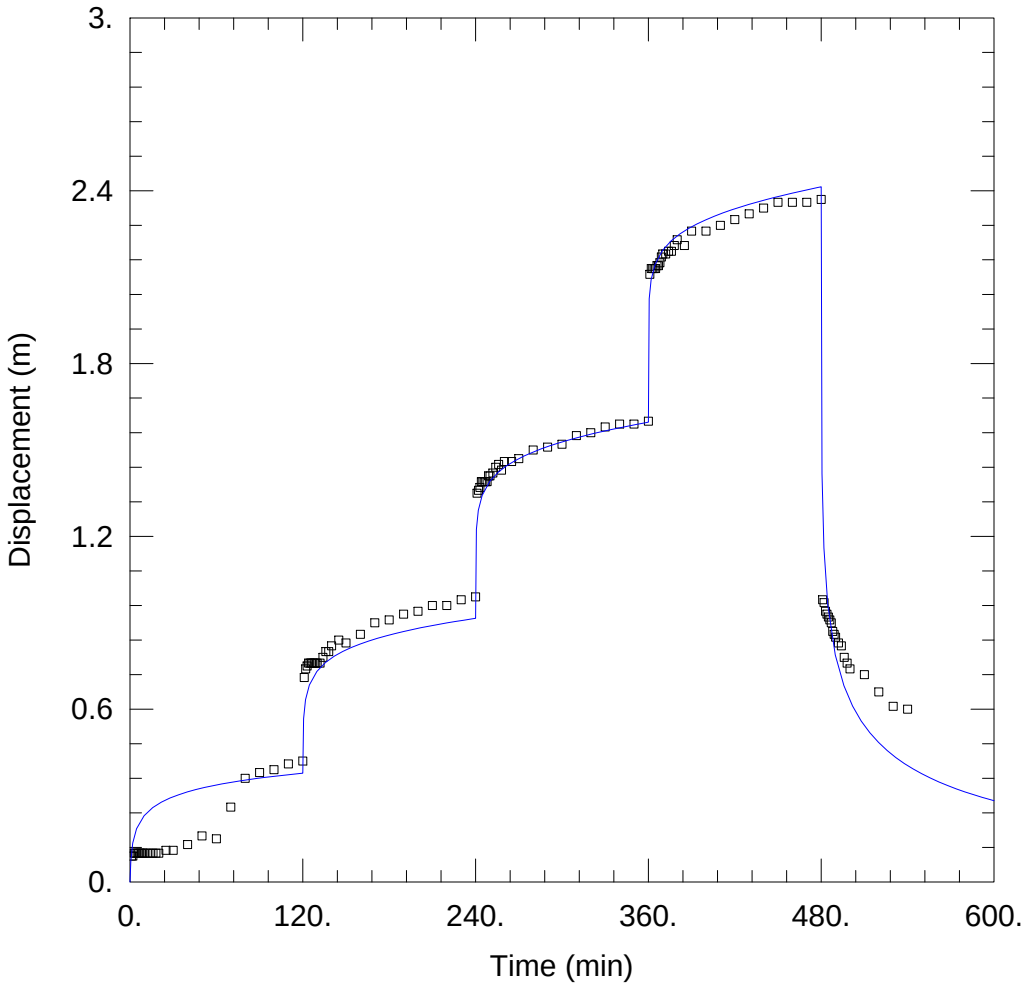
Well Name	X (m)	Y (m)
NDTW1-08	562366.8	4804125.2

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 450. m^2/day
Sw = -5.192
P = 2.

S = 0.0005
C = 1.963 min^2/m^5



NDTW2-08 STEP TEST

Data Set: C:\Users\JHancox\Desktop\Cambridge East\Aqtesolv\NDTW2-08.aqt
Date: 04/21/16 Time: 23:18:04

PROJECT INFORMATION

Company: Golder Associates
Client: RMOW
Project: 05-1112-010 (1900)
Location: North Dumfries Park
Test Well: NDTW2-08
Test Date: October 16, 2008

AQUIFER DATA

Saturated Thickness: 87.8 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
NDTW2-08	562219.7	4800075.7

Observation Wells

Well Name	X (m)	Y (m)
NDTW2-08	562219.7	4800075.7

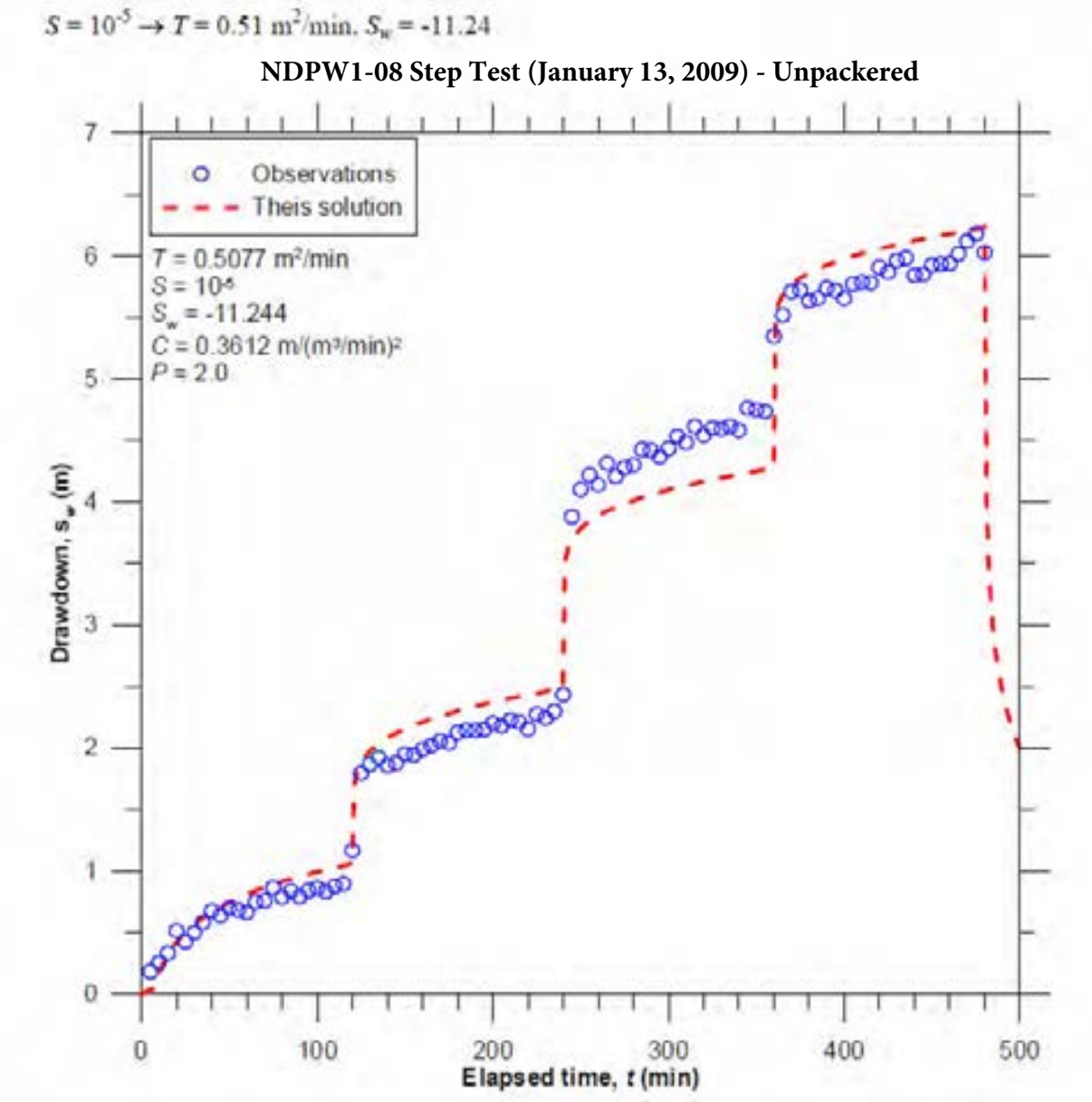
SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 443.2 m^2/day
Sw = -6.805
P = 2.

S = 8.0E-5
C = 1.149 min^2/m^5

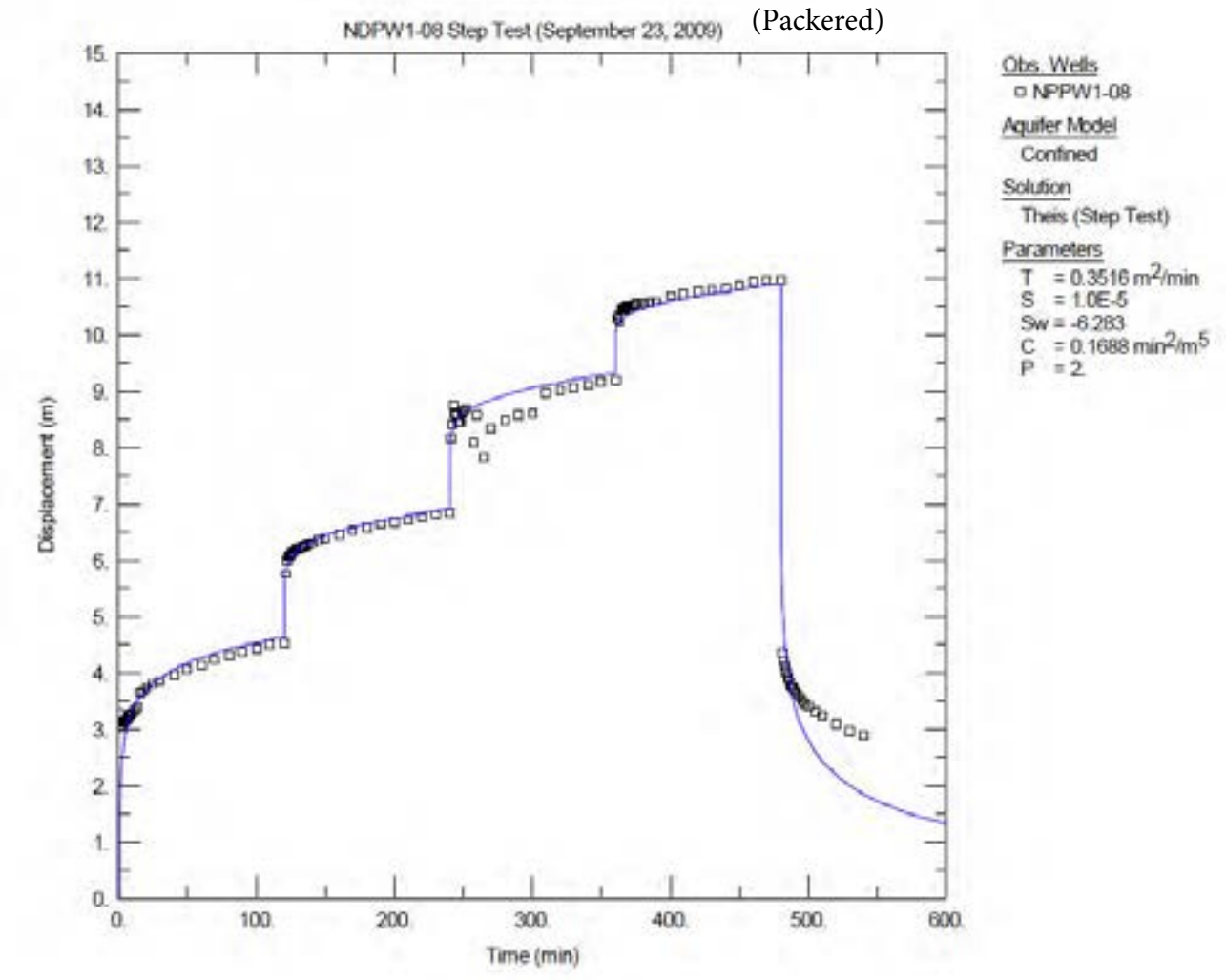
Figure A4.22



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February 23, 2011

Figure A4.23

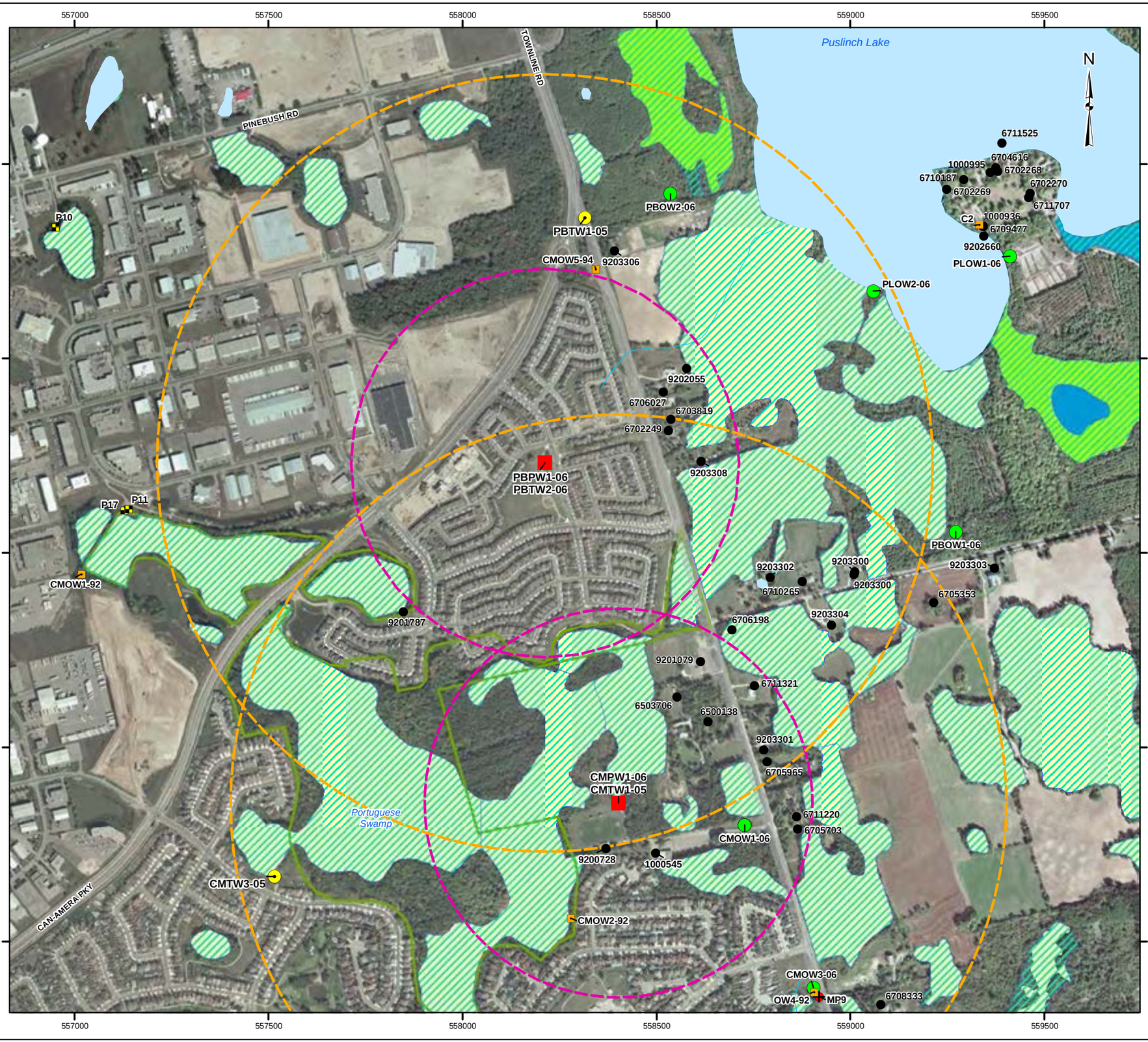
$S = 10^{-5} \rightarrow T = 0.35\ m^2/min\ (510\ m^2/d),\ S_w = -6.28$



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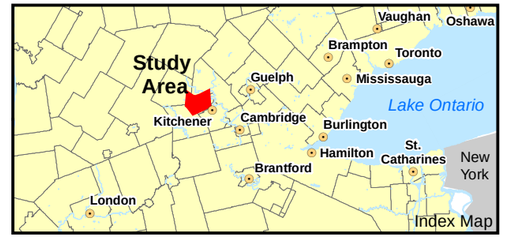
ATTACHMENT A5

Private Well Inventories



LEGEND

- Monitoring Wells (not including IUS wells)
- Private Well
- Mini-Piezometer
- Surface Water Level Station
- Municipal Supply Wells
- Test Production\Test Wells
- Test Wells
- IUS Project Overburden Monitoring Wells
- Railway
- Watercourse
- Water
- Provincially Significant Wetlands
- Bog
- Fen
- Marsh
- Swamp
- ESAs
- Municipalities
- 1km Buffer around Test Supply Wells
- 500m Buffer around Test Supply Wells



REFERENCE

Base Data - MNR LIO, obtained 2009
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2012
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17
Imagery: ERSI World Mosaic

200 0 200 400 600
Meters

PROJECT
CAMBRIDGE EAST WATER SUPPLY
CLASS ENVIRONMENTAL ASSESSMENT

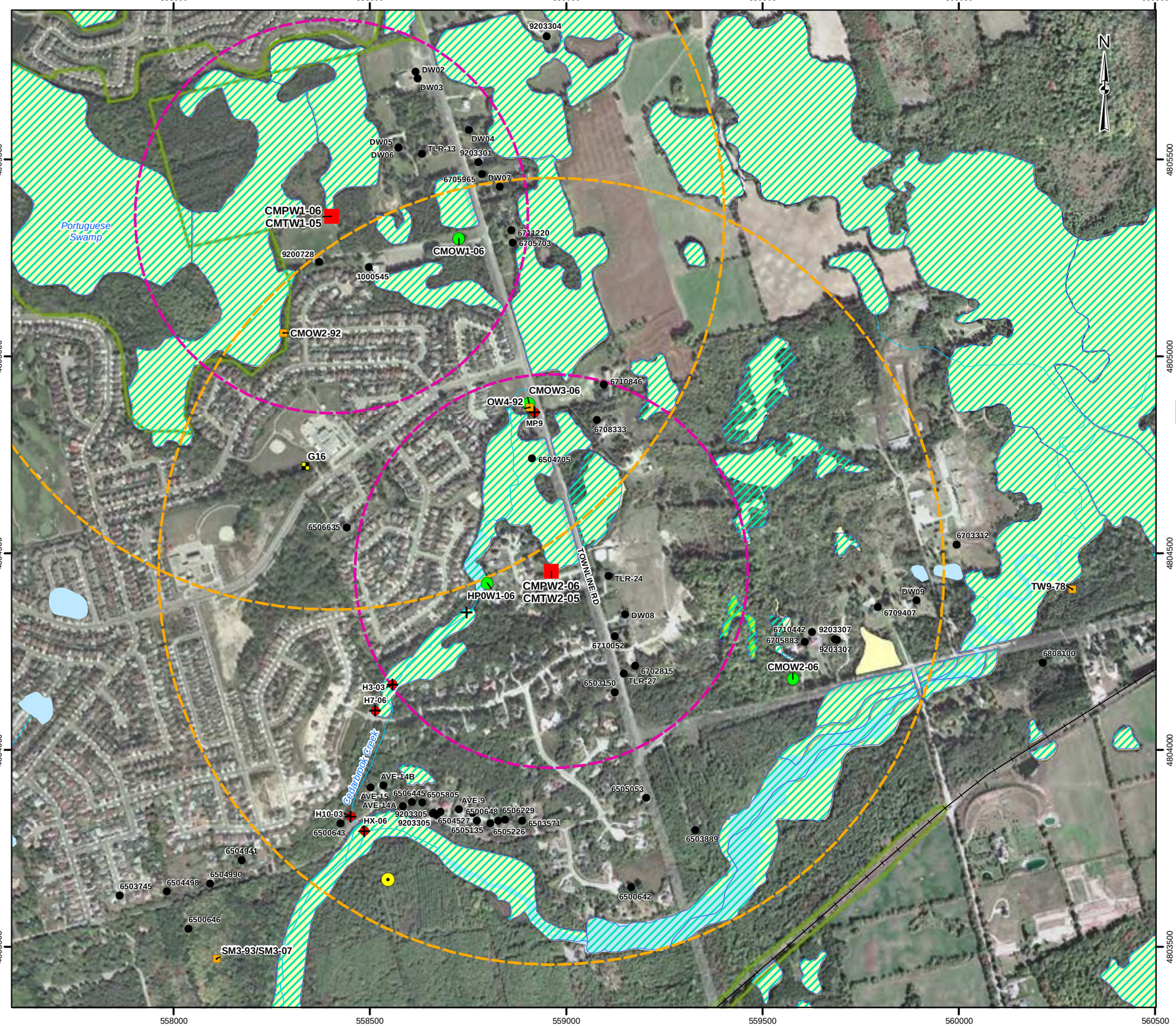
TITLE
PRIVATE WELL INVENTORY (Northern Area)

Golder Associates
Mississauga, Ontario

PROJECT NO. 05-1112-010		SCALE 1:10,000	REV. 2
DESIGN	CGG	10 Mar. 2005	
GIS	KD	17 Sep. 2012	
CHECK	JH	17 Sep. 2012	
REVIEW	JP	17 Sep. 2012	

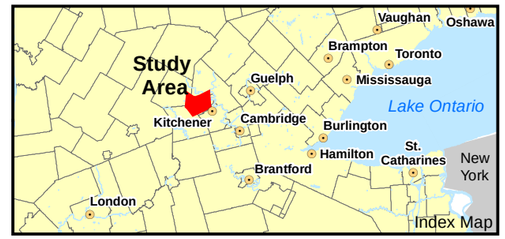
FIGURE: A5.1

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Cambridge_East_Class_EA\FigA5.1_Northern_Private_Well_Inventory.mxd



LEGEND

- Monitoring Wells (not including IUS wells)
- Private Well
- Mini-Piezometer
- Surface Water Level Station
- Municipal Supply Wells
- Test Production\Test Wells
- Test Wells
- IUS Project Overburden Monitoring Wells
- Railway
- Watercourse
- Water
- Provincially Significant Wetlands
- Bog
- Fen
- Marsh
- Swamp
- ESAs
- Municipalities
- 1km Buffer around Test Supply Wells
- 500m Buffer around Test Supply Wells



REFERENCE

Base Data - MNR LIO, obtained 2009
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2012
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17
Imagery: ERSI World Mosaic

200 0 200 400 600
Meters

PROJECT
CAMBRIDGE EAST WATER SUPPLY
CLASS ENVIRONMENTAL ASSESSMENT

TITLE
PRIVATE WELL INVENTORY (Southern Area)

Golder Associates
Mississauga, Ontario

PROJECT NO. 05-1112-010			SCALE 1:10,000	REV. 2
DESIGN	CGG	10 Mar. 2005	**FIGURE: A5.2**	
GIS	KD	17 Sep. 2012		
CHECK	JH	17 Sep. 2012		
REVIEW	JP	17 Sep. 2012		

G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\CambridgeCambridge_East_Class_EA\FigA5.2_Southern_Private_Well_Inventory.mxd

Table A5.1
Cambridge East Private Well Inventory - Well Locations

OBJ_NUM	Golder / Lotowater ID	UTM Easting	UTM Northing	Source UTM Coordinates	Last Name	Address
6505135	AVE-3	558772.93	4803820.86	WRAS database	Calogeridis	935 Avenue Rd
6506229	AVE-4	558844.44	4803824.26	mapped	Loudiges	929 Avenue Rd
6500648	AVE-5	558827	4803822	Golder Handheld GPS	Schwantz	925 Avenue Rd
6505226	AVE-6	558807.92	4803814.86	WRAS database	Price & Juhasz	915 Avenue Rd
6505053		559209	4803781	Golder Handheld GPS	Krebsz	908 Avenue Rd
	AVE-7	558762.19	4803840.94	mapped	Lyttle	905 Avenue Rd
6505681	AVE-8	558754.93	4803845.87	WRAS database	Poweska	889 Avenue Rd
	AVE-9	558727	4803850	Golder Handheld GPS	Tellier	879 Avenue Rd
6504527	AVE-10	558680.69	558680.69	RMOW Survey Mar-07	Rodrigues	859 Avenue Rd
9203305	AVE -11	558661	4803839	Golder Handheld GPS	Ford	855 Avenue Rd
6505805	AVE-12?	558633.99	4803867.67	mapped	Fryberger?	849 Avenue Rd
6506445	AVE-13	558585	4803858	Golder Handheld GPS	Dickson	839 Avenue Rd
	AVE-14A	558585	4803858	Golder Handheld GPS	Breckles	829 Avenue Rd
	AVE-14B	558535	4803911	Golder Handheld GPS	Silverthorn	819 Avenue Rd
	AVE-15	558503	4803907	Golder Handheld GPS	Edur	809 Avenue Rd
6500643	AVE-16	558427	4803814	Golder Handheld GPS	Tomson	785 Avenue Rd
9203302	TLR-7	558781.83	4805941.79	RMOW Survey Oct-06	Elligson	6494 Concession 1
6710265	TLR-8	558876	4805927	Golder Handheld GPS	Atwal	6504 Concession 1
9203304		558943.20	4805820.19	RMOW Survey Oct-06	Frosh	6505 Concession 1
9203300		559009.43	4805945.93	RMOW Survey Oct-06	Budwal	6508 Concession 1
6503889	AVE-1	559329	4803798	mapped	Stewart	6485 Gore Rd
6705883		559608	4804275	Golder Handheld GPS	Hunt	6514 Gore Rd
6710442		559626.17	4804299.79	WRAS database	Worzniak	6518 Gore Rd
9203307		559689.37	4804280.38	RMOW Survey Oct-06	Smallbone & Reeve	6522 Gore Rd
6709407		559794	4804364	Golder Handheld GPS	Reeve	6526 Gore Rd
	DW09	559891.73	4804380.96	mapped	Ayers	6536 Gore Rd
6500642	AVE-2A	558800	4803800	WRAS database	Gudisco & Grandy	50 Grandy Avenue
6503150	TLR-28	559124	4804147	mapped	Licktey	Townline Rd
6702815	TLR-27	559147	4804195	Golder Handheld GPS	Corrent	171 Townline Rd
6710052	TLR-26	559124.18	4804289.78	WRAS database	McCarley	317 Townline Rd
	TLR-24	559107.76	4804442.95	mapped	Will	335 Townline Rd
	DW08	559150	4804345	Golder Handheld GPS	Will	337 Townline Rd
6708333	TLR-23	559078.12	4804839.04	RMOW Survey Oct-06	Oliver	485 Townline Rd
6504705		558912.92	4804740.86	WRAS database	Cranen	540 Townline Rd
6710846	TLR-22	559096.18	4804929.78	WRAS database		563 Townline Rd

Table A5.1
Cambridge East Private Well Inventory - Well Locations

OBJ_NUM	Golder / Lotowater ID	UTM Easting	UTM Northing	Source UTM Coordinates	Last Name	Address
6705703		558864	4805290	Golder Handheld GPS	Ferriera	863 Townline Rd
6711220		558861.17	4805321.78	WRAS database	Cherubino	883 Townline Rd
1000545	DW-CLUB WELL	558497.83	4805227.39	Surveyed Sept 05	Portuguese Club	870 Townline Rd
9200728	DW-SOCCER WELL	558370.72	4805240.77	Surveyed Sept 05	Portuguese Club	870 Townline Rd
6705965	TLR-17	558785.17	4805463.78	WRAS database	Kinzie	967 Townline Rd
	DW07	558831.52	4805432.09	mapped	Cutting	937 Townline Rd
	DW02	558617	4805725	Golder Handheld GPS	Italian Club	Townline Rd
	DW03	558622	4805707	Golder Handheld GPS	Italian Club	Townline Rd
9203301	DW10	558776.87	4805494.70	RMOW Survey Mar-07	Anderson	1007 Townline Rd
	TLR-13	558633	4805516	Golder Handheld GPS		1070 Townline Rd
	DW04	558752.65	4805576.52	mapped		1085 Townline Rd
	DW05	558573.31	4805532.24	mapped	Emerald	1110 Townline Rd
	DW06	558573.31	4805532.24	mapped	Emerald	1110 Townline Rd
6711321		558753.17	4805658.78	WRAS database	Singh	1121 Townline Rd
6503706	TLR-11	558553	4805630	Golder Handheld GPS	Mirkovic	1140 Townline Rd
9203308	TLR-6	558602.92	4896220.01	RMOW Survey Oct-06	Zimmerman	1493 Townline Rd
6702249	TLR-5	558531	4806315	Golder Handheld GPS	Lee	1543 Townline Rd
6703819		558537	4806345	Golder Handheld GPS		1567 Townline Rd
	DW01	558511.27	4806385.13	mapped	Gil	1593 Townline Rd
6706027	TLR-3	558518	4806415	Golder Handheld GPS	Walker	1619 Townline Rd
9202055	DW-REED	558577.85	4806476.18	Surveyed Sept 05	Reed	1639 Townline Rd
9203306	TLR-1	558392.58	4806777.92	RMOW Survey Oct-06	Quinnel	1873 Townline Rd

Wells Outside of the 1 km radius, Used for Monitoring

OBJ_NUM	Golder / Lotowater ID	UTM Easting	UTM Northing	Source UTM Coordinates	Last Name	Address
9203303		559371.22	4805960.89	RMOW Survey Oct-06	Frosh	6525 Concession 1
9203311		558582.54	4804061.32	RMOW Survey Mar-07	Majonke	6699 Concession 1
6710783		559620.04	4808220.25	RMOW Survey Mar-07	St. Pierre	44 Lake Ave
1000936	C2	559341.83	4806840.90	RMOW Survey Oct-06	Hueton	32 Lakeside Dr

Abandoned Wells

OBJ_NUM	Golder / Lotowater ID	UTM Easting	UTM Northing	Source UTM Coordinates	Last Name	Address
6503571	AVE-17	558887.92	4803820.86	WRAS database	Foley	695 Avenue Rd
6502996	TLR-25	558832.91	4804360.86	WRAS database	Fernandez	55 Cedarbrook Crt
6704391	TLR-9	558939.17	4805922.78	WRAS database		6508 Concession 1

Table A5.2
Cambridge East Private Well Inventory - Well Descriptions

OBJ_NUM	Golder / Lotowater ID	Location	Uses	Date Constructed	Well Depth (m)	Well Type	Accessible	Comments From Owner
6505135	AVE-3	well not observed	DOMESTIC	07-May-80	36.58	drilled	no	
6506229	AVE-4		DOMESTIC	24-Nov-87	9.75	drilled	?	owner has never had an issue with well
6500648	AVE-5	behind house with concrete cover	DOMESTIC	31-Aug-67	34.44	drilled	not easily	modified well
6505226	AVE-6	in front deck	DOMESTIC	27-Aug-81	37.19	drilled	not easily	
6505053		behind house, beside pool in garden	DOMESTIC	04-Apr-75	42.67	drilled	not easily	
	AVE-7	buried behind house	DOMESTIC	1972	27	drilled	no	problems with water quality & pressure
6505681	AVE-8	well not observed; likely buried in front lawn	DOMESTIC	09-May-85	36.88	drilled	no	
	AVE-9	behind house (NW)	DOMESTIC		12.2	drilled	yes	
6504527	AVE-10	in front of house (SW)	DOMESTIC	01-Sep-76	45.7	drilled	yes	bad water pressure; poor quality
9203305	AVE -11	in bushes in front of house (SE)	DOMESTIC		4.6	dug	yes	
6505805	AVE-12?	buried in front lawn	DOMESTIC	16-Jan-86	22.25	drilled	no	well not located
6506445	AVE-13	SE of house behind rock	DOMESTIC	06-Sep-88	10.67	drilled	yes	owner believes quality & quantity affected by new subdivision
	AVE-14A	in front yard, to SE of house	DOMESTIC		10	dug	no	
	AVE-14B	behind house	DOMESTIC		6.7	dug	yes	
	AVE-15	behind house, underneath porch	DOMESTIC		12.2	drilled	not easily	
6500643	AVE-16	in driveway	DOMESTIC	12-Jul-58	28.96	drilled	yes	owner moved in 1 yr ago
9203302	TLR-7	S of house in small garden, N of	DOMESTIC			dug	yes	pump set at ~30 ft
6710265	TLR-8	on W side of house	DOMESTIC	03-Dec-90	13.72	drilled	yes	good production
9203304		behind house (SW corner)	DOMESTIC		31.7	drilled	yes	
9203300		in driveway (E of house)	DOMESTIC	1976		dug	yes	owner concerned about his water
6503889	AVE-1	well not observed	DOMESTIC	15-Jun-56	32.31	drilled	no	
6705883		E side of house	DOMESTIC	18-Mar-75	25.3	drilled	yes	
6710442		on property with locked gate	DOMESTIC	13-Jul-90	15.85	drilled	not easily	
9203307		behind house (NW corner)	DOMESTIC	2004	26	drilled	yes	pump set at ~ 50 ft
6709407		beside porch, E side of house	DOMESTIC	23-Sep-88	9.75	drilled	yes	pond in front of house
	DW09	buried, E of house	DOMESTIC			drilled	no	has sulphur odour in water
6500642	AVE-2A	buried on S side of house	STOCK, DOMESTIC	12-Oct-51	27.43	drilled	no	good production; pump inside house
6503150	TLR-28	buried in front lawn	DOMESTIC	23-Feb-70	19.2	drilled	no	
6702815	TLR-27	in shrubs in front of house, S side of driveway	DOMESTIC	22-Dec-66	17.07	drilled	yes	
6710052	TLR-26	buried in front yard	DOMESTIC	10-Mar-89	18.29	drilled	no	
	TLR-24	in wishing well on S side of house	DOMESTIC, STOCK			drilled	no	
	DW08	to E of house	DOMESTIC	1999	15	drilled	not interested	Graham Well Drilling 519-824-3690
6708333	TLR-23	on N side of house	DOMESTIC	21-Nov-85	9.75	drilled	yes	pump set at around 30 ft
6504705		inside house, in basement	DOMESTIC	01-Jun-77	7.62	drilled	not easily	
6710846	TLR-22	on SE side of house	DOMESTIC	19-Sep-91	11.58	drilled	yes	
6705703		buried on SE corner of driveway	DOMESTIC	17-Sep-75	21.34	drilled	no	pump inside house
6711220		to NW of house in trees	DOMESTIC	19-Sep-92	15.24	drilled	yes	

Table A5.2
Cambridge East Private Well Inventory - Well Descriptions

OBJ_NUM	Golder / Lotowater ID	Location	Uses	Date Constructed	Well Depth (m)	Well Type	Accessible	Comments From Owner
1000545	DW-CLUB WELL	on W side of Club building	COMMERCIAL	26-Sep-95	29.56	drilled	yes	
9200728	DW-SOCCER	on S side of washrooms; beside the	IRRIGATION,	20-Jun-00	30.18	drilled	yes	
6705965	TLR-17	well not observed	DOMESTIC	16-Dec-75	27.13	drilled	?	
	DW07	behind house (SE)	DOMESTIC			dug	yes	
	DW02	E of building, in garden in parking lot				drilled	yes	
	DW03	E of building, in parking lot				dug	yes	
9203301	DW10	in flower pot, SW side of house	DOMESTIC	2003	15	drilled	yes	
	TLR-13	located behind house (W)	DOMESTIC			dug	yes	
	DW04	beside garage (SE corner)				dug	yes	not in use
	DW05	past driveway on lawn, SE of house	IRRIGATION	1975	6.1	dug	yes	dug well, around 25 yrs old, only used for irrigation of lawn
	DW06	past driveway on lawn, SE of house	DOMESTIC	2000	27.4	drilled	yes	drilled well by McLaughlin Water Wells; 5-
6711321		well not located	DOMESTIC	30-Jun-93	13.72	drilled	no	
6503706	TLR-11	S of house, below hand pump	DOMESTIC	23-Sep-72	22.25	drilled	no	
9203308	TLR-6	beside parking lot in driveway (SE	DOMESTIC		12.5	dug	yes	
6702249	TLR-5	buried on N side of driveway	DOMESTIC	06-Oct-59	40.54	drilled	no	
6703819		on S side of house	DOMESTIC	10-Jan-70	35.97	drilled	yes	
	DW01	buried in front lawn, W of house	DOMESTIC			drilled	no	shallow dug well behind house; depth
6706027	TLR-3	in front of house (SW corner)	DOMESTIC	17-May-76	51.82	drilled	yes	owner has never had problems with well
9202055	DW-REED	on E side of house, down grassy	DOMESTIC	01-Jul-05	34.13	drilled	yes	pump setting at 70 feet
9203306	TLR-1	in front of house (S)	DOMESTIC			drilled	yes	

Wells Outside 1 km Radius Used for Monitoring

OBJ_NUM	Golder / Lotowater ID	Location	Uses	Date Constructed	Well Depth (m)	Well Type	Accessible	Comments From Owner
9203303		in front of barn	DOMESTIC	1995		drilled	yes	
9203311		on N side of house, beside shrine	DOMESTIC			drilled	yes	
6710783		between driveway and house	DOMESTIC	11-Dec-91	21.3	drilled	yes	
1000936	C2	in garden in front of house (E side)	DOMESTIC		27.43	drilled	yes	historical monitoring data

Abandoned Wells

OBJ_NUM	Golder / Lotowater ID	Location	Uses	Date Constructed	Well Depth (m)	Well Type	Accessible	Comments From Owner
6503571	AVE-17	abandoned; old well not located	DOMESTIC	19-Apr-72	14.02	drilled	no	
6502996	TLR-25	abandoned; old well not located	DOMESTIC	12-Sep-68	35.36	drilled	no	new owner does not know where old well located
6704391	TLR-9	likely abandoned	DOMESTIC	14-Aug-72	14.02	drilled	no	well not located

Table A5.3:
Town of Clyde Private Well Inventory

OBJ_NUM	Golder ID	Easting	Northing	Name	Address	Location	Date Constructed	Well Depth (m)	Well type	Accessible	Comments
		-	-	JOHN STARK JR	6627 GORE RD	-	-		-	-	Notice delivered
		-	-	GIBSON	6642 GORE RD	-	-		-	-	Notice delivered
		-	-	BARTELSE FARMS LIMITED	6647 GORE RD	-	-		-	-	Notice delivered
		561726	4804706	-	6648 GORE RD	front lawn	-		-	-	TAG: A056208
		-	-	-	6652 GORE RD	-	older well		-	-	good yield, high iron - also have shallow barn well
		-	-	NEIL GUNN	6717 GORE RD	-	-		-	-	Notice delivered in mailbox
		-	-	GEORGE WALLIS	6725 GORE RD	-	-		-	-	Notice delivered
		-	-	DOUGLAS DUBRICK	6743 GORE RD	-	-		-	-	Notice delivered
		-	-	MARK DUBRICK	6747 GORE RD	-	-		-	-	Notice delivered
		-	-	DENNIS KELLIHER	1388 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
		561481	4803421	RIBERO MARIA	1407 CLYDE RD	side of house, behind bush	-		drilled	good	
		-	-	-	1419 CLYDE RD	-	-		-	-	no access, no notice
		-	-	-	1429 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
6504571		-	-	SHARON CABRAL	1440 CLYDE RD	-	33 yrs	39.1	-	-	good water
		561813	4803724	BARTELSE INVESTMENTS LIMITED	1486 CLYDE RD	between barn and house	-		-	ok	tenants at the property
		-	-	-	1491 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
6503897		561917	4803608	ROBERT INGRAM	1496 CLYDE RD	front lawn	37 yrs	33.5	drilled	good	good water, has a well cover
		-	-	STEVEN PAULITZKI	1504 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
6503896		-	-	JOHN WELFING	1512 CLYDE RD	-	40 yrs	33.8	-	-	Notice received - used mailbox, beware of dog
		-	-	DARKO FERCEC	1524 CLYDE RD	-	-		-	-	Notice not delivered
		562294	4803705	FRED THOMPSON	1574 CLYDE RD	front lawn	approx. 40yrs	1.7	drilled	poor	good water, well is under bush
1000798		-	-	COLIN ROSE	1597 CLYDE RD	-	11 yrs	11.6	-	-	Not home, notice delivered, well not located
		562459	4803741	MONA BRUDER	1608 CLYDE RD	backyard, left side of house	>25 yrs		dug	good	beware of dog
6810591		-	-	GREGORY ROBERTSON	1611 CLYDE RD	left siide of house	25 yrs	11.9	drilled	poor	good water, jet pump
		-	-	HENDRIK VAN DER GELD	1615 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
1001132	RW5	562527	4803697	PAUL RICHARDSON	1629 CLYDE RD	backyard	10yrs	10.7	dug than drilled	good	well went dry therefore it was drilled in 1998
1001131		562604	4803738	DEAN CAMPBELL	1631 CLYDE RD	front lawn	10 yrs	13.7	drilled	good	Not Home
		562580	483793	MORLEY HILL	1634 CLYDE RD	right side of house	40 yrs	15.8	drilled	poor	poor water quality, a lot of iron, 6 foot dry well
6505766		562612	4803800	NORBERT FERNENGEL	1644 CLYDE RD	front lawn behind bush	23 yrs	15.9	drilled	ok	
6506088		562672	4803808	WILLIAM BURCHETT	1654 CLYDE RD	below decorative well on front lawn	21 yrs	34.4	drilled	ok	good water
		-	-	MICHAEL ELLIS	1660 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
		562897	4803838	BRAD SCHILLING	1698 CLYDE RD	front lawn, under tree	-	51.8	drilled	ok	
1001124		562925	4803844	DAVID EASTMAN	1706 CLYDE RD	front, beside driveway	10 yrs	47.2	drilled	good	Not Home
		-	-	DAVID VAN WIJNGAARDEN	1714 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located

Table A5.3:
Town of Clyde Private Well Inventory

OBJ_NUM	Golder ID	Easting	Northing	Name	Address	Location	Date Constructed	Well Depth (m)	Well type	Accessible	Comments
		562987	4803915	DAVID BRODHAGEN	1726 CLYDE RD	front, side of house	-		drilled	good	Not Home
		563089	4803945	KATHARINE SCHMIDT	1738 CLYDE RD	front lawn in shed	-		probably drilled	ok	board horses, owner was busy
6503883		563120	4803641	MILLER	1745 CLYDE RD	behind left side of house	46 yrs	33.5	drilled	good	high iron
9201188		-	-	-	1751 CLYDE RD	-	7 yrs	24.4	-	-	Not home, notice delivered, well not located
		563263	4803829	DUENCH	1769 CLYDE RD	front lawn	1 yr		drilled	good	well is overflowing
		-	-	-	1787 CLYDE RD	-	-		-	poor	Notice delivered
		-	-	LOUISE SMITH	1802 CLYDE RD	-	-		-	-	Not home, notice delivered, well not located
		-	-	MOHAMAD SALAME	CLYDE RD	-	-		-	-	Mailing addres is 30 Pinedale Dr, Kitchener - Notice received
6505729		-	-	GARY LACROIX	9 ANGUS CRT	-	23 yrs	11.6	drilled	-	not co-operative, doesn't want well surveyed
1000523		-	-	ANTONIO PANDEIRADA	11 ANGUS CRT	-	14 yrs	12.2	drilled	-	two wells on property
6506723		562367	4803784	ANTONIO PANDEIRADA	11 ANGUS CRT	front lawn	19 yrs	12.5	drilled	good	Not home, notice delivered, two wells
6507016		-	-	VERONICA DEIGNAN	15 ANGUS CRT	backyard, left side of house	18 yrs	11.0	drilled	good	good water
6503900		562209	4803697	JOANNE TUDISCO	1 LANGFORD DR	front garden near front door	45 yrs	14.6	drilled	good	Not Home (May have new well by front door)
6506418	RW2	-	-	DONALD MOORE	2 LANGFORD DR	-	20 yrs	10.1	-	-	Not home, notice delivered, well not located
6810754		-	-	MICHAEL BANCARZ	3 LANGFORD DR	-	24 yrs	10.4	-	-	Not home, notice delivered, well not located
6507866		562133	4803731	EMILIO BAZON	4 LANGFORD DR	front lawn, under pine tree	24 yrs	11.0	drilled	ok	Not Home
6507868		562251	4803803	HOWARD HILL	5 LANGFORD DR	front lawn, corner of house	24 yrs	9.5	-	good	good water
		562135	4803764	JOHN MAGLIOCCO	6 LANGFORD DR	front lawn, corner beside porch	-		drilled	ok	Not Home
6506428		-	-	SHAWN SCHMITZ	7 LANGFORD DR	-	20 yrs	9.8	-	-	Not home, notice delivered, well not located
6505967		-	-	MICHAEL MELDRUM	8 LANGFORD DR	-	22 yrs	11.9	-	-	Not Home, Well not located
6505762		-	-	DAVID PIMENTEL	10 LANGFORD DR	-	23 yrs	9.1	drilled	-	Not Home, Well not located
6506189		-	-	ALAN LITTLE	12 LANGFORD DR	-	21 yrs	11.3	-	-	Not Home, Well not located
6506244		562248	4803877	BRIAN WIECHERS	14 LANGFORD DR	front lawn	21 yrs	9.8	drilled	good	Not Home
6506243	RW1	562291	4803917	ROBERT SELLECK	16 LANGFORD DR	front lawn	21 yrs	10.1	drilled	good	house # 519-620-2349
6506848		-	-	GIORGIO LUNGHI	17 LANGFORD RD	-	18 yrs	11.3	drilled	-	Not home, notice delivered, well not located
		562336	4803962	ROORDINK TERVELD	18 LANGFORD DR	front lawn	20 yrs		drilled	good	issues with bacteria
6506420		-	-	BRIAN KLEINSTEUBER	20 LANGFORD DR	front lawn	20 yrs	10.1	drilled	good	good water, owners cell 519-223-1588
6506893		-	-	WILLIAM HEWITT	22 LANGFORD DR	front lawn	18 yrs	12.2	drilled	good	good water, high in iron
		562837	4803870	JOHN LEVAC	1 CLYDEBANK DR	backyard	1 yr	17.4	drilled	good	old well went dry, good water (OLD ID: 6506153)
6505769		-	-	LUIS RESENDES	2 CLYDEBANK DR	-	23 yrs	16.8	drilled	-	Not home, notice delivered, well not located
6505970		562819	4803929	JULIE CRANHAM-WILSON	3 CLYDEBANK DR	front lawn in flower bed	-	13.7	drilled	good	
		-	-	MARGARET SNYDER	4 CLYDEBANK DR	-	-		-	-	Not home, notice delivered, well not located
6506345		-	-	KIM CUERRIER	5 CLYDEBANK DR	-	20 yrs	36.0	drilled	-	Not home, notice delivered, well not located
6506419		-	-	WALTER MURPHY	6 CLYDEBANK DR	appears to be in front lawn	20 yrs	18.0	drilled	-	Not Home

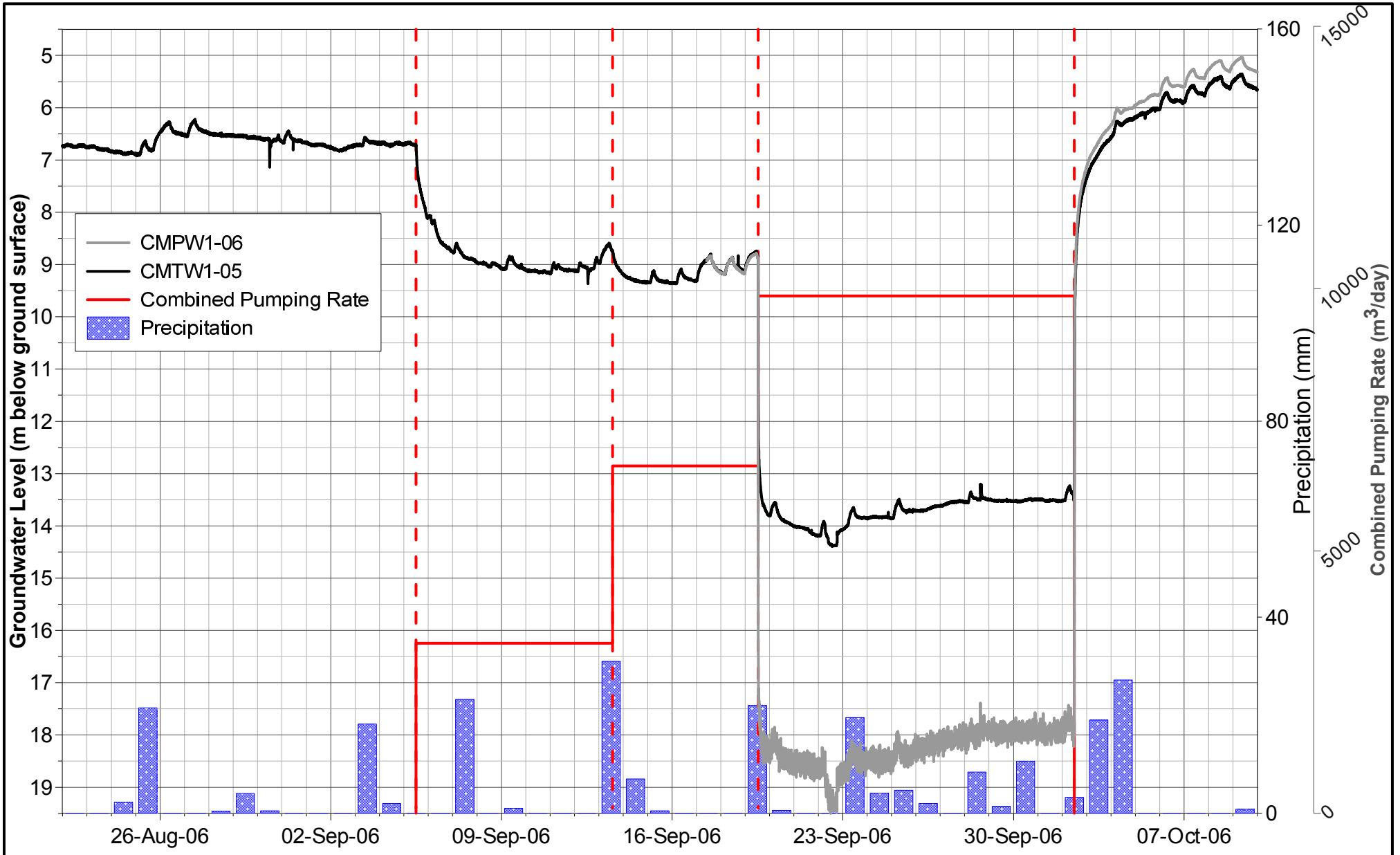
Table A5.3:
Town of Clyde Private Well Inventory

OBJ_NUM	Golder ID	Easting	Northing	Name	Address	Location	Date Constructed	Well Depth (m)	Well type	Accessible	Comments
6505765		-	-	FRANCIS MCCOMB	7 CLYDEBANK DR	front flower bed	23 yrs	18.3	drilled	difficult	
6505965		562781	4804052	PETER OSTOPOVICH	9 CLYDEBANK DR	backyard	22 yrs	16.2	drilled	difficult	
6505966		-	-	DEBORAH GRAHAM	11 CLYDEBANK DR	-	22 yrs	15.9	-	-	Not home, notice delivered, well not located
6505725		562683	4803980	ENZO TERESI	15 CLYDEBANK DR	behind rocks, corner of lot	23 yrs	16.8	drilled	ok	Not Home
6505761		-	-	MARY TAYLOR	16 CLYDEBANK DR	-	23 yrs	20.4	drilled	-	Not Home, Well not located
9200853		562647	4803989	ALBERTO PEREIRA	17 CLYDEBANK DR	front lawn	9 yrs	14.6	drilled	good	
6505973		562620	4803910	KEITH PASCOE	18 CLYDEBANK DR	front patio	22 yrs	12.5	-	good	Not Home
6505768		562577	4803997	EDWARD STUEHLER	19 CLYDEBANK DR	front lawn behind wagon wheel	23 yrs	16.8	drilled	good	Not Home
6505968		562553	4803912	JAMAL MEHYO	20 CLYDEBANK DR	front lawn behind rocks	22 yrs	16.5	probably dug	good	Not Home
		562528	4804030	ERIC STANGL	21 CLYDEBANK DR	back corner of house	-		-	good	Not Home
6505969		-	-	DEREK FRANK	22 CLYDEBANK DR	backyard	22 yrs	14.3	drilled	no access	well is buried under 18 inches of soil
		562498	4804037	STEPHEN GEORGE	23 CLYDEBANK DR	backyard by deck	>20 yrs	25.0	drilled	good	good water
6503882		-	-	-	1134 VILLAGE RD	-	39 yrs	35.7	-	-	Notice delivered - left on truck window
6503921		562557	4803638	DAVID HALLMAN	1154 VILLAGE RD	front lawn	35 yrs	32.0	-	good	Not Home
6503908		562522	4803773	GORDON GRAHAM	1169 VILLAGE RD	backyard	39 yrs	31.7	-	poor	well under cover, cover has a black metal pump on top
		562475	4803781	SARAH BRUDER	1174 VILLAGE RD	side of house on hill	-		-	good	Not Home, notice delivered
		562525	4803791	JOHN JASIK	1177 VILLAGE RD	backyard, right side of house	-	10.7	dug or drilled	ok	good water
6503899		562434	4803805	DEANNA MARCY	1180 VILLAGE RD	backyard	46 yrs	38.4	-	ok	
6503907		-	-	SCOTT LAHEY	1185 VILLAGE RD	-	39 yrs	14.6	-	-	Not Home, notice delivered, well not located
		-	-	DONALD AUSTIN	1190 VILLAGE RD	-	-		-	-	Notice delivered, no info on well
6503906		-	-	ROBERT LAURENCE	1191 VILLAGE RD	-	41 yrs	13.1	-	-	Not home, notice delivered
6503903		-	-	PAUL DECKERT	1198 VILLAGE RD	-	40 yrs	15.2	-	-	Not home, notice delivered
6808338		-	-	THOMAS BUTLER	1199 VILLAGE RD	-	24 yrs	10.6	-	-	Not home, notice delivered
6503902		562429	4803919	GERALD LOCKIE	1206 VILLAGE RD	front lawn	43 yrs	44.5	-	ok	well under pile of leaves and dirt at left corner of house
	RW3	562557	4804316	CARL REYNOLDS	1275 VILLAGE RD	backyard	new well		drilled	good	Gone for 4 weeks (OLD ID: 6507869, 6810757)
	RW4	562155	4804340	ROBERT J NICKEL	1310 VILLAGE RD	right side of house in garden	6 yrs		drilled	good	broken lid
6504822		-	-	ROBERT NICKEL	1326 VILLAGE RD	-	30 yrs	17.1	-	-	Notice delivered through son
		-	-	CARL REYNOLDS	TOWNSHIP RD 27A	-	-		-	-	Notice delivered to 1275 Village Rd
		-	-	CARL REYNOLDS	TOWNSHIP RD 27A	-	-		-	-	Notice delivered to 1275 Village Rd
		-	-	CARL REYNOLDS	TOWNSHIP RD 18	-	-		-	-	Notice delivered to 1275 Village Rd
		-	-	NORTH DUMFRIES TOWNSHIP	TOWNSHIP RD 27A	-	-		-	-	Notice received

ATTACHMENT A6

Constant Rate Testing

- Hydrographs
- Drawdown Versus Elapsed Time Plots
- Municipal Well Interference
- t/r_2 Composite Plots
- Surface Water Analyses
- Fish Inventory Notes
- MTE Report on Discharge



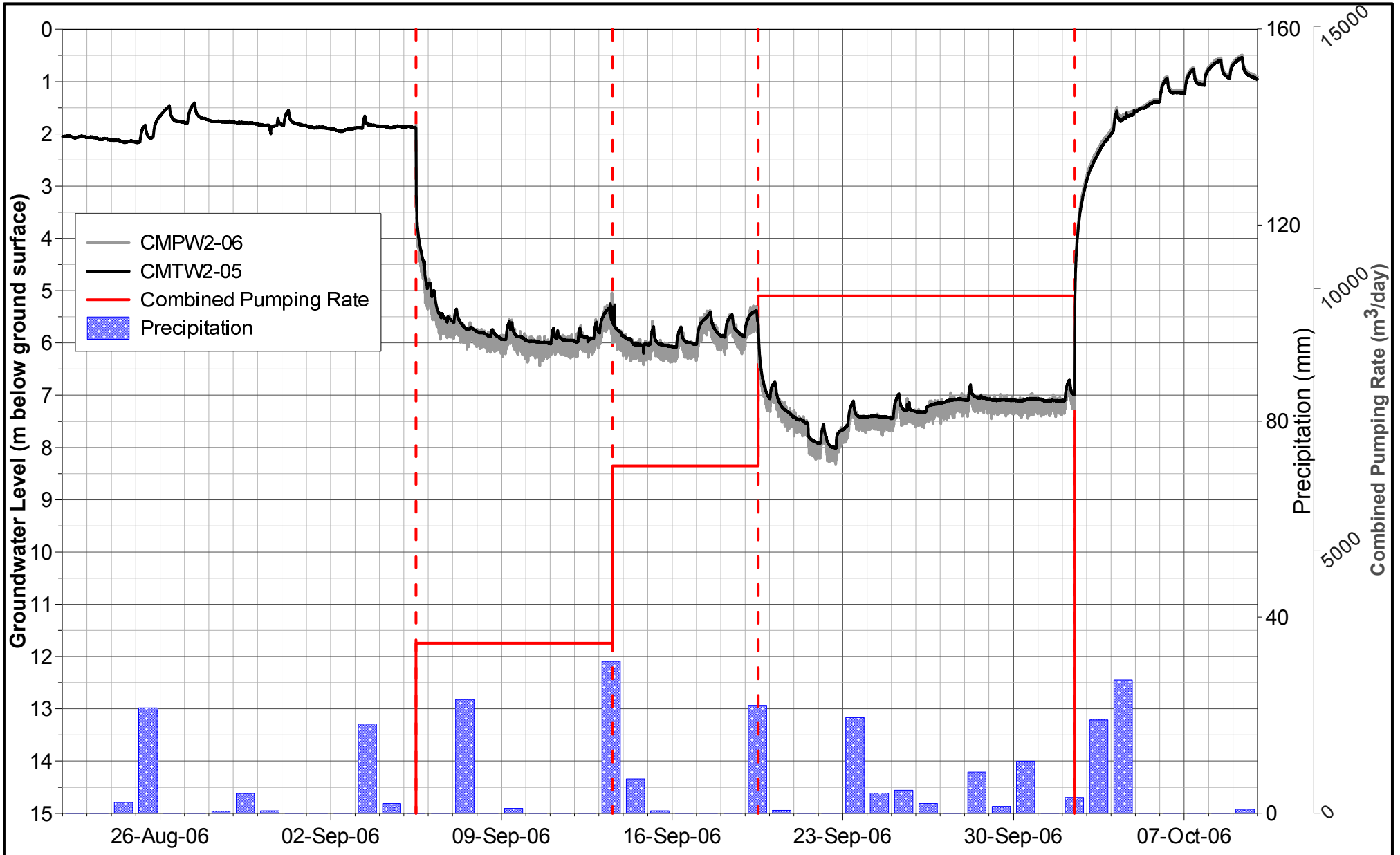
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Phase I 28-Day Cambridge East Pumping Test

CMPW1-06 and CMTW1-05

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.1



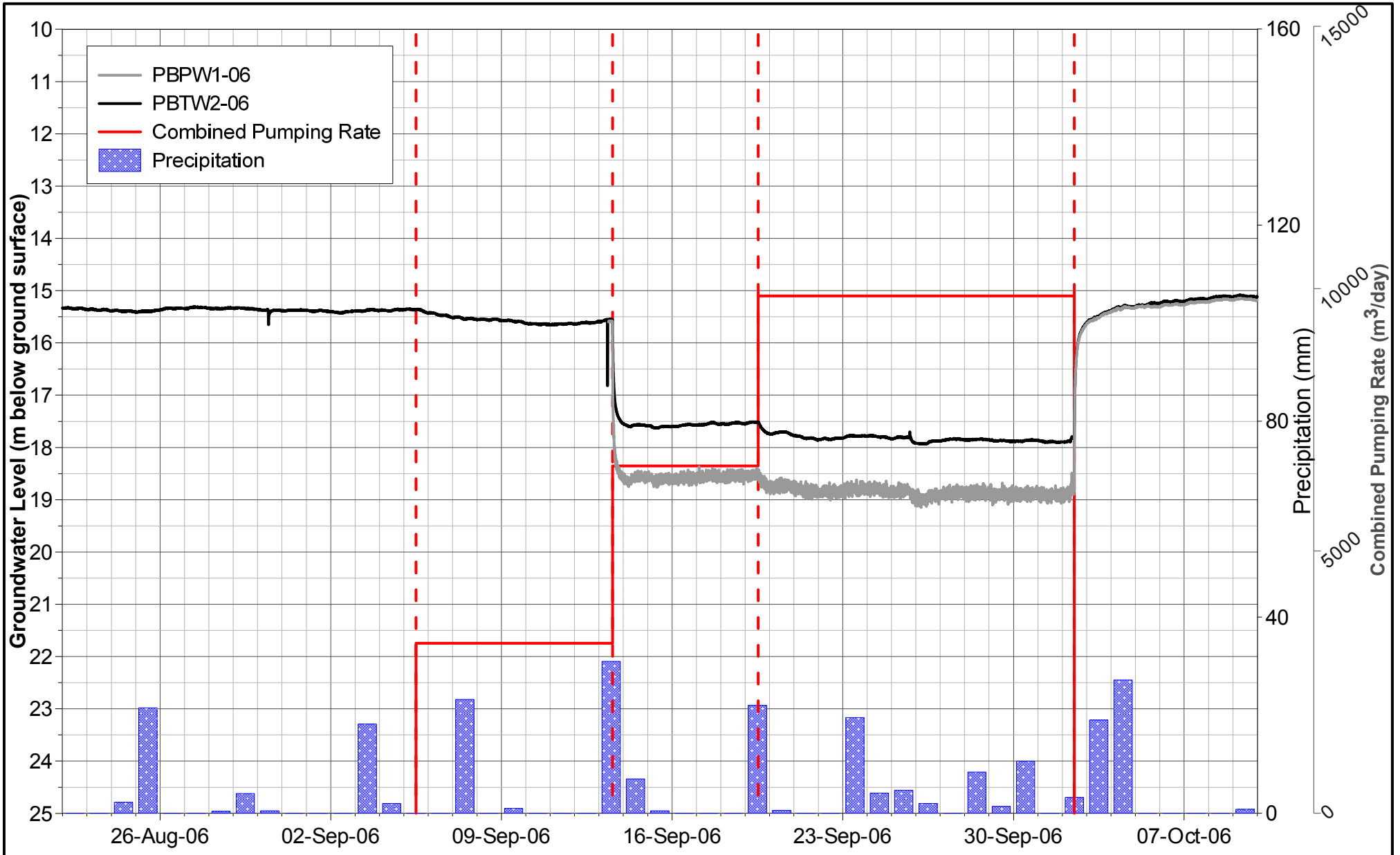
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Phase I 28-Day Cambridge East Pumping Test

CMPW2-06 and CMTW2-05

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.2



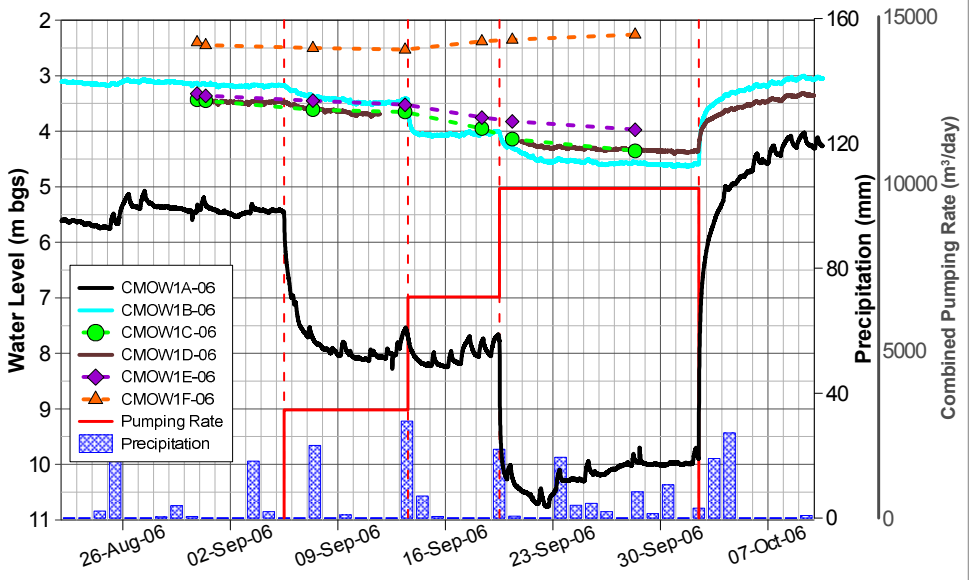
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

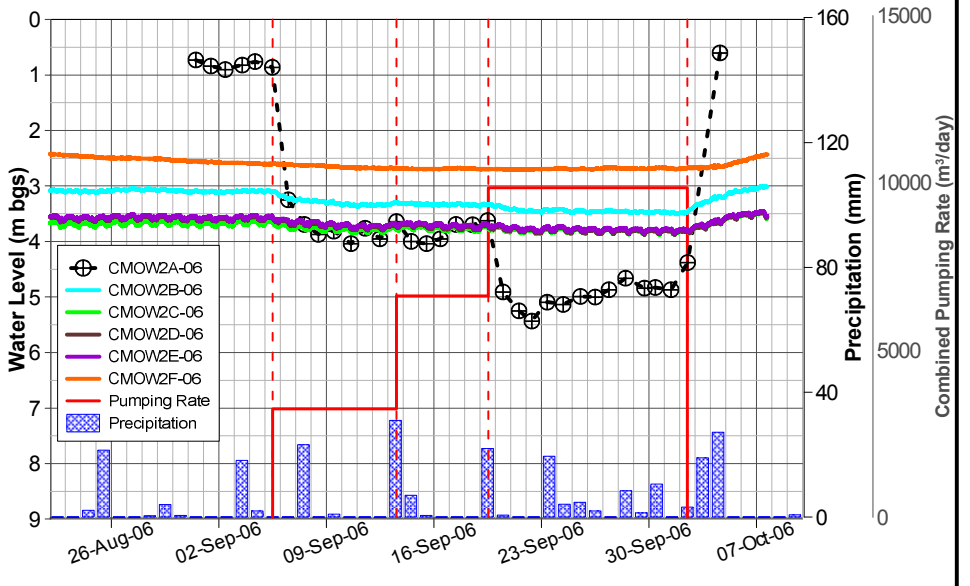
Phase I 28-Day Cambridge East Pumping Test

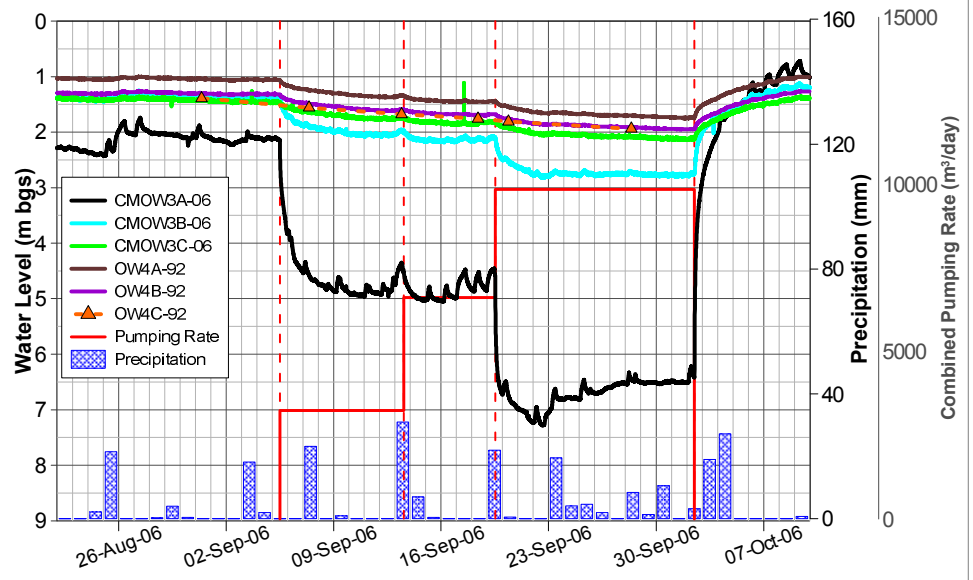
PBPW1-06 and PBTW2-06

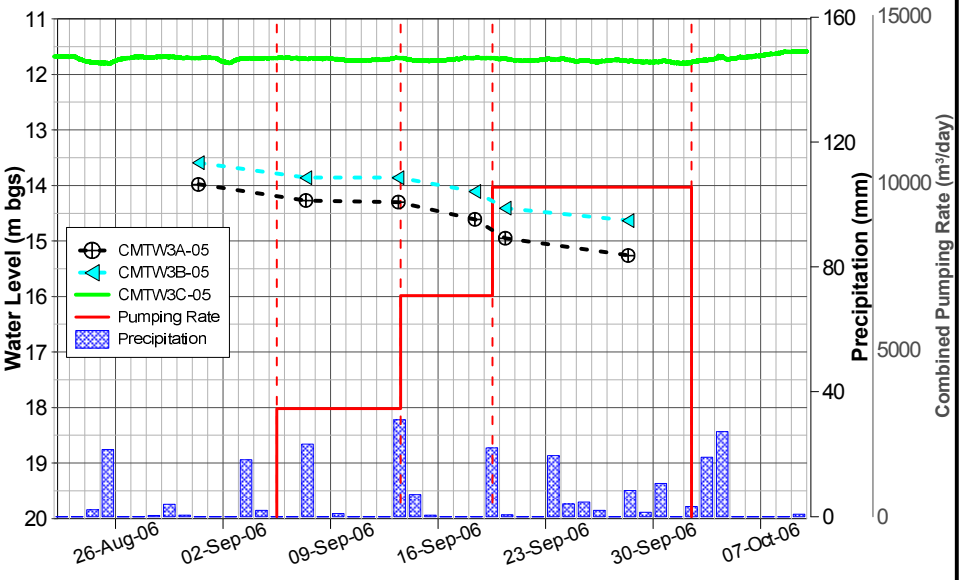
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.3









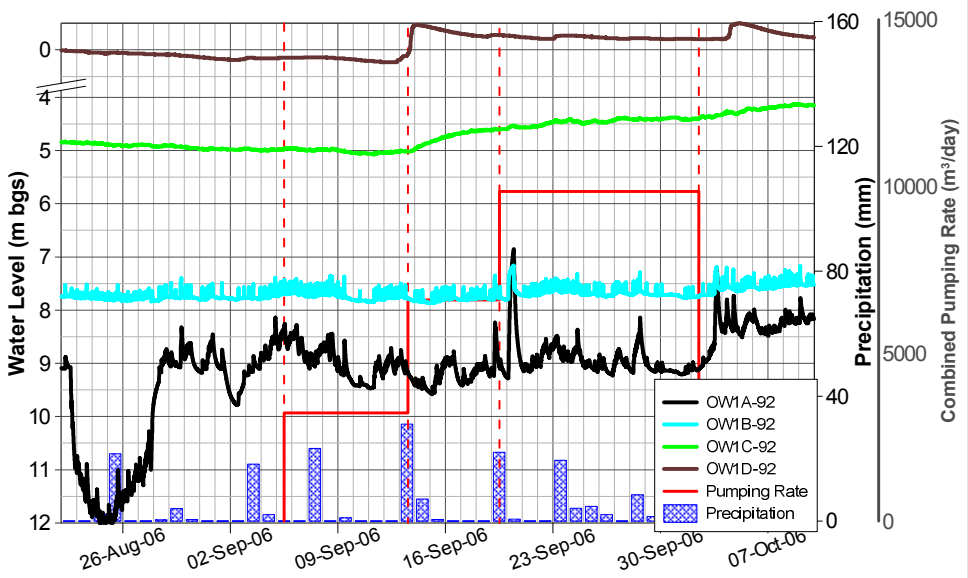
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

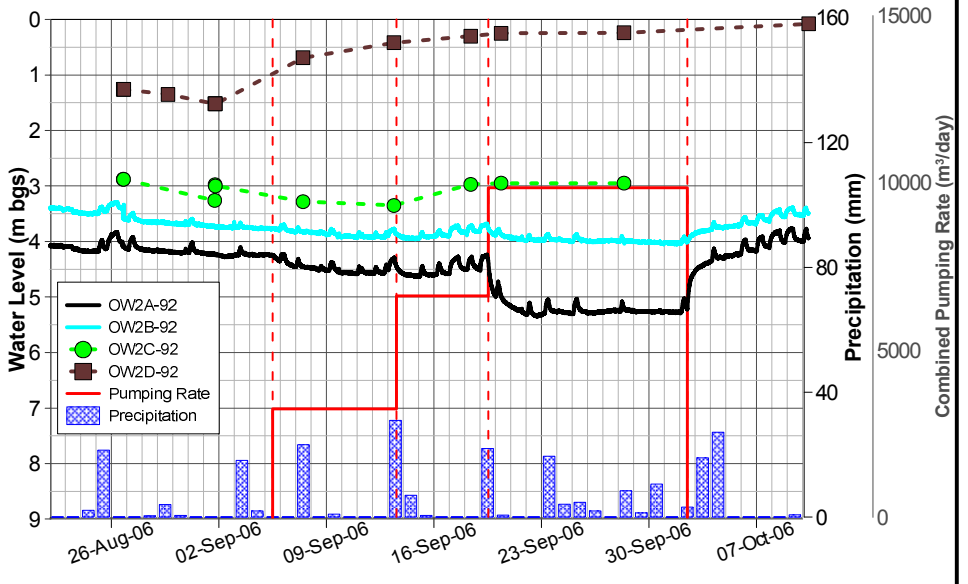
Phase I 28-Day Cambridge East Pumping Test

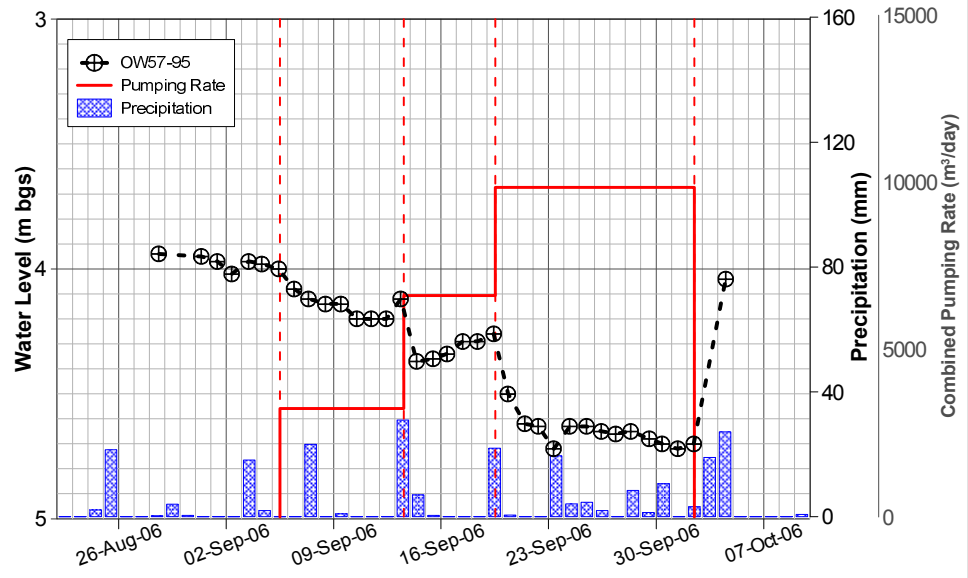
Cedarbrook Wellfield Monitors

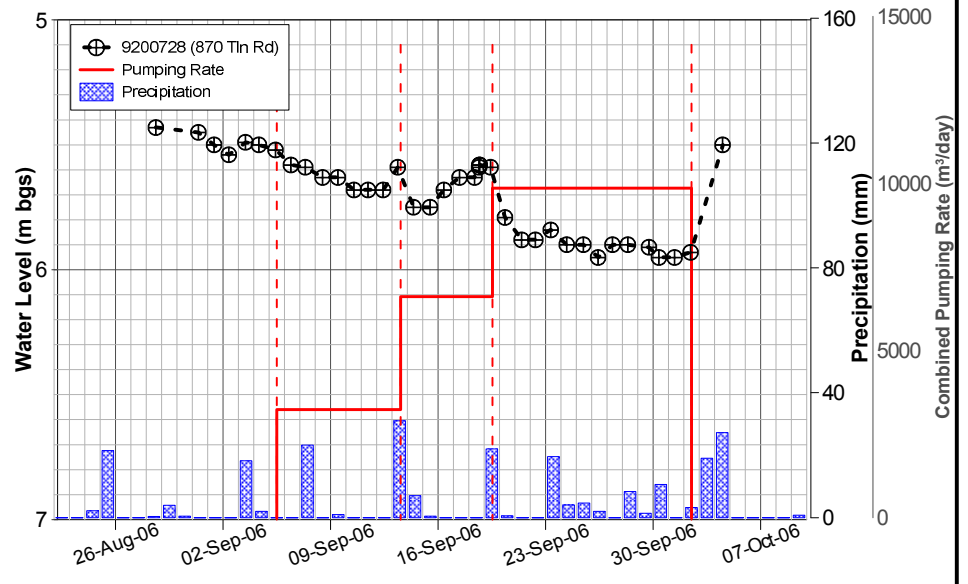
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.4









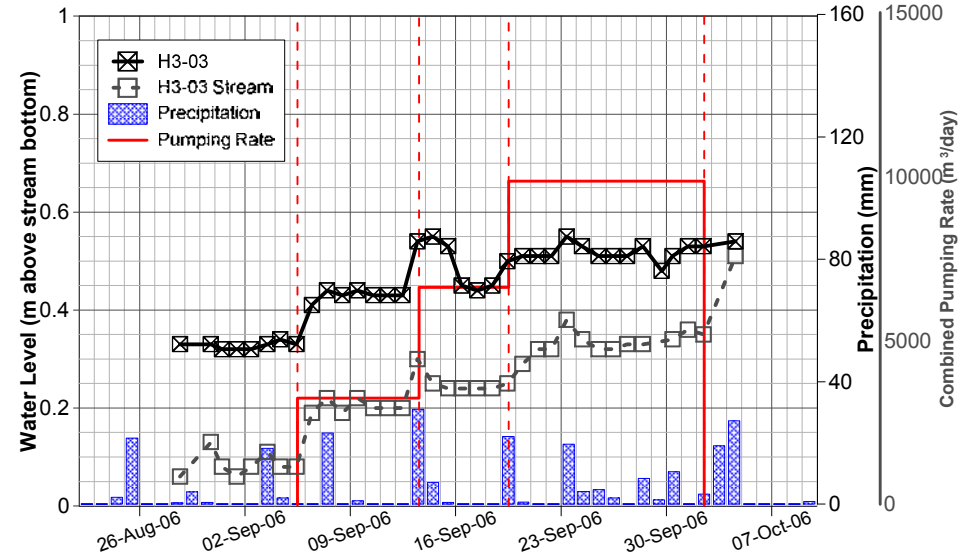
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

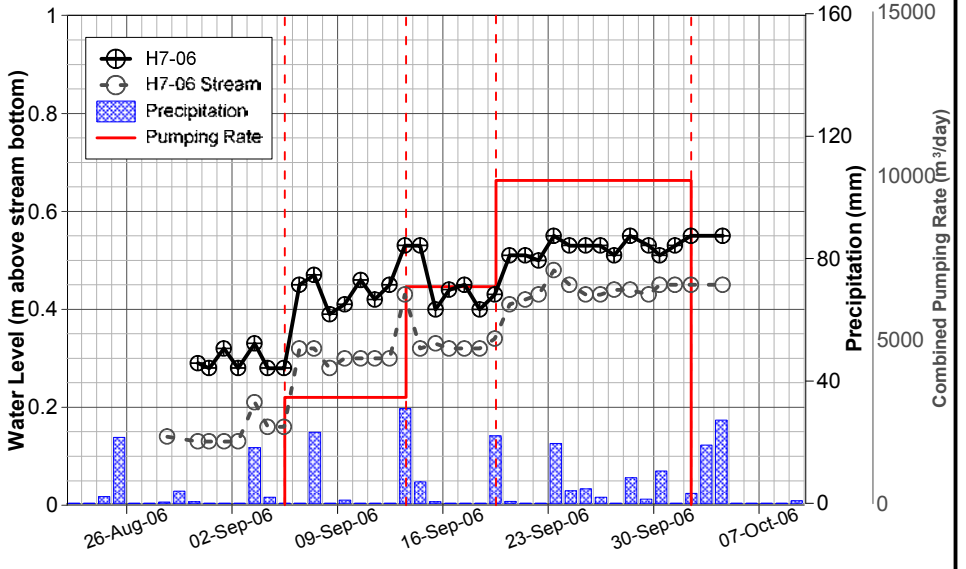
Phase I 28-Day Cambridge East Pumping Test

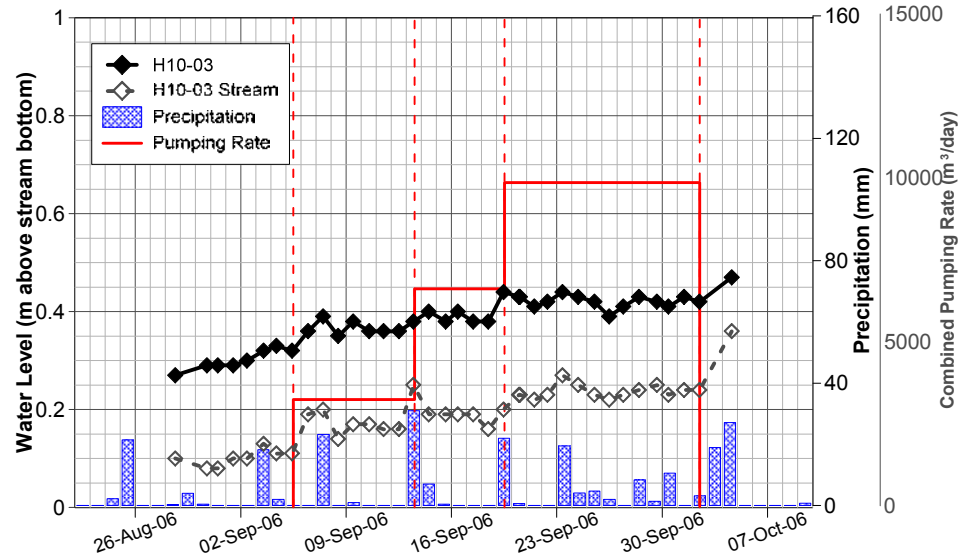
Cedarbrook Wellfield Monitors

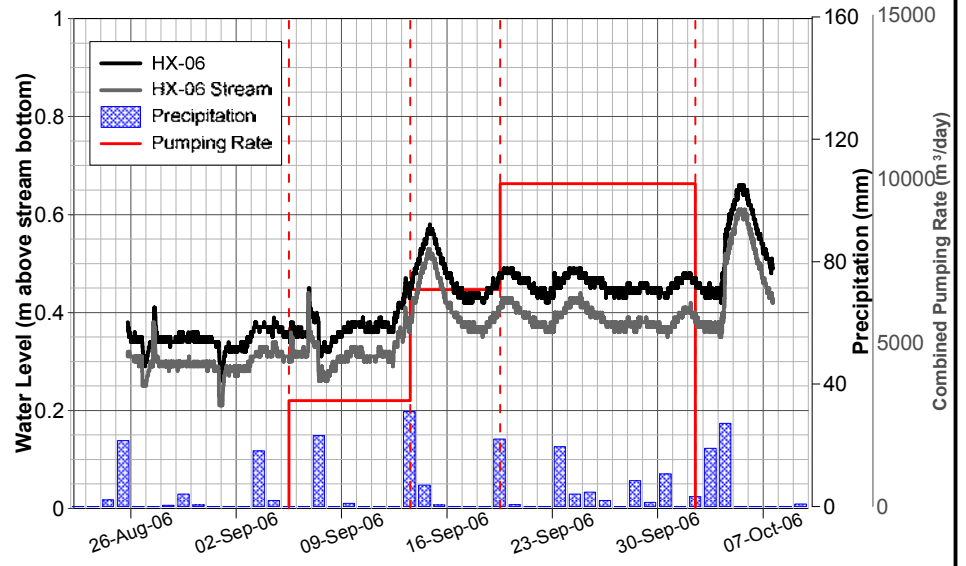
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.5









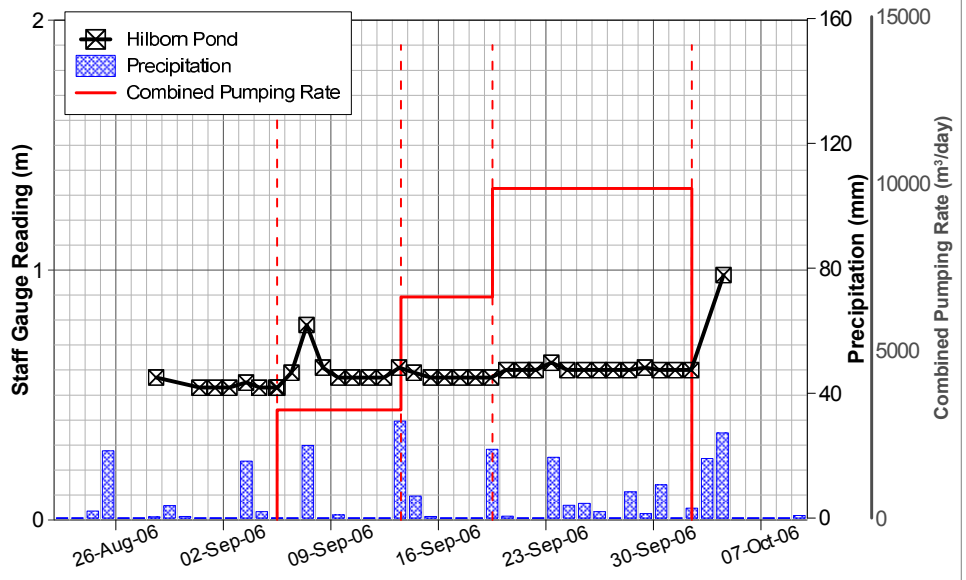
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

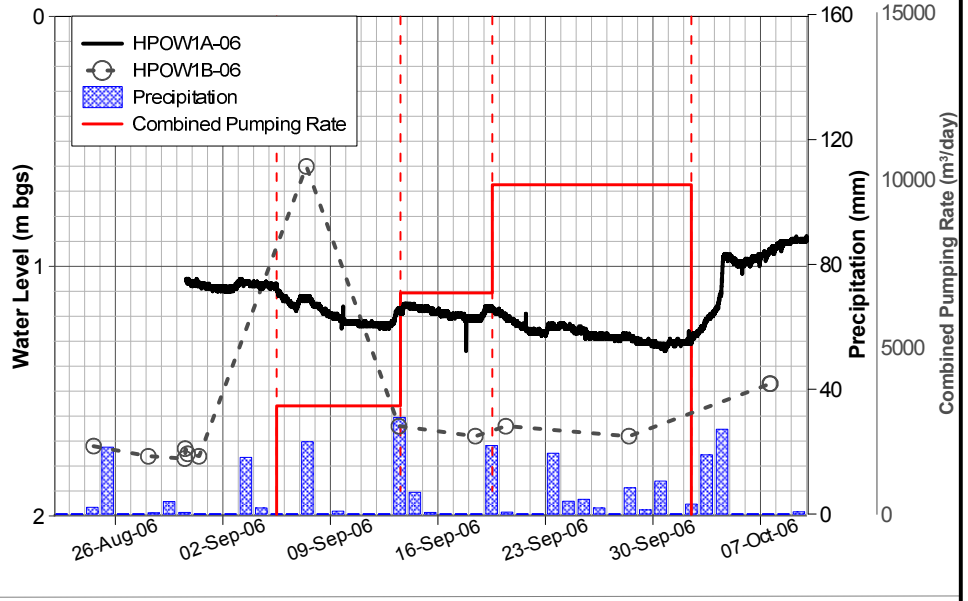
Phase I 28-Day Cambridge East Pumping Test

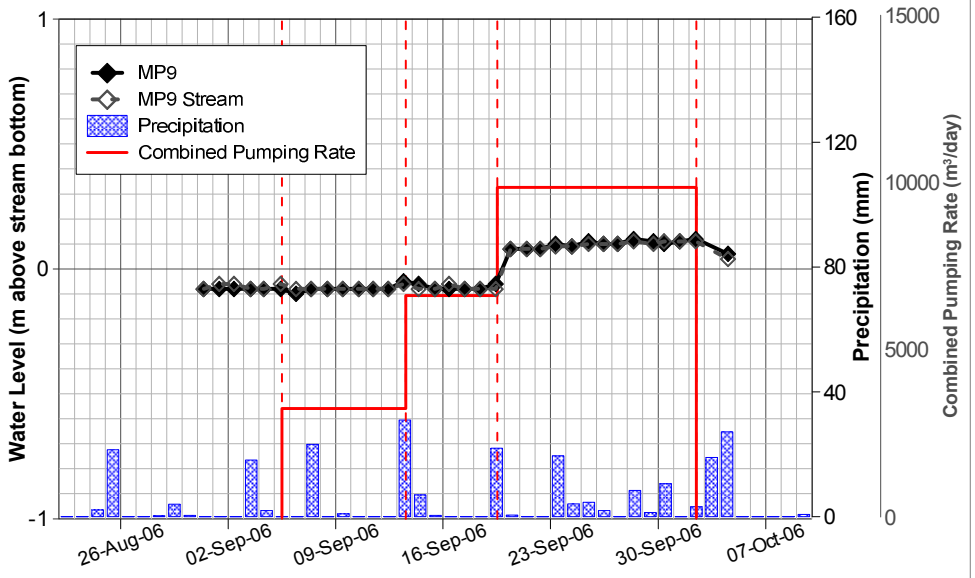
Cedarbrook Creek Piezometers

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.6







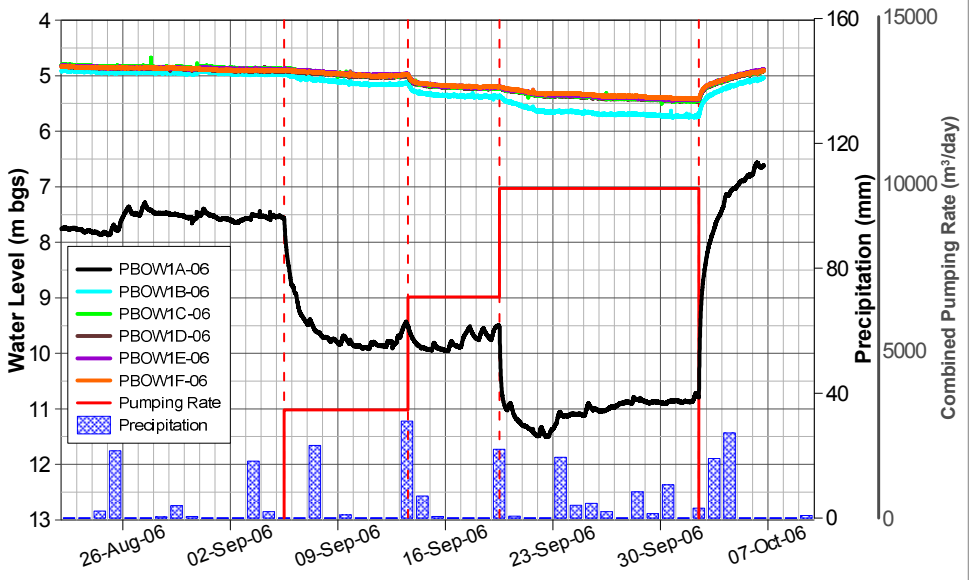
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

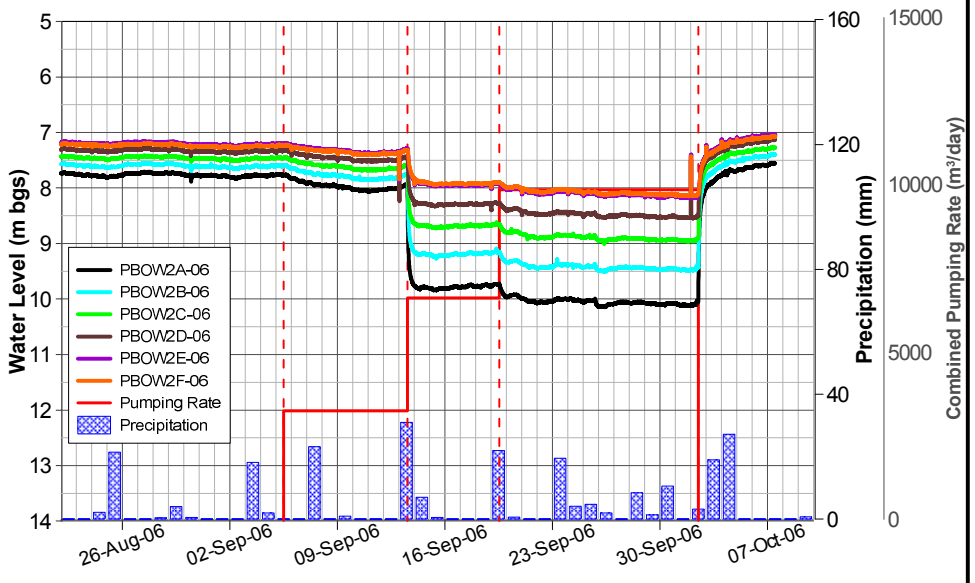
Phase I 28-Day Cambridge East Pumping Test

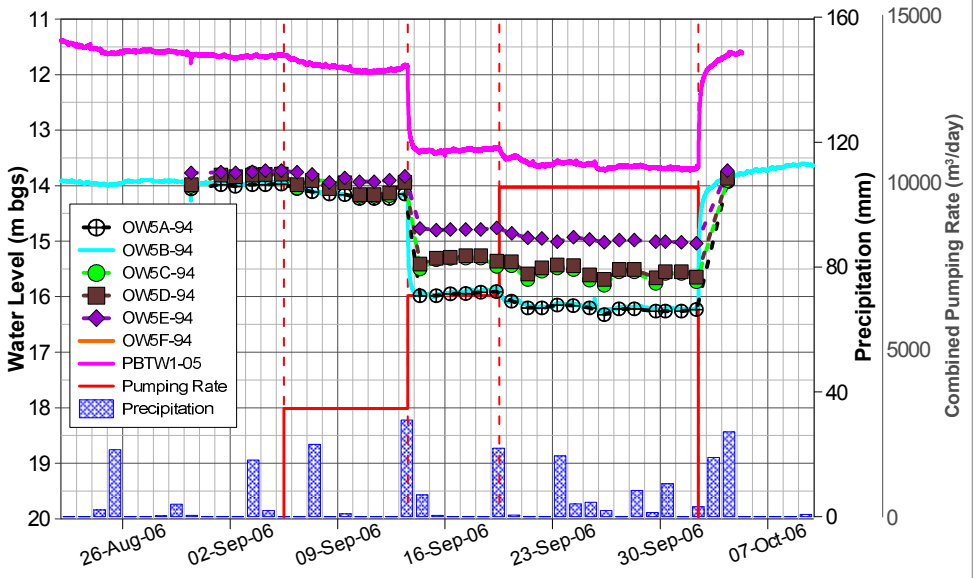
Hilborn Pond Level and Shallow Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.7







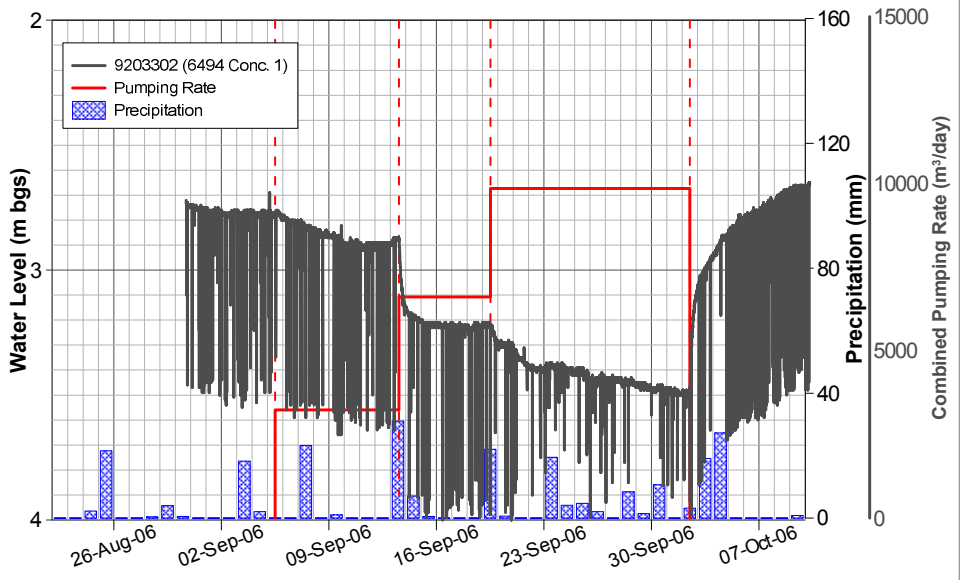
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
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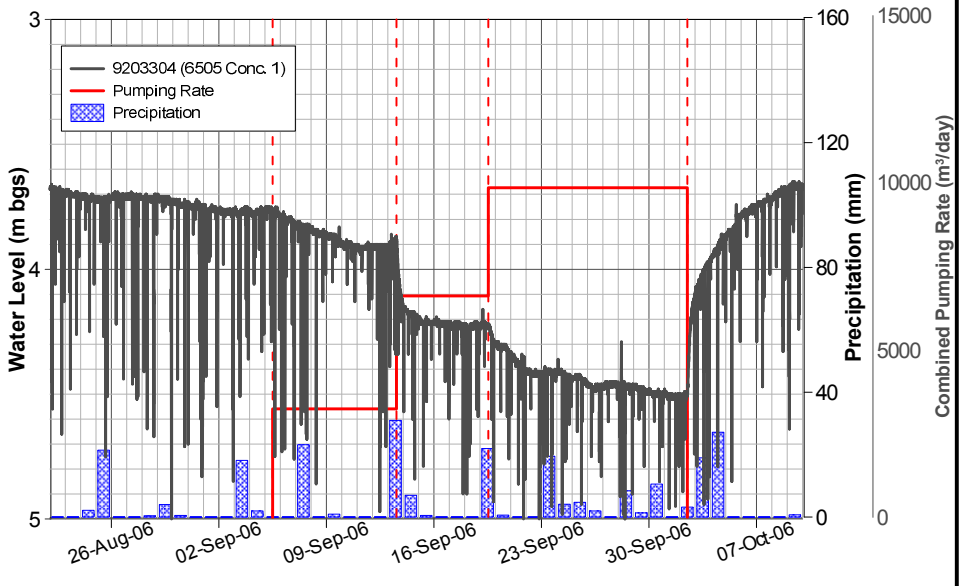
Phase I 28-Day Cambridge East Pumping Test

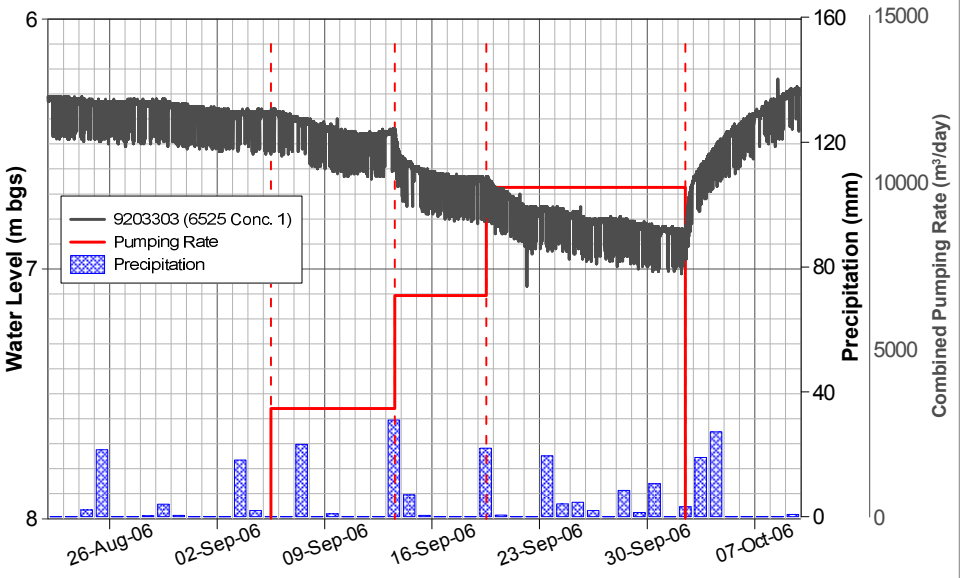
Pinebush Wellfield Monitors

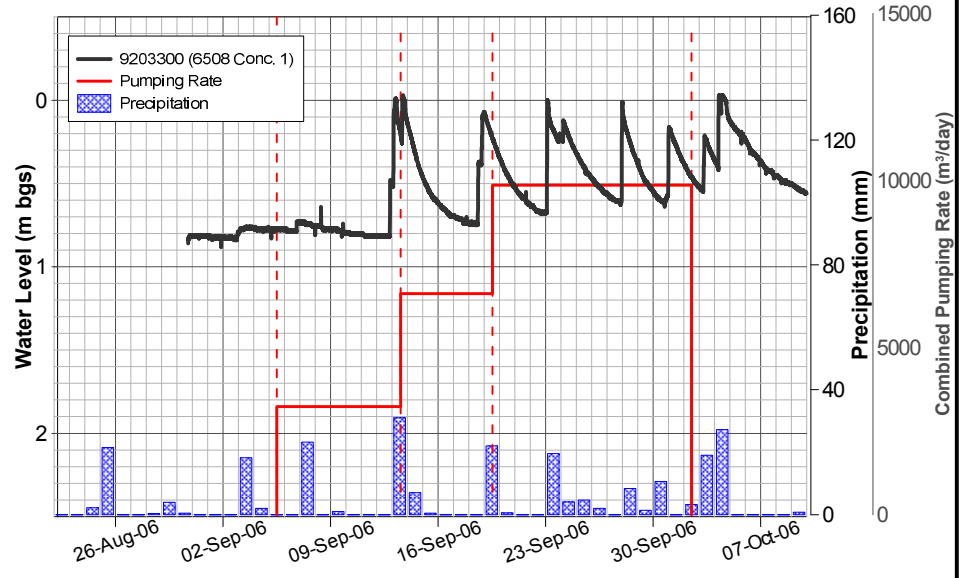
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.8









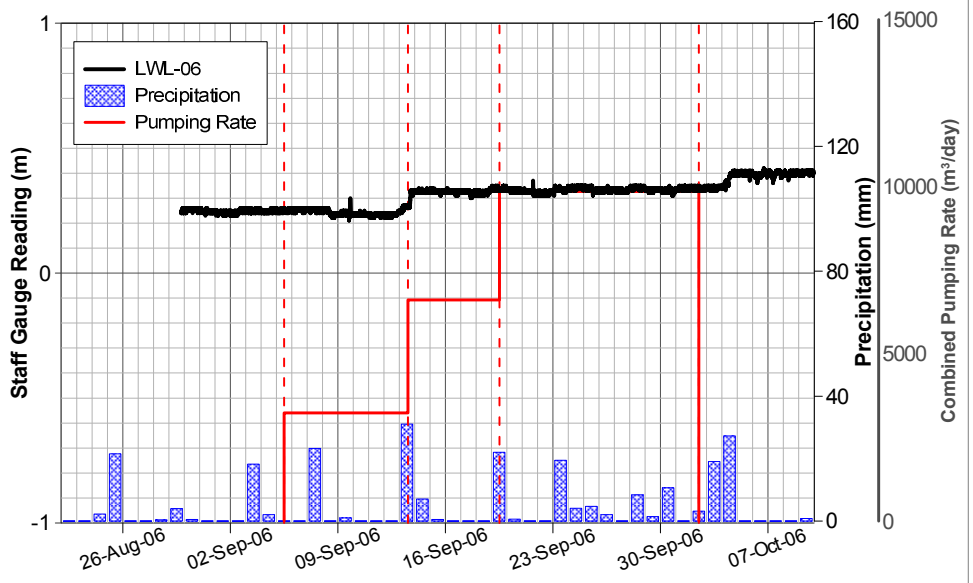
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
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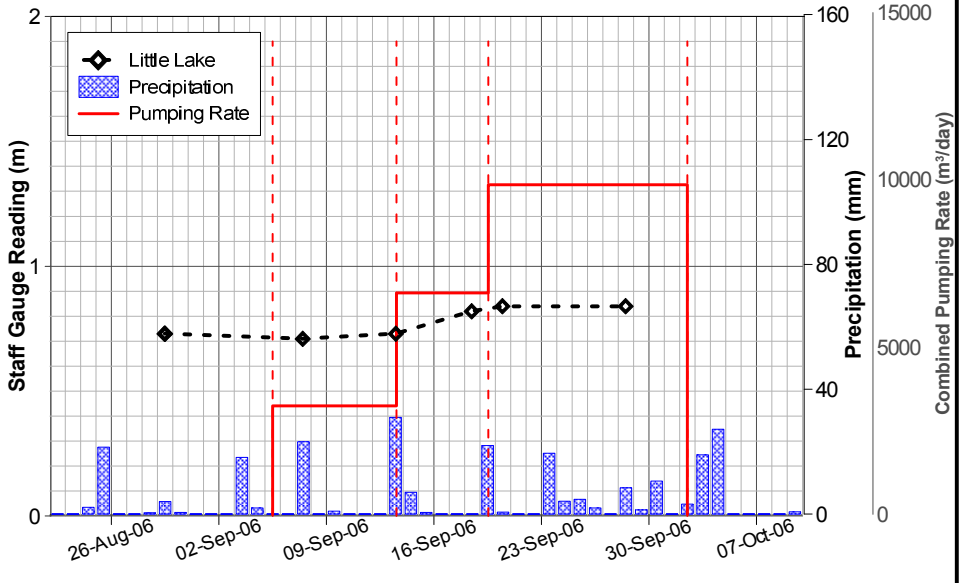
Phase I 28-Day Cambridge East Pumping Test

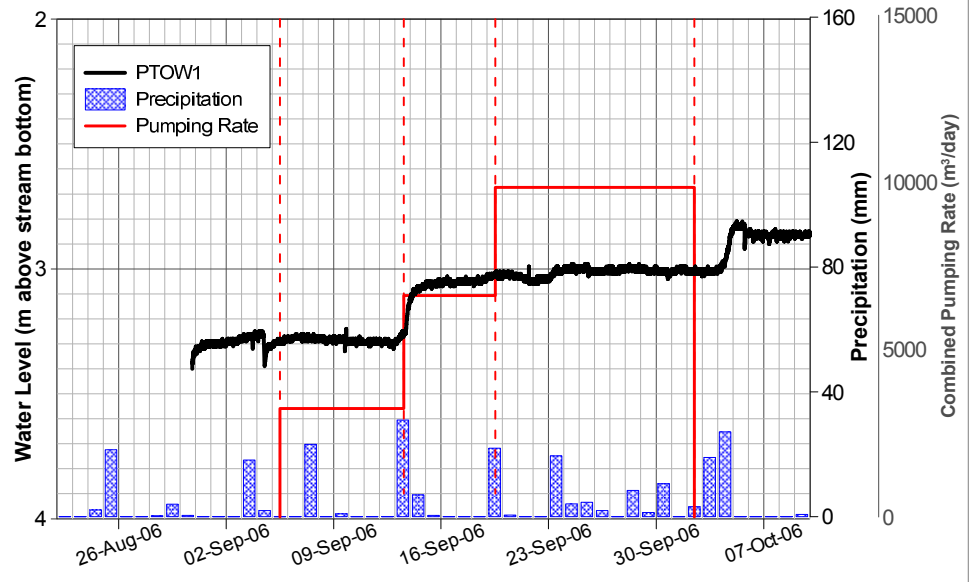
Concession 1 Private Wells

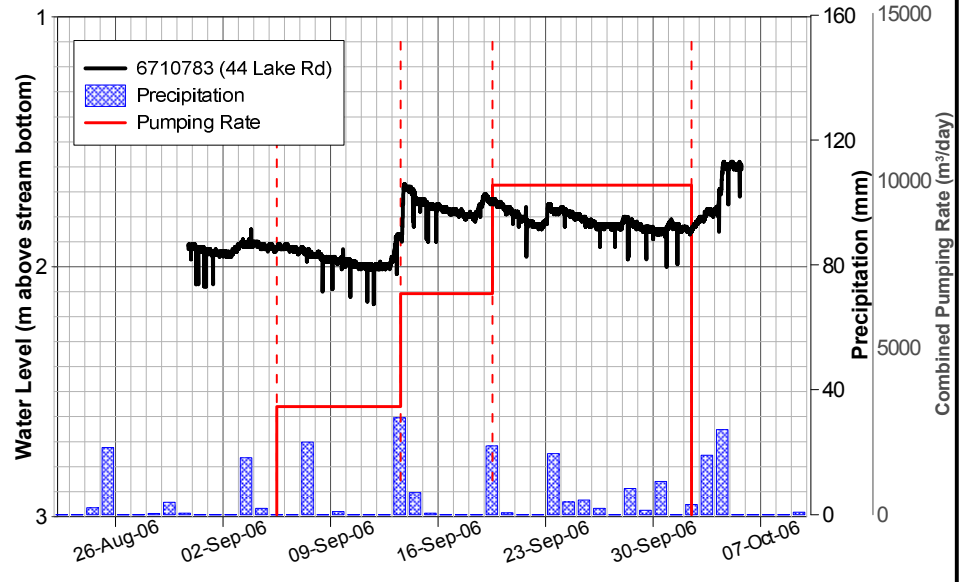
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.9









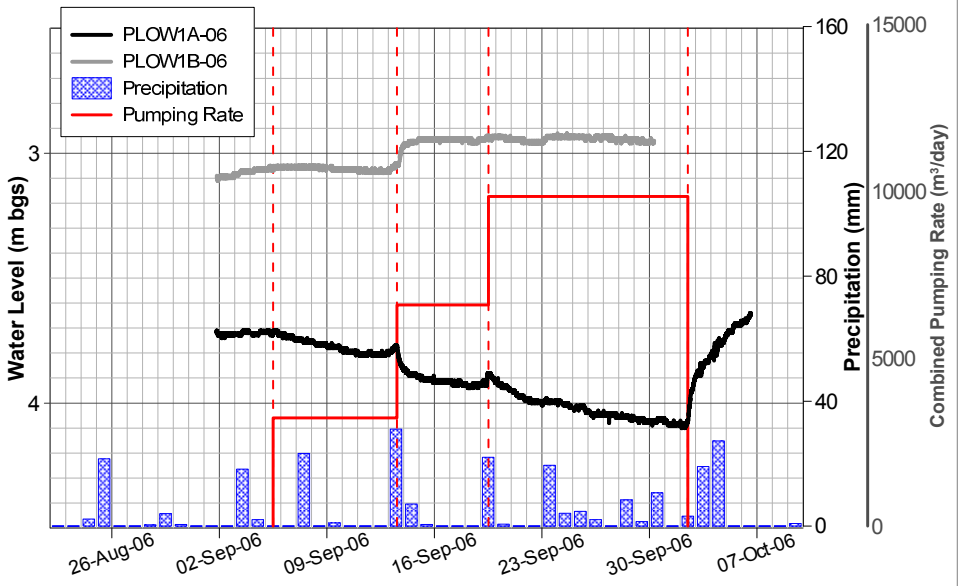
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
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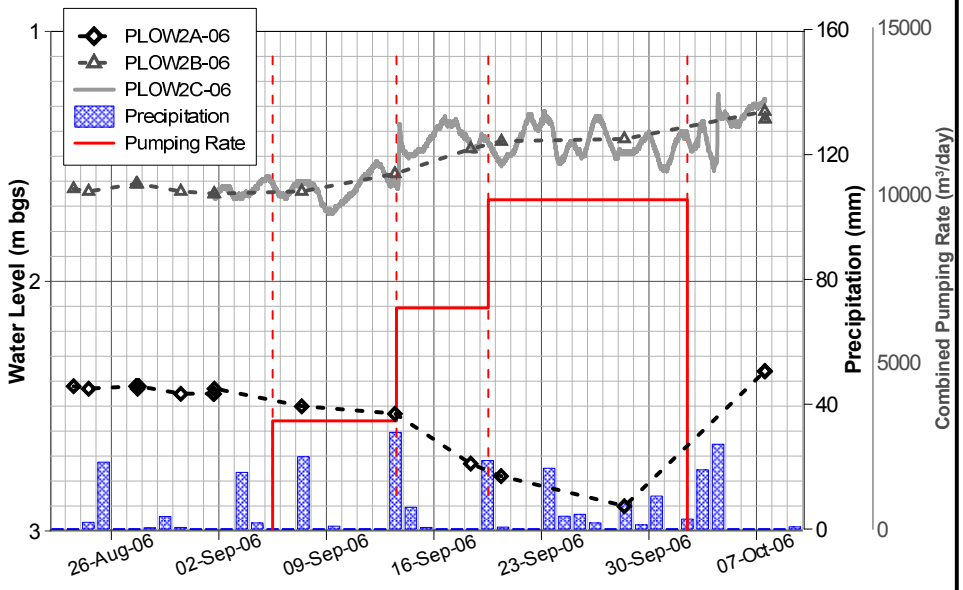
Phase I 28-Day Cambridge East Pumping Test

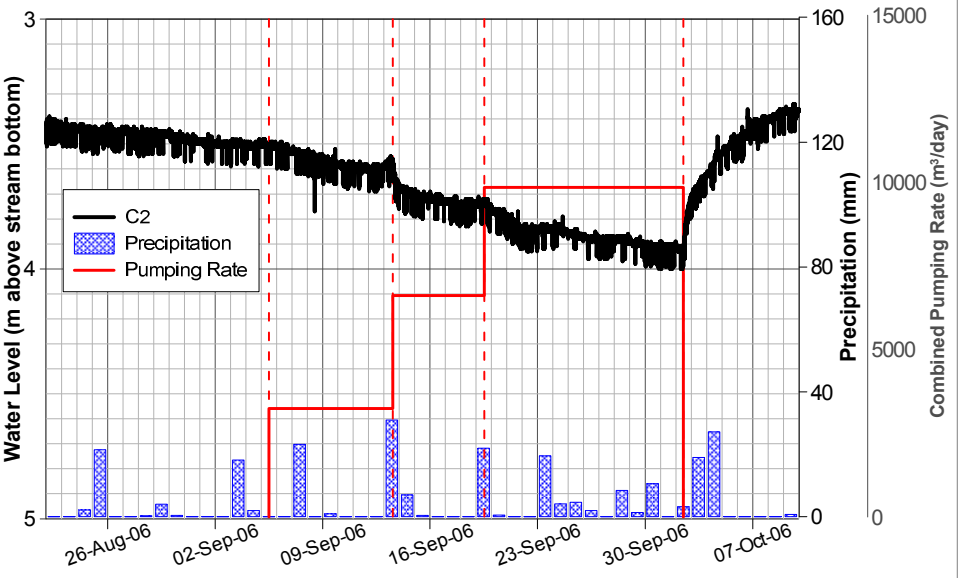
Puslinch Lake Area Staff Gauges and Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.10







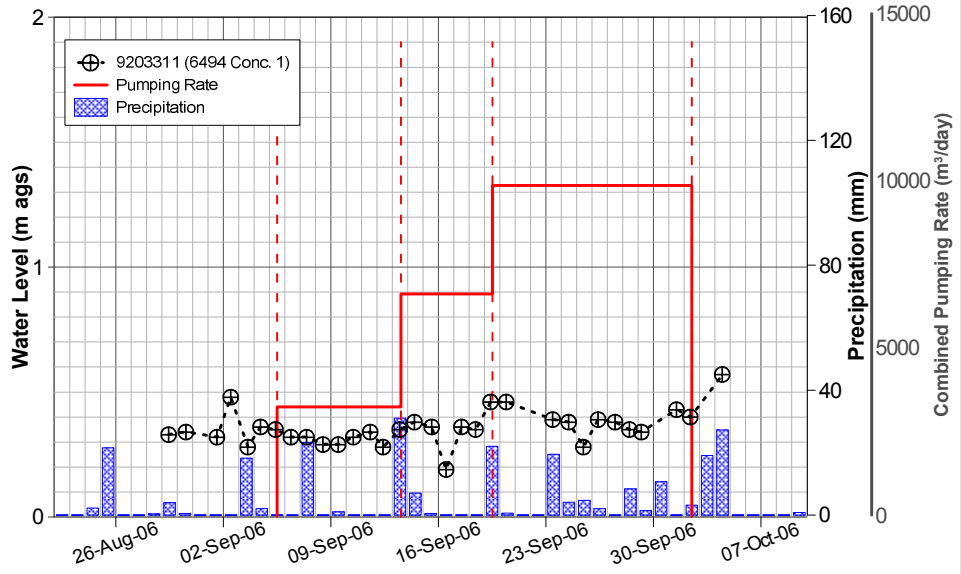
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

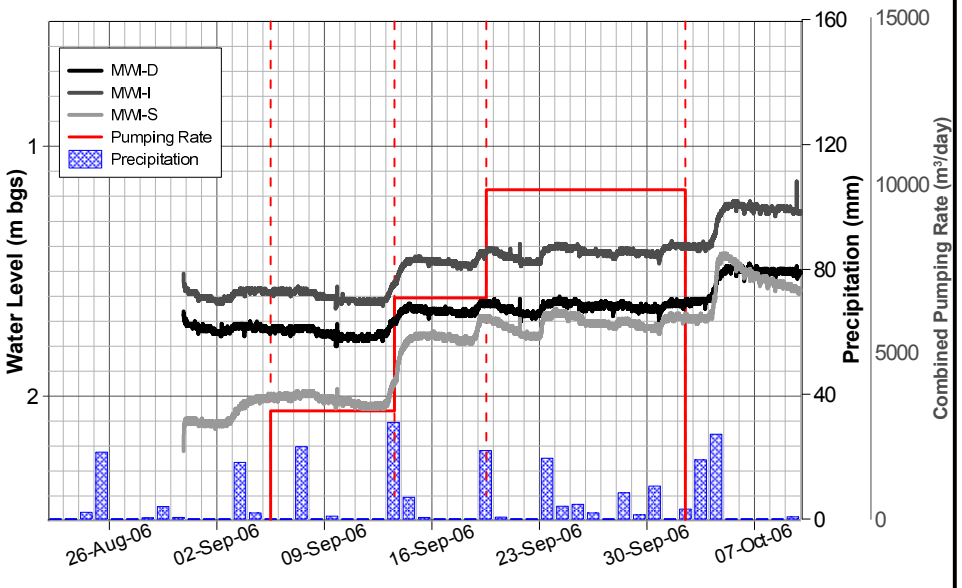
Phase I 28-Day Cambridge East Pumping Test

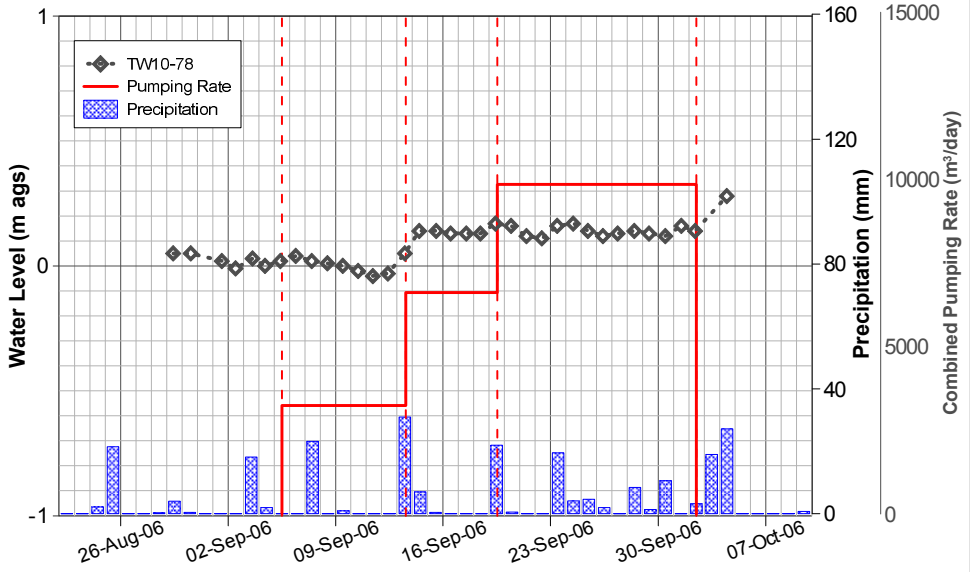
Puslinch Lake Area Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.11







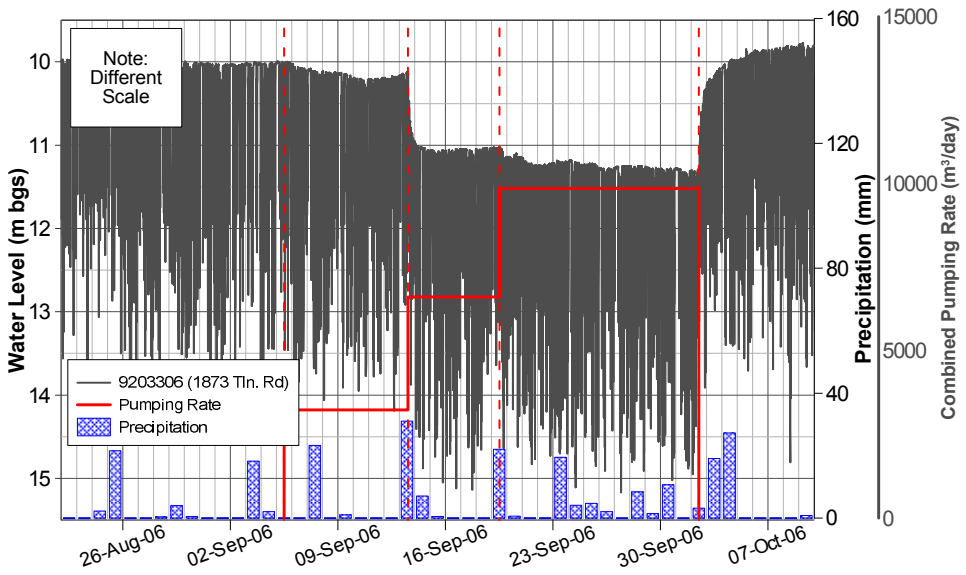
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

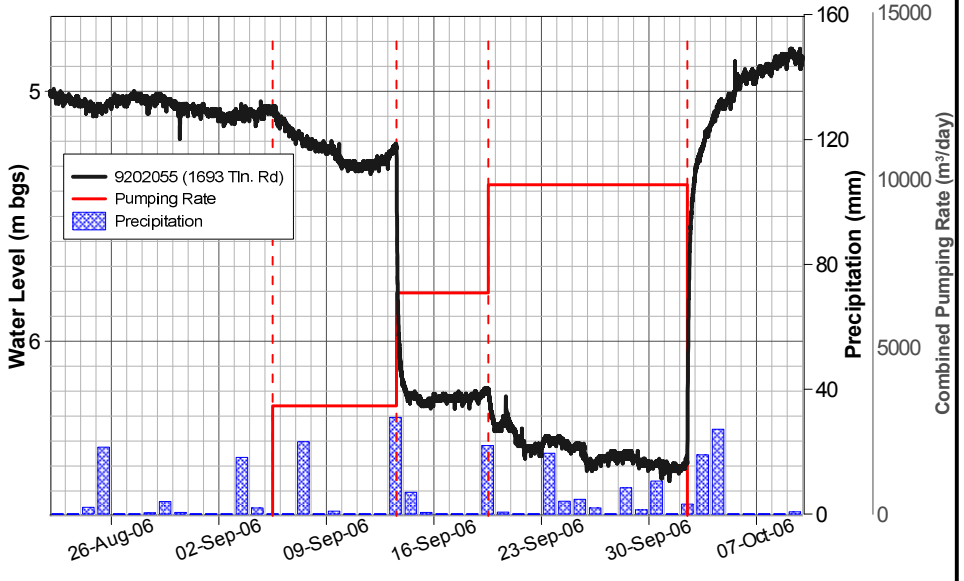
Phase I 28-Day Cambridge East Pumping Test

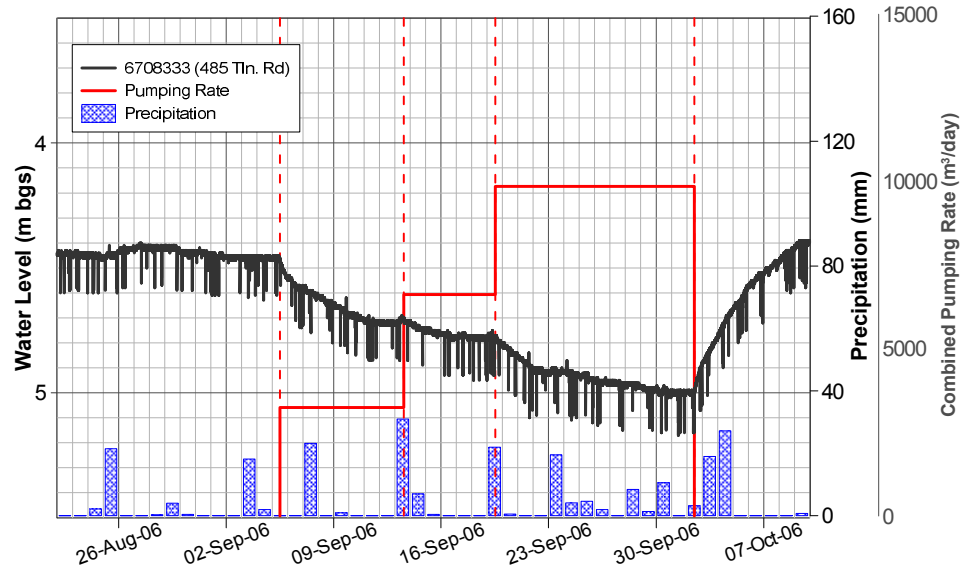
Sideroad 10 Area Wells

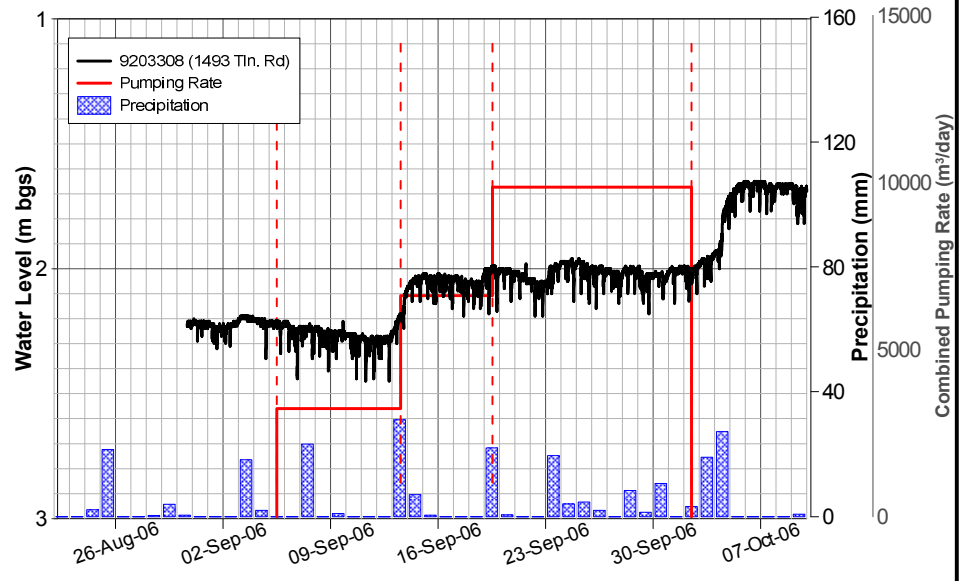
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.12









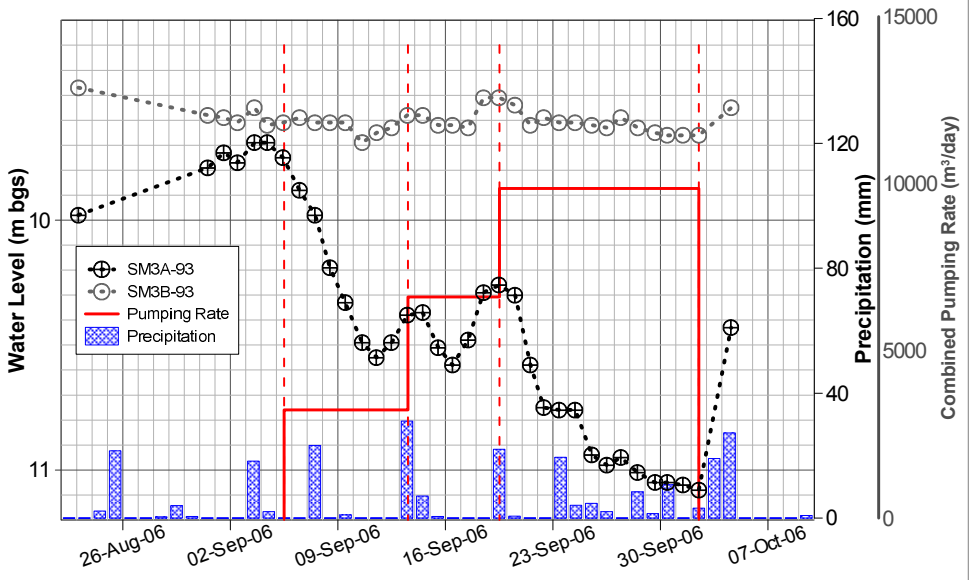
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
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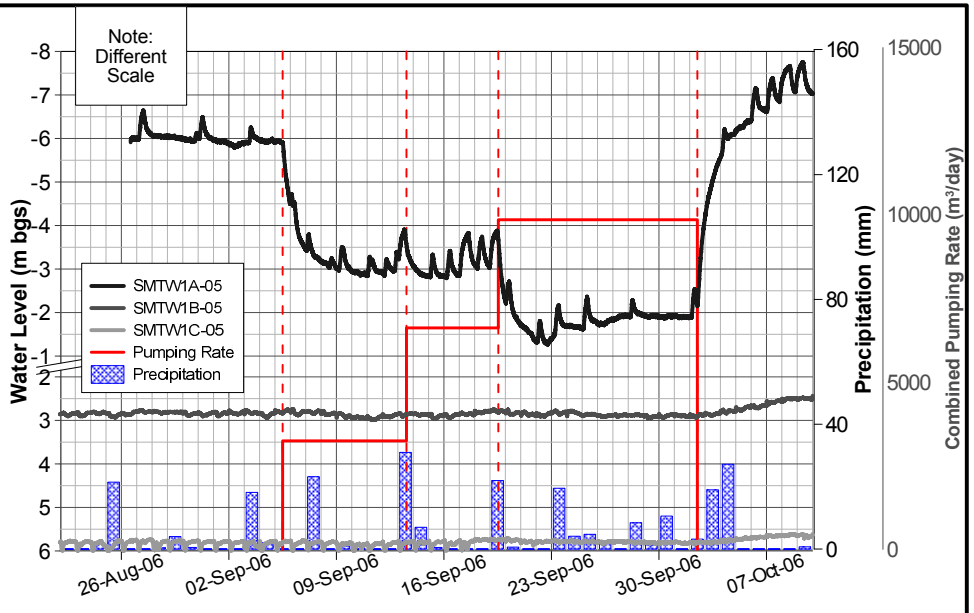
Phase I 28-Day Cambridge East Pumping Test

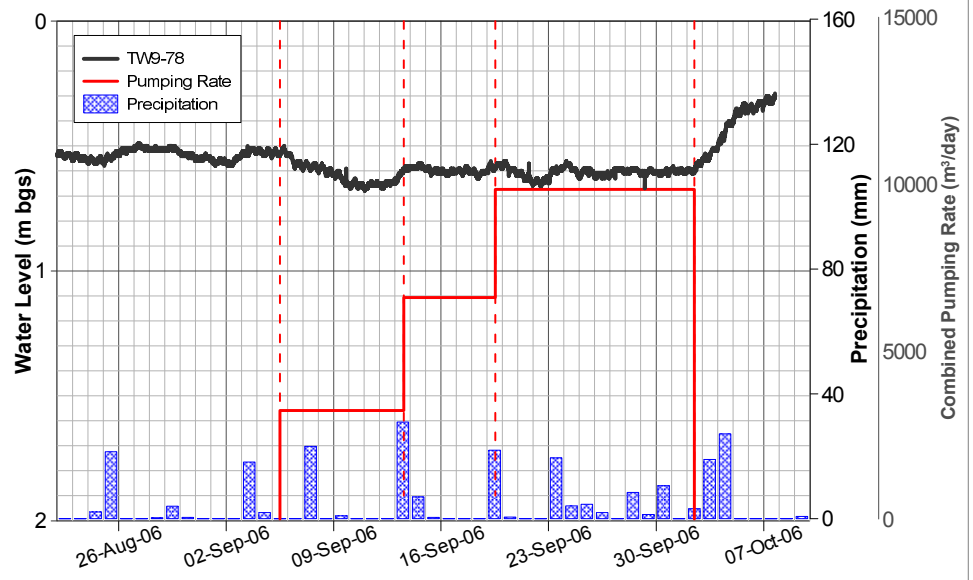
Townline Road Private Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.13







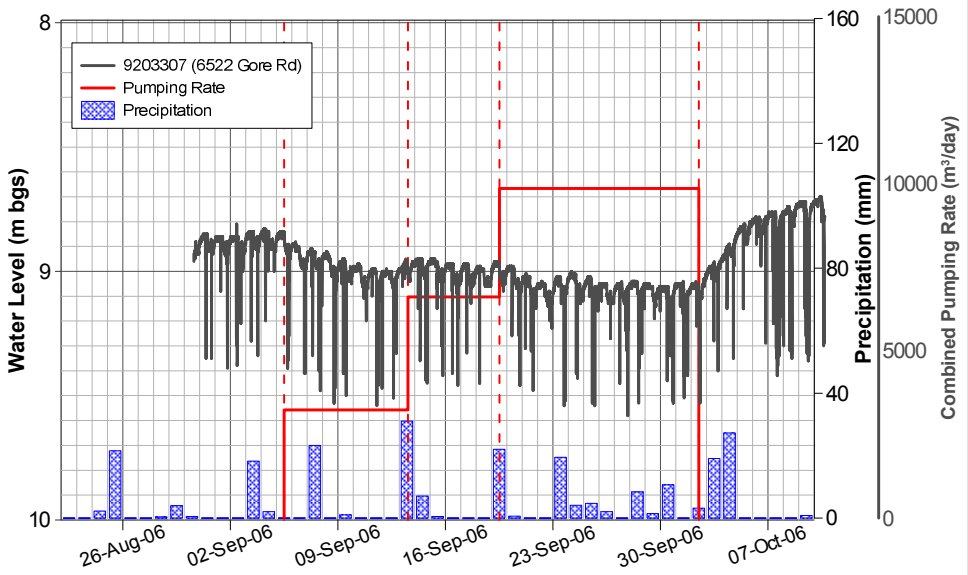
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

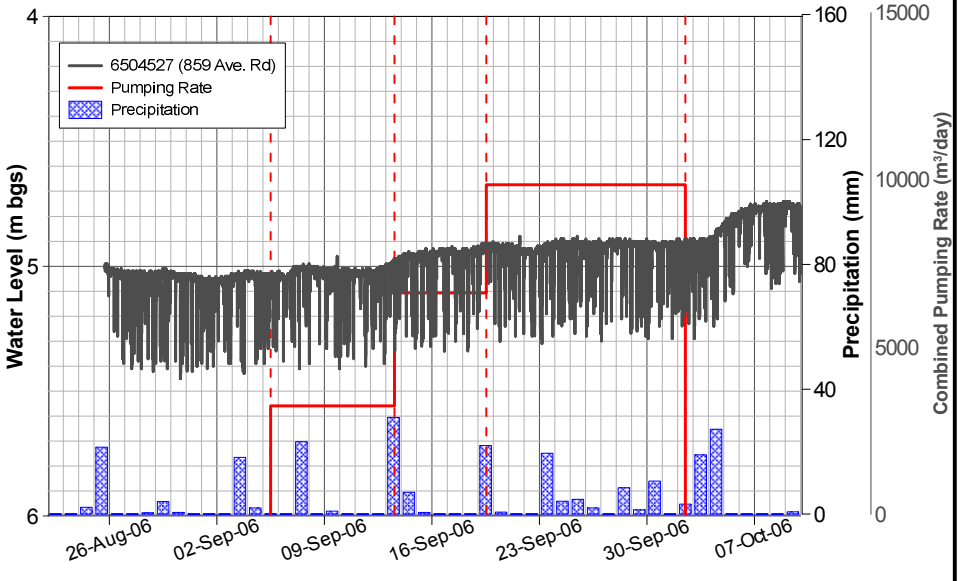
Phase I 28-Day Cambridge East Pumping Test

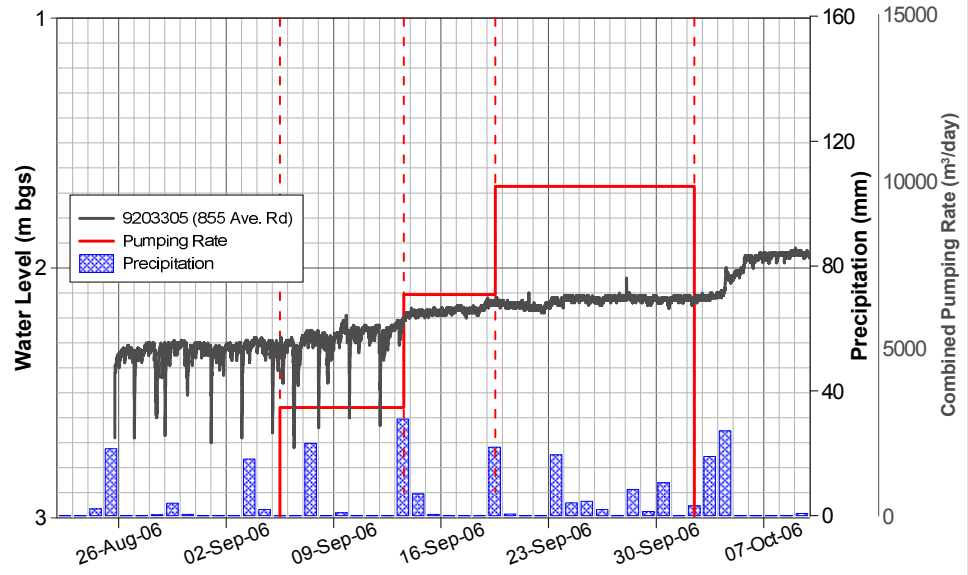
Shades Mills Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.14







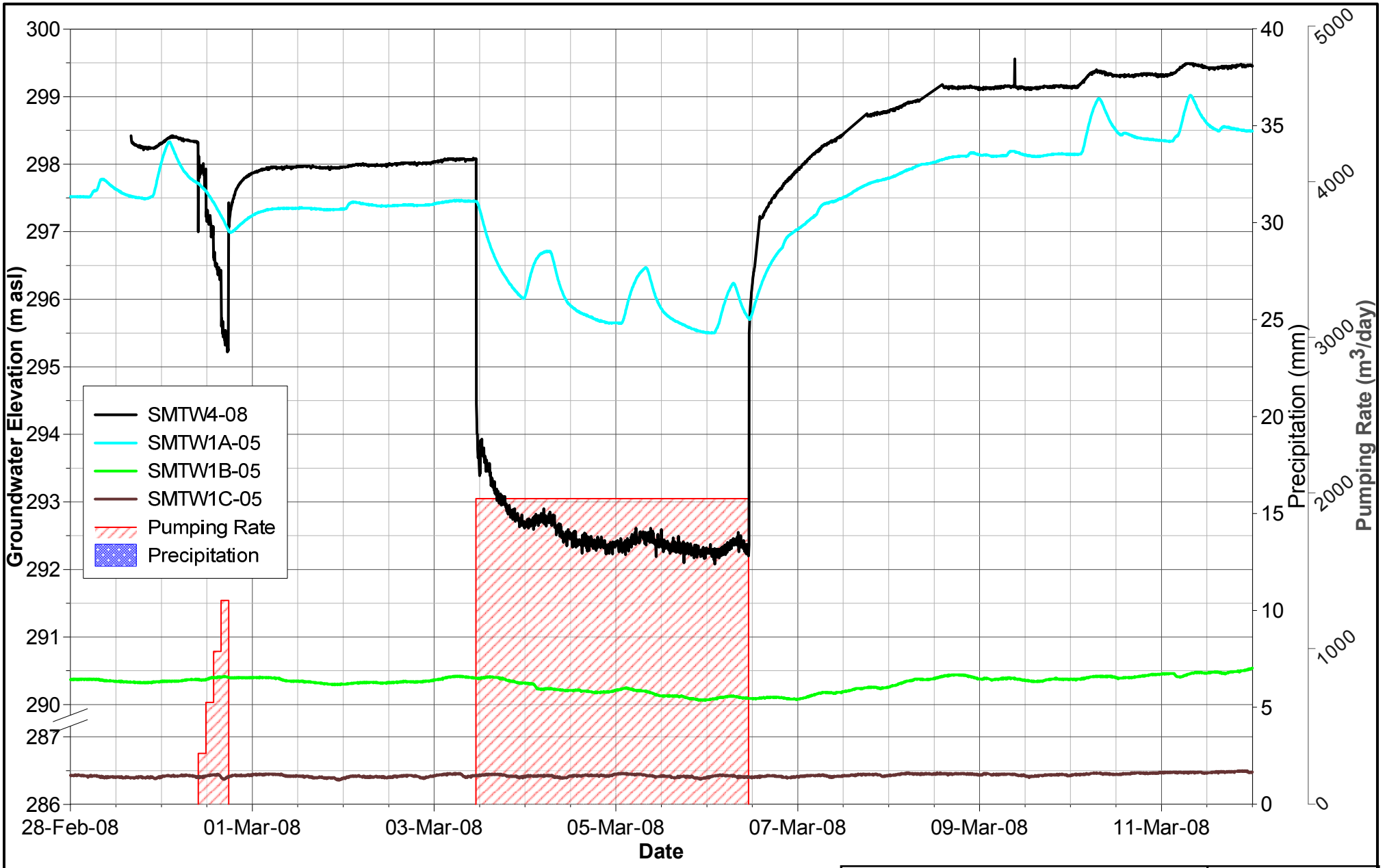
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Phase I 28-Day Cambridge East Pumping Test

Avenue Road and Gore Road Private Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.15



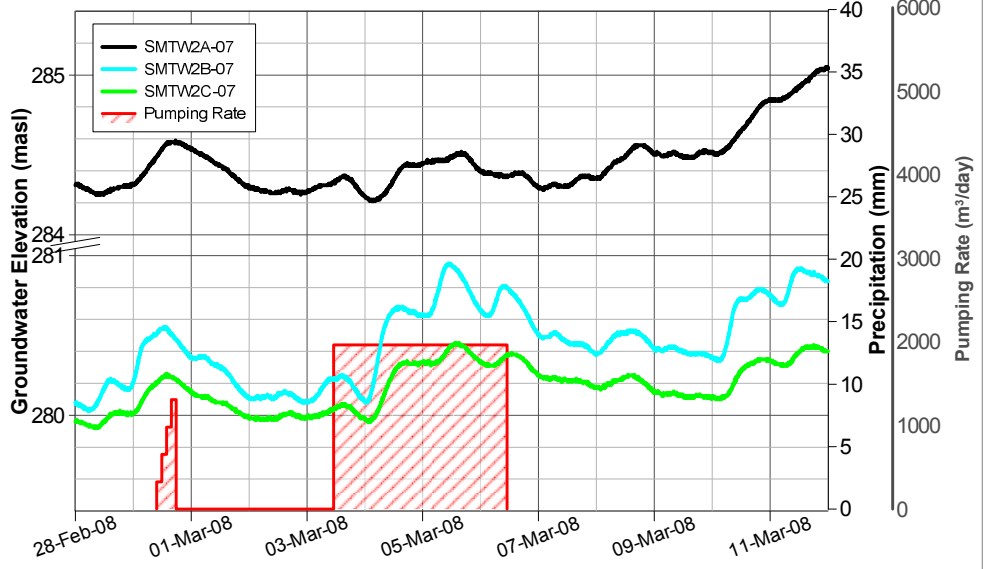
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

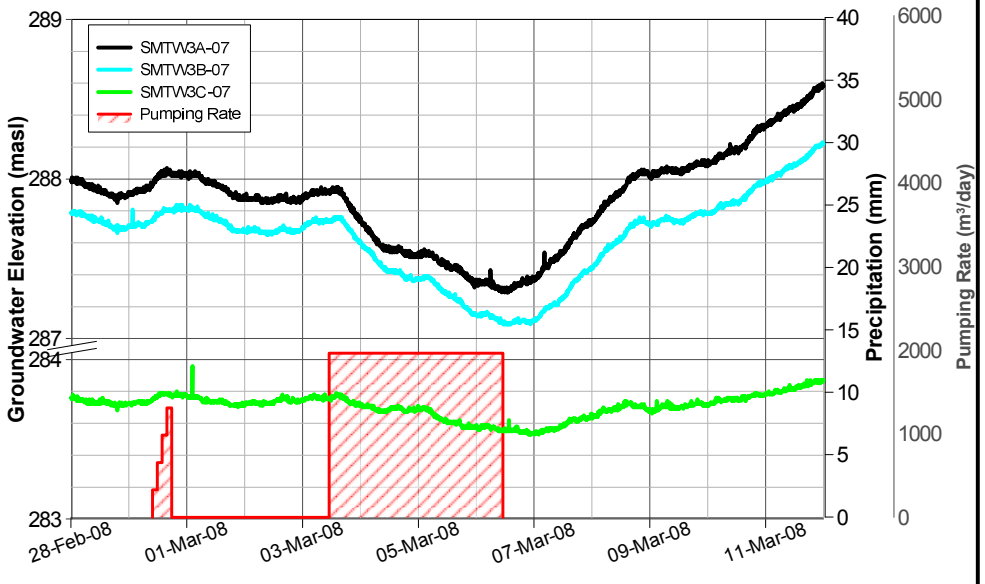
Phase II
SMTW4-08
Pumping Test

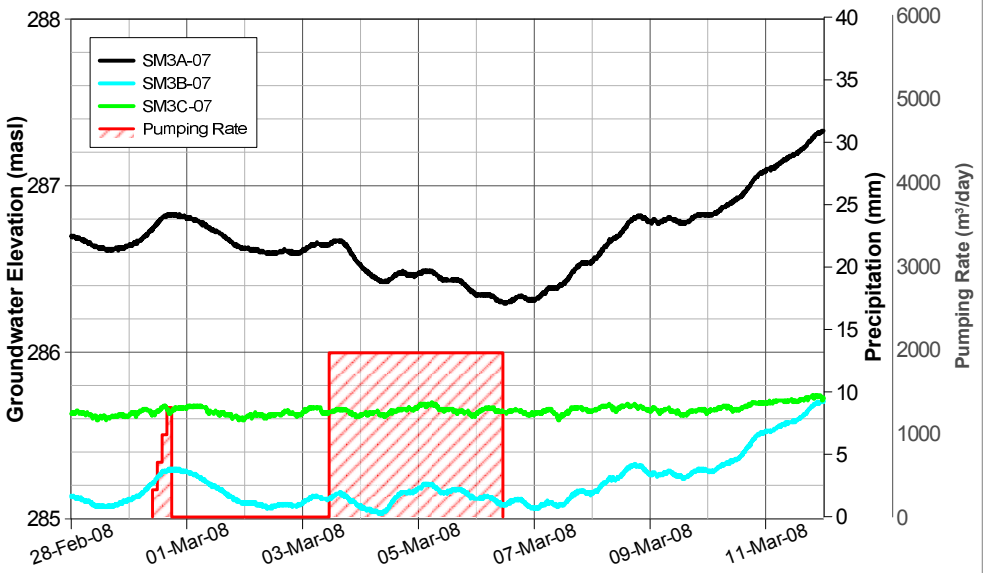
SMTW4-08 and SMTW1-05

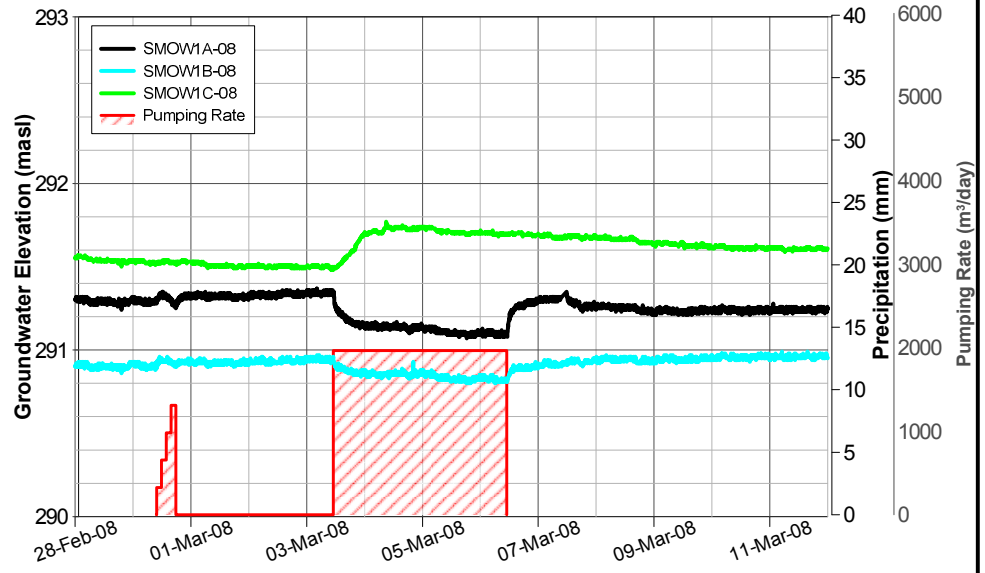
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.16









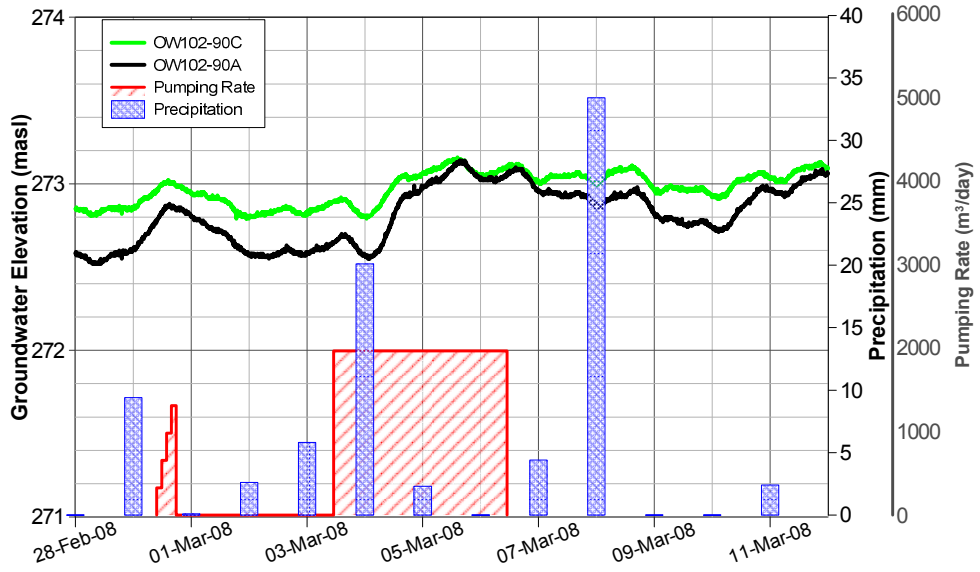
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

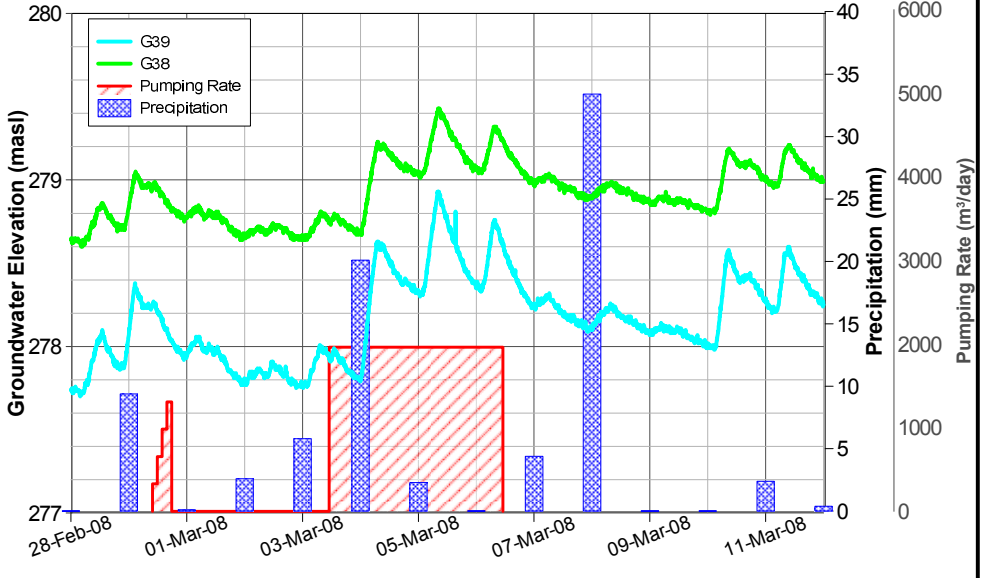
Phase II SMTW4-08 Pumping Test

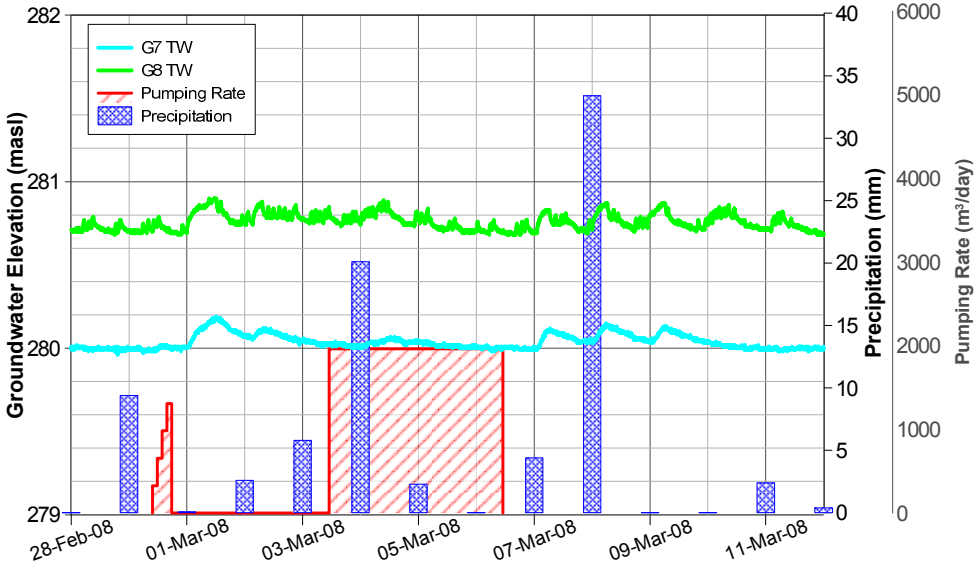
Shades Mill Wellfield Monitors

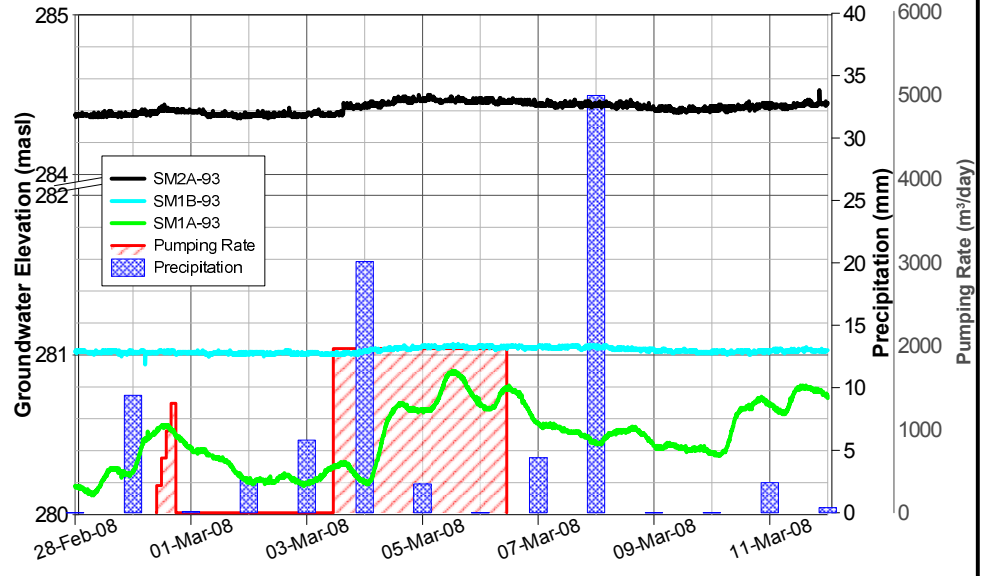
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.17









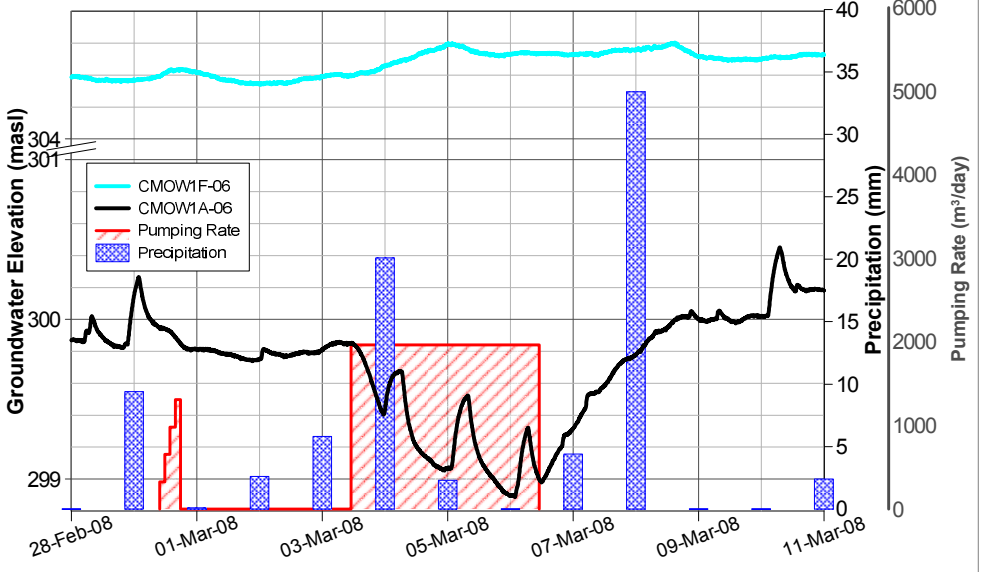
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

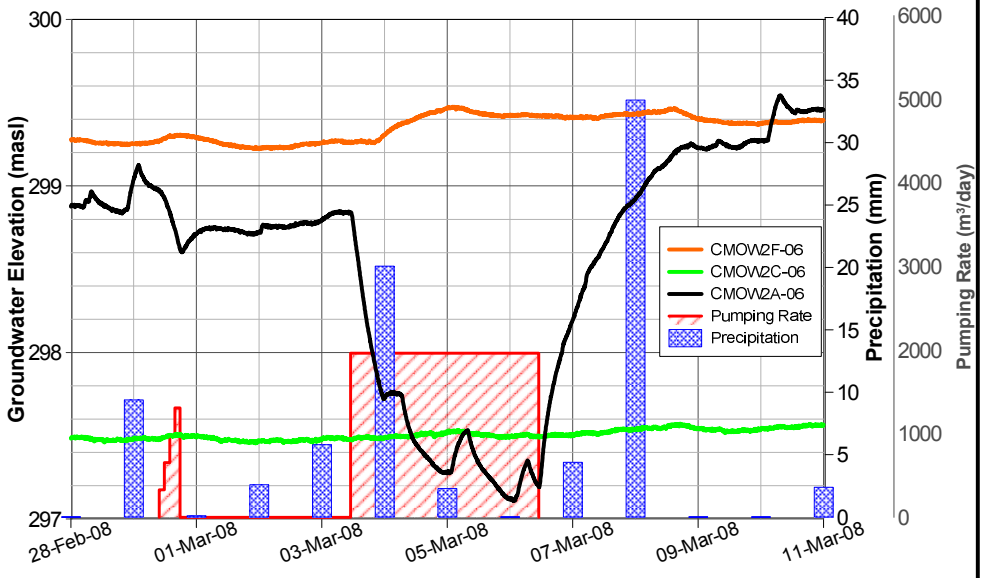
Phase II
SMTW4-08
Pumping Test

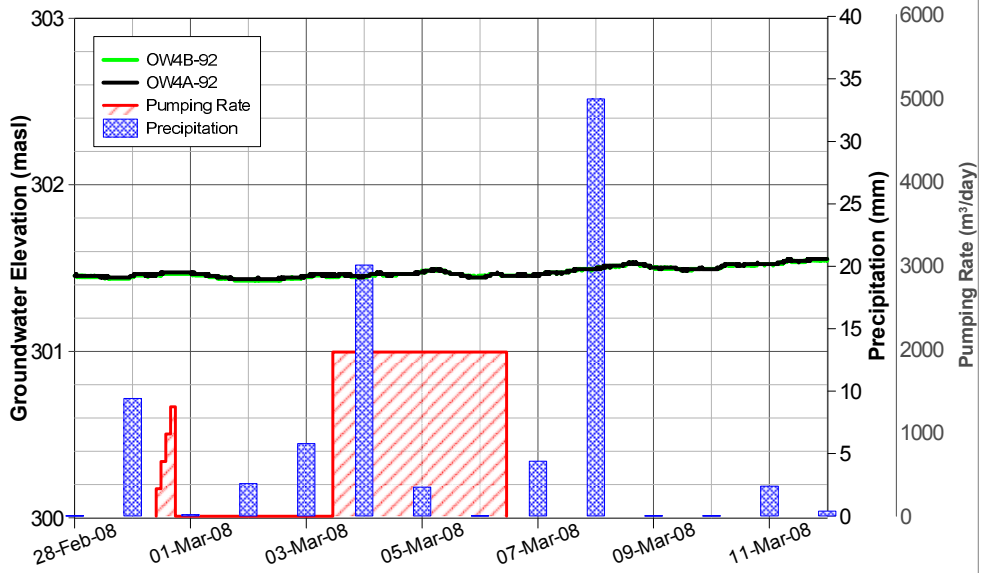
Shades Mill Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.18







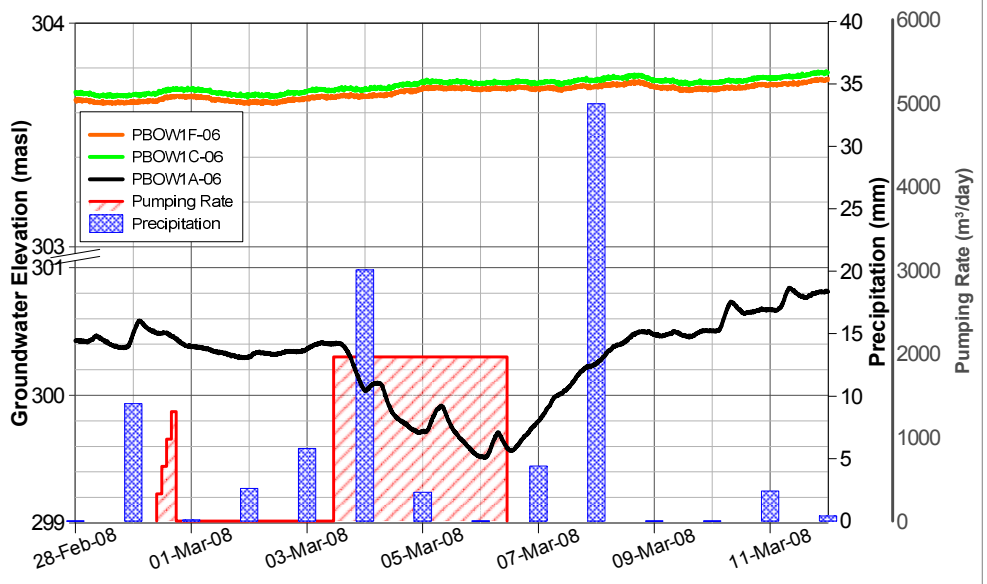
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

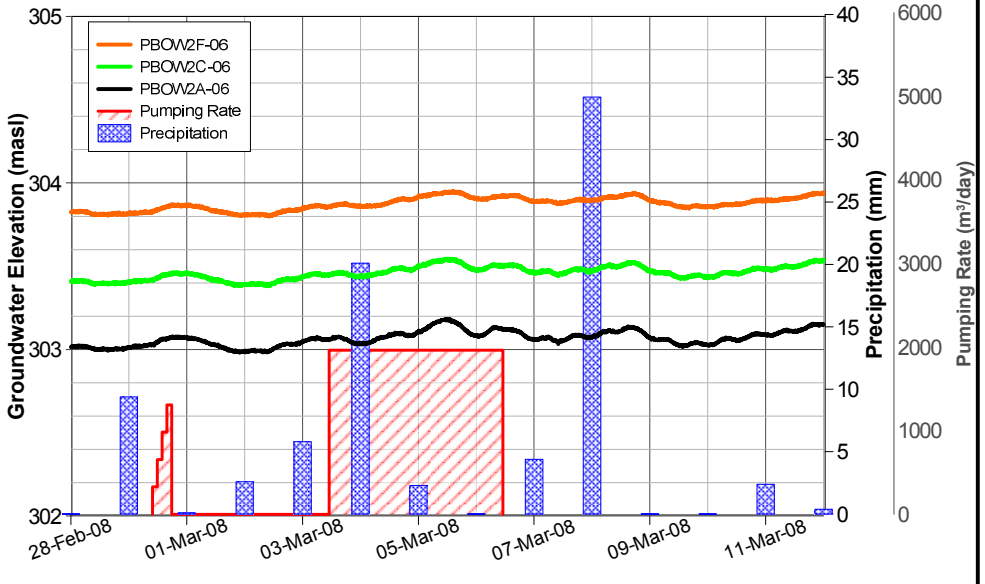
Phase II SMTW4-08 Pumping Test

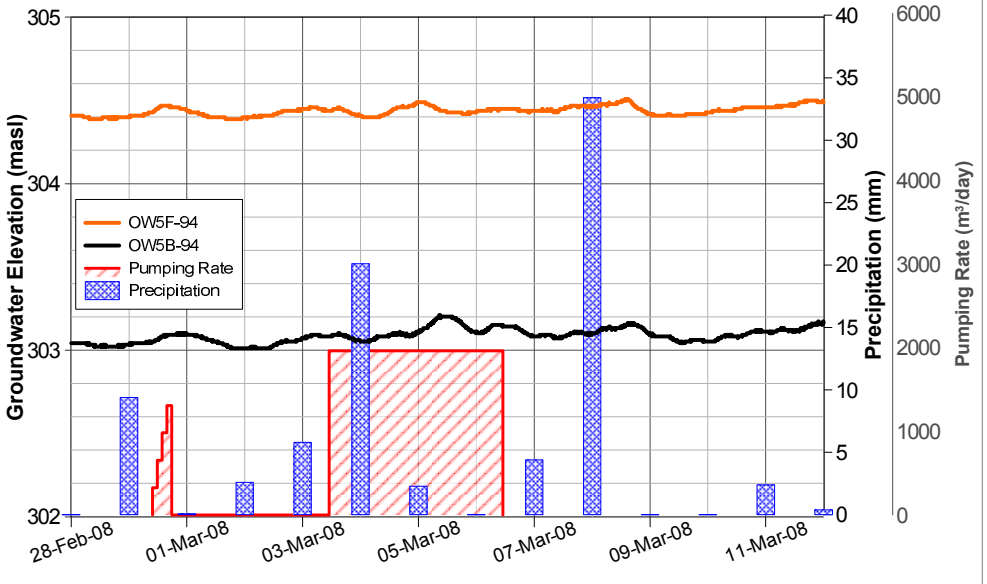
Clemens Wellfield Monitors

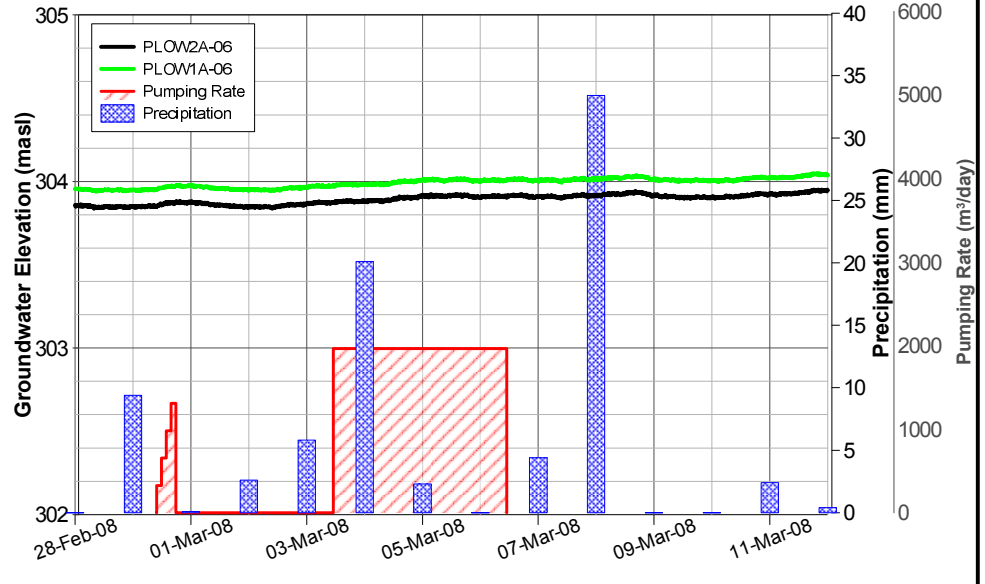
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.19









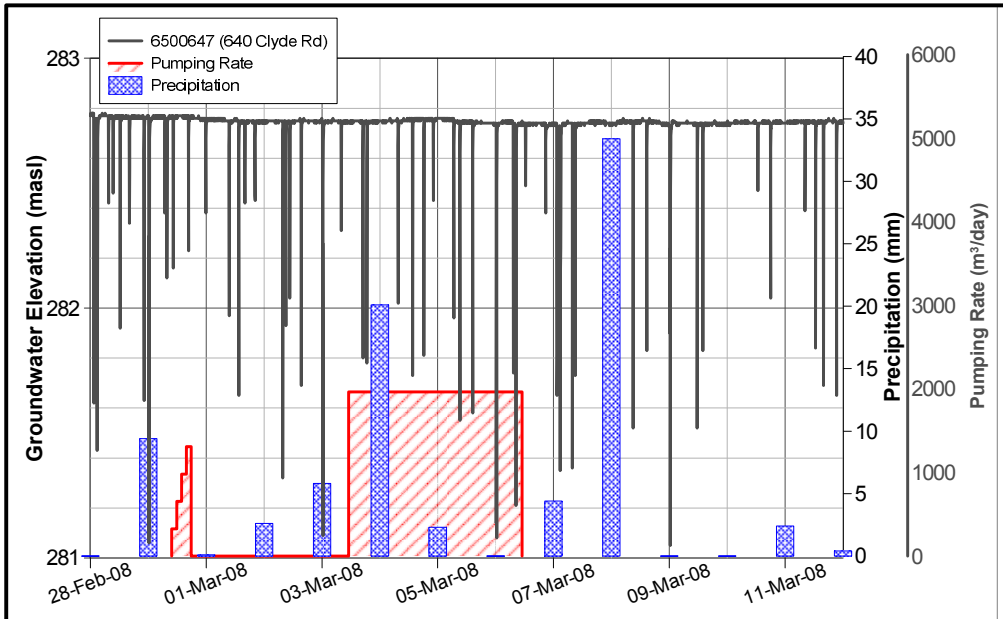
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

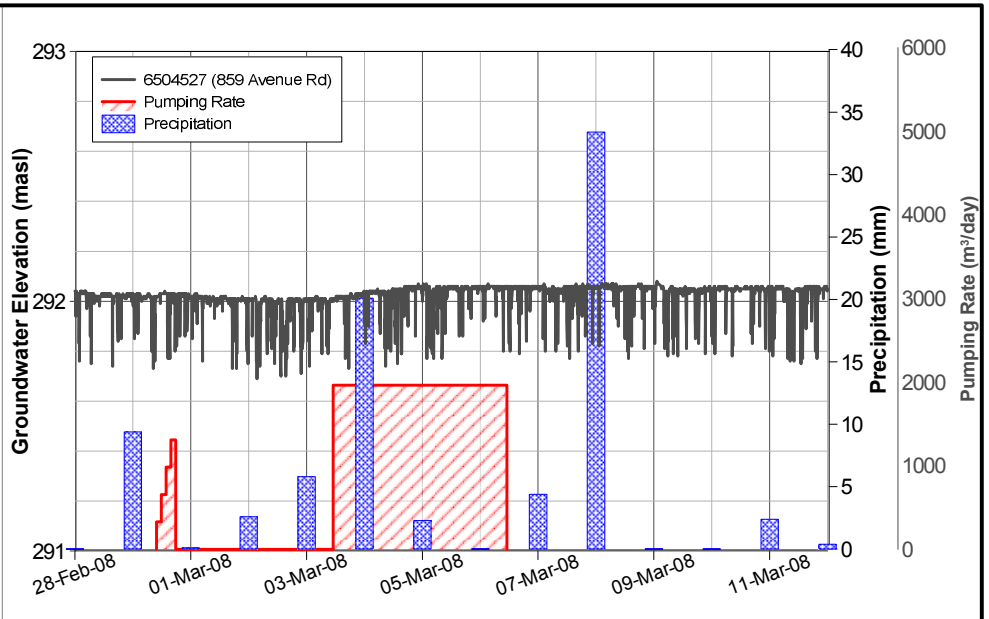
Phase II
SMTW4-08
Pumping Test

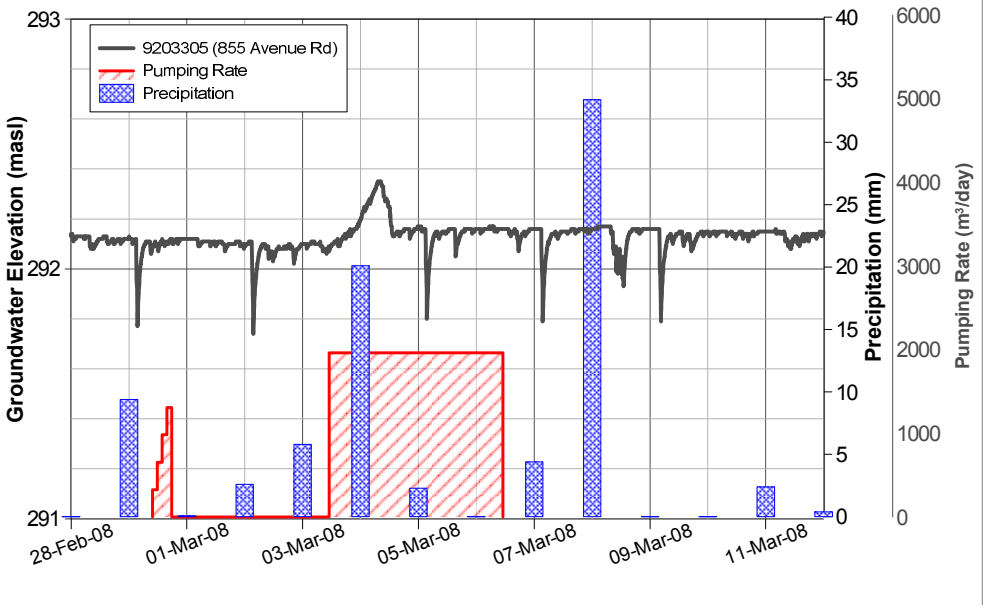
Pinebush Wellfield Monitors

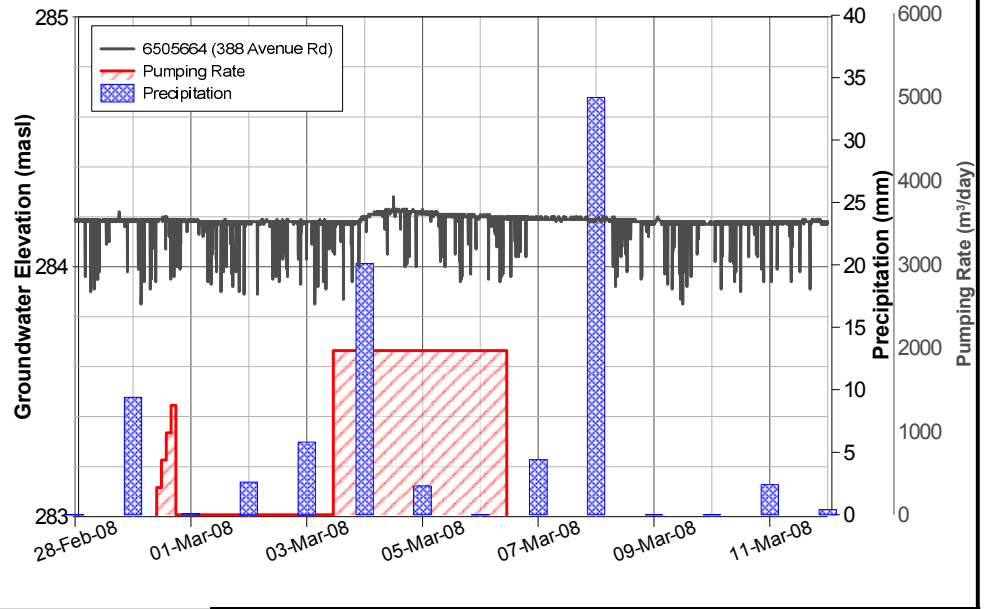
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.20









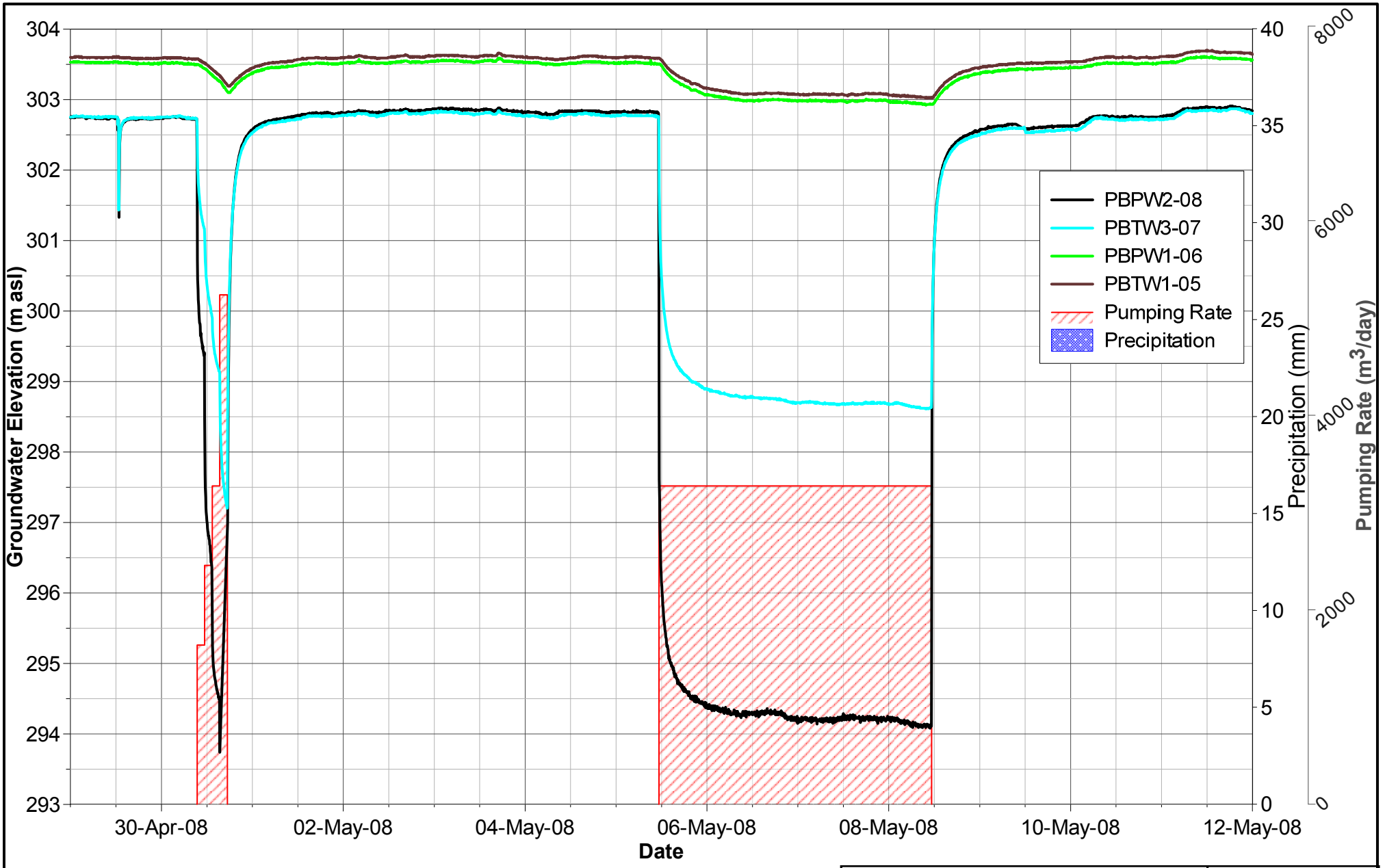
Notes:
1) The 3-day constant rate test at SMTW4-08 took place between March 3-6, 2008 at a rate of 1,964 m³/day (22.8 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Phase II
SMTW4-08
Pumping Test

Private Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.21



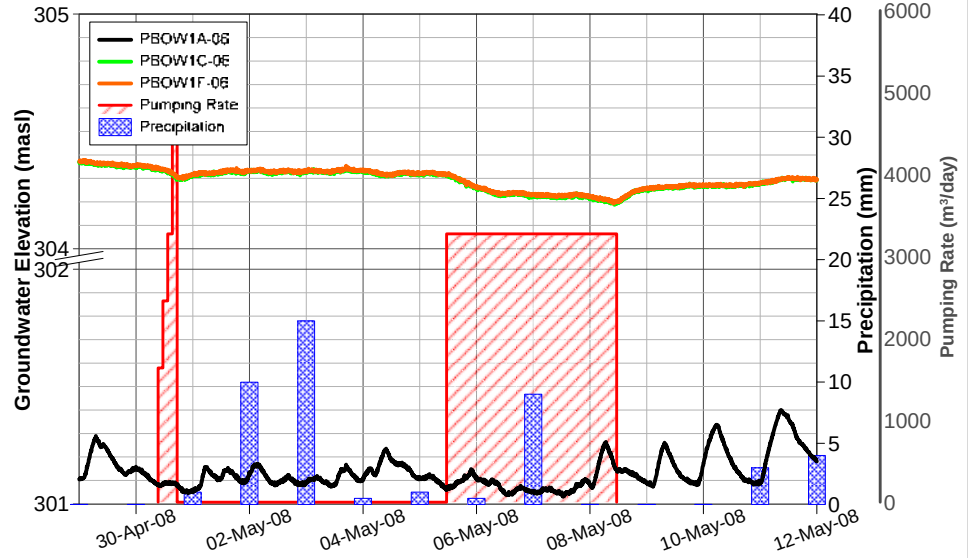
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

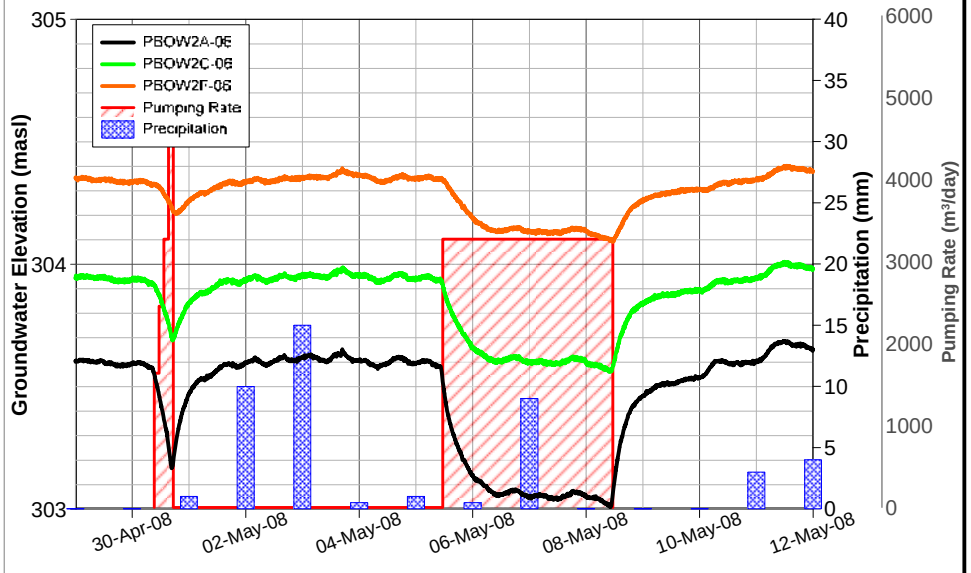
Phase II PBPW2-08 Pumping Test

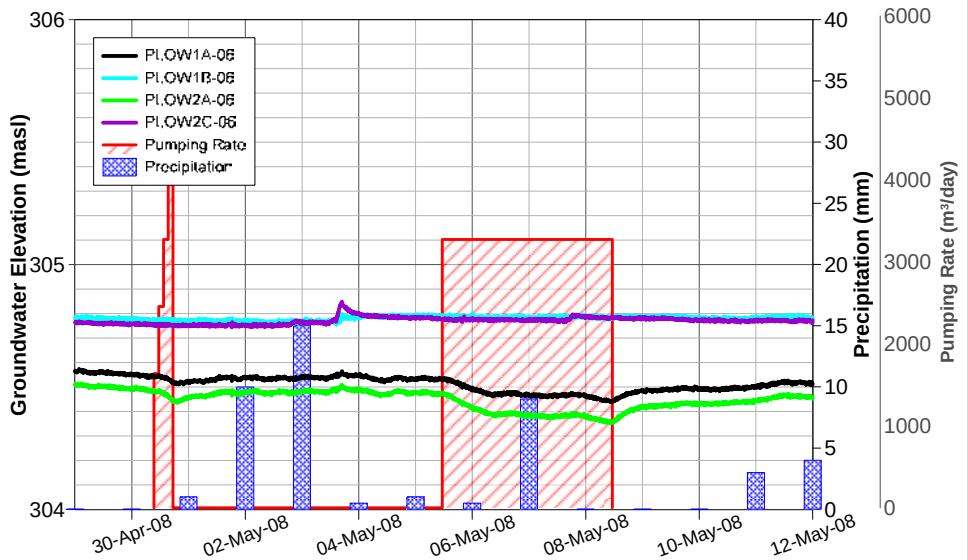
PBPW2-08 and Nearby Test Wells

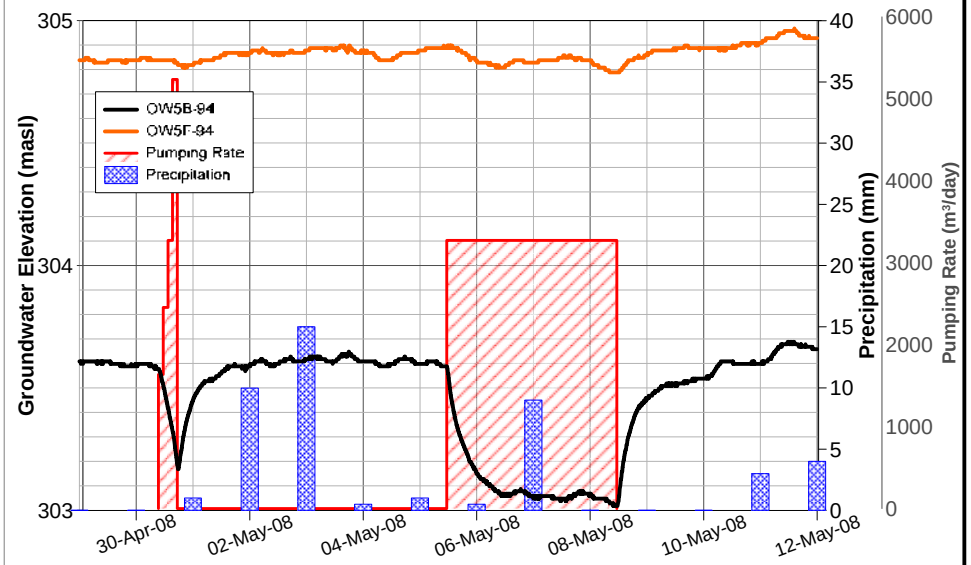
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.22









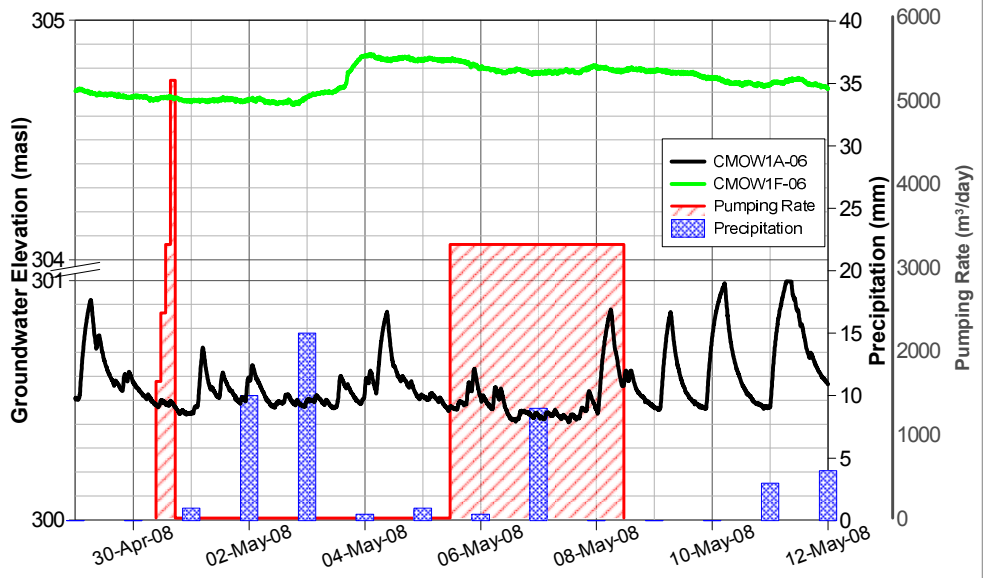
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s)
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388)

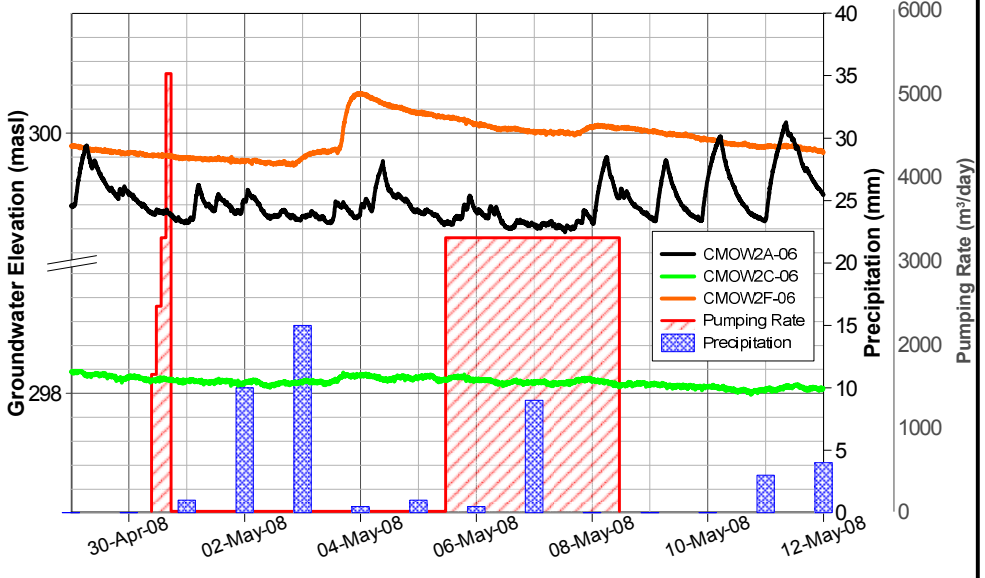
Phase II PBPW2-08 Pumping Test

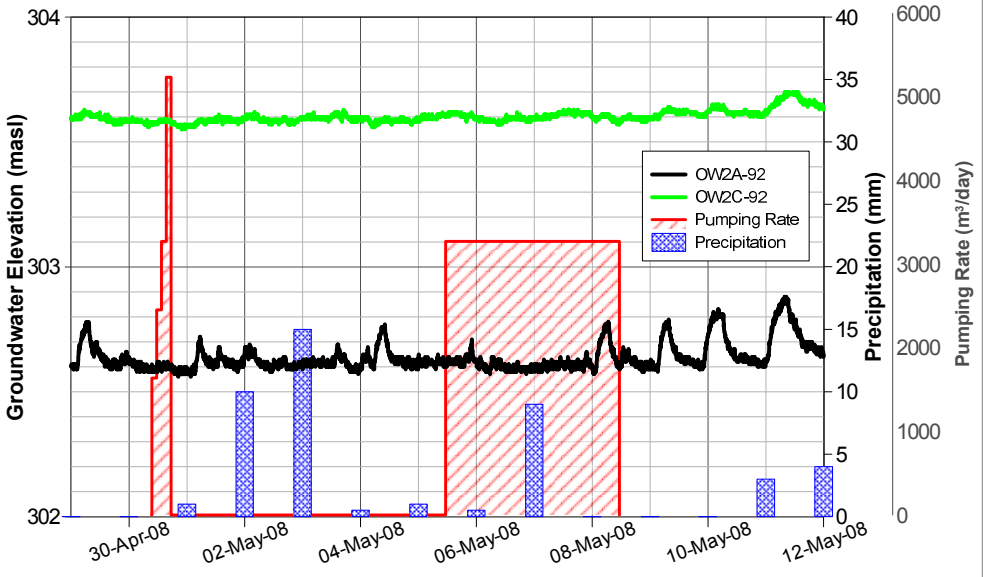
Pinebush Wellfield Monitors

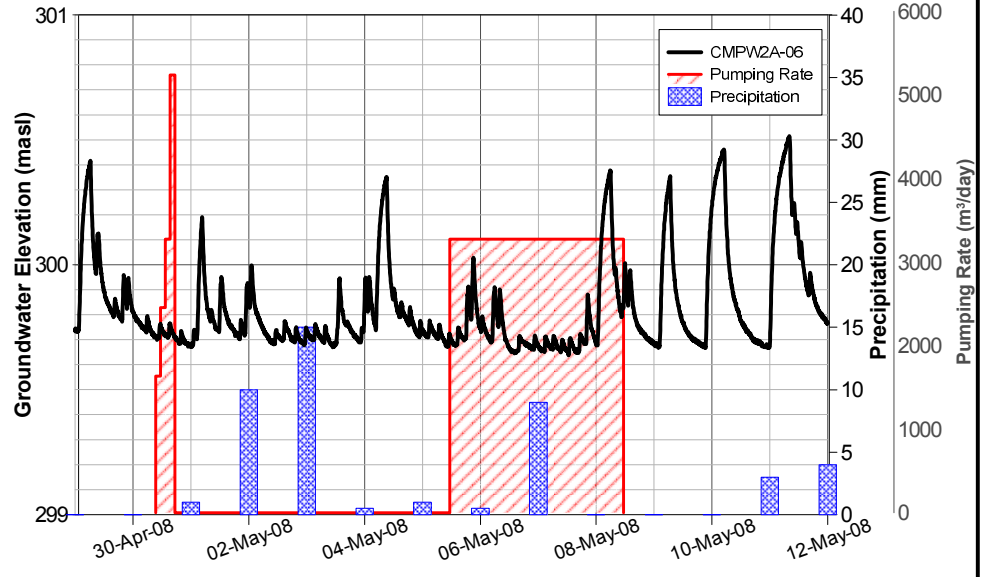
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.23









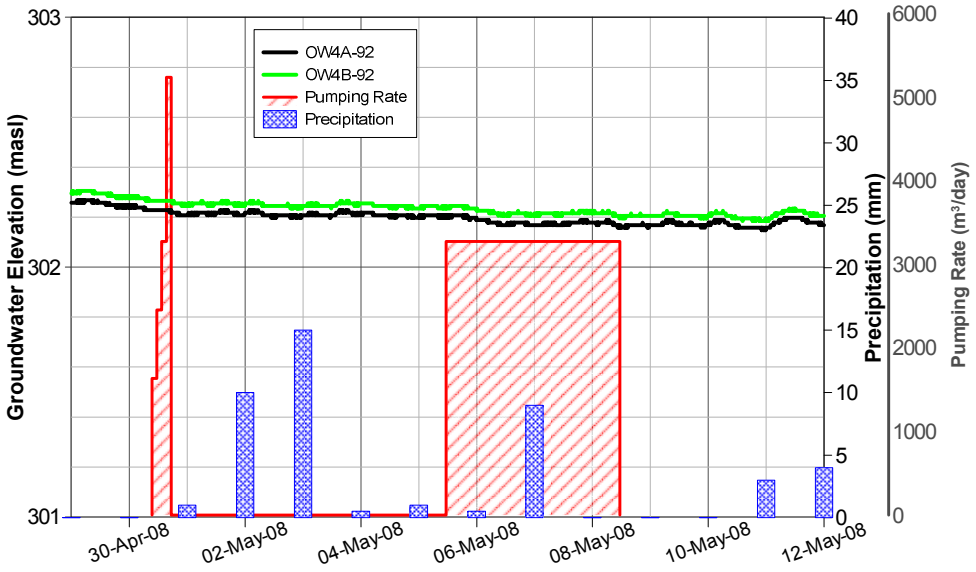
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

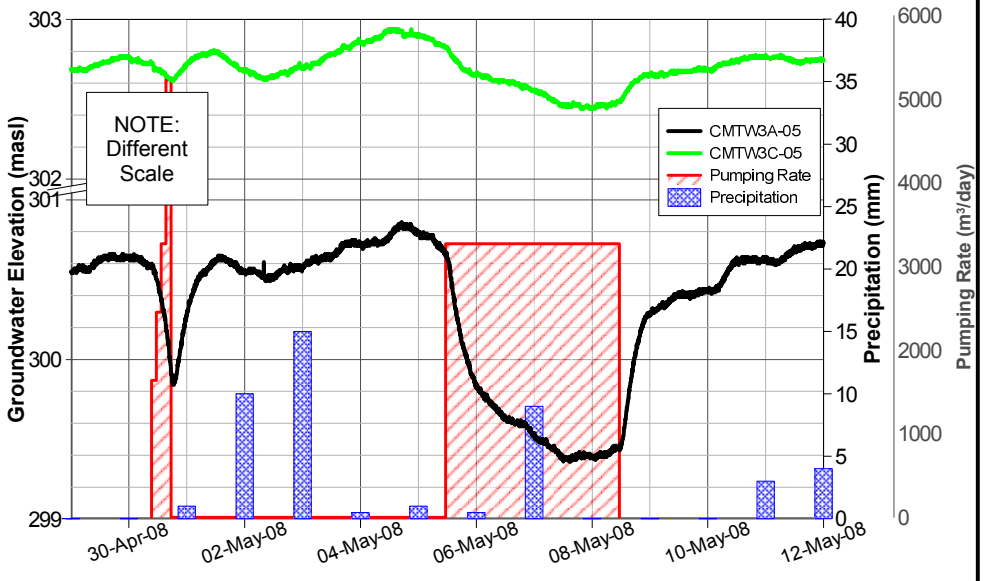
Phase II
PBPW2-08
Pumping Test

Clemens Mill Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.24





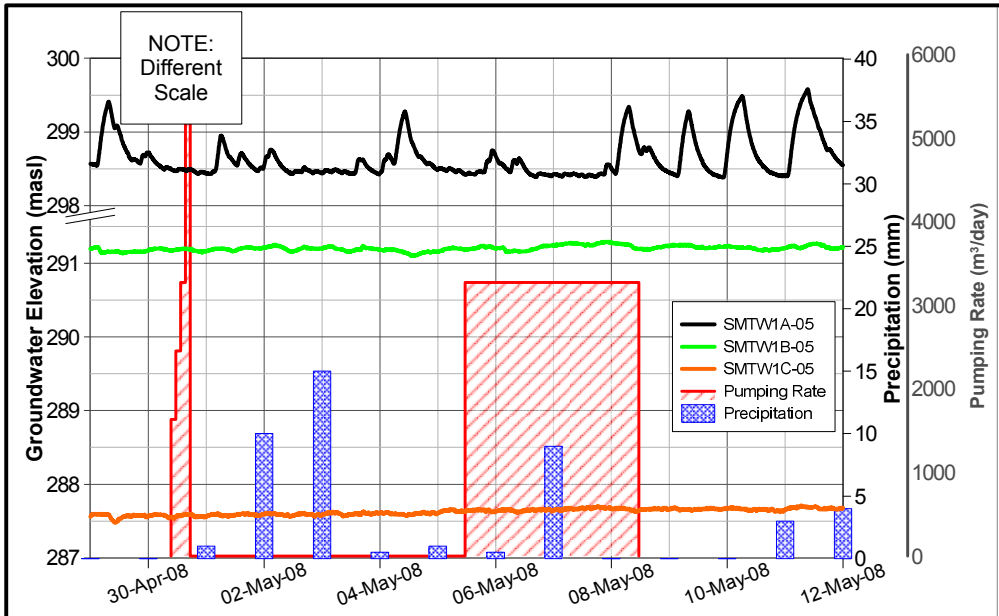
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

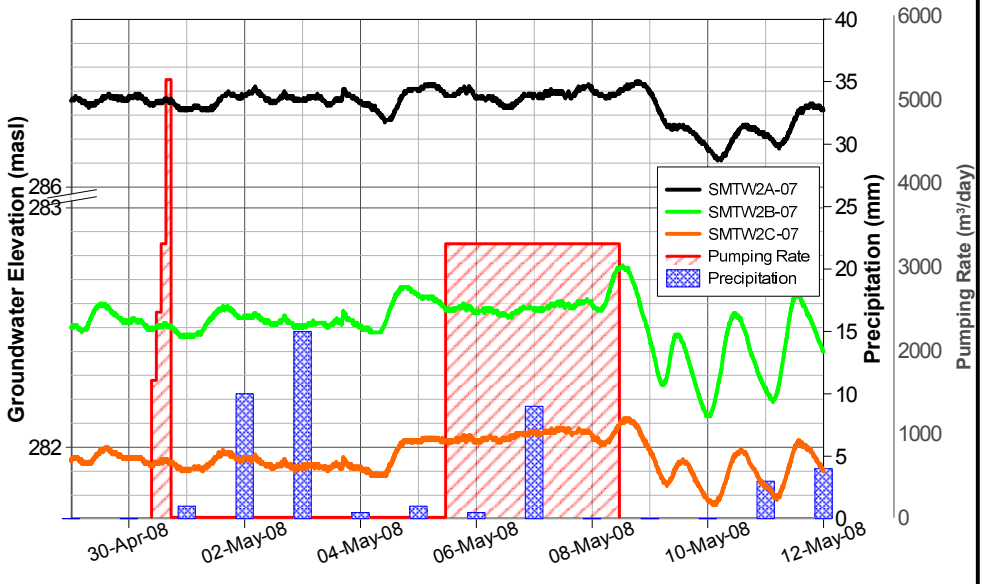
Phase II
PBPW2-08
Pumping Test

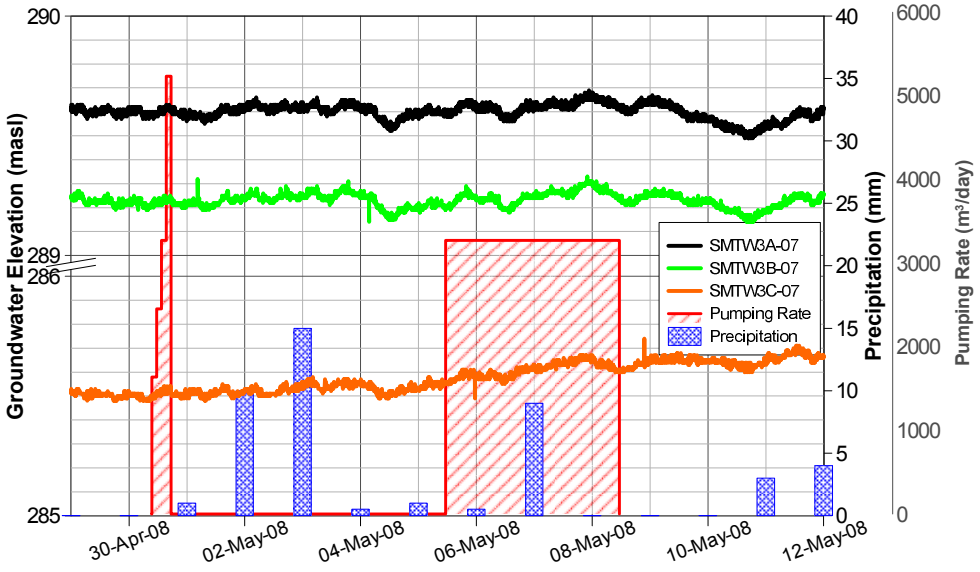
Clemens Wellfield Monitors

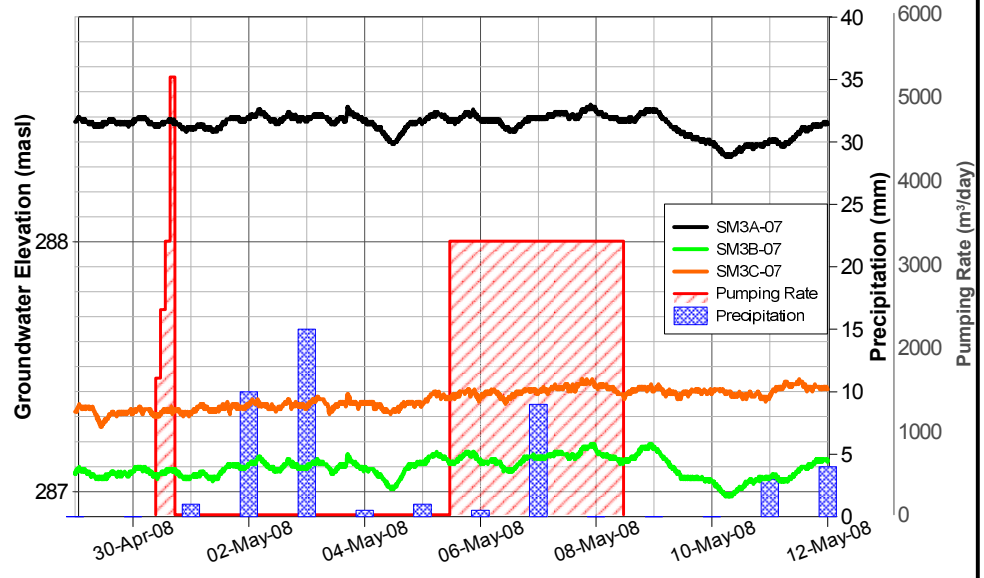
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.25









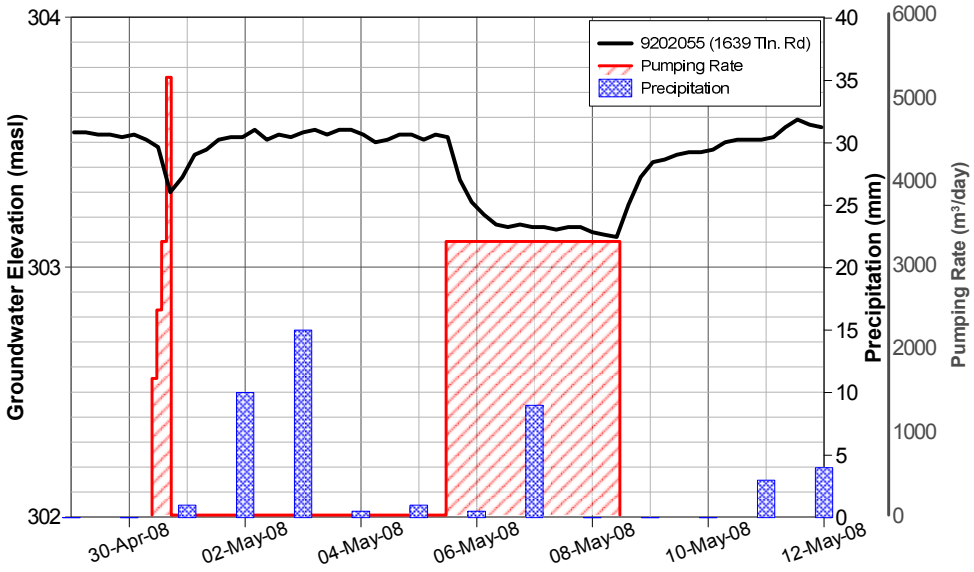
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

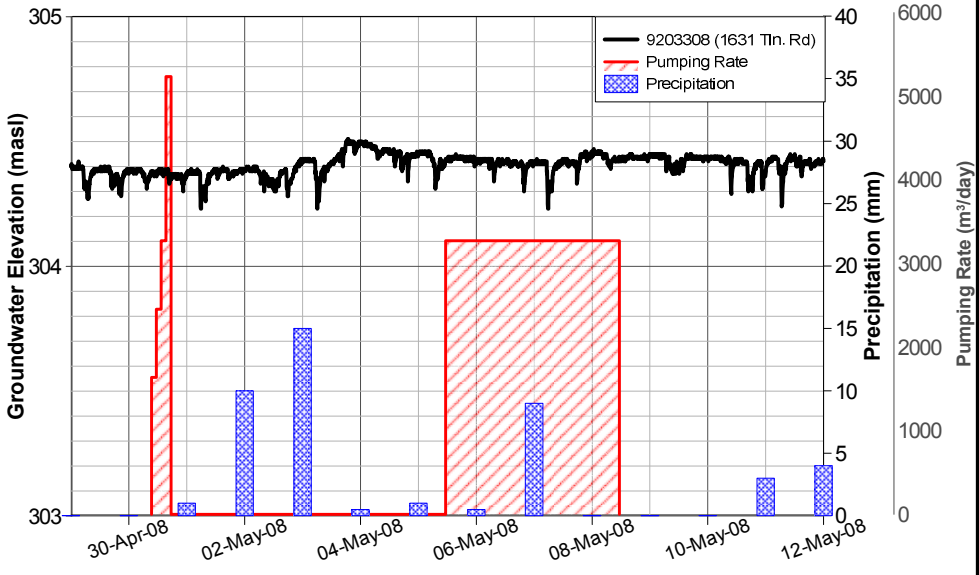
Phase II
PBPW2-08
Pumping Test

Shades Mill Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.26





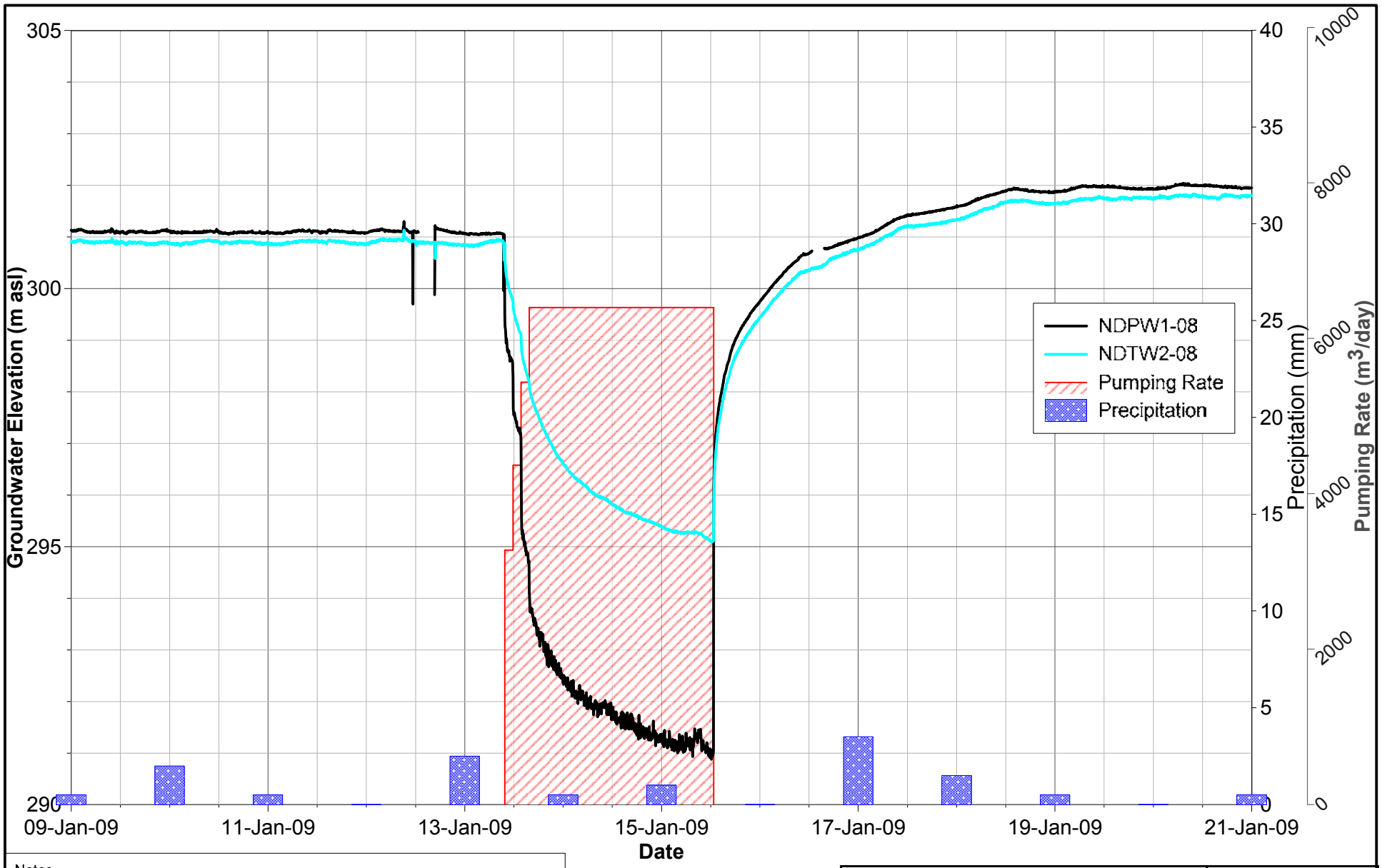
Notes:
1) The 3-day constant rate test at PBTW2-08 took place between May 5-8, 2008 at a rate of 3,273 m³/day (37.9 L/s).
2) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

Phase II
PBPW2-08
Pumping Test

Private Wells

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.27



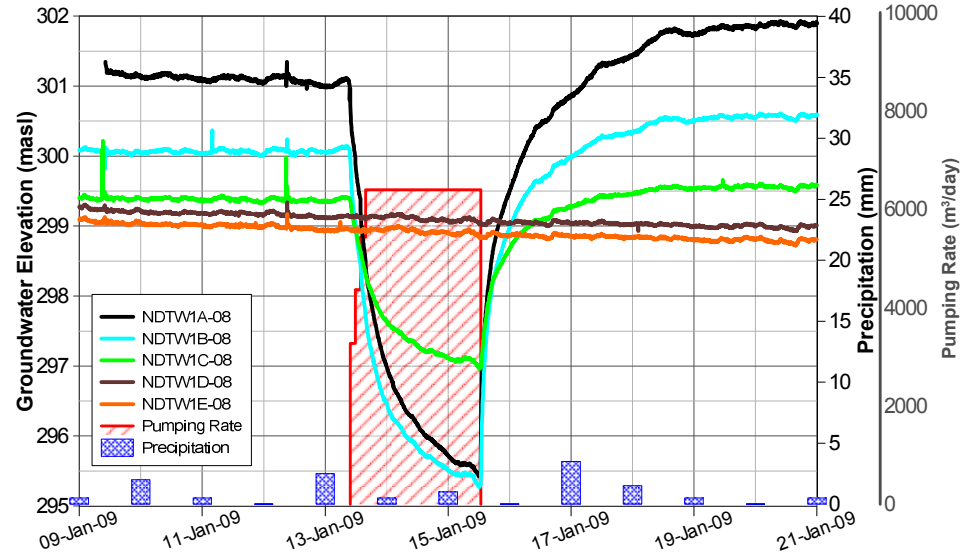
Notes:
1) The 2-day constant rate test at NDPW1-08 took place between Jan 13-15, 2009 immediately following step testing at a rate of 6,396 m³/day (74.0 L/s).
2) Testing took place on the open borehole.
3) Testing ended early due to generator failure and ice jams restricting flow of water through culverts
4) Precipitation data is from the Environment Canada Region of Waterloo Climate Station (ID # 6149388).

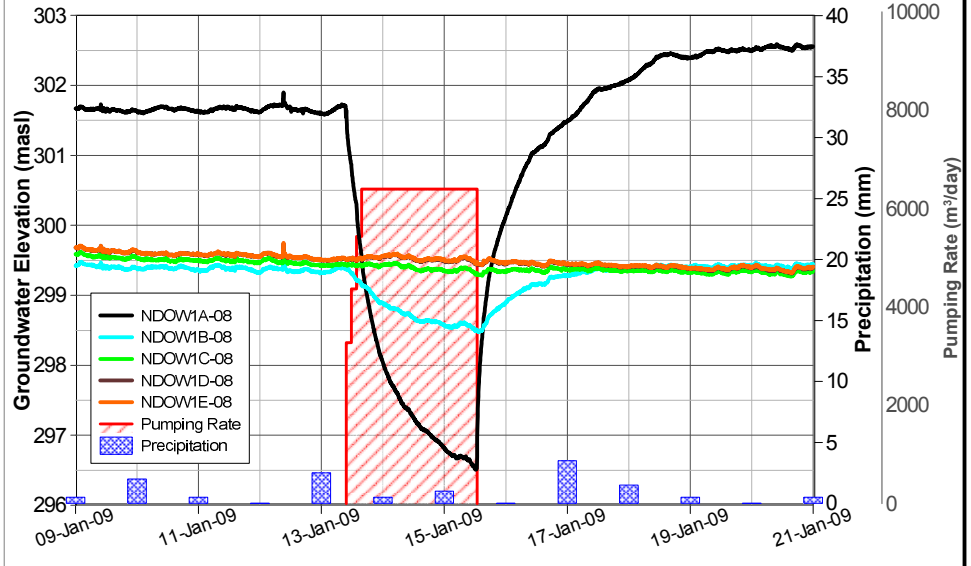
Phase III
NDPW1-08
Pumping Test
January 2009

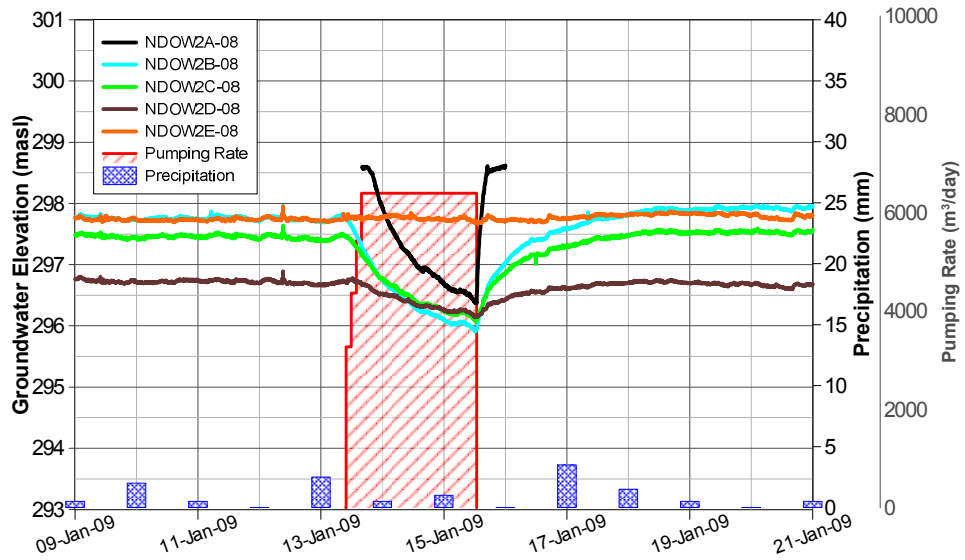
NDPW1-08 and NDTW2-08

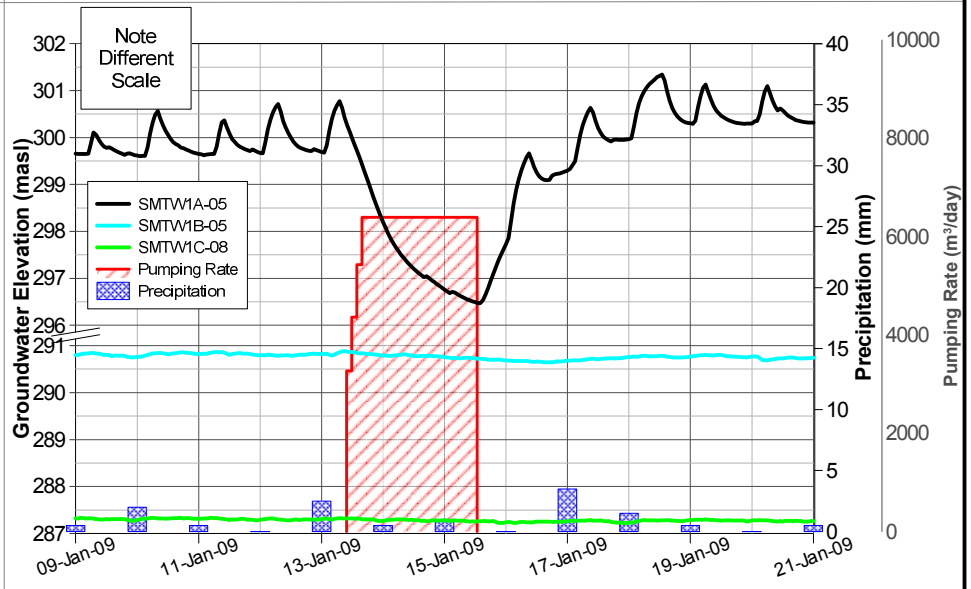
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.28









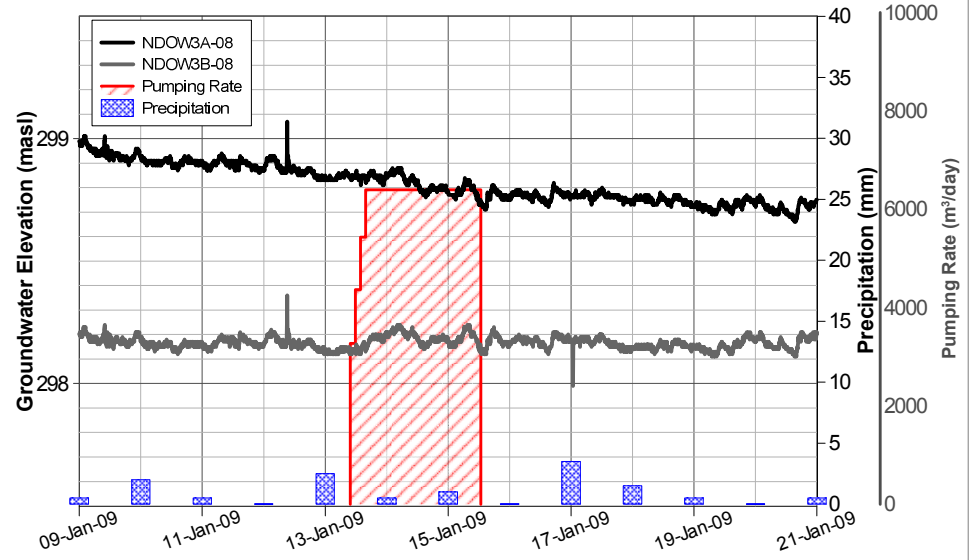
Notes:
1) The 2-day constant rate test at NDPW1-08 took place between Jan 13-15, 2009 immediately following step testing at a rate of 6,396 m³/day (74.0 L/s).
2) Testing took place on the open borehole.
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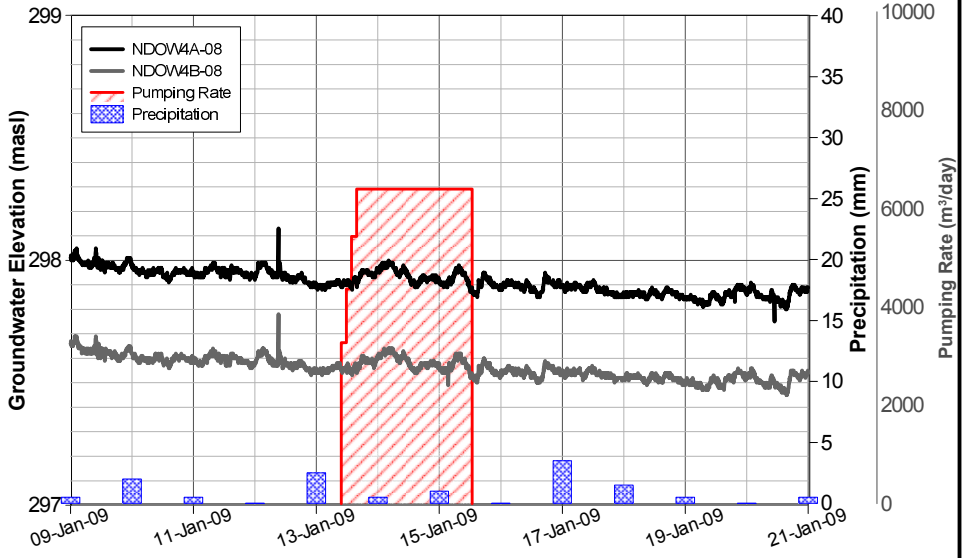
Phase III
NDPW1-08
Pumping Test
January 2009

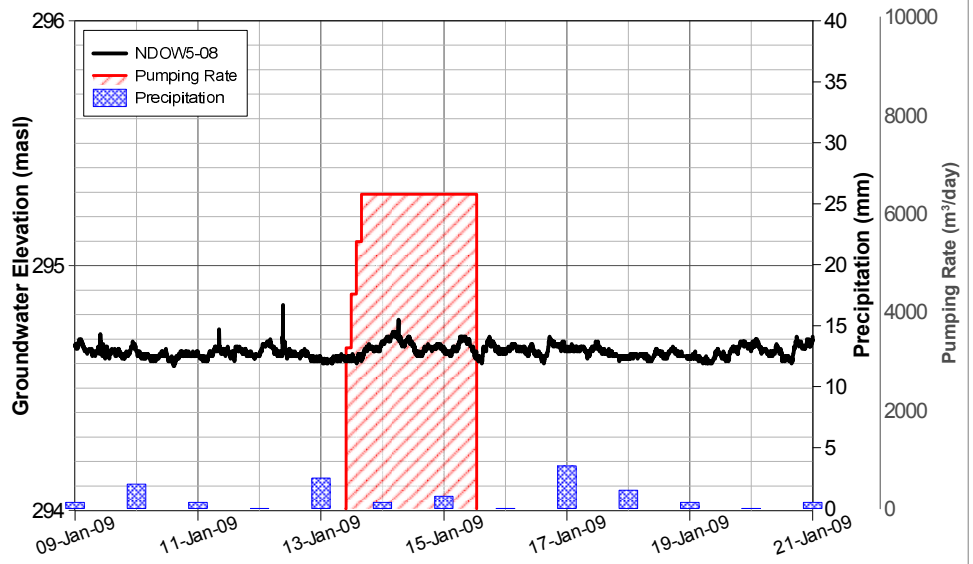
Monitors Near the Town of Clyde

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.29







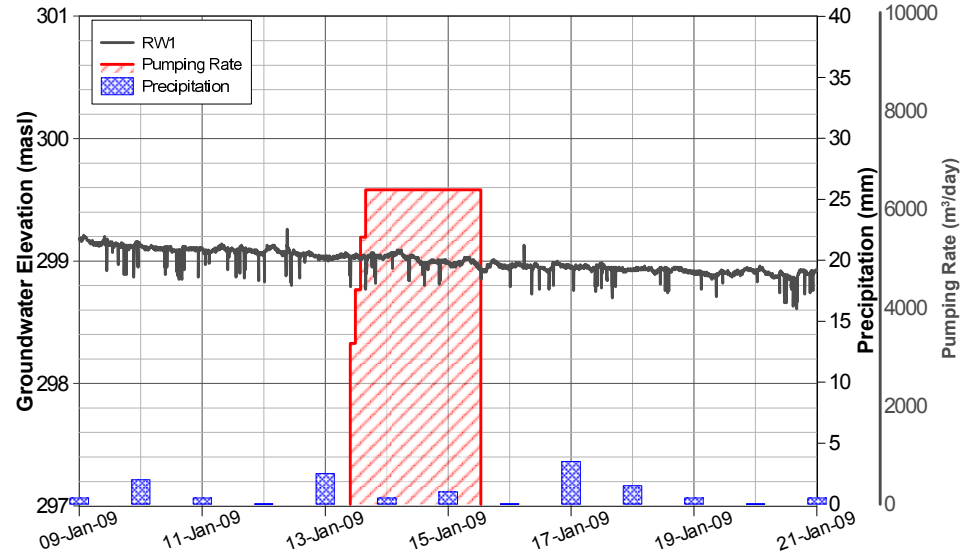
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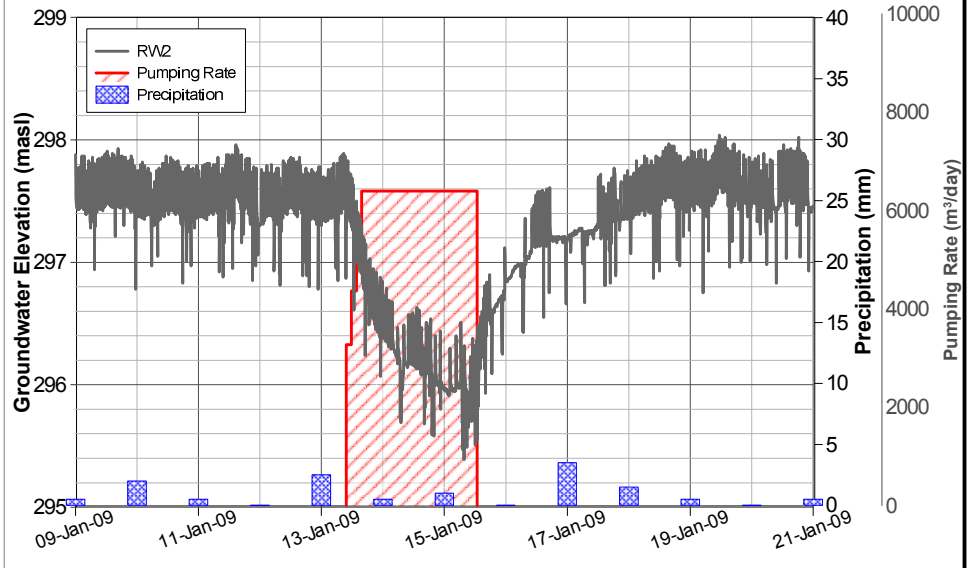
Phase III
NDPW1-08
Pumping Test
January 2009

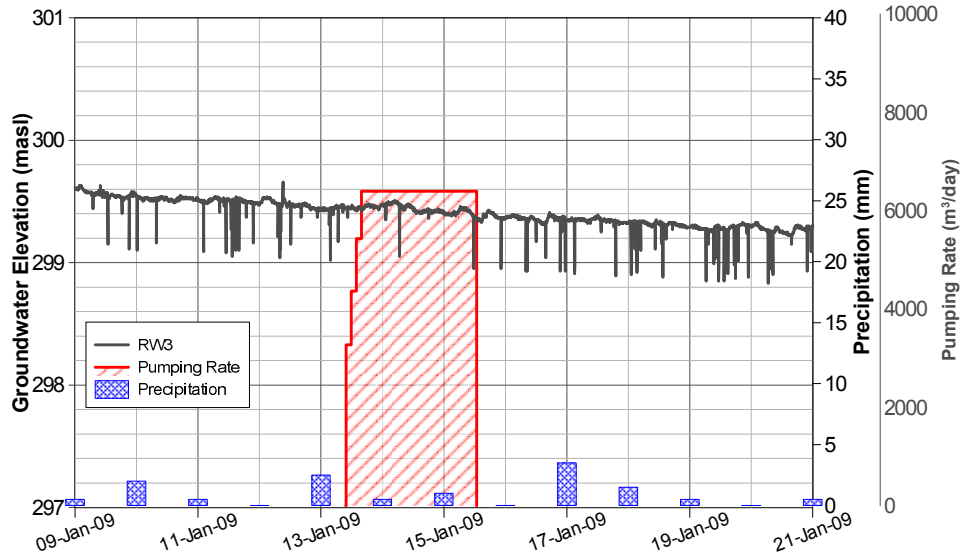
Shallow Monitors Near the Town of Clyde

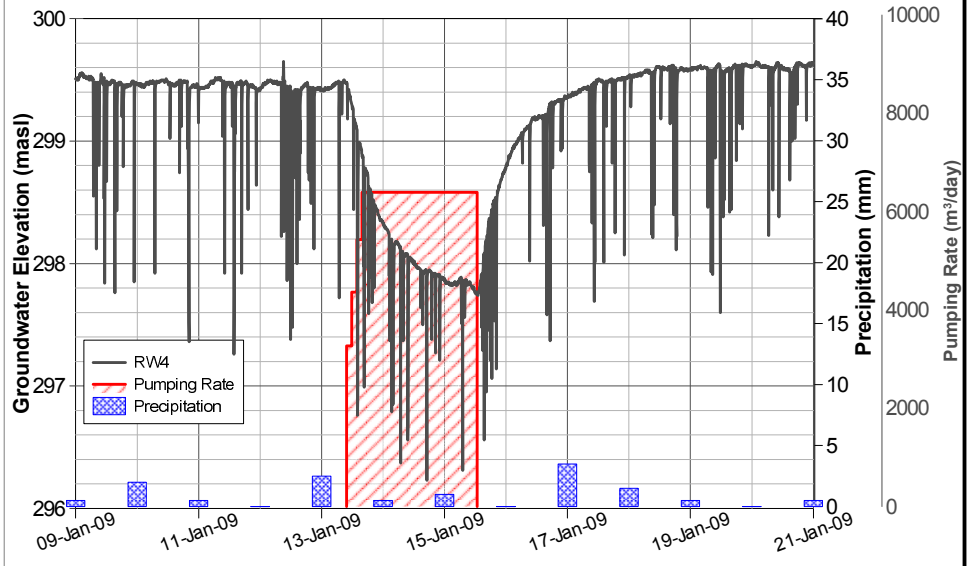
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.30









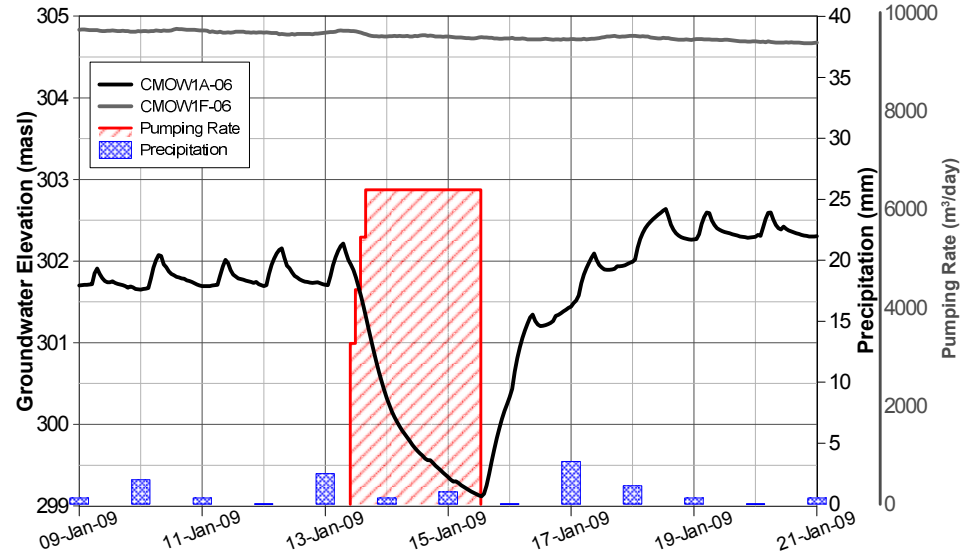
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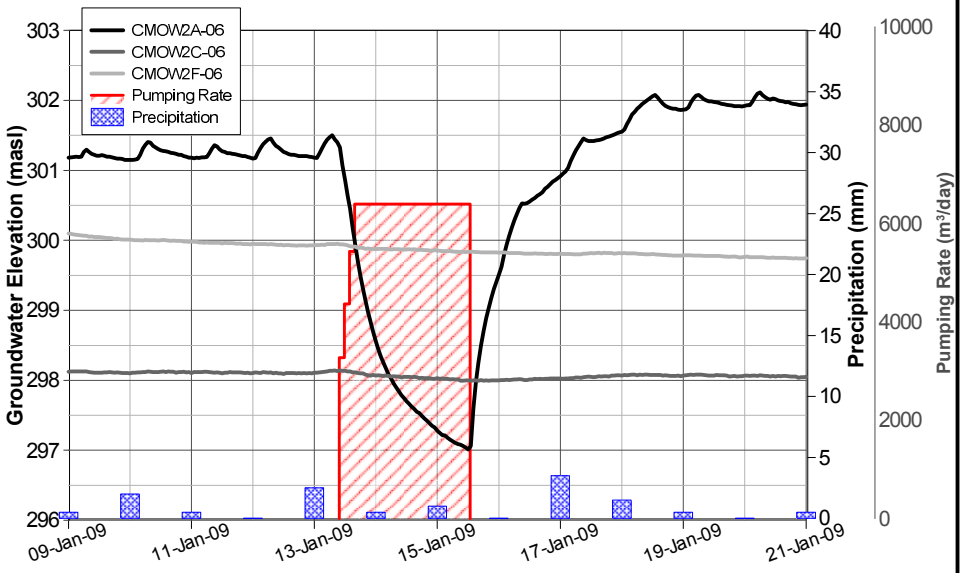
Phase III
NDPW1-08
Pumping Test
January 2009

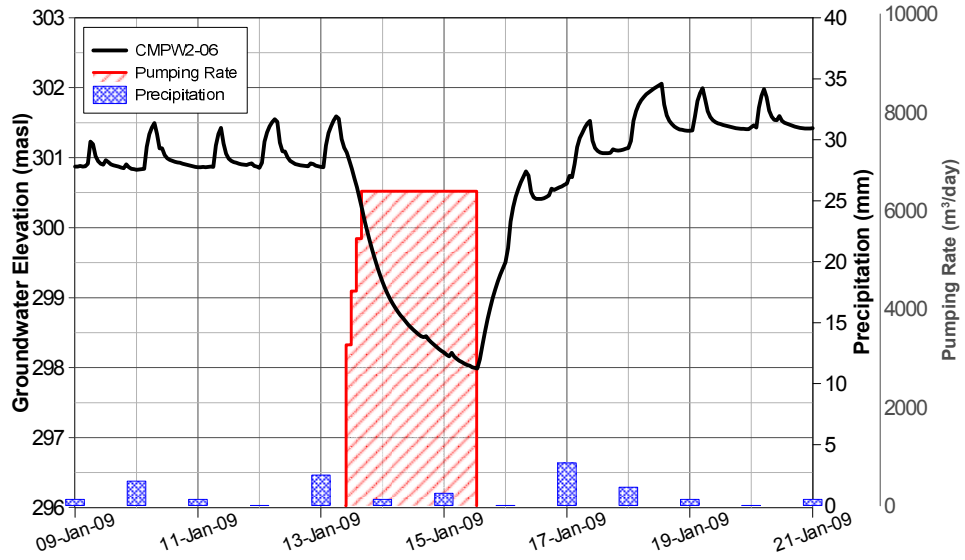
Private Wells
Town of Clyde

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.31







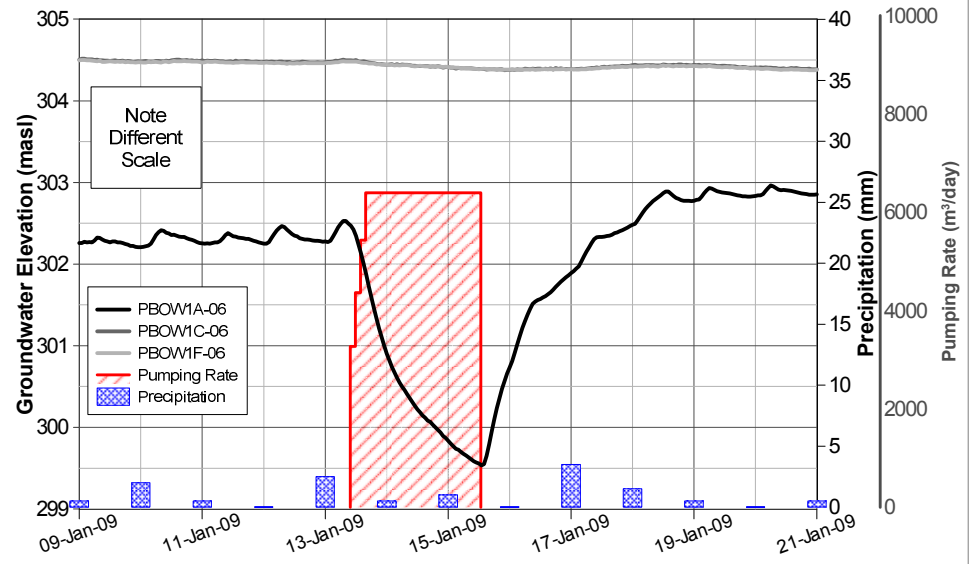
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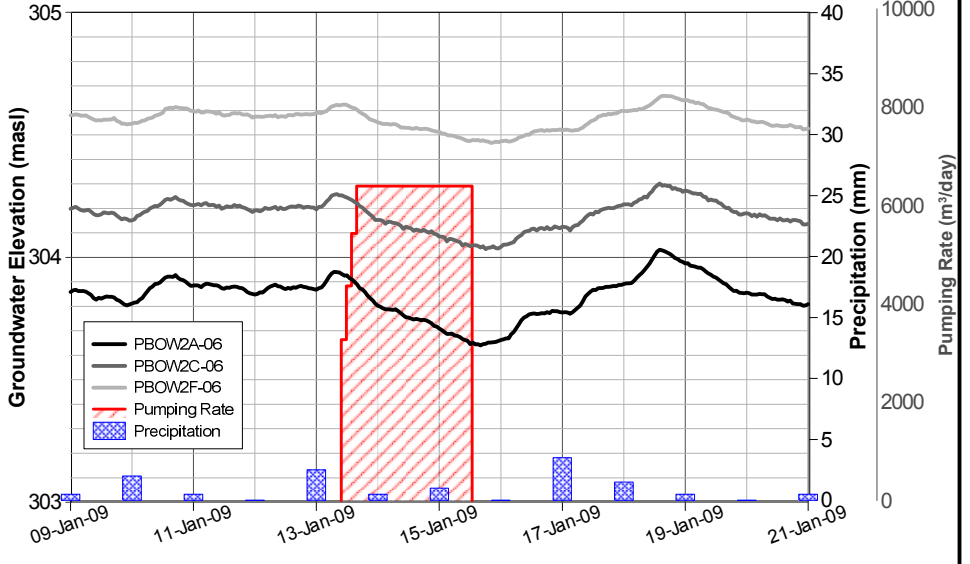
Phase III NDPW1-08 Pumping Test January 2009

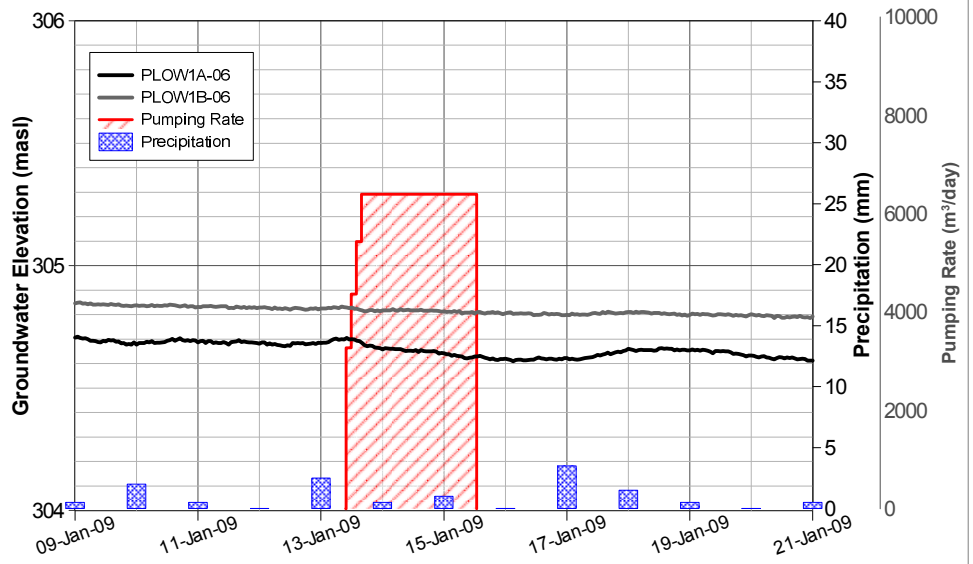
Clemens Mill Wellfield Monitors

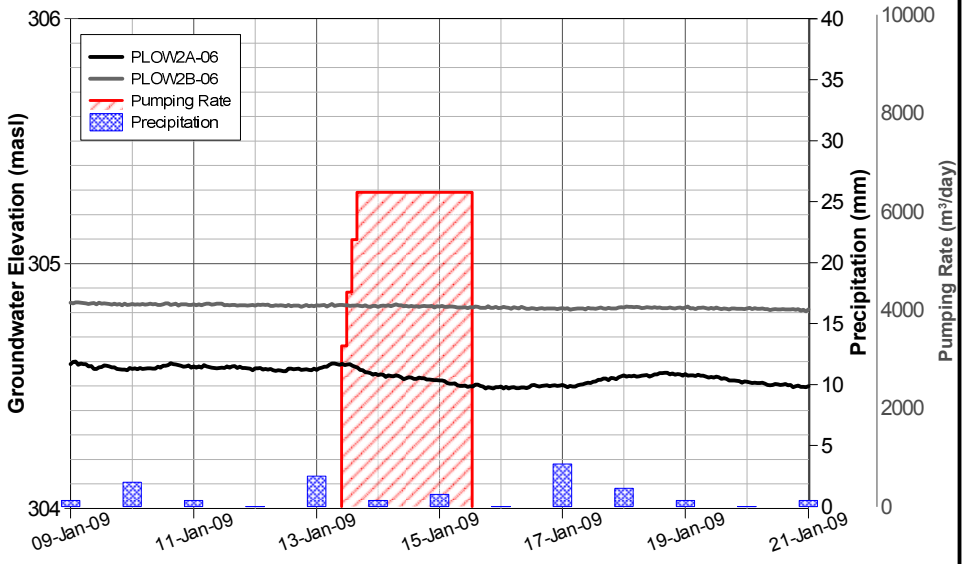
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.32









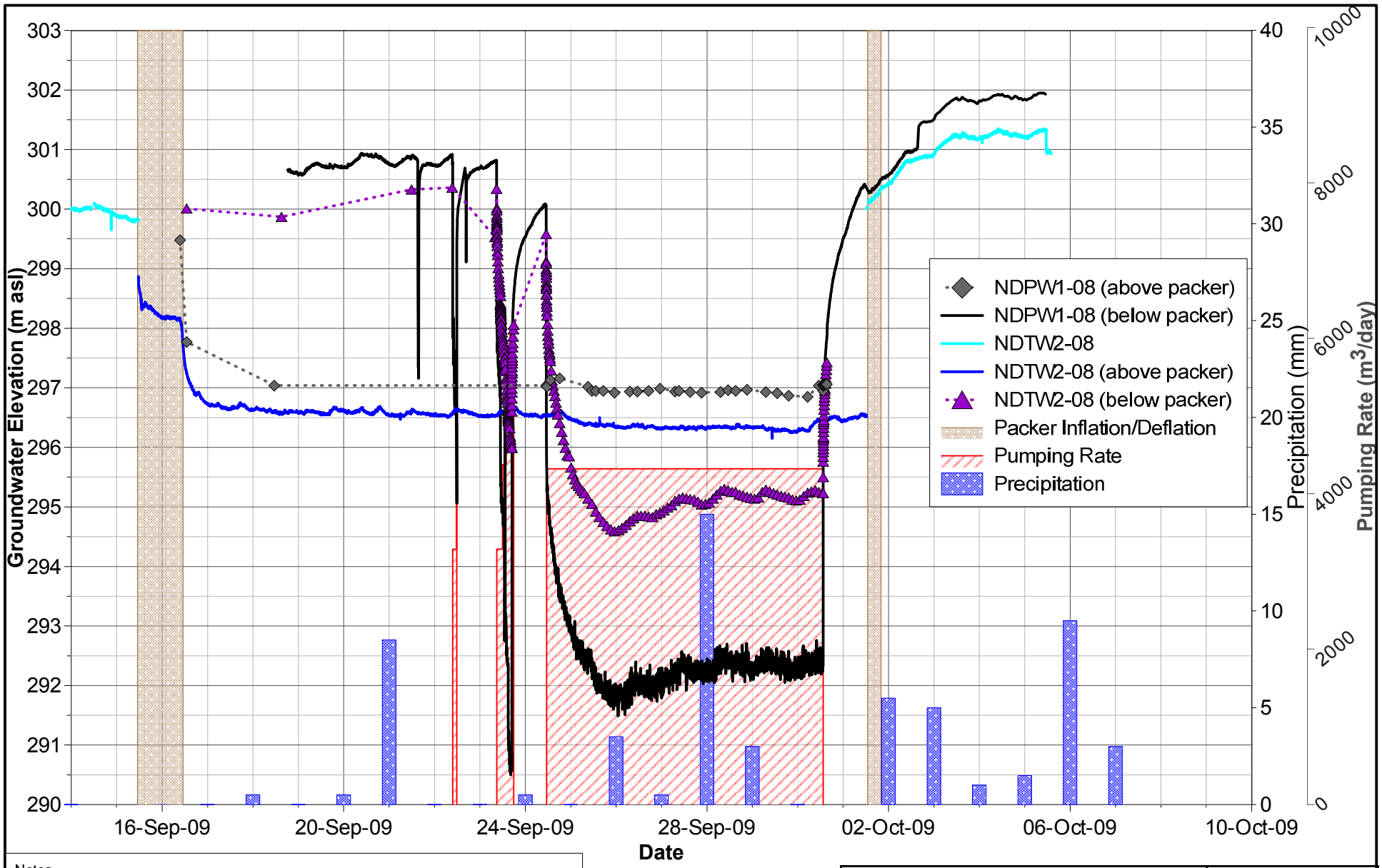
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Phase III NDPW1-08 Pumping Test January 2009

Pinebush Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.33



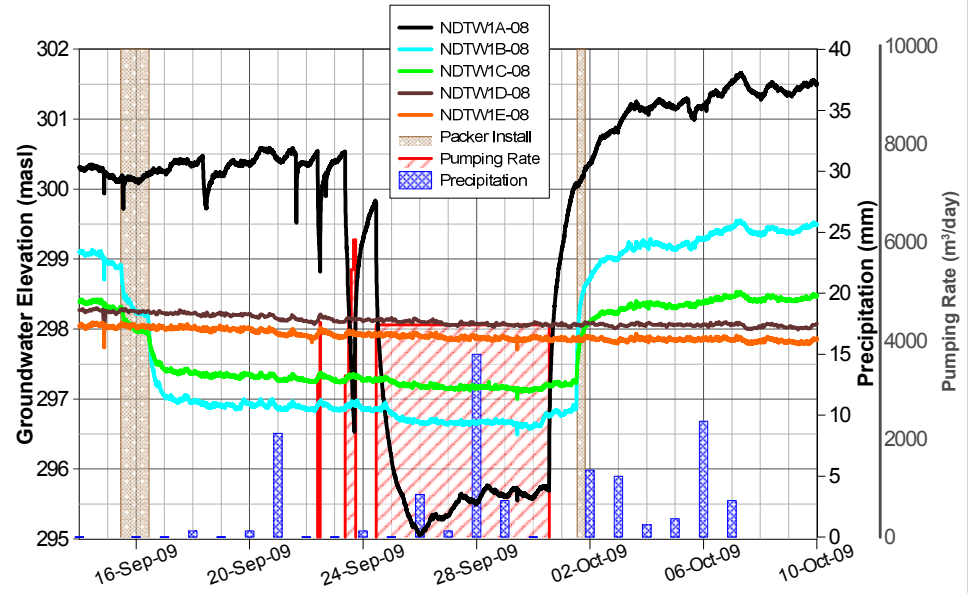
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1) The 6-day constant rate test at NDPW1-08 took place between Sept 24-30, 2009. at a rate of 4,321 m^3/day (50.0 L/s).
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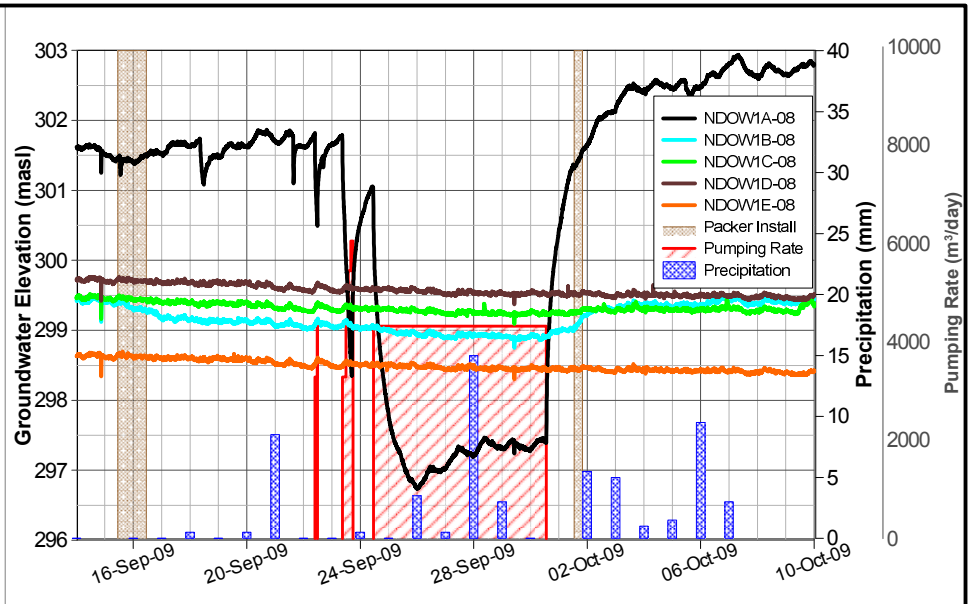
Phase III
NDPW1-08
Pumping Test
September 2009

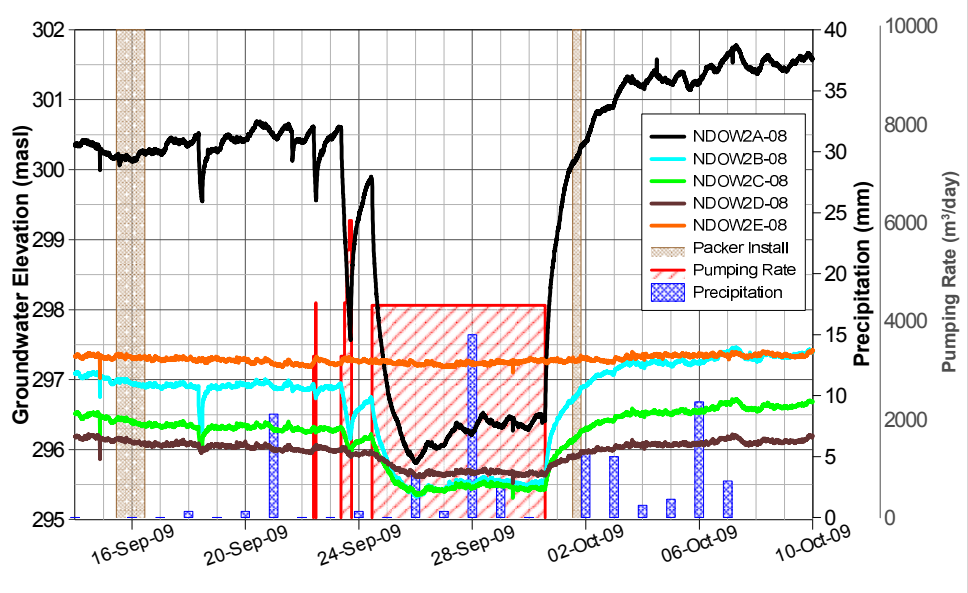
NDPW1-08 and NDTW2-08

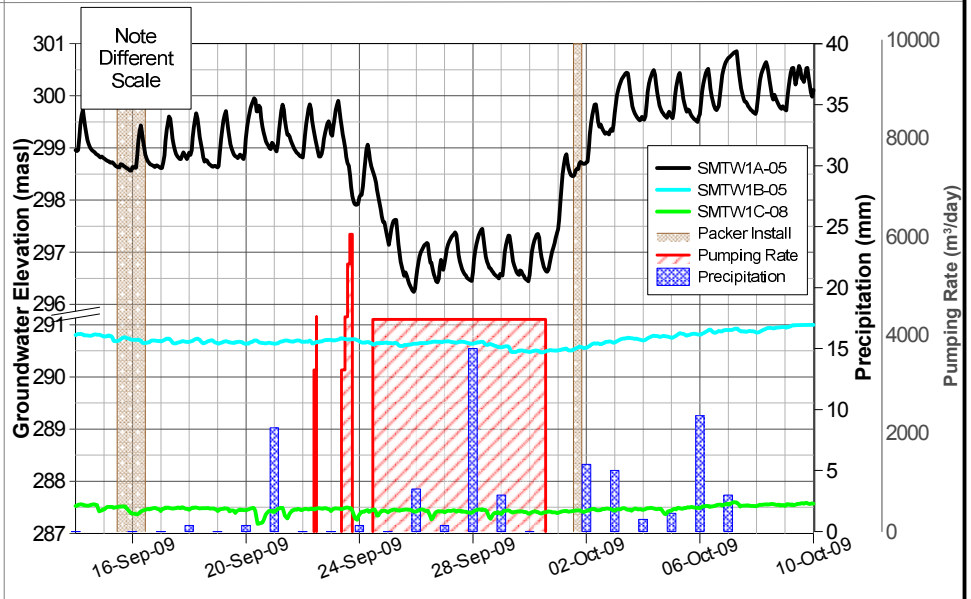
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.34









Notes:

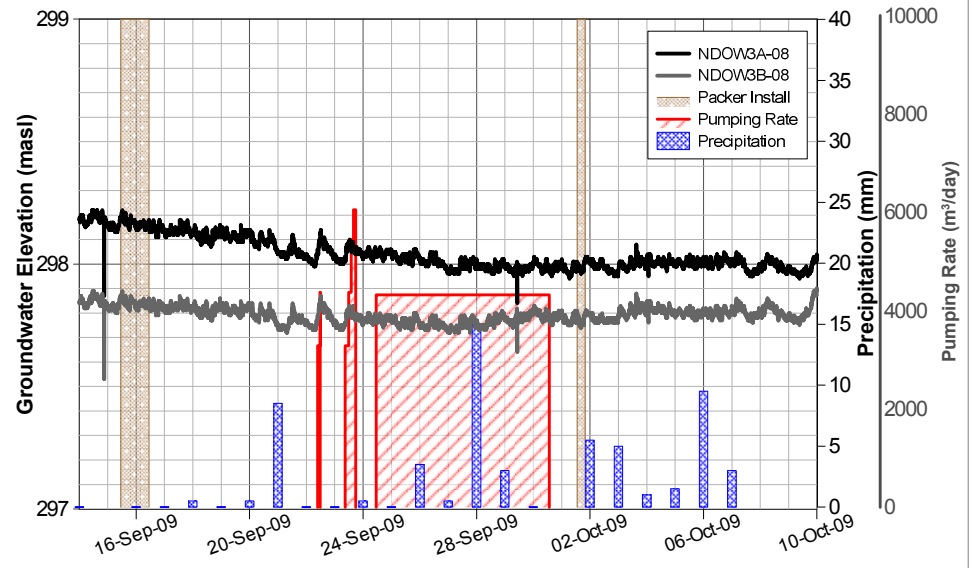
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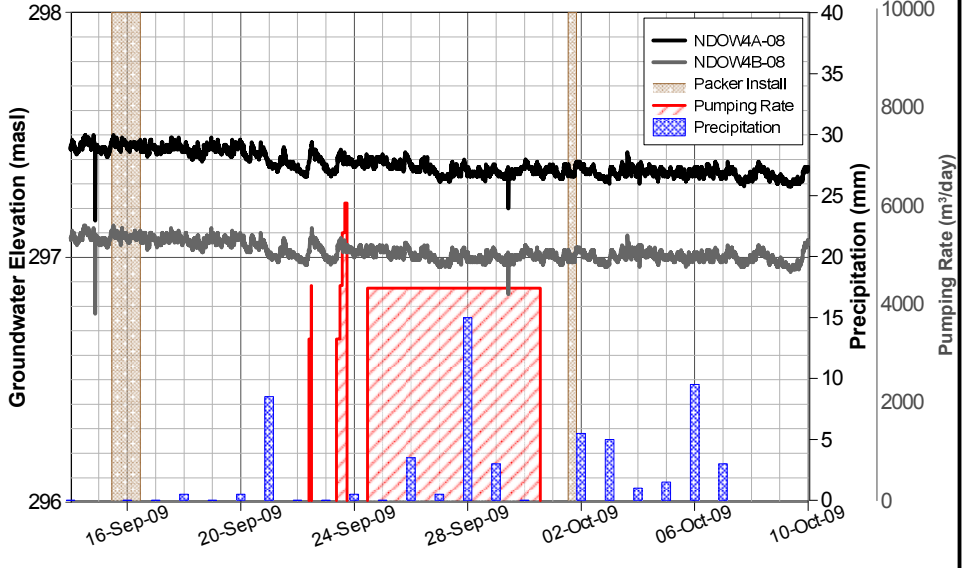
Phase III
NDPW1-08
Pumping Test
September 2009

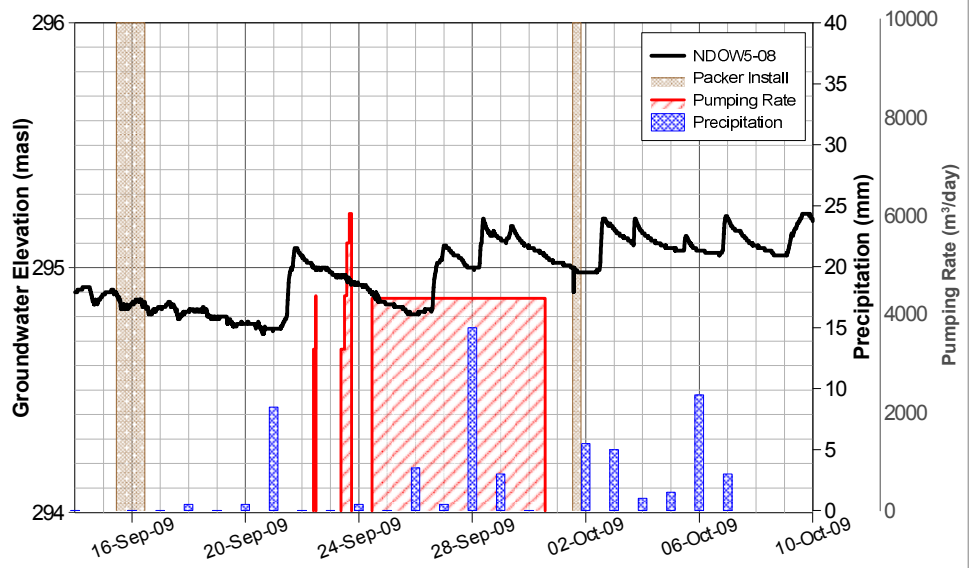
Monitors Near the Town of Clyde

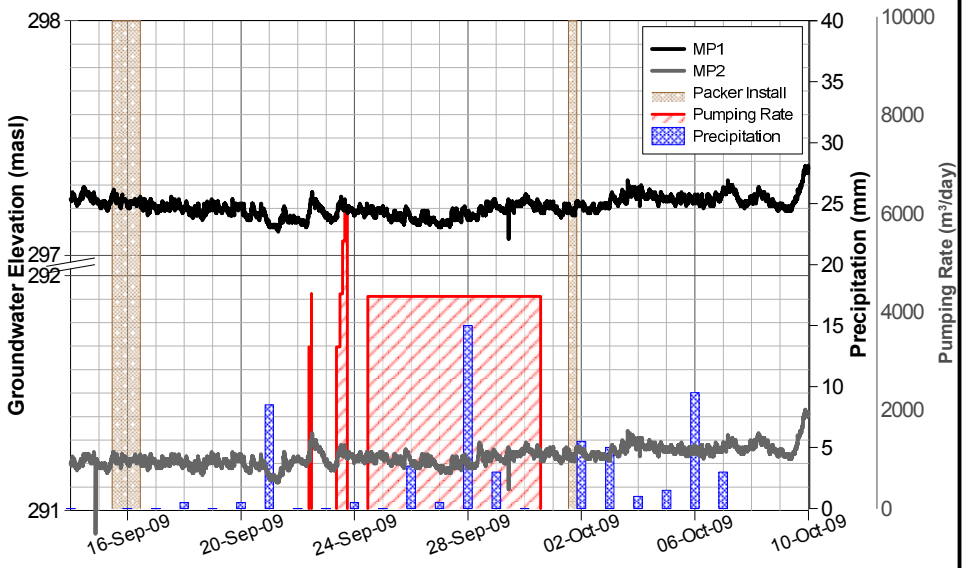
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.35









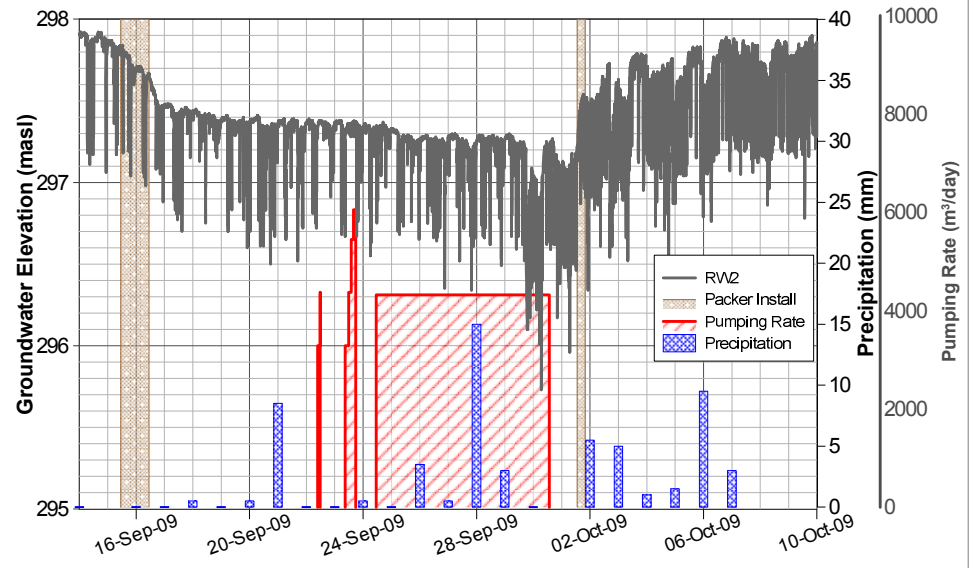
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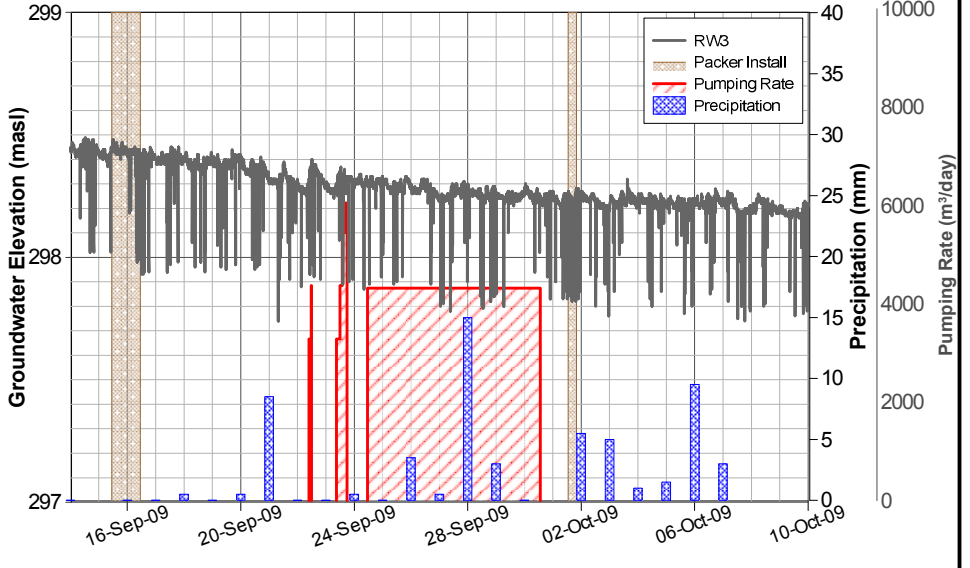
Phase III NDPW1-08 Pumping Test September 2009

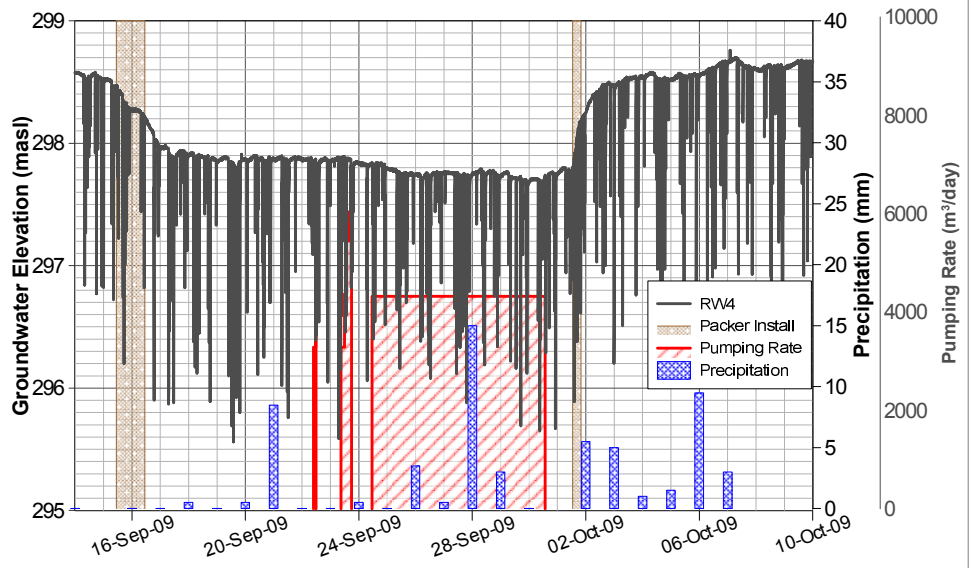
Monitors Near the Town of Clyde

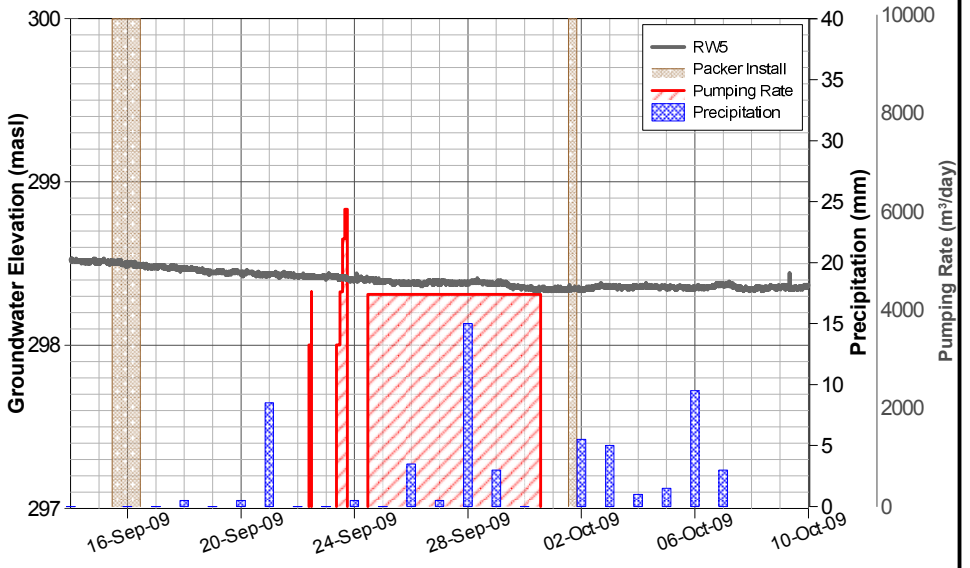
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.35









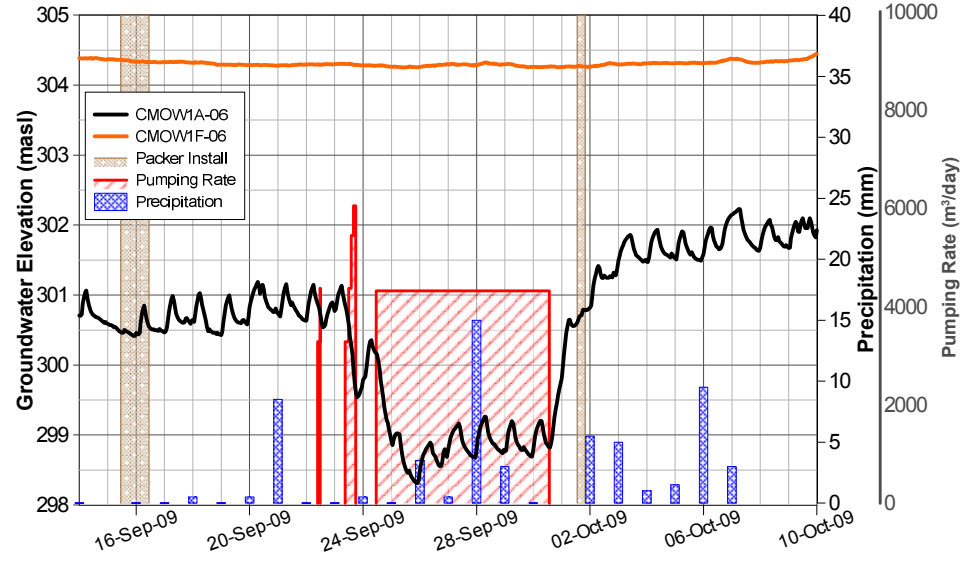
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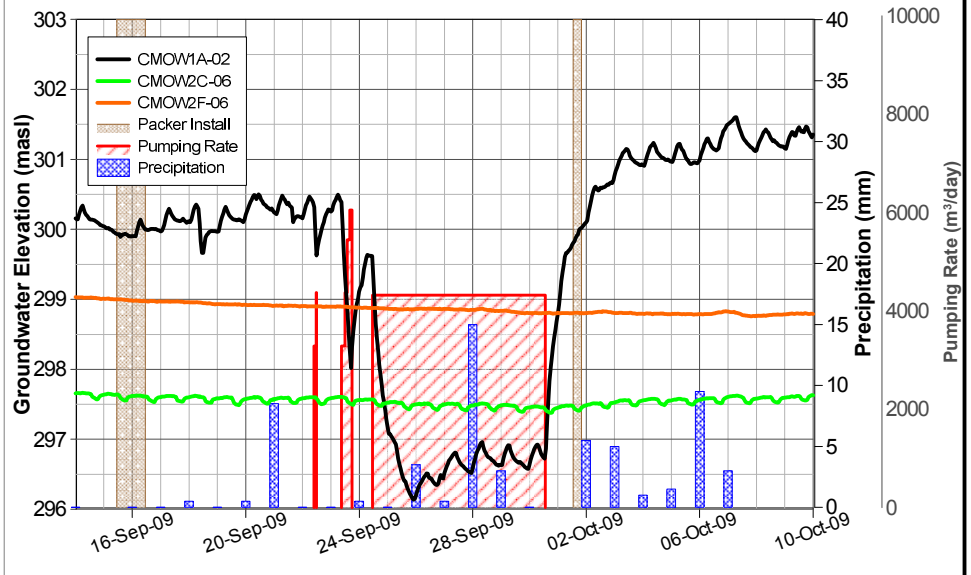
Phase III
NDPW1-08
Pumping Test
September 2009

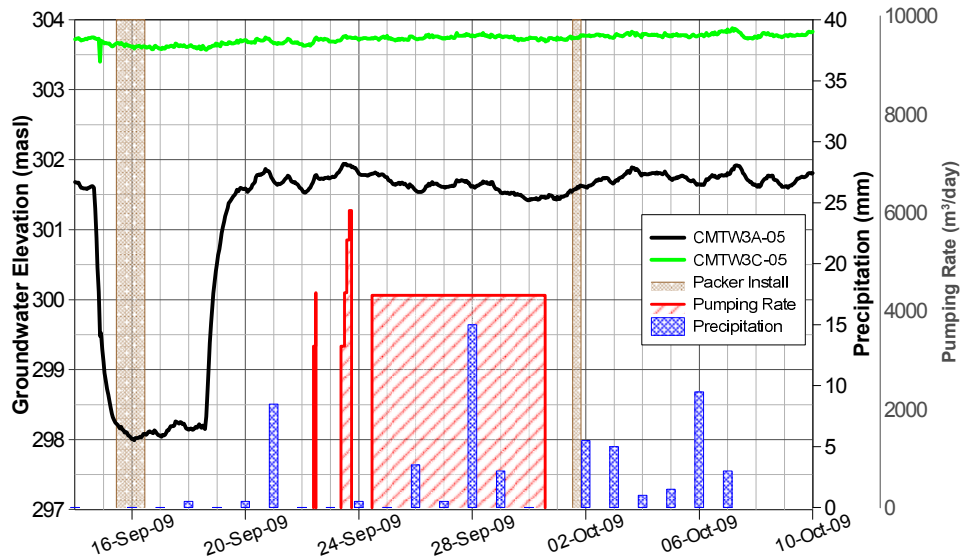
Private Wells
Town of Clyde

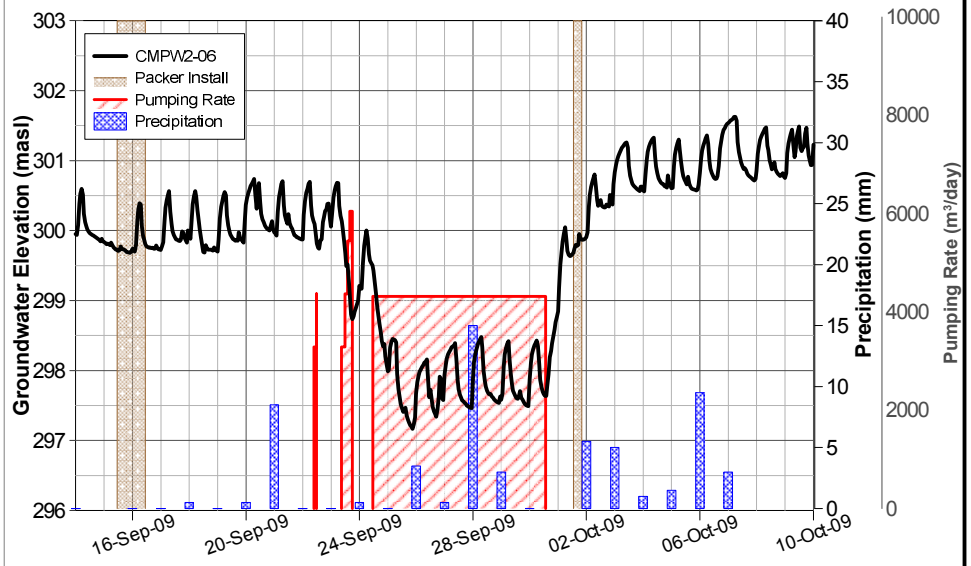
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.37









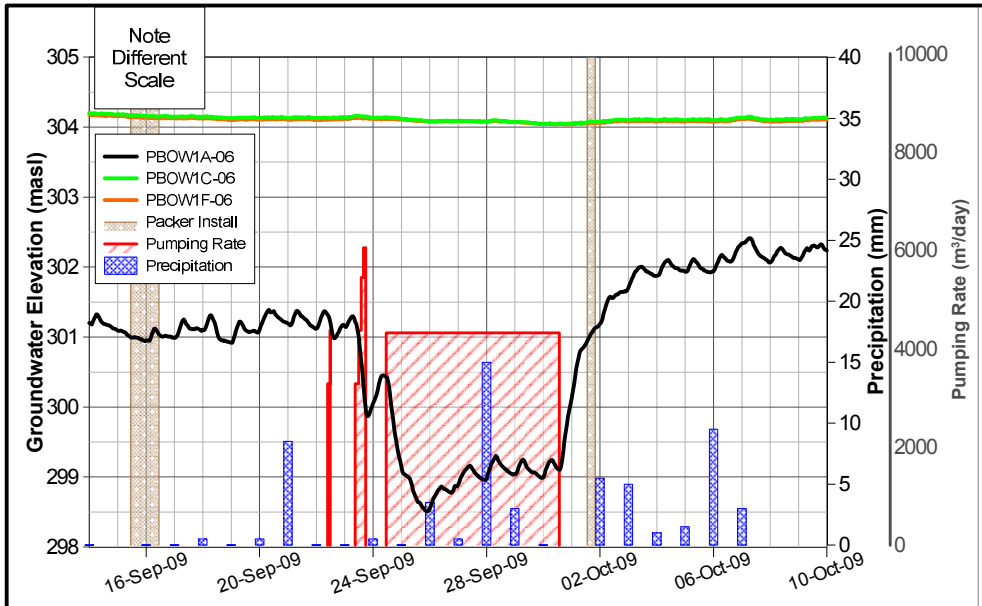
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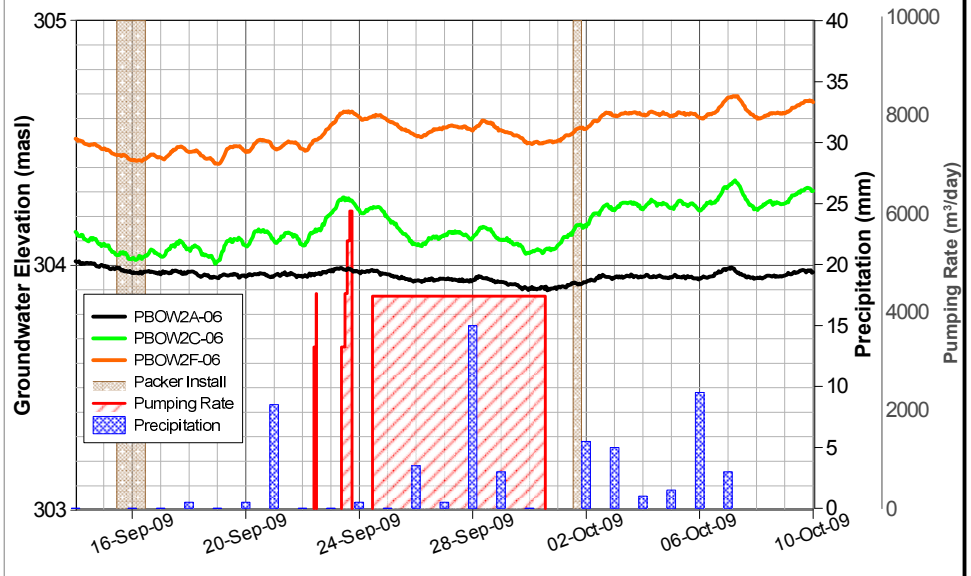
Phase III NDPW1-08 Pumping Test September 2009

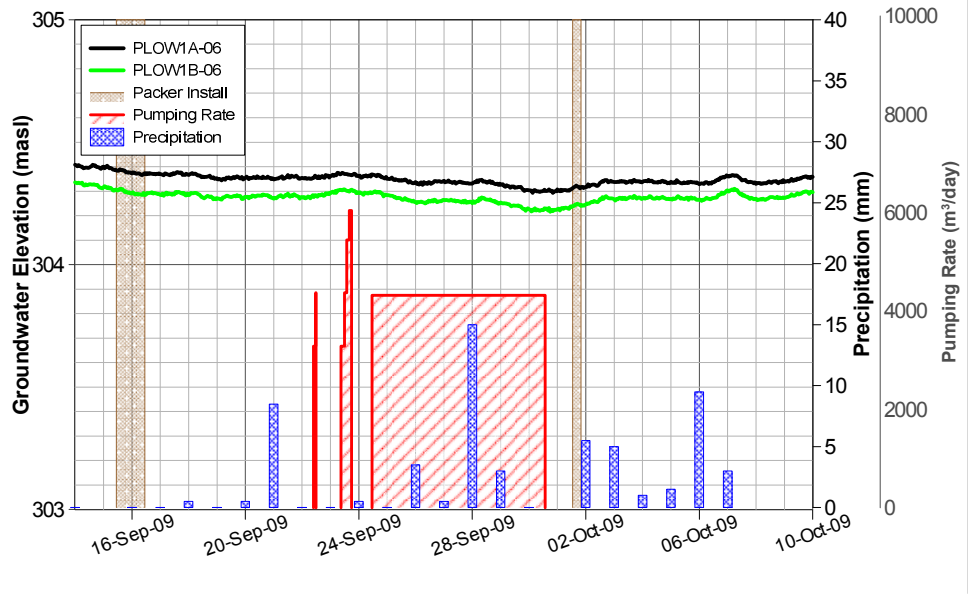
Clemens Mill Wellfield Monitors

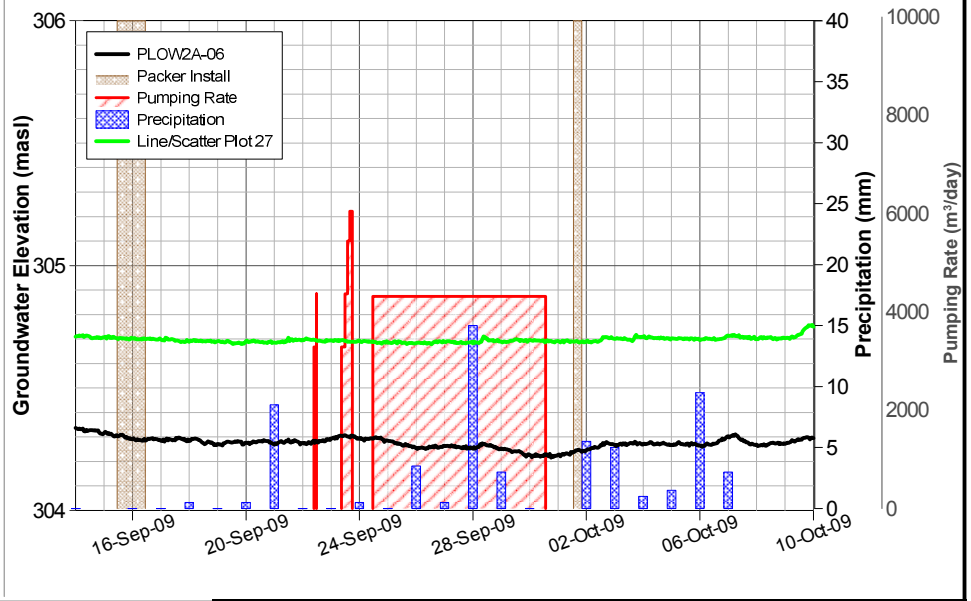
Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.38









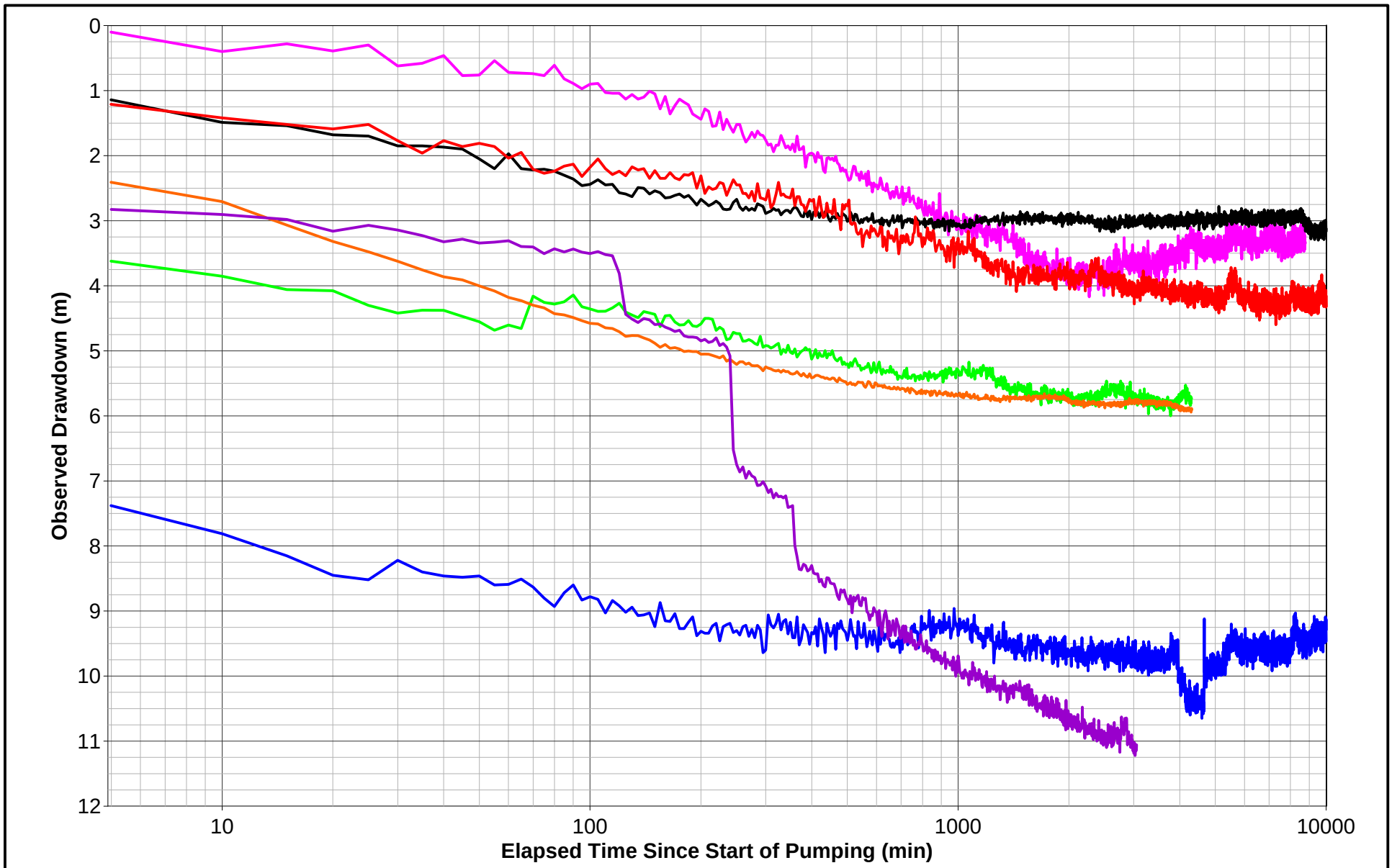
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Phase III NDPW1-08 Pumping Test September 2009

Pinebush Wellfield Monitors

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.39

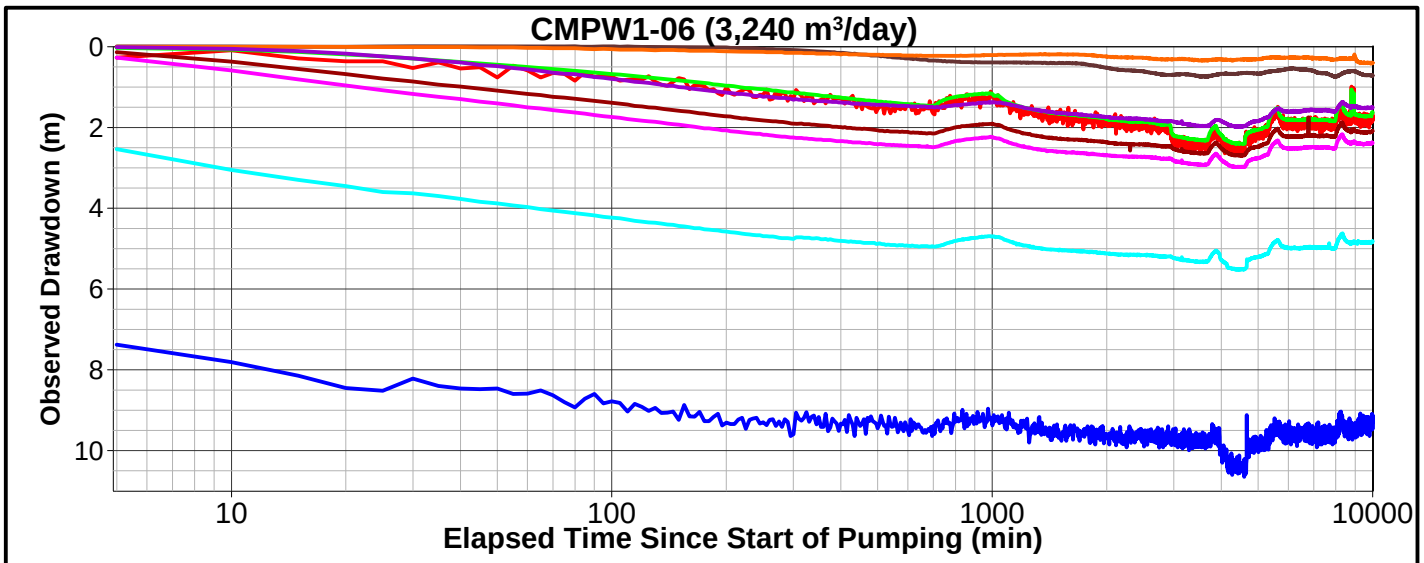


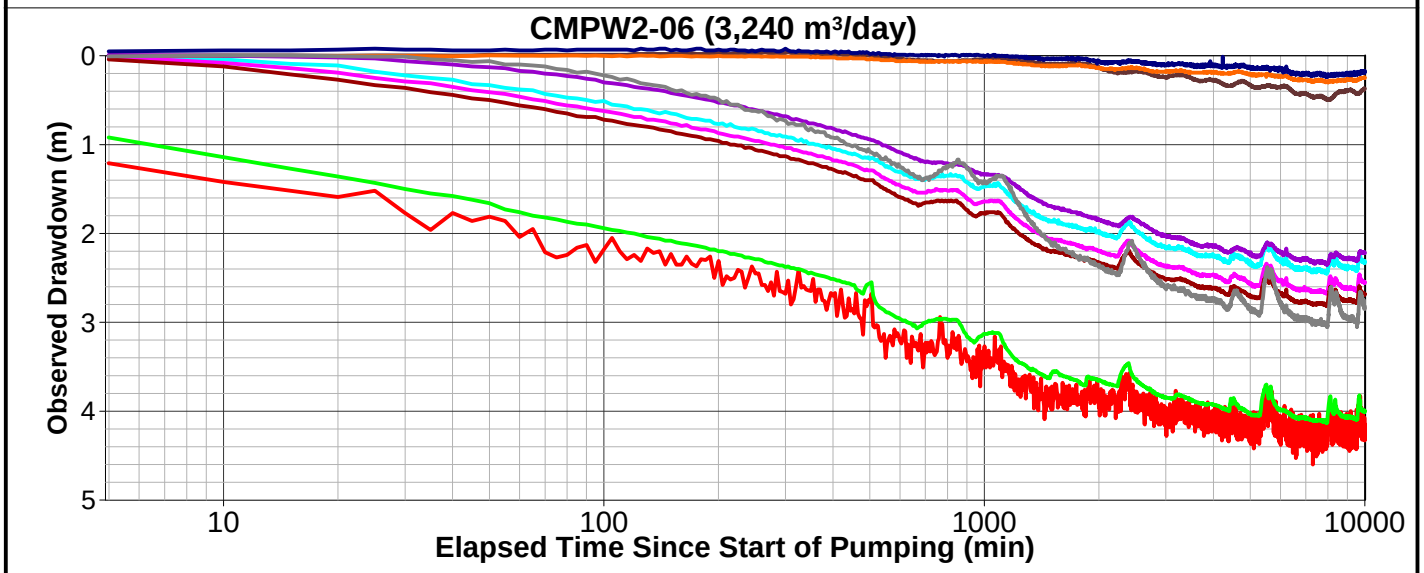
Cambridge East Water Supply Class EA

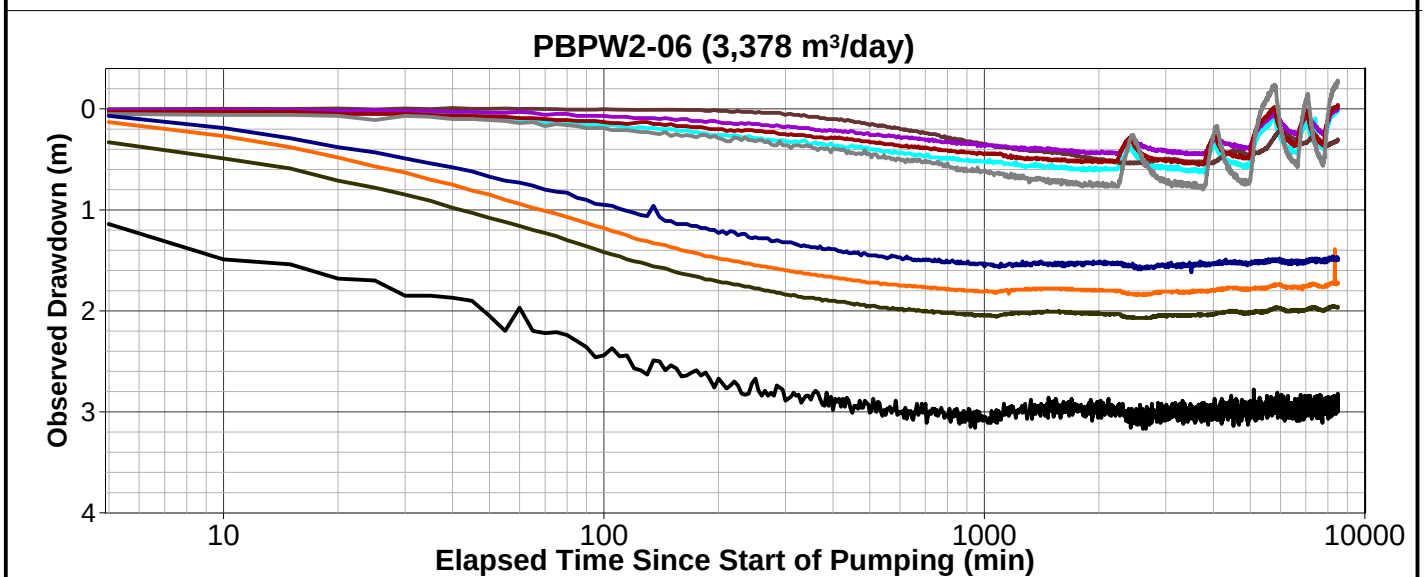
Test Production Well Comparison Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.40





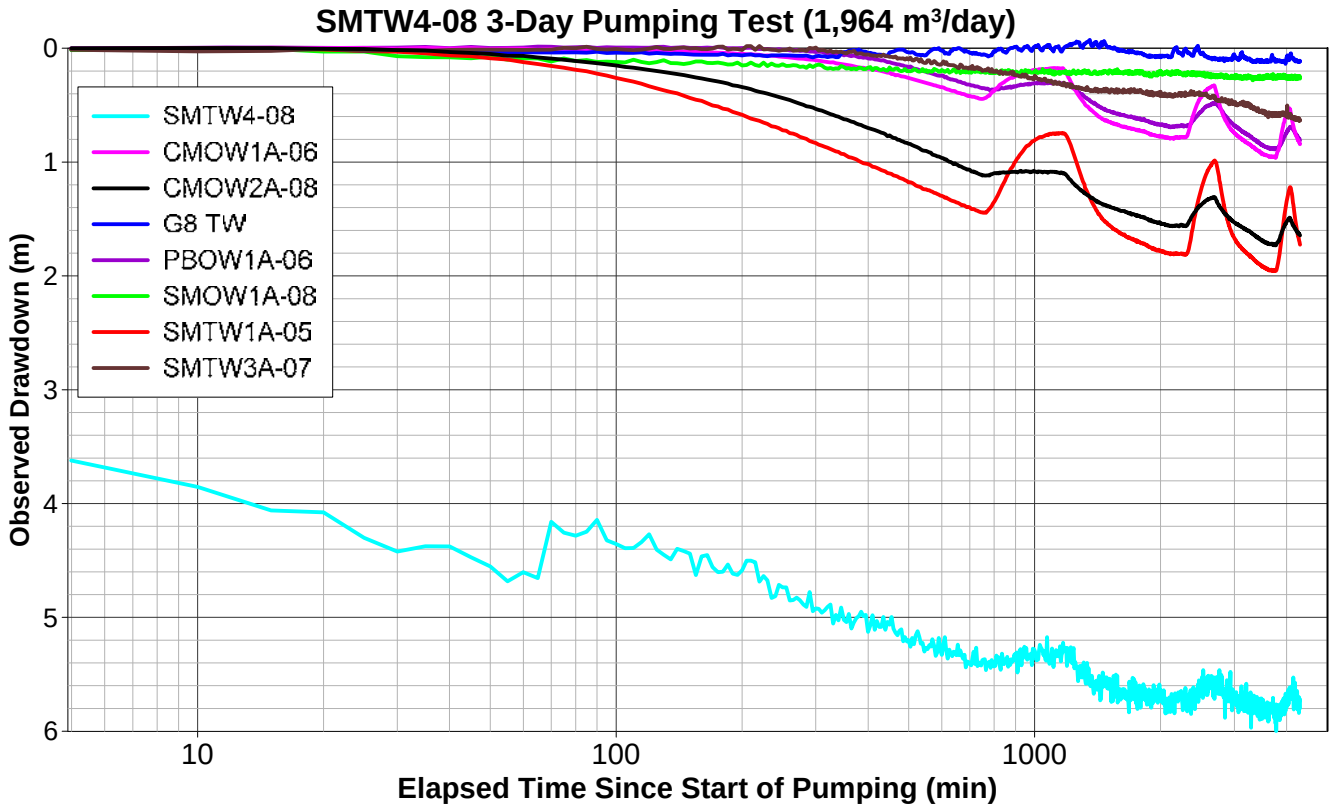


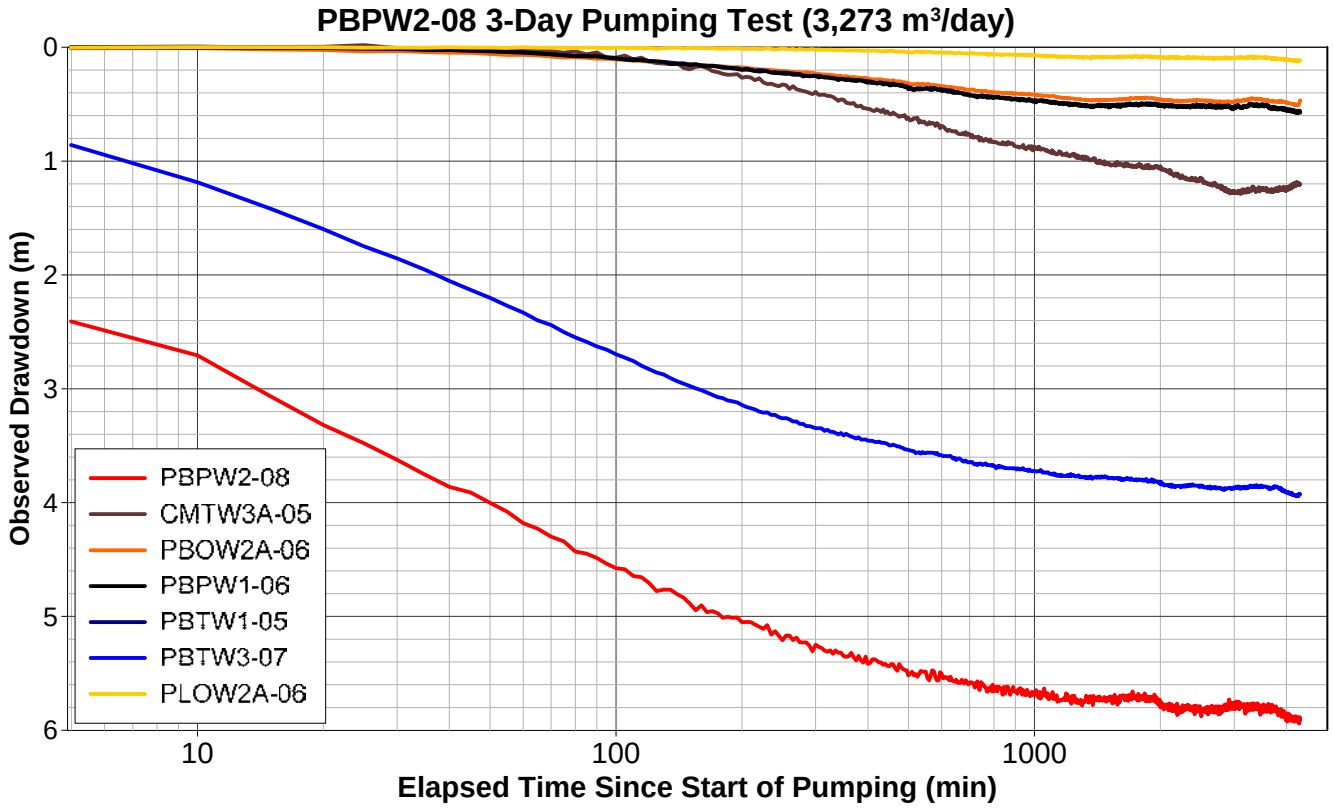
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CMPW2-06
PBPW1-06
CMOW1A-06
CMOW3A-06
CMTW1-05
CMTW2-05
CMTW3A-05
PBOW2A-06
PBOW1A-06
PBTW1-05
PBTW2-08
SMTW1A-05

28-Day Cambridge East Pumping Test
Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.41



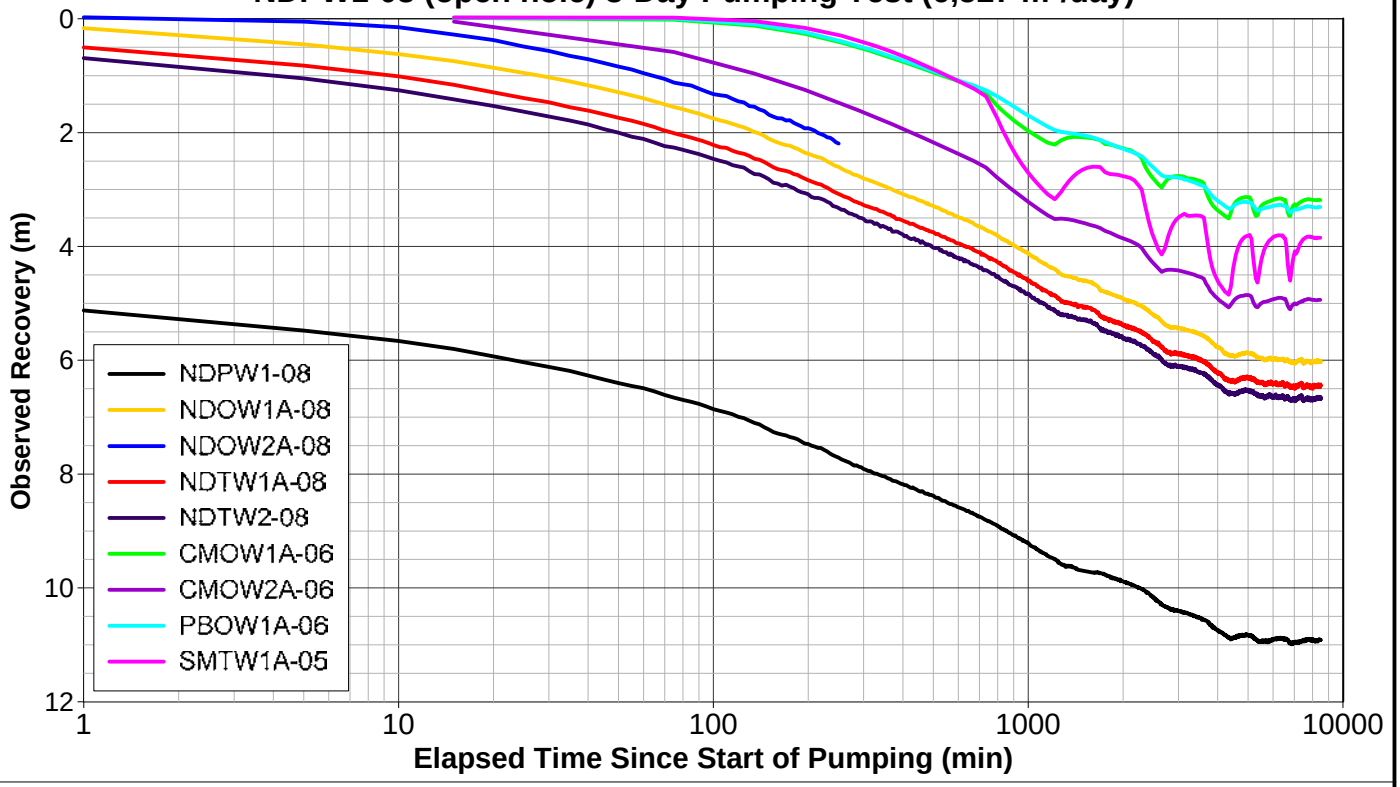


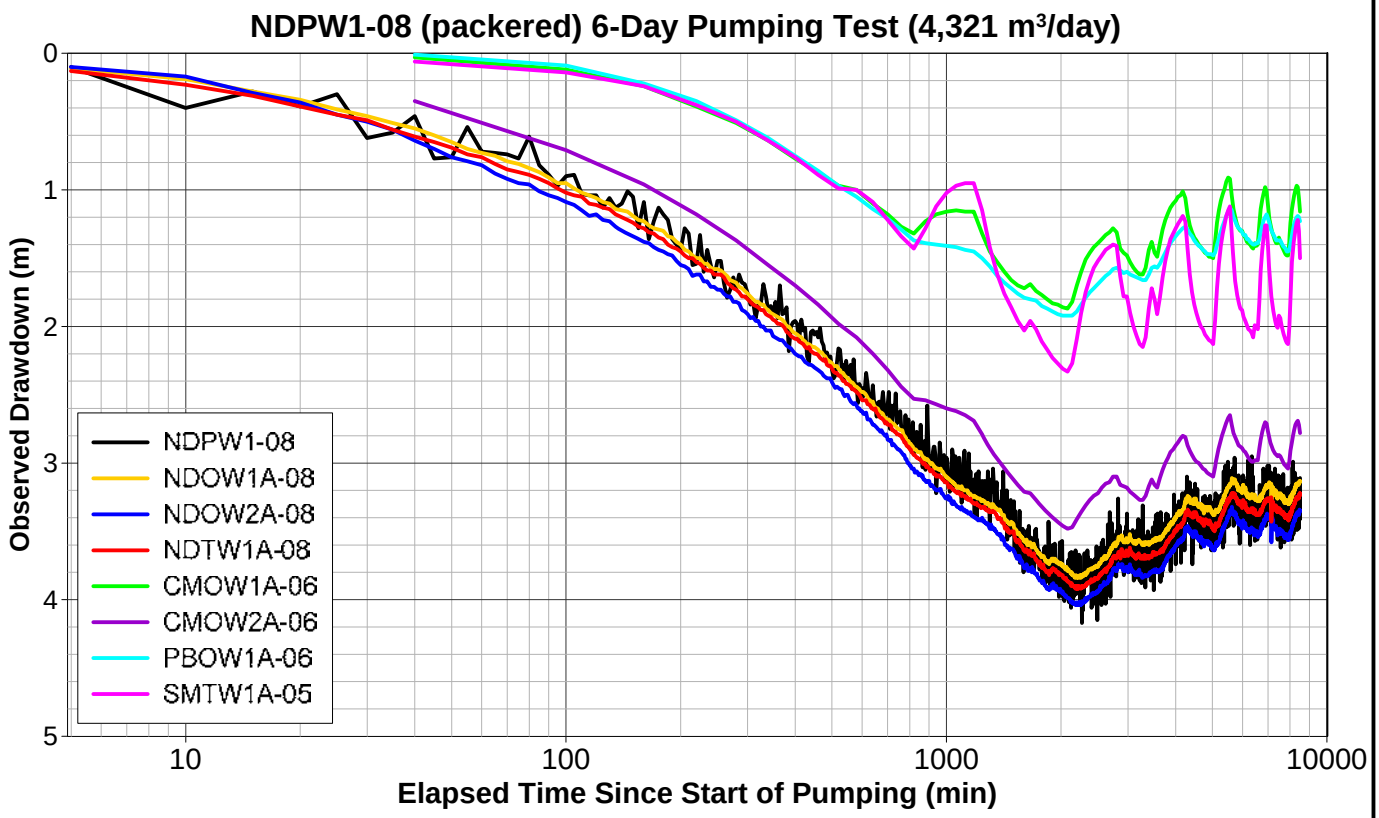
Cambridge East Water Supply Class EA

Phase II Cambridge East Pumping Tests Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.42



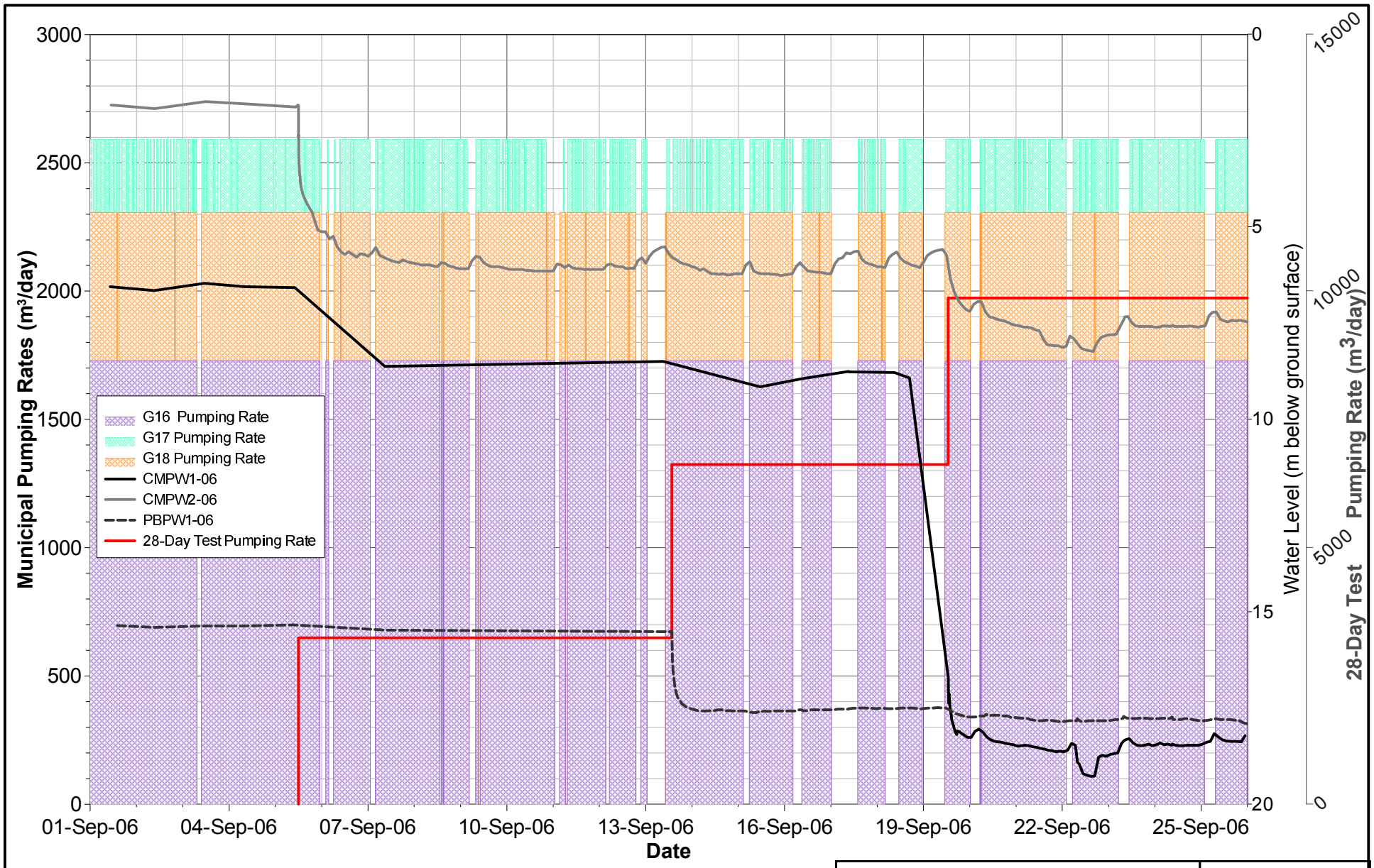


Cambridge East Water Supply Class EA

Phase III Cambridge East Pumping Tests Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.43



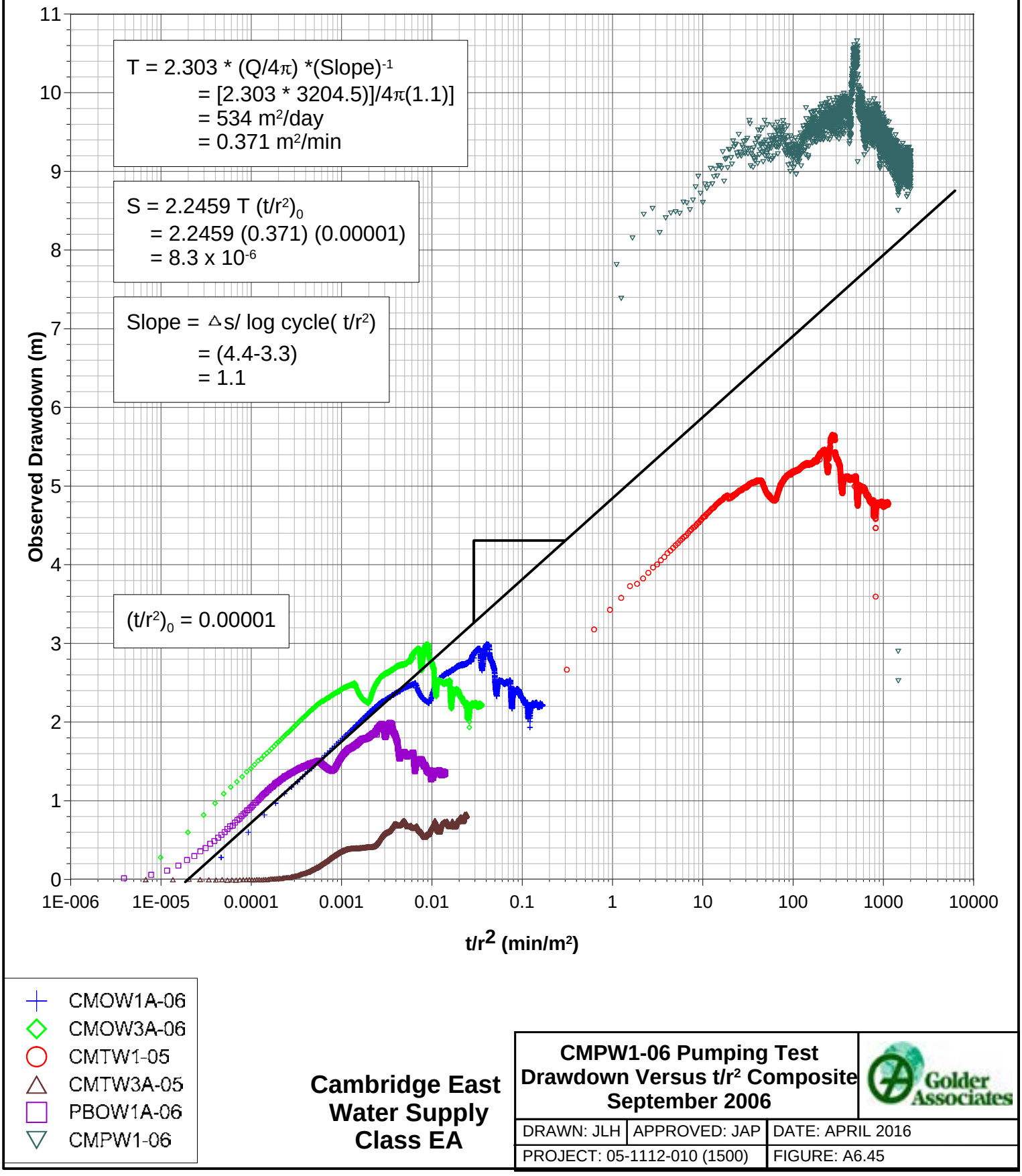
Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. CMPW2-06 started at 3,240 m³/day (37.5 L/s) on Sept 5, PBPW1-06 started at 3,378 m³/day (39.1 L/s) on Sept 13 and CMPW1-06 started at 3,240 m³/day (37.5 L/s) on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Phase I 28-Day Cambridge East Pumping Test

Municipal Production Well (G16, G17 and G18) Pumping Rates

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.44

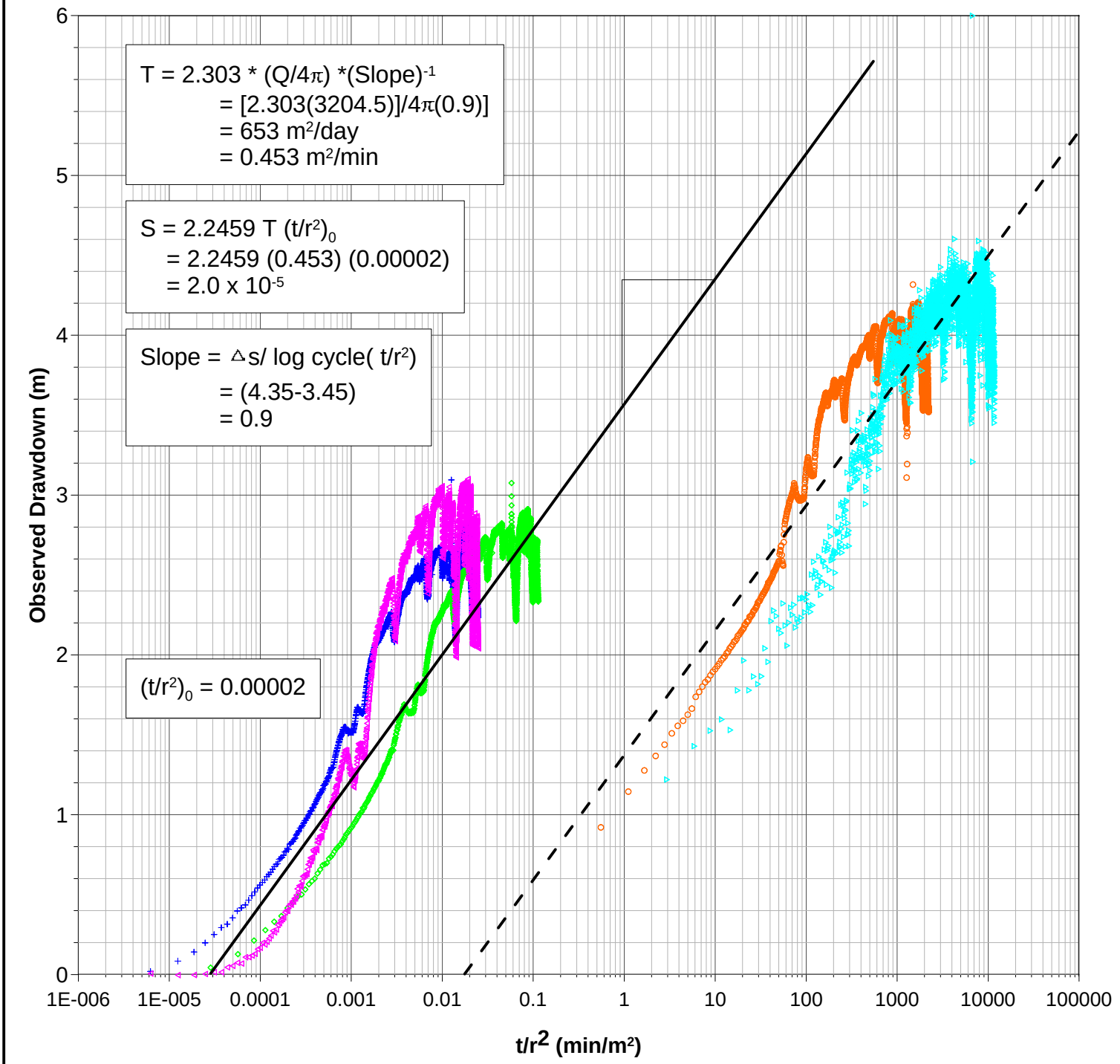


Cambridge East Water Supply Class EA

CMPW1-06 Pumping Test Drawdown Versus t/r² Composite September 2006

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.45



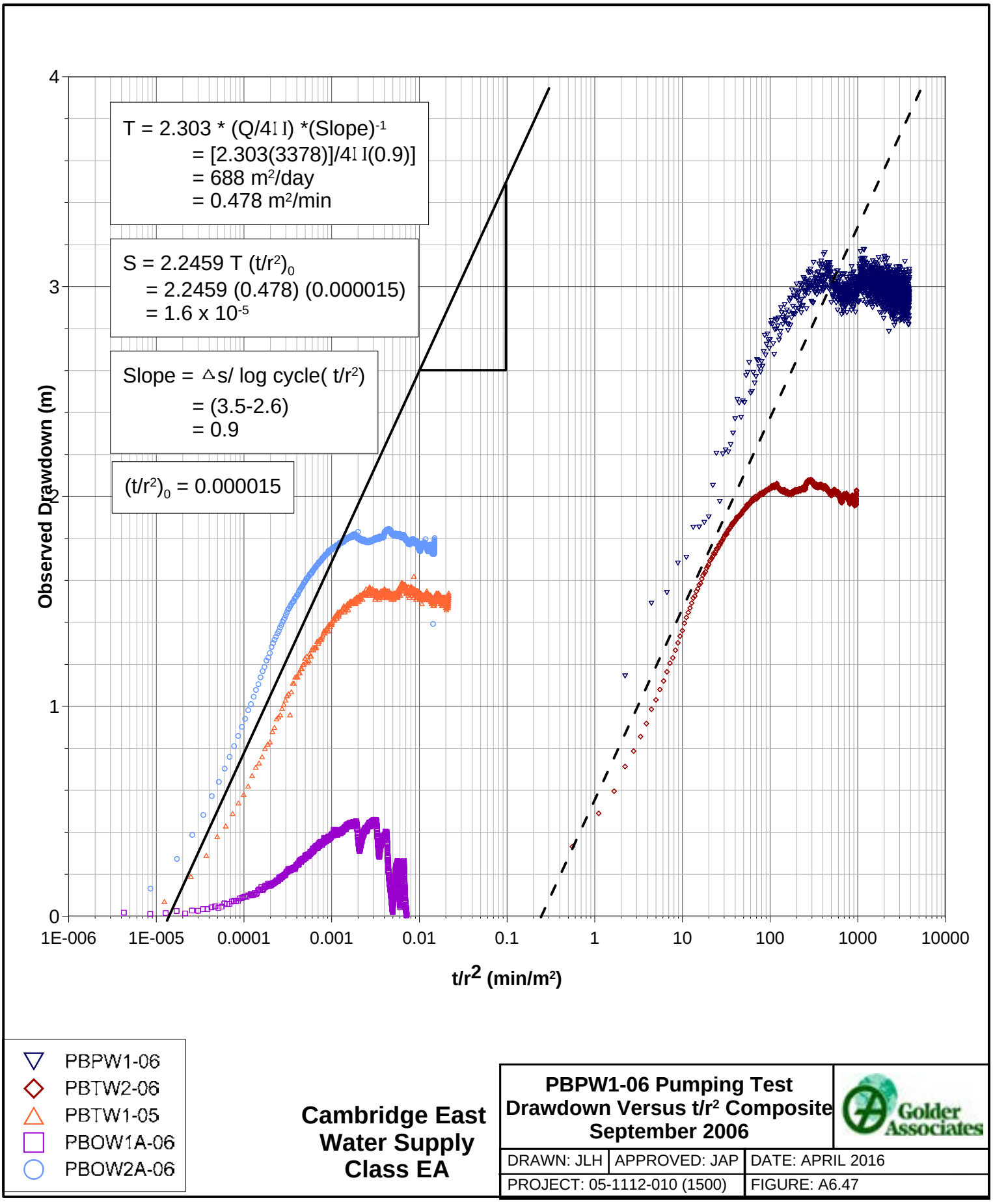
CMPW2-06
CMTW2-05
CMOW1A-06
CMOW3A-06
SMTW1A-05

Cambridge East Water Supply Class EA

CMPW2-06 Pumping Test Drawdown Versus t/r² Composite September 2006

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.46

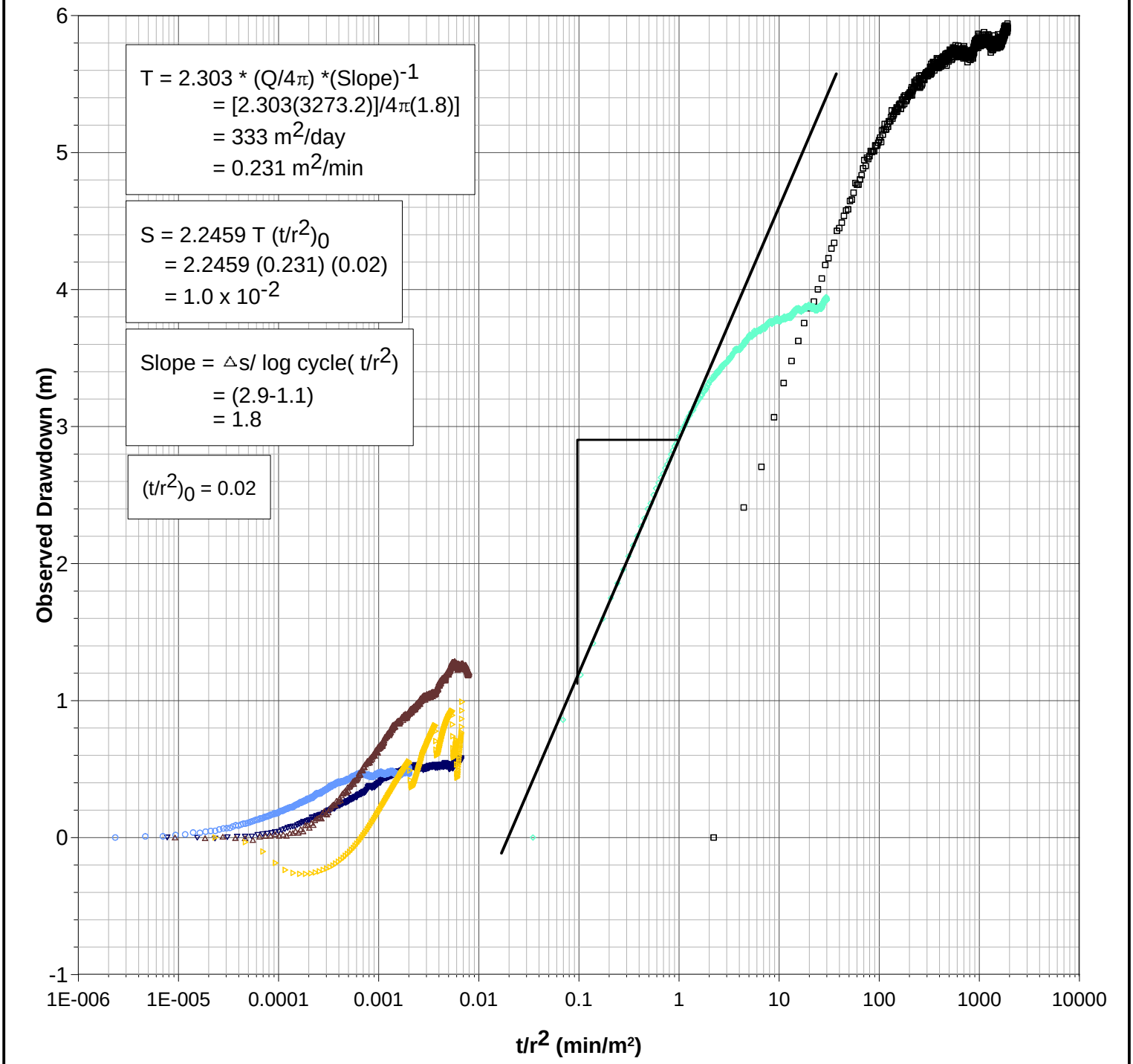


Cambridge East Water Supply Class EA

PBPW1-06 Pumping Test Drawdown Versus t/r² Composite September 2006

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.47



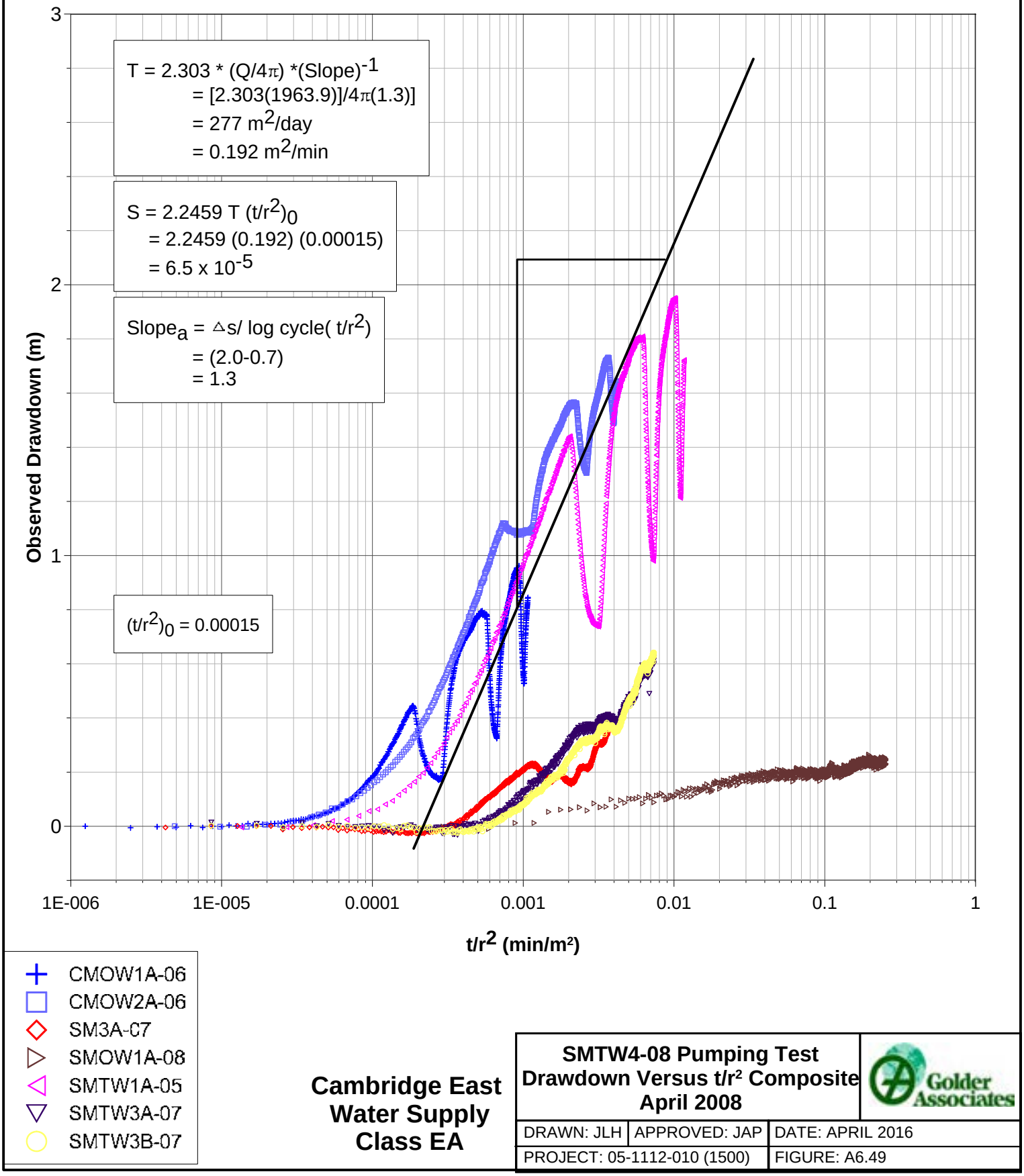
PBPW2-08
PBTW3-07
CMTW3A-05
OW1A-92
PBOW2A-06
PBPW1-06

Cambridge East Water Supply Class EA

PBPW2-08 Pumping Test Drawdown Versus t/r² Composite March 2008

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.48

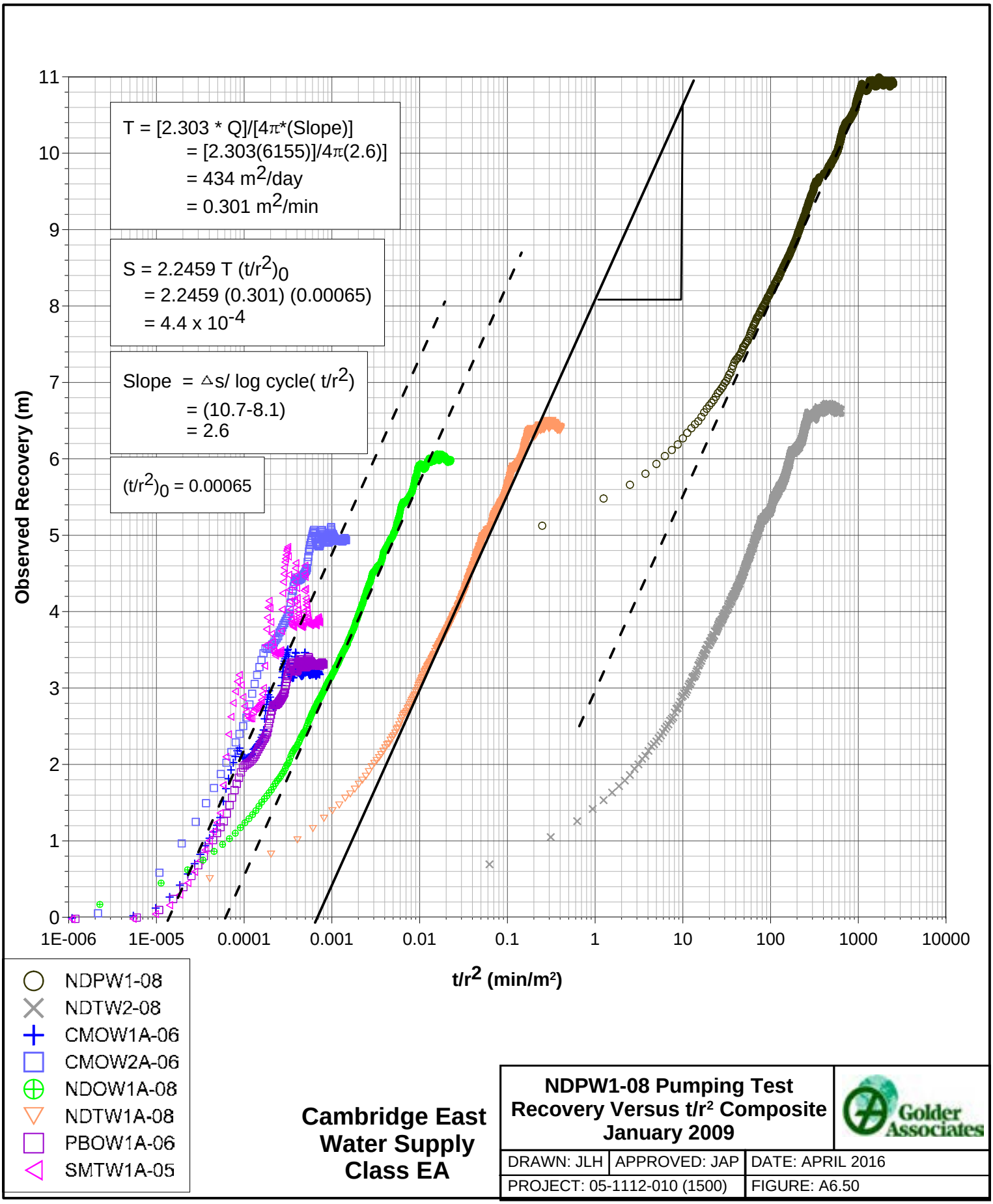


Cambridge East Water Supply Class EA

SMTW4-08 Pumping Test Drawdown Versus t/r² Composite April 2008

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.49

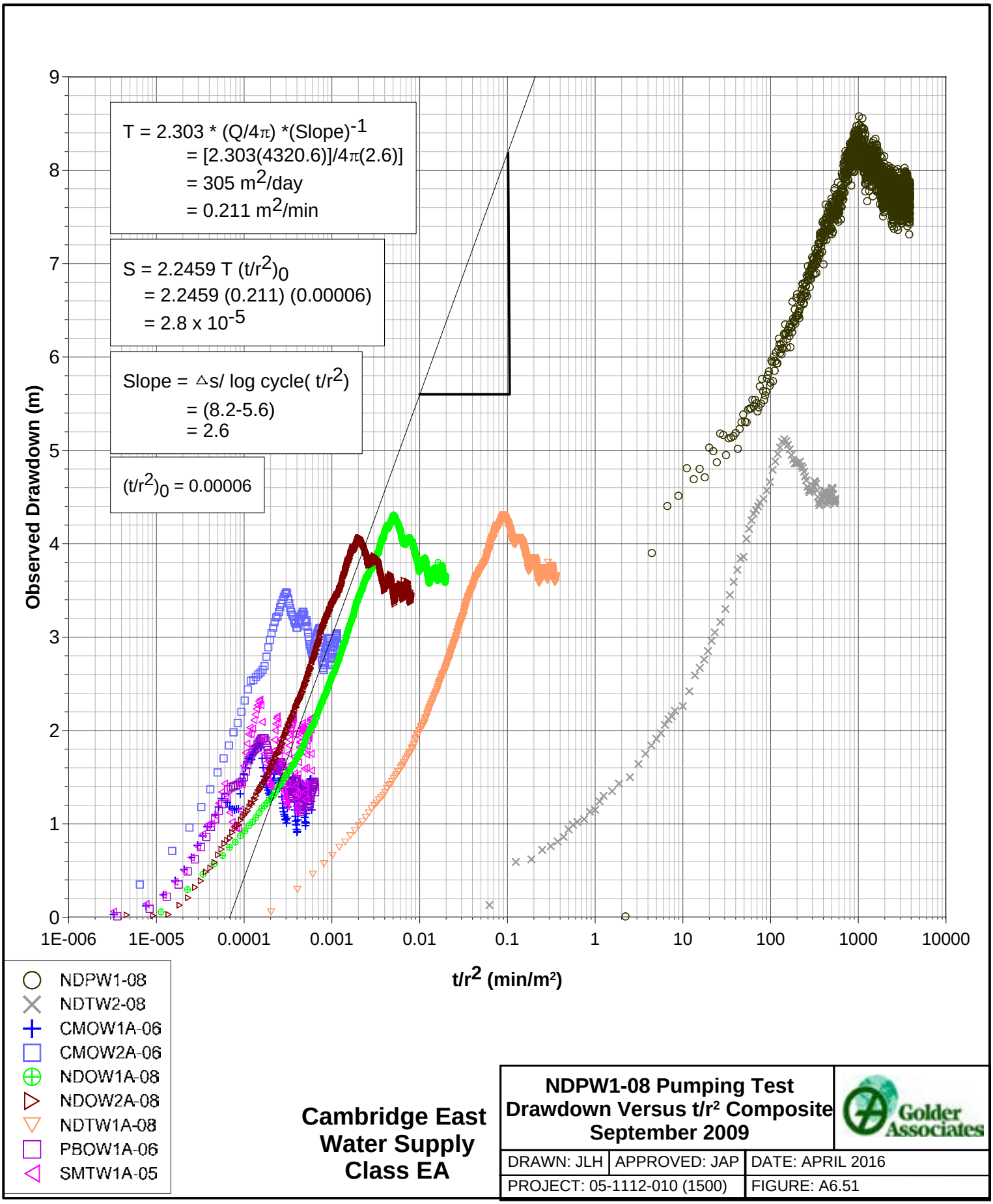


Cambridge East Water Supply Class EA

NDPW1-08 Pumping Test Recovery Versus t/r² Composite January 2009

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.50



Cambridge East Water Supply Class EA

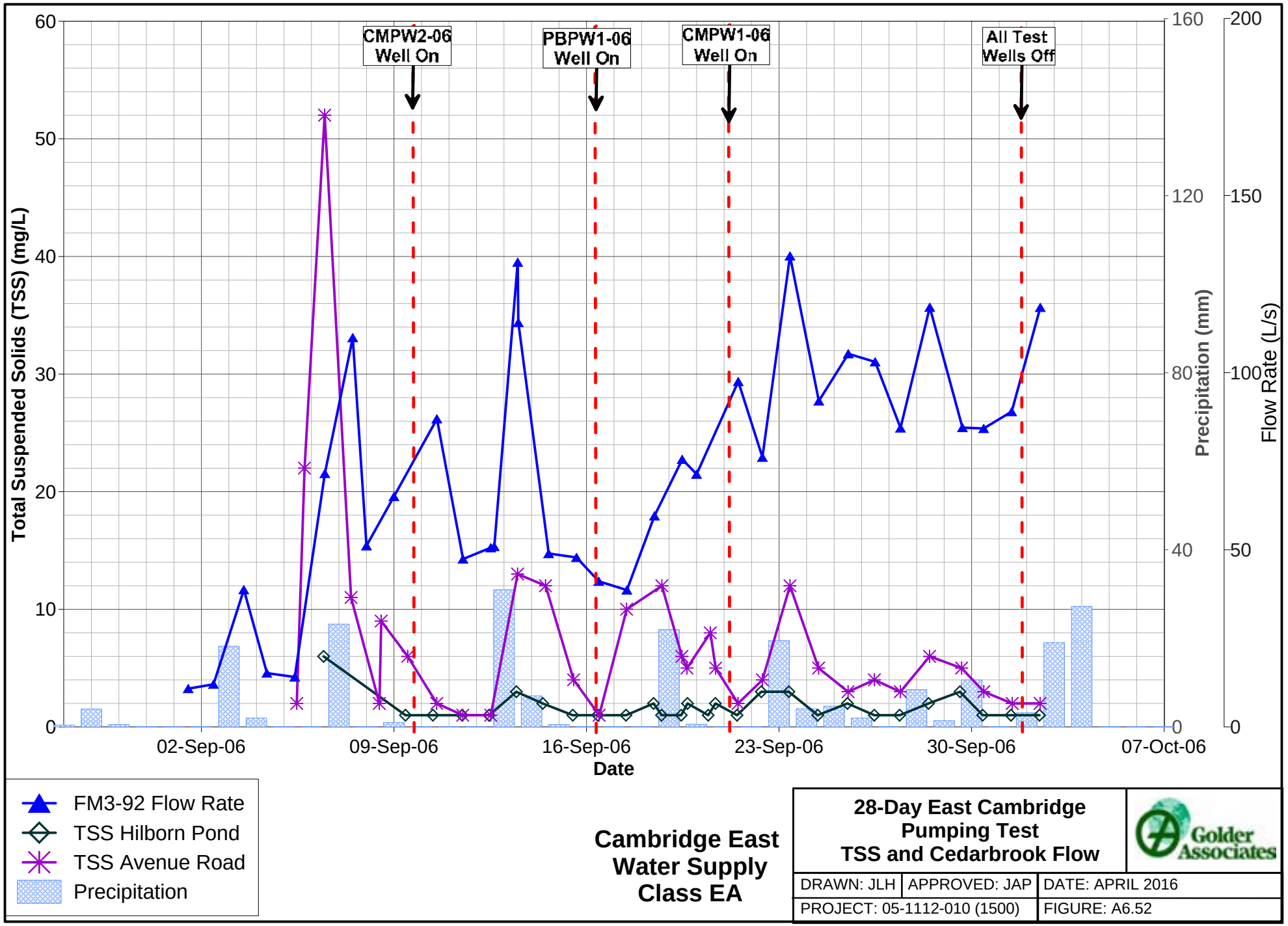
NDPW1-08 Pumping Test Drawdown Versus t/r² Composite September 2009

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.51

Table 6.1
Cedarbrook Creek
Total Suspended Solids Results Summary

Sampling Location			
Hilborn Pond Discharge		**Avenue Road**	
Date Time	**TSS (mg/l)**	**Date Time**	**TSS (mg/l)**
09/05/2005 11:50	3	09/05/2006 11:15	2
09/05/2005 17:50	2	09/05/2006 18:00	22
09/06/2006 10:40	6	09/06/2006 11:30	52
09/07/2007 11:45	1	09/07/2006 10:35	11
09/08/2008 14:50	6	09/08/2006 11:15	2
09/09/2006 10:00	1	09/08/2006 12:55	9
09/10/2006 10:00	1	09/09/2006 12:00	6
09/11/2006 11:30	1	09/10/2006 13:25	2
09/12/2006 11:00	1	09/11/2006 12:00	1
09/13/2006 10:45	3	09/12/2006 12:30	1
09/14/2006 9:45	2	09/13/2006 11:50	13
09/15/2006 12:00	1	09/14/2006 12:15	12
09/16/2006 9:45	1	09/15/2006 12:45	4
09/17/2006 10:30	1	09/16/2006 11:00	1
09/18/2006 10:30	2	09/17/2006 11:00	10
09/18/2006 17:30	1	09/18/2006 17:45	12
09/19/2006 10:40	1	09/19/2006 11:15	6
09/19/2006 16:05	2	09/19/2006 15:40	5
09/20/2006 10:10	1	09/20/2006 12:00	8
09/20/2006 16:30	2	09/20/2006 16:45	5
09/21/2006 11:20	1	09/21/2006 12:10	2
09/22/2006 8:30	3	09/22/2006 9:30	4
09/23/2006 8:30	3	09/23/2006 9:30	12
09/24/2006 9:45	1	09/24/2006 10:30	5
09/25/2006 11:40	2	09/25/2006 12:10	3
09/26/2006 11:05	1	09/26/2006 11:10	4
09/27/2006 9:15	1	09/27/2006 9:50	3
09/28/2006 10:25	2	09/28/2006 11:20	6
09/29/2006 13:50	3	09/29/2006 15:15	5
09/30/2006 9:40	1	09/30/2006 10:40	3
10/01/2006 10:15	1	10/01/2006 11:20	2
10/02/2006 11:15	1	10/02/2006 11:45	2



Cambridge East Water Supply Class EA

28-Day East Cambridge Pumping Test TSS and Cedarbrook Flow

Golder Associates

DRAWN: JLH	APPROVED: JAP	DATE: APRIL 2016
PROJECT: 05-1112-010 (1500)		FIGURE: A6.52

TECHNICAL MEMORANDUM

Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON, Canada L5N 5Z7
Telephone: 905-567-4444
Fax Access: 905-567-6561

TO:	Kevin Trimble	**DATE:**	September 5, 2006
FROM:	T.C. den Haas	**JOB NO:**	051112010
EMAIL:	tdenhaas@golder.com		
RE:	September 1, 2006 Fish Inventory, Cedarbrook Creek, Cambridge, Ontario.		

This technical memo describes the fish inventory of Cedarbrook Creek done on Friday September 1st 2006 by Taco den Haas and Derek Morningstar. The purpose of the survey was to make an inventory of fish species in Cedarbrook creek. The inventory is required to determine the impact of pumping water into the creek by the pumping test starting on September 5th, 2006.

Cedarbrook Creek was surveyed at three stations between Hillborn pond at the upstream end and the confluence with Mill Creek at the Downstream end. Station one was at the confluence of Mill Creek and Cedarbrook Creek. Station three was at the outflow of Hillborn Pond. Station two was between these two locations. The three stations represented a range of different habitat. All surveys were done by two persons, one operating the backpack electro-fisher and another a dipnet. In total the backpack electrofisher was used during 2626 seconds and a stretch of 135 metres of the creek was surveyed.

Weather conditions in the 24 hours prior to the survey were mainly sunny with some overcast, no precipitation. Air temperature at the time of the survey was 20°C. During the survey Cedarbrook Creek was at moderate stream stage. The water was clear at all three stations. Seeps were observed close to the banks of the creek indicating that groundwater contributes to the flow. Also water temperature in the creek decreases 5°C between Hillborn pond and the confluence with Mill Creek.

In total 108 fish were caught consisting 16 species. One adult brook trout was found at Station 2. Presence of groundwater contributing to the creek and the presence of an adult brook trout makes this site a likely spawning area for this species. Substrate at this site is gravel, suitable for brook trout spawning. Two brown trout were caught at the confluence of Mill Creek and Cedarbrook Creek. The substrate and characteristics of the creek are not ideal for brown trout spawning in this stretch.

Taco den Haas

TH/

Table 1 Characteristics of the three stations in Cedarbrook Creek.

	Station 1	Station 2	Station 3
Adjacent Land Use	Roads & Conservation Land	Residential	Residential
Vegetation <5m	Swamp thicket & mixed herbs	Cedar Swamp	Dogwood thicket, Cedar swamp
Substrate	Cobble, Gravel, Sand & Silt	Gravel & Silt	Organic matter, silt, some cobble
Morphology	Riffles and a deep pool	Run	Run
Water Temperature (°C)	13.5	15.0	18.0
Length of station (m)	35	50	50
Electrofishing seconds	1127	740	757
Number of fish species	12	5	4
Number of fish	55	37	16

Table 2 List of species found at the three Stations in Cedar Creek.

Common name	Scientific name	Station 1	Station 2	Station 3
brown trout	*Salmo trutta*	2		
brook trout	*Savelnius fontinalis*		1	
bluntnose minnow	*Pimephalus notatus*	9	1	
creek chub	*Semotilus atromaculatus*	9	27	9
blacknose dace	*Rhinichtys*		4	2
fathead minnow	*Pimephalus promelas*		4	4
northern redbelly dace	*Phoxinus eos*			1
smallmouth bass	*Micreopterus*	1		
largemouth bass	*Micropterus*	4		
common carp	*Cyprinus carpio*	1		
pumpkinseed	*Lepomis gibbosus*	4		
whitesucker	*Catostomus commersoni*	4		
rock bass	*Amploplites rupestris*	2		
brown bullhead	*Ameiurus nebulosus*	1		
johnny darter	*Etheostoma nigrum*	3		
Rainbow darter	*Etheostoma caeruleum*	3		

MTE
More Than Engineering

August 24, 2006
File: C1804 800

Mr. John Petrie, M.Sc., P.Geo
Principal
Golder Associates
2390 Argentia Road
Mississauga, ON L5N 5Z7

Dear Mr. Petrie:

Re: Request for Technical Assistance
Discharge of Well Water from Pumping Test
Upper Country Club Subdivision and Burnett Avenue Pump Station
City of Cambridge

Further to your e-mail of August 17, 2006, we report as follows:

1.0 Storm Sewers

We have reviewed the theoretical capacity of the storm sewers, from the park on Arthur Fach Drive in Upper Country Club subdivision to the SWM pond west of Dellgrove Circle. A spreadsheet of the City of Cambridge Storm Sewer Design Sheet for the 5 year storm is attached. A flow of 39 l/sec was added at the park for the pump test. This analysis indicates that all the storm sewers have capacity for the additional flows. Therefore, we conclude that the storm sewers can accommodate the additional flows from the proposed pump test.

2.0 Stormwater Management Facility

We routed the flow from the proposed pump test, 39 l/sec, through the SWM pond in Upper Country Club Subdivision, using the MIDUSS computer model. The constant flow through the pond will raise the level in the pond by approximately 0.4 m for the duration of the test, and will reduce the active storage in the pond by approximately 2484 m^3.

The pond was designed to control peak flows for up to the 5 year storm to pre-development levels. Therefore, for the duration of the pump test, peak flow control for the 5 year storm would not be provided. The main purpose of peak flow control is to minimize potential erosion downstream of the SWM pond. Therefore, the reduction in peak flow control would increase the risk of erosion at the outlet for the duration of the test. However, based on the limited duration of the pump test, the impact of this is likely to be minimal.

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario N2B 3X9
Tel: 519-743-6500 Fax: 519-743-6513

The pond was designed to provide 1,714 m^3 of extended detention for quality control with 24 hours of detention (ie. 40 m^3/ha as per MOE Guidelines,2003). When this volume of storage is provided for storm water in addition to the pump test flows, the extended detention time is reduced to 10 hours due to the increased head on the outflow control orifice. When the 25mm storm (4 hour duration) is routed through the pond in addition to the pump test flows, extended detention of 2,491 m^3 for 14 hours is achieved compared to values of 4,400 m^3 and 36 hours, that would normally be achieved for the 25mm storm. Therefore, there will be a reduction in quality control provided for rainfall events that occur during the pump test. Again, based on the limited duration of the pump test, the impact is likely to be minimal.

Discharging the pump test to the storm sewers and through the SWM facility will result in the total volume of water from the pump test being discharged to the Portuguese Swamp. Based on our previous analysis of cumulative discharges to the Portuguese Swamp, this is unlikely to cause any flooding issues. However, we have not assessed any impacts this may have on infiltration, vegetation, wildlife or insects. A copy of our previous report, Modelling of Flood Impacts Related to ESPA 72 (Portuguese Swamp), November 8, 2006, is attached for your reference.

3.0 Sanitary Sewers

We have reviewed the theoretical capacity of the sanitary sewers from the Park on Arthur Fach Drive in Upper Country Club subdivision to Burnett Avenue Pumping Station. Our analysis was based on the actual number of housing units in the drainage area and 3.5 persons per unit. A flow of 39 l/sec was added at the park for the pump test. A spreadsheet of the City of Cambridge Sanitary Sewer Design Chart is attached. Four sections of sewer are slightly under capacity (i.e. estimated flows are 4% to 15% over the pipe capacity). This analysis assumed the entire area was built-out. If the serviced population is reduced by approximately 325 to allow for unbuilt units in Upper Country Club Phase 4, only 2 sections of sewer are approximately 5% over capacity. In addition, the sewers in question are deep (approx. 5m), and could easily accommodate minor surcharging (approx. 0.2m surcharge required to pass excess flow). Therefore, we conclude that the sanitary sewers could accommodate the additional flows from the proposed pump test.

4.0 Burnett Avenue Pumping Station

The Burnett Avenue Pumping Station has been designed and constructed using a phased approach. The initial phase consists of a two pump system with a design capacity of 70 Lps. One of the two pumps is a redundant standby. Ultimately, the pumping station will have a four pump configuration with a total capacity of 180 Lps. The station is currently configured with two pumps per the first phase of the design.

As indicated on the attached sanitary design sheets, given the current buildout within the station's drainage area, the current theoretical peak flow to the pumping station is approximately 110 Lps. This is about 50% higher than the station's current design capacity. This analysis indicates that consideration should be given to upgrading the pumping station to increase its capacity. This type of upgrade is a long term issue and will not meet the immediate requirements of the proposed groundwater pumping program.

To confirm the accuracy of the theoretical flows, a brief review of the station's actual operating records was completed. The operating records indicate that the station is meeting the current flows however the pumps are operating frequently. There is little excess capacity in the station without possibly cutting into the redundant standby capability (i.e. using the both pumps at the same time).

The proposed groundwater flow of 39 Lps represents a significant contribution (56% of design capacity) to the flow. Given that both the theoretical analysis and the actual flows to the station indicate that the station is at its initial phase design capacity, it is not recommended that the groundwater be pumped to the sanitary sewer without any upgrade to the station's pumping capacity.

However, the station's capacity can be upgraded with a temporary standby pump. The pump would have to have to be able to pump at least 39 Lps. It would be powered from the station's existing electrical supply (i.e. not powered by a portable generator). It would operate in emergency standby mode incase the capacity of the two permanent sewage pumps was exceeded. The temporary pump would be operated on the basis of temporary high level float switches completely independant of the station's permanent control system which would not be revised in any way to accommodate the temporary pump. The discharge from the temporary pump would be connected to one of the two existing forcemains via the existing valved bypass connection. Pending City of Cambridge approval of the use of a temporary pump to increase the capacity of the Burnett Avenue Pumping Station, detailed pump sizing and connection logistics will be provided to City staff.

The above information and opinions are provided for your consideration in determining where to discharge wellwater from your proposed pump test. We are not recommending or approving the use of any of these sewer systems. It will be up to the City of Cambridge and the Region of Waterloo as owners and operators of these systems to provide approval for you to use these systems.

Please call if you have any questions or require additional information.

Yours truly,
MTE Consultants Inc.





Ward Wilson, P.Eng
Director, Land Development

Dave Wilhelm, P.Eng
Manager, Design Services

cc. Dave Law, City of Cambridge
Carlo Radicioni, City of Cambridge
Brad Trussler, Mattamy
John Piersol, Golder
Amy Domaratzki, RMOW

M:\1804\1804-800Request for Technical Assistance.wpd

MTE

ATTACHMENT A7

Public Communication

- Public Notices
- Agreements with Property Owners
- Sample Results Letter
- Public Meeting Participation Lists

REGION OF WATERLOO
NOTICE OF WELL CONSTRUCTION AND TESTING
CITY OF CAMBRIDGE

Dear Resident,

The Regional Municipality of Waterloo has awarded a contract for the drilling and testing of several water supply test wells in the City of Cambridge. The test wells are being installed as part of a program to evaluate whether additional groundwater supplies can be developed in the eastern part of the City.

Test wells have recently been constructed at the following sites shown in the figures on the reverse side of this letter:

1. Behind 808 Burnett Avenue, Cambridge
2. Road allowance behind 60 Cedarbrook Court, Cambridge

From November 18th to December 2nd, 2005, each well will undergo a pumping test of approximately 12 hours duration. Groundwater will be pumped from the test well at rates of up to 1000 l/min (220 gpm) and discharged to the storm water management basins or to adjacent wetland areas shown in the figures.

While no impacts to private wells are anticipated from these short-term tests, staff from Golder Associates Ltd. may carry out a survey of nearby private water wells prior to testing. If you have a water well, Golder personnel may ask questions regarding your well construction, and any past or present problems you may have experienced with water quantity or quality. They may also ask permission to install temporary water level monitoring equipment in your well.

Private well owners within 500 m of each site will be notified at least 24 hours prior to the commencement of testing at that site. Testing at Clemens Mill Location C will begin on Friday November 18, 2005.

No disruption of traffic is anticipated as a result of the well testing.

We thank you for your patience and cooperation during this program. If you have any questions about the project in general or the work being done near you in particular please contact Jim Robinson, the Region's project manager or John Petrie the consultant's project manager. Contact information is provided below.

Jim Robinson
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3
Phone: 519-575-4424
Fax: 519-575-4452
E-mail: rjim@region.waterloo.on.ca

John Petrie
Golder Associates Ltd.
2390 Argentia Road
Mississauga, Ontario
L5N 5Z7
Phone: 905-567-4444
Fax: 905-567-6561
E-mail: jpetrie@golder.com


N
Groundwater discharge to adjacent wetland area
Clemens Mill Location E
COUNTRY CLUB DR
WOOD GROVE CRES
EDGER POINT DR
Study Area
Lake Ontario
Index Map
LEGEND
Specific Drilling Locations
Rivers
Railway
Lakes, Rivers, and Ponds
Municipalities
Local Roads
Major Roads
Principal Highway
MUNICIPALITY OF WATERLOO
IUS - WATERLOO
CAMBRIDGE EAST
CLEMENS MILL LOCATION E
FIGURE: 1


N
BRAUN CRT
SPRUCE CRES
Groundwater discharge to adjacent wetland area
Clemens Mill Location C
CLYDE RD
Study Area
Lake Ontario
Index Map
LEGEND
Specific Drilling Locations
Rivers
Railway
Lakes, Rivers, and Ponds
Municipalities
Local Roads
Major Roads
Principal Highway
MUNICIPALITY OF WATERLOO
IUS - WATERLOO
CAMBRIDGE EAST
CLEMENS MILL LOCATION C
FIGURE: 2

REGION OF WATERLOO
NOTICE OF WELL CONSTRUCTION AND TESTING
CITY OF CAMBRIDGE AND TOWNSHIP OF PUSLINCH

Dear Resident,

The Regional Municipality of Waterloo has awarded a contract for the drilling and testing of three test production wells in the City of Cambridge and the installation of five monitoring wells nearby, in both Cambridge and the Township of Puslinch. The test wells and associated monitoring wells are being installed as part of a program to evaluate whether additional groundwater supplies can be developed in the eastern part of the City.

The construction of the three test production wells is currently planned at the following locations, three of which are adjacent to test wells constructed in 2005.

1. 100 Arthur Fach Drive (Witmer Park) in Cambridge OR if not favourable then on the road allowance in front of 2310 Townline Road, Cambridge
2. 870 Townline Road, Cambridge (Portuguese Club)
3. Road allowance behind 60 Cedarbrook Court, Cambridge

Construction locations for the three test production wells and five monitoring wells are shown on the reverse side of this letter:

It is expected that drilling of the first of these wells will commence on May 8th. It is anticipated that the drilling and installation of each well will take about 5 working days to complete, with work being conducted between the hours of 7:30 AM and 6:00 PM. The installation of these wells is expected to be completed by July.

A test pumping program is planned for sometime in August when the three test wells will be pumped during a month long testing program.

Prior to this test pumping program, staff from Golder Associates Ltd. will conduct a survey of nearby private water wells. If you have a water well, Golder personnel may ask questions regarding your well construction and any past or present problems you may have experienced with water quantity or quality. They may also ask permission to install temporary water level monitoring equipment in your well to obtain water level measurements prior to, during and immediately following the test pumping program. Details of the test pumping program will be provided in a second notice to be handed out during the summer.

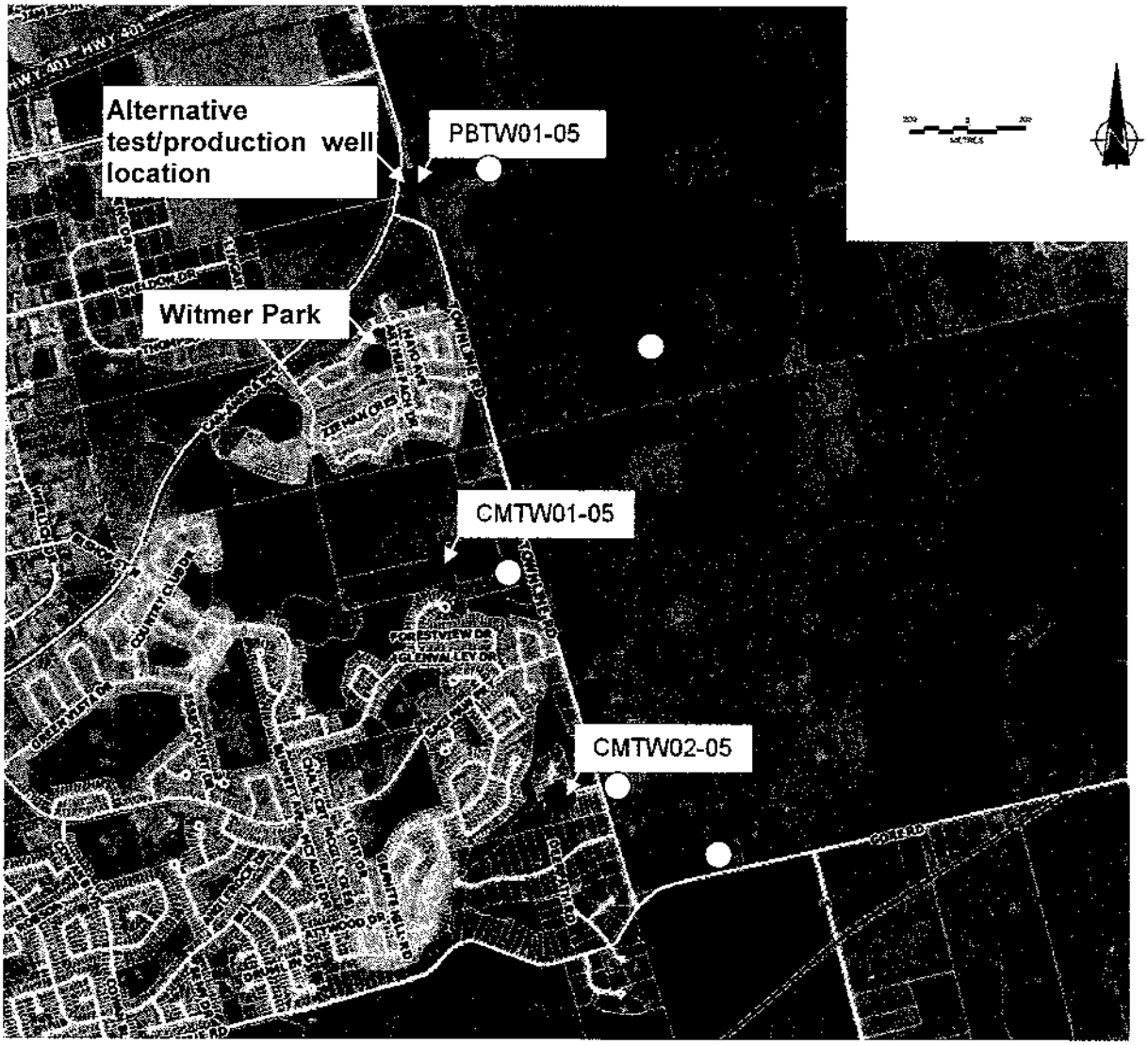
No disruption of traffic is anticipated as a result of the well drilling or testing.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area, please contact Jim Robinson, the Region's project manager, or John Petrie the consultant's project manager. Contact information is provided below.

Jim Robinson
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3
Phone: 519-575-4424
Fax: 519-575-4452
E-mail: rjim@region.waterloo.on.ca

John Petrie
Golder Associates Ltd.
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Phone: 905-567-4444
Fax: 905-567-6561
E-mail: jpetrie@golder.com

Figure 1 – Test Wells and Monitoring Well Nests
Cambridge East and Puslinch Township
Contracts 2006-014 and 2006-015



○ Planned Monitoring Well

● Test Well

REGION OF WATERLOO
NOTICE OF WELL TESTING
IN CAMBRIDGE EAST

Dear Resident,

The Regional Municipality of Waterloo has completed the drilling of three large diameter test production wells in the City of Cambridge and completed the installation of monitoring wells nearby, in both Cambridge and the Township of Puslinch. The test wells and associated monitoring wells are being installed as part of a program to evaluate whether additional municipal groundwater supplies can be developed in the eastern part of the City, as described in a previous letter. A long-term test pumping program for these three wells will begin the week of August 28th and last for four weeks. The details of the pumping test are described below.

The three test production wells that will be pumped in the test have been drilled at the following locations.

1. 100 Arthur Fach Drive (Witmar Park) in Cambridge
2. 870 Townline Road, Cambridge (Portuguese Club)
3. Road allowance behind 60 Cedarbrook Court, Cambridge

The locations of the three test production wells are shown on the reverse side of this letter:

The test pumping program will begin on or about August 28th and last for four weeks. The start of pumping will be staggered with pumping to begin at the Cedarbrook well followed by the Witmar Park well and then finally commencing at the Portuguese Club well. At each well the pumped water will be conveyed in piping and discharged into the sewer system. No disruption of traffic is anticipated at the Portuguese Club location as a result of the testing and discharge piping. At the Witmar Park and Cedarbrook Crt. Locations, the discharge piping may be connected to the sewer system inlets on the road and up to a full lane of the road may be blocked off for the duration of the testing with appropriate signs and barricades put in place.

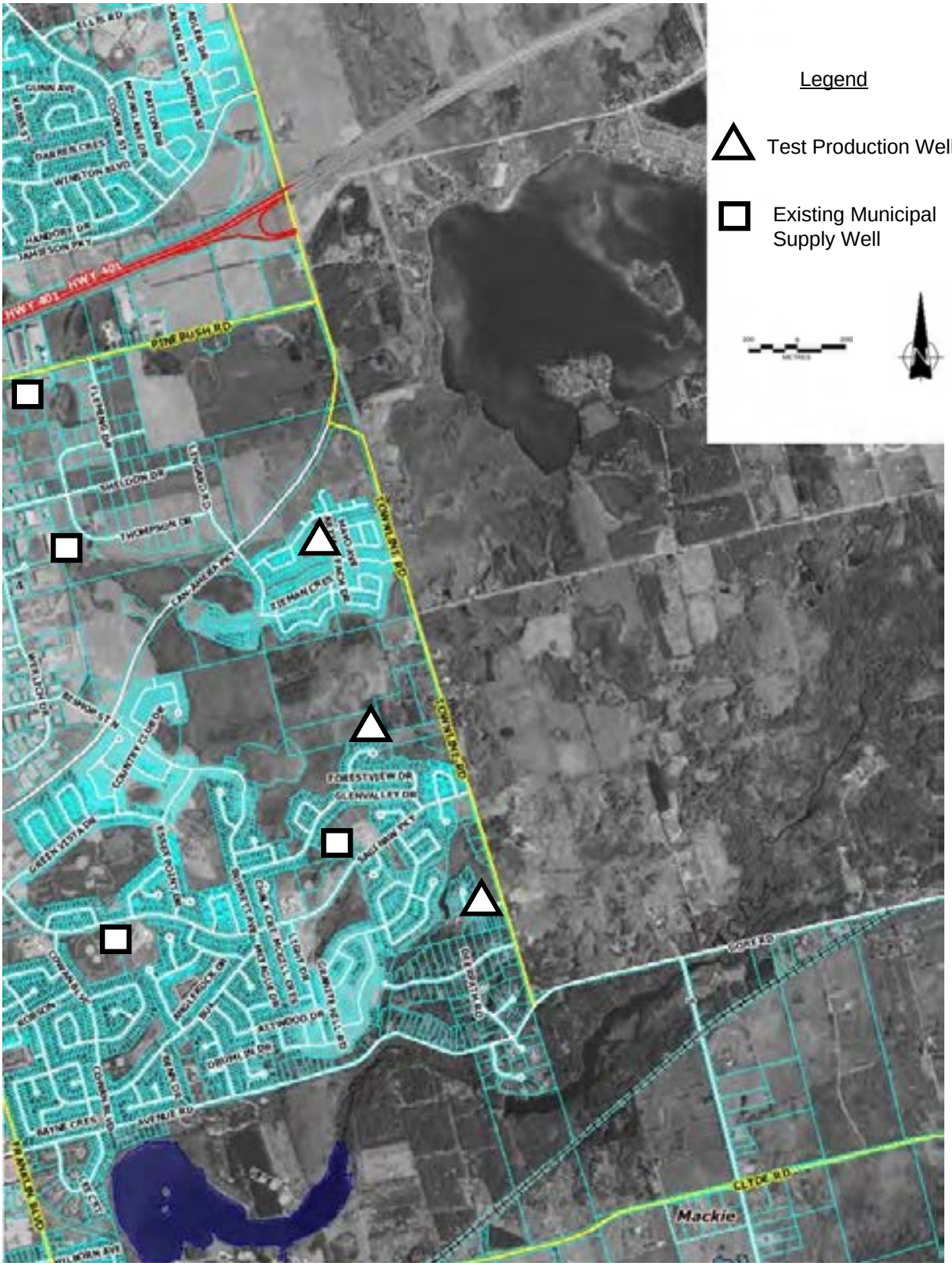
The pumps for the test will be powered by generators that will run 24 hours a day during the testing. Low noise generators will be used for the testing to minimize noise disturbance during the testing.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area, please contact Jim Robinson, the Region's project manager, or John Petrie the consultant's project manager. Contact information is provided below.

Jim Robinson
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Test Production Wells
Cambridge East IUS Project



Region of Waterloo
August 25th, 2006

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

The Occupant,
480 Townline Road
Cambridge Ontario

RE: CONTINGENCY PLAN FOR DOMESTIC WATER WELLS
PUMPING TEST PROGRAM, CAMBRIDGE EAST

Dear Occupant,

As you are likely aware, the Region of Waterloo plans to conduct a pumping test of three test production water wells located in Cambridge east generally in the vicinity of Townline Road. Pumping will begin on or about August 28th and continue into early October.

Our consultant, Golder Associates, has conducted a survey of private water wells and delineated an area where groundwater levels in the bedrock aquifer will likely decline in response to this pumping test. An outline of this area is provided with the attached Question and Answer sheet that was prepared in response to questions from the Residents Meeting held in Puslinch on July 6th. While some change in water levels in the bedrock aquifer in this area will likely be experienced during the testing program, such changes are not expected to interfere with the operation of a bedrock water supply well. Water levels are expected to recover soon after test pumping is terminated and no long term effects will result from this testing program.

However, the possibility exists that shallow (less than 10 m deep) water wells in this area may also experience some water level declines. While the water level decline in shallow wells will be less than in nearby bedrock wells, such a decline could interfere with the operation of a water well where the amount of water above the pump is limited. Because of this concern, the Region has developed the following contingency plan.

The purpose of this letter is to advise you that your well is located in the area where changes in water levels in the bedrock aquifer are anticipated and to advise you of the procedures to follow in the event of a disruption to your well water supply.

The Region of Waterloo maintains a 24/7 emergency number at the Mannheim Treatment Plant. Your address and name has been provided to the operations staff at this location. In the event that you experience a problem with your well water supply during this program, please:

DIAL: (519) 571-6208

STATE YOUR ADDRESS, NAME AND NATURE OF CONCERN

The operator will immediately call Weitzel Pumps and Water Treatment. Weitzel are on contract to the Region to supply water to any householder in the delineated area who experiences a problem with well water supplies during this testing program. Upon receipt of such notification from the Region's 24/7 staff, Weitzel will immediately dispatch a truck complete with water tank and trained staff to install and connect this tank and ensure provision of water to your household. Water will continue to be delivered until your well water level recovers following completion of the testing program. All costs associated with the provision of emergency water supplies will be paid directly by the Region.

During the testing program, our consultants, Golder Associates will make daily measurements of water levels in numerous wells in the area to monitor the effects of pumping. Golder Associates will also conduct an inspection of your well in the event that you report a problem with your supply. If you would like a second opinion, Puslinch Township's consultant can be contacted to conduct another inspection. Should problems with the operation of your well be attributable to the testing program, any costs associated with these inspections and the restoration of your well to an operating condition will also be paid directly by the Region.

Should you have any questions, please contact Jim Robinson on (519) 575-4424.

Yours sincerely,

REGION OF WATERLOO

Attachment: Question and Answer

JP/wlm

IMPORTANT

In the event of a disruption to your water supply during Region's testing program

DIAL: (519) 571-6208

STATE YOUR ADDRESS, NAME AND NATURE OF CONCERN

Note: testing program from August 28th to early October, 2006

INFORMATION UPDATE- SEPTEMBER 29, 2006
LONG TERM PUMPING TEST – CAMBRIDGE

This fourth information update provides depth to water level information obtained at representative monitoring wells and the operational status of the three test production wells recently installed to the west of Townline Road as shown on Figure 1. The Region is monitoring a total of 65 monitoring locations, including 15 private water wells, using dataloggers to obtain a continuous record of water level fluctuations over the testing period. These dataloggers will be downloaded at the end of the test. Manual measurements are also obtained daily at most of these same monitoring locations. These manual measurements have been used to prepare the graphs presented below.

At many monitoring locations, individual wells (piezometers) are screened at different depths within the overburden to depths of about 30 m below ground and within the bedrock to depths of about 120 m below ground. This information update graphically presents depth to water measurements from shallow overburden monitoring wells, generally completed at depths of about 10 m below ground and shallow (upper) bedrock monitoring wells, generally completed at depths of about 40 m below ground.

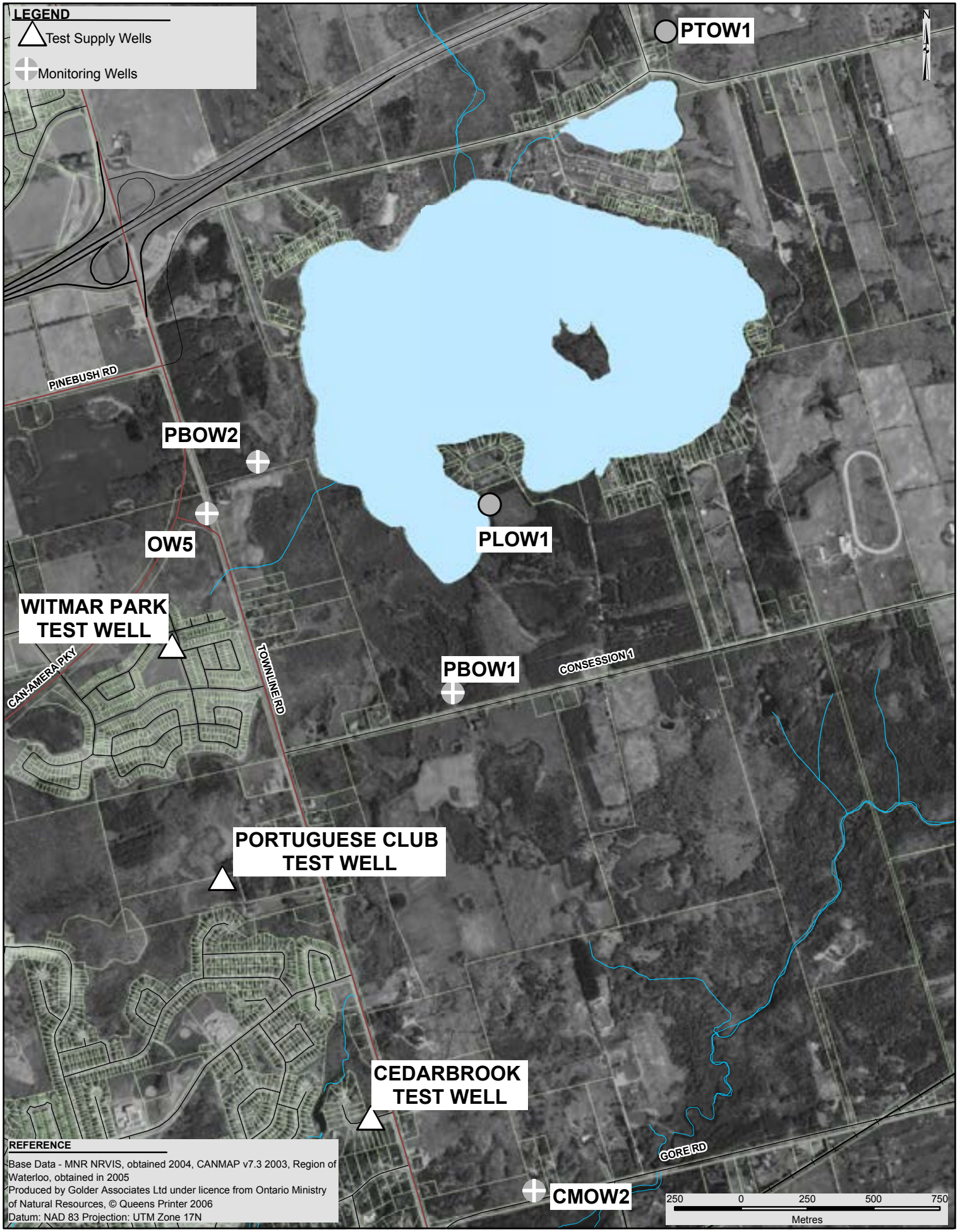
Groundwater levels normally decline through the summer and early fall and recover in the late fall with the fall rains and spring snow melt. The record of water level fluctuations from the fall of 2005 in one of the Region's long term monitoring wells (OW5-94) is provided to illustrate the typical decline in water levels observed during the months of September and October.

The three test production wells are completed in the bedrock aquifer to depths of about 120 m below ground. Each of these wells has been constructed with a steel casing extending from ground surface into the top of the bedrock at depths that vary from about 30 to 40 m below ground. Pumping from these wells draws in water from the bedrock aquifer.

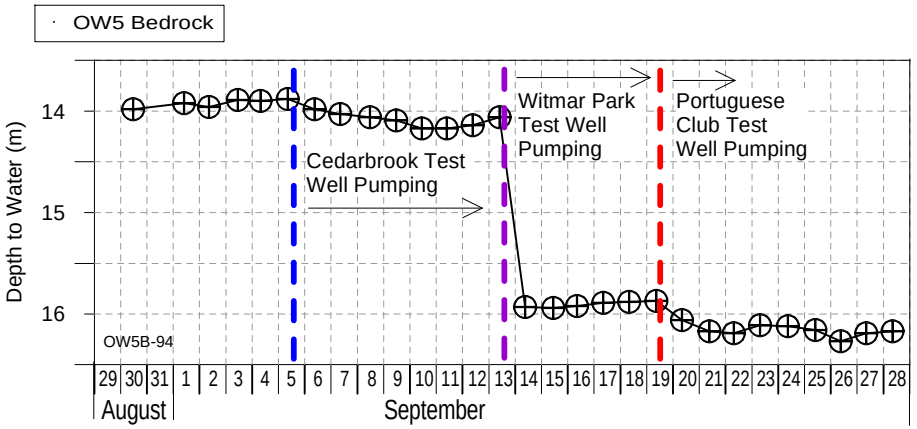
The operational status of the three test wells is as follows:

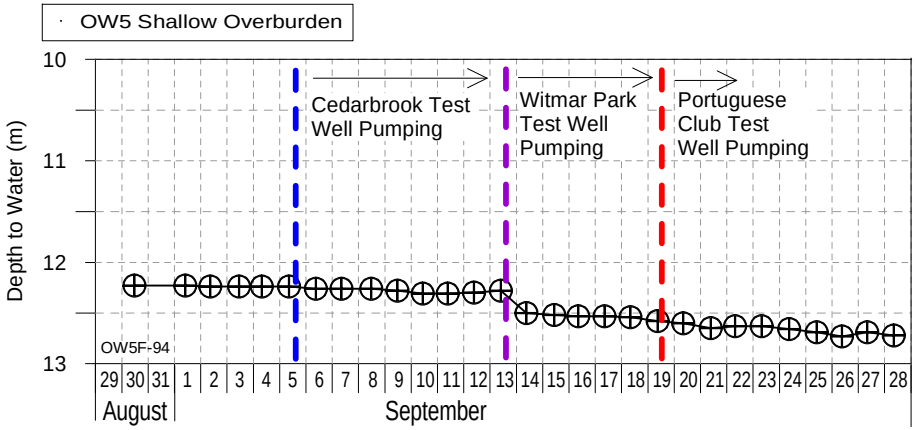
Cedarbrook Crt. Test Well (CMPW02-06) -pumping rate 595 US gpm beginning 12 noon September 5th
Witmar Park Test Well (PBPW01-06) -pumping rate 620 US gpm beginning 1:30 pm September 13th
Portuguese Club Test Well (CMPW01-06) -pumping rate 595 US gpm beginning 12:45 pm September 19th

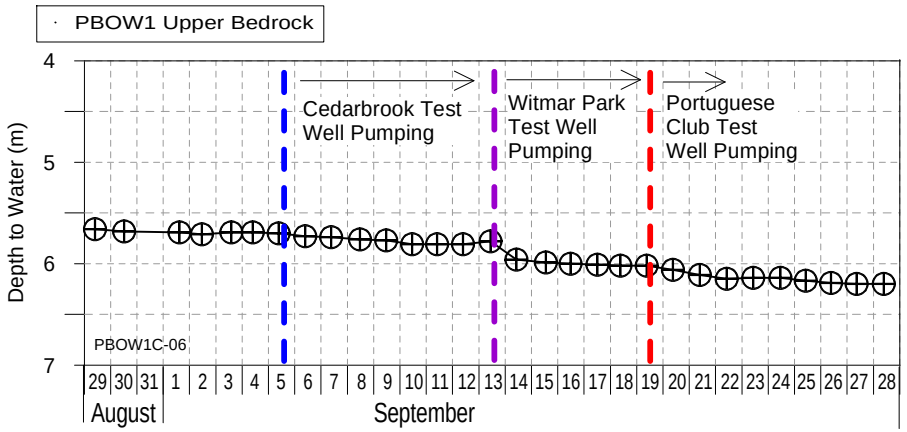
Figure 1

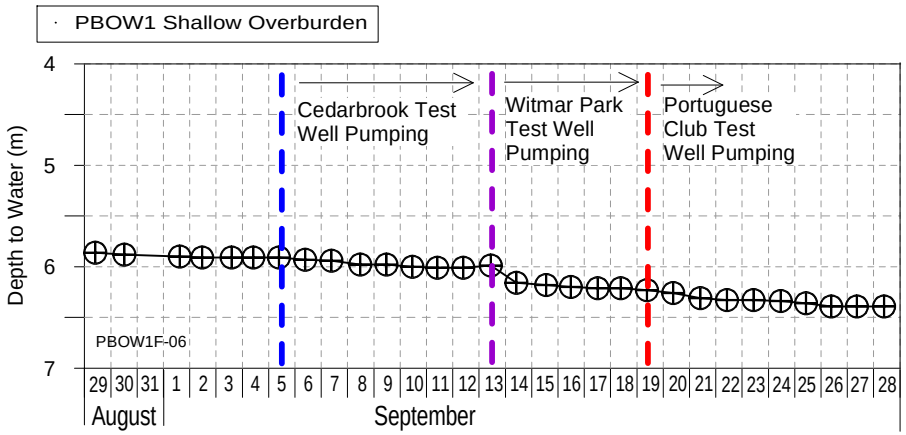


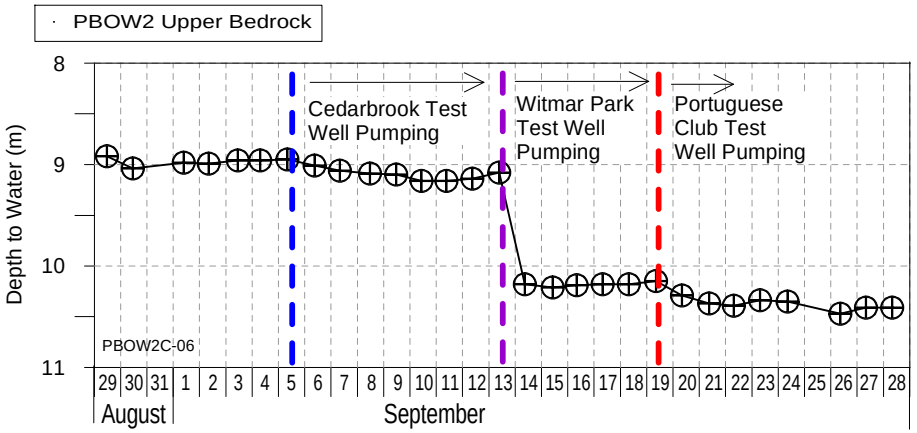
G:\Projects\2005\05-1112-010_IUS_Groundwater_Waterloo\GIS\MXDs\Draft\Cambridge\Drilling_Tender\August2006_Edits\8x11_EcologicialMonitoringLocations_d_portrait.mxd

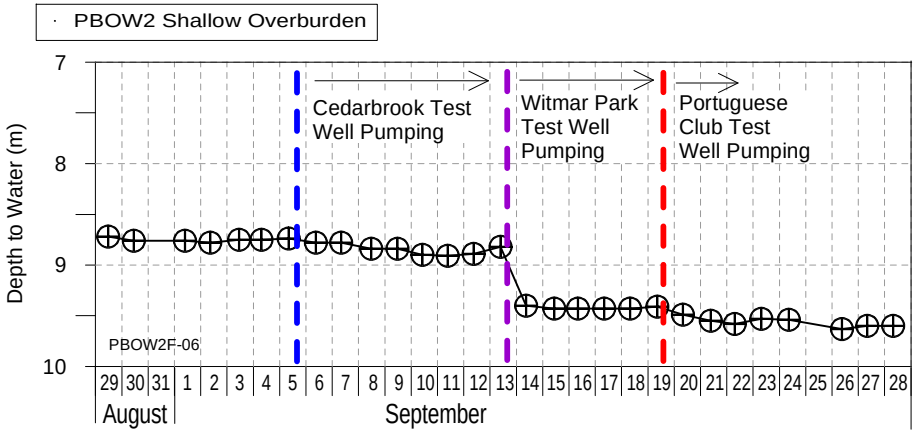




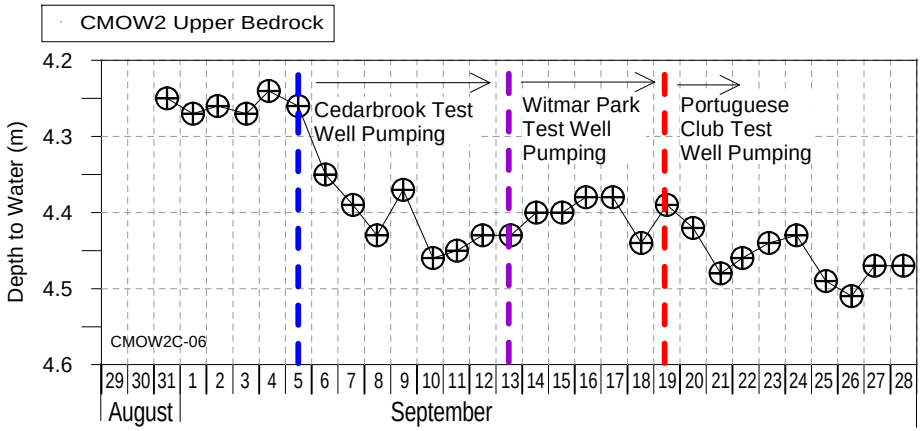


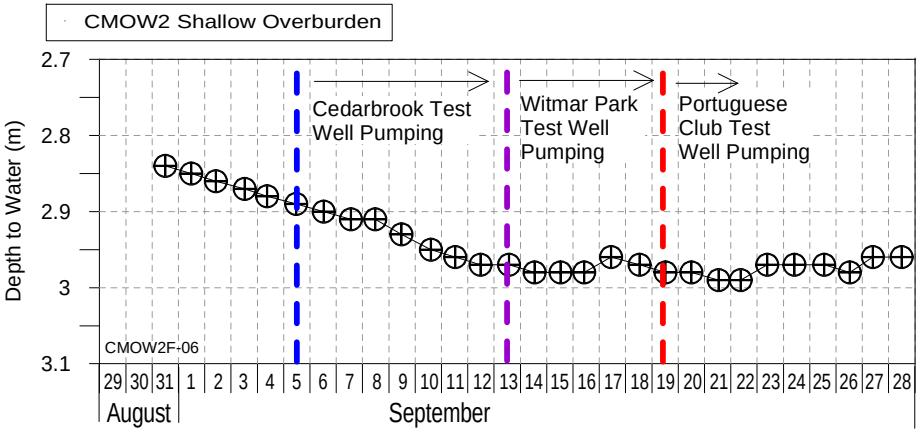


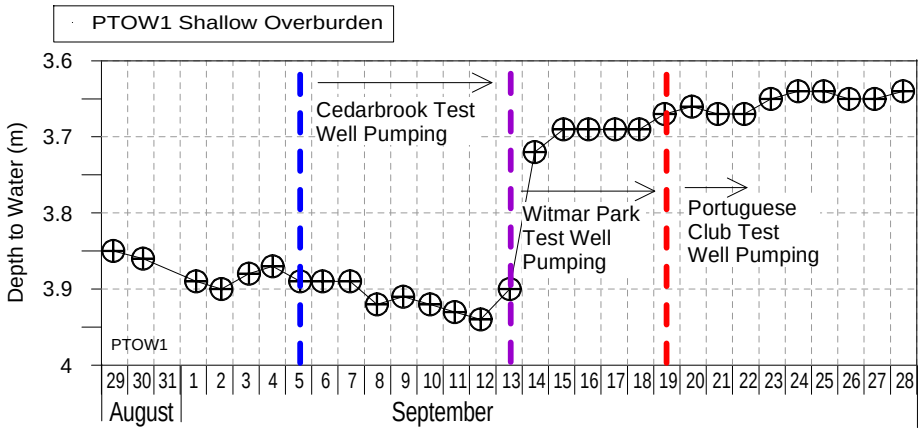


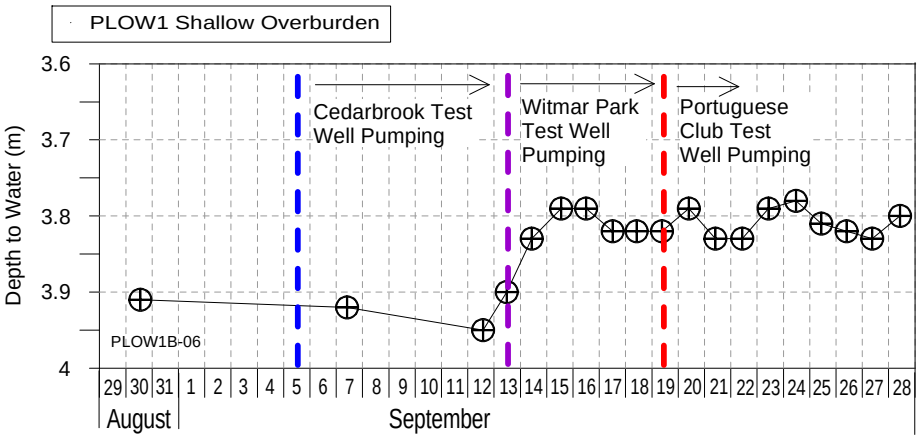


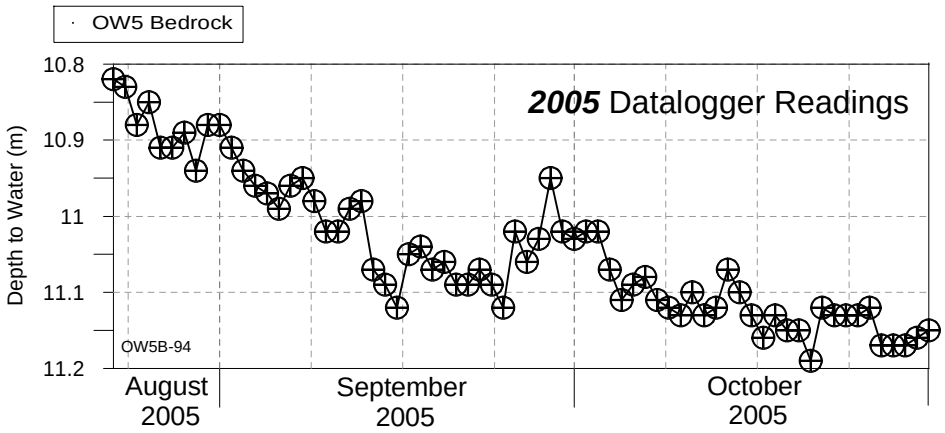
Manual Depth to Water Measurements (meters below measuring point)

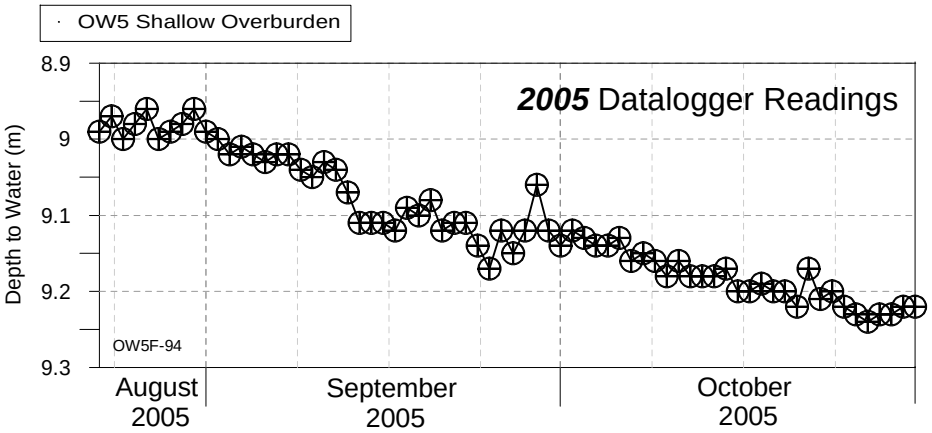












Depth to Water Measurements (meters below measuring point)

REGION OF WATERLOO
NOTICE OF WELL CONSTRUCTION AND TESTING
CITY OF CAMBRIDGE

Dear Resident,

The Regional Municipality of Waterloo has awarded a contract for the drilling and testing of one test well and a shallow monitoring well in the Shades Mill area of the City of Cambridge. The test well is being installed as part of a testing program to evaluate whether suitable groundwater supplies are available in the eastern part of the City. The work is being done as part of the Cambridge East project, the object of which is to enable the Region of Waterloo to pump water from the existing well fields in Cambridge East at their currently permitted rates. The contract work will be supervised by Golder Associates Ltd. on behalf of the Region. Golder staff will be on site for all of the work being done. The drilling locations for the test well and shallow monitoring well, located on Shades Mill Area Grand River Conservation Authority (GRCA) land, are shown on the reverse side of this letter.

The drilling of these wells will commence in early February, 2008. Each well should be completed in approximately 5-8 working days. The work will be conducted between the hours of 7:30 AM and 6:00 PM, from Monday to Friday. The installation of these wells is expected to be completed by mid-February. Following the completion of drilling, an 8-hour duration well performance test and 72-hour long test pumping program will be conducted at the test well site. During this time, a contractor representative will be at the well sites, under the supervision of Golder Associates. Details of the test pumping program will be provided in a second notice to be handed out in mid-February, 2008.

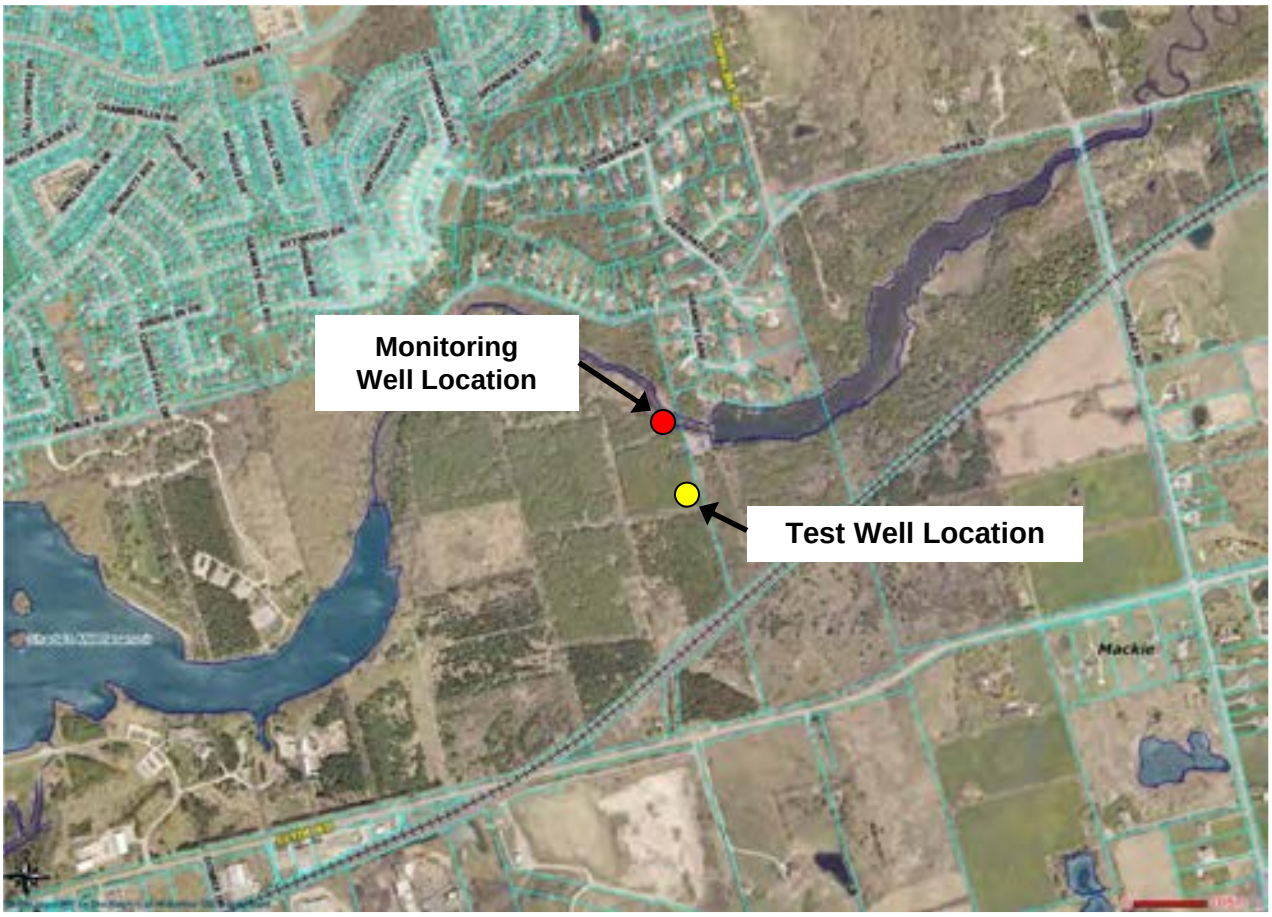
No disruption of traffic is anticipated as a result of the well drilling or testing.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area, please contact Jim Robinson, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

Jim Robinson
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Water Services Division
150 Frederick Street, 7th Floor
Kitchener, Ontario
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Shades Mill Drilling Locations on GRCA Land



REGION OF WATERLOO
NOTICE OF WELL TESTING
CITY OF CAMBRIDGE

Dear Resident,

This letter serves as a follow-up to the Notice of Well Construction, which was distributed on January 29, 2008. The drilling of these wells was completed on February 19, 2008. The location of the test well and shallow monitoring well, on Shades Mill Area Grand River Conservation Authority (GRCA) land, are shown on the reverse side of this letter.

Please be advised that an 8-hour duration well performance test and 72-hour long test pumping program will be conducted at the test well site. These tests will take place during the weeks of February 25 and March 3, 2008. During this time, a contractor representative will be at the well sites, under the supervision of Golder Associates.

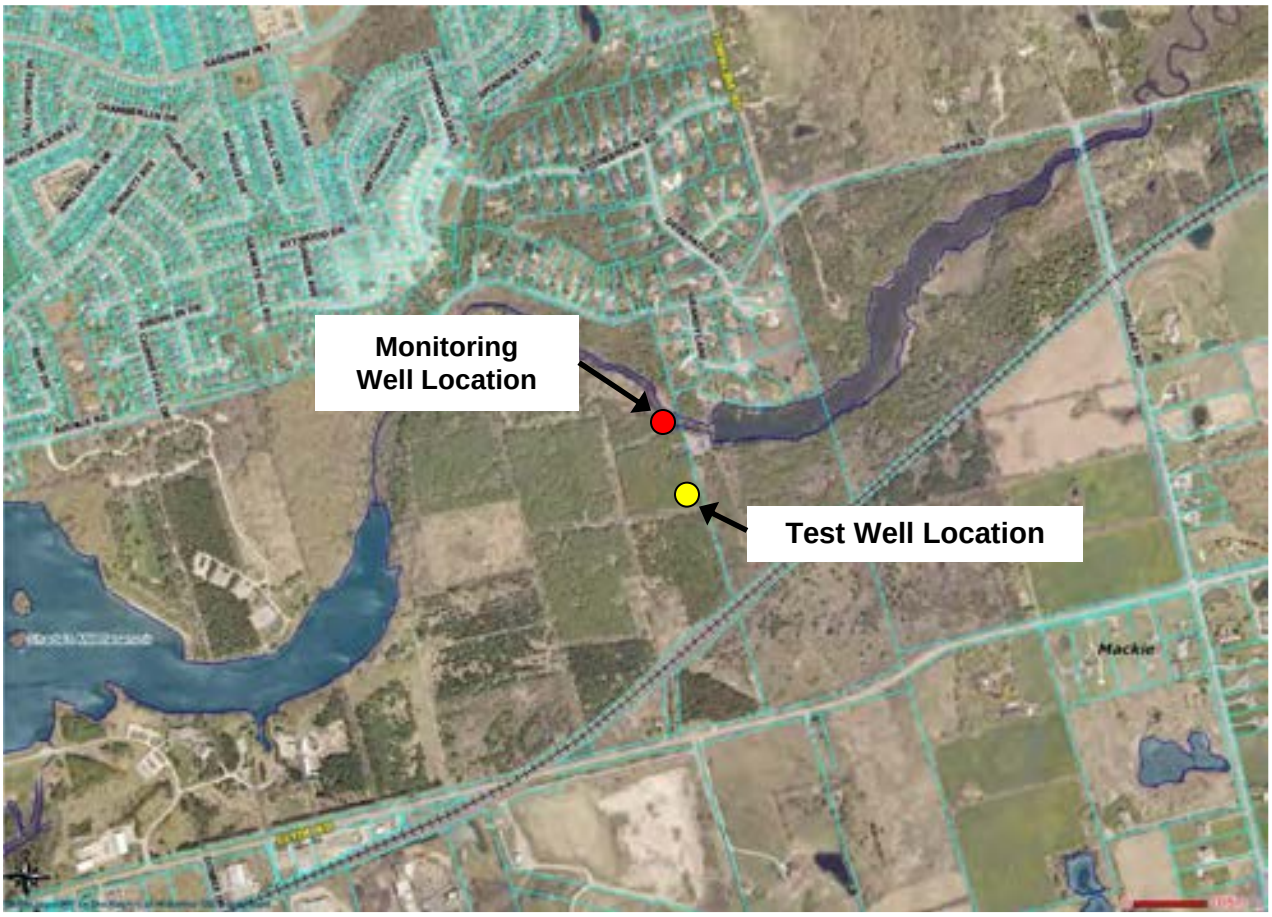
No disruption of traffic is anticipated as a result of the well testing.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area, please contact Jim Robinson, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

Jim Robinson
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E-mail: jpiersol@golder.com

Shades Mill Drilling Locations on GRCA Land



REGION OF WATERLOO
NOTICE OF WELL TESTING
CITY OF CAMBRIDGE

Dear Resident,

The Regional Municipality of Waterloo has completed the drilling of a test production well in the City of Cambridge. The location of the test production well is shown on the reverse side of this letter. The test well is being installed as part of a program to evaluate options to restore municipal groundwater supplies in the eastern part of the City.

A long-term test pumping program for the well will begin during the week of May 5th and should last for three days. The pumped water will be conveyed in piping and discharged into a storm water management pond. There should be no disruption to traffic as a result of the testing and discharge piping.

The pump for the test will be powered by a generator throughout the testing. Low noise generators will be used for the testing in order to minimize noise disturbance during the testing.

The contract work will be supervised by Golder Associates Ltd. on behalf of the Region.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area, please contact Jim Robinson, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

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Test Production Well Location, East Cambridge



REGION OF WATERLOO
THIRD NOTICE OF WELL CONSTRUCTION AND TESTING
VILLAGE OF CLYDE
January, 2009

Dear Resident,

As you were notified last fall, the Regional Municipality of Waterloo is conducting a drilling and pumping test program at in Clyde Park, Township of North Dumfries. This third notice follows two previous notices delivered to residents in September and October, 2008, which provided notification of the construction and testing of two six-inch diameter test wells and a large diameter test production well located in Clyde Park. The large diameter test production well has been drilled and has been left temporarily flowing until the pumping test is completed at which time the well will be fully sealed. Final restoration of the drill site will be completed later in the spring.

The purpose of this third notice is to inform residents of the schedule for the 7-day pumping test, which is planned to take place during the week of January 12th, 2009. A comprehensive monitoring program has been established in advance of this 7-day testing program and includes monitoring of water levels in some private water wells/ponds. The pumping test will be supervised by Golder Associates Ltd. on behalf of the Region.

In the unlikely event that water supplies during testing are disrupted at any private well, the Region will immediately provide an alternative temporary water supply. If you experience water supply problems in your well during the testing, you can call the following Region Number: 519-571-6208, which is manned 24 hours per day, 7 days per week. Following report of a problem, a contractor who provides plumbing and water supply services for the Region will be immediately contacted. This contactor will be available 24 hours a day for the duration of the test and will undertake any action immediately. Following the provision of water, the well will be inspected by a licensed water well contractor to determine if the cause of the problem was water level decline due to the testing program. The provision of a temporary water source and inspection will be done at no cost to the well owner.

The results of the 7-day pumping test will be provided in future correspondence. The water level record obtained from private wells/ponds will be provided to the owner.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area that have not been addressed, please contact Amy Domaratzki, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

Amy Domaratzki
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
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L5N 5Z7
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Fax: 905 576-6561
E-mail jpiersol@golder.com

REGION OF WATERLOO
NOTICE OF WELL TESTING
VILLAGE OF CLYDE
August, 2009

Dear Resident,

The Regional Municipality of Waterloo is conducting a pumping test program at a test well site in Clyde Park, Township of North Dumfries. The test well program is part of the Integrated Urban System Groundwater Supply Optimization and Expansion Project that the Region is conducting to improve the efficiency of the current water supply system and look for additional water supply well sites to meet future demand in Waterloo Region. As you were notified last spring, a Public Information Centre was held on May 5, 2009 to inform and get input from residents on the Cambridge East Water Supply Class Environmental Assessment and the Clyde Park testing program.

The purpose of this notice is to inform residents of the schedule for a 7-day pumping test, which is planned to take place during the week of August 17th, 2009 at the existing test production well at Clyde Park. This is part of the ongoing work which began in the fall of 2008 with the construction and testing of two six-inch diameter test wells and a large diameter test production well located in Clyde Park. The testing contract work will be supervised by Golder Associates Ltd. on behalf of the Region.

A comprehensive monitoring program is currently being established and will include monitoring of water levels in private water wells, ponds, and wetlands. The results of the 7-day pumping test will be provided in future correspondence. The water level record obtained from private wells/ponds will be provided to the owner.

In the unlikely event that water supplies during testing are disrupted at any private well, the Region will immediately provide an alternative temporary water supply. If you experience water supply problems in your well during the testing, you can call the following Region Number: 519-571-6208, which is manned 24 hours per day, 7 days per week. Following report of a problem, a contractor who provides plumbing and water supply services for the Region will be immediately contacted. This contactor will be available 24 hours a day for the duration of the test and will undertake any action immediately. Following the provision of water, the well will be inspected by a licensed water well contractor to determine if the cause of the problem was water level decline due to the testing program. The provision of a temporary water source and inspection will be done at no cost to the well owner.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area that have not been addressed, please contact Amy Domaratzki, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

Amy Domaratzki
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
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REGION OF WATERLOO
NOTICE OF WELL CONSTRUCTION AND TESTING
VILLAGE OF CLYDE

Dear Resident,

The Regional Municipality of Waterloo has awarded a contract for a drilling and pumping test program at two test well sites in Clyde Park, Township of North Dumfries (locations shown on attached map). A public meeting was held on September 11, 2008 to inform residents about this test well program that is part of the Integrated Urban System Groundwater Supply Optimization and Expansion Project that the Region is conducting to improve the efficiency of the current water supply system and look for additional water supply wells to meet future demand in Waterloo Region. This notice follows the initial letter delivered to residents in early September, which provided further background information on the project.

The purpose of this notice is to inform residents of the schedule for the drilling program and 8-hour duration well performance testing. Also attached are responses to key questions asked by residents at the public meeting.

Well construction is scheduled to begin during the week of September 29th, 2008. Following the drilling process, well performance tests (8-hour duration) will be conducted at the two test well sites. We anticipate that both 8-hour duration tests will take place on separate days during the week of October 6th, 2008. The drilling and testing contract work will be supervised by Golder Associates Ltd. on behalf of the Region. The work will be conducted during the hours of 7 am to 6 pm, Monday to Friday.

Because of the short term duration of the well performance testing, no adverse impacts to nearby private wells or environmental features are anticipated. Should this initial testing provide satisfactory results, a large diameter test production well will then be drilled adjacent to the test well with the greatest capacity and it will be subjected to a 7-day pumping test. A comprehensive monitoring program will be established in advance of this 7-day testing program that will include monitoring of private wells, ponds, wetlands. As part of this program, three new bedrock/overburden monitoring well nests and up to six shallow overburden monitoring well nests will be installed within the area. A second notice will be delivered to local residents advising of the drilling and testing of this large diameter production well should it be drilled.

Additional information on the results of the testing and any potential long-term impacts of the pumping will be provided in future correspondence.

We thank you for your patience and cooperation during this program. **If you have any questions about the project or the work being done in your area that have not been addressed, please contact Jim Robinson, the Region's project manager, or John Piersol the consultant's assistant project manager.** Contact information is provided below.

Jim Robinson
Regional Municipality of Waterloo
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Fax: 905 576-6561
E-mail jpiersol@golder.com

Region of Waterloo

Clyde Park Test Well Program- North Dumfries
Questions & Answers for Residents

Key questions asked by residents at the public meeting held on September 11, 2008 and our responses are provided below.

Will my water well be affected during the testing program?

The 8 hour testing program should not interfere with the operation of any private wells. Because of the short duration of these tests, water level declines will be minor and local during pumping and will return to pre-testing levels within a few hours following the completion of the test.

It is also anticipated that the 7 day testing program will not cause interference with private well operation. A comprehensive monitoring program will be developed and implemented prior to the 7-day pumping test on the larger diameter test production well. While water level declines will be localized and recover to pre-test levels within a few days following this testing, it is important that the changes to groundwater levels during the longer duration test are well understood. The monitoring program will include the measurement of water levels in representative private water wells in the immediate vicinity of the test well and elsewhere in the village to clearly address this concern (and to meet the requirements of the Ministry of the Environment for such testing).

If there is any interruption to my water supply caused by the testing program, how will the Region of Waterloo respond?

In the unlikely event that water supplies during testing are disrupted at any private well, such as a shallow well with low depth of pump submergence or low well capacity, the Region will immediately provide an alternative temporary water supply. If you experience water supply problems in your well during the testing, you can call the following Region Number: 519-571-6208, which is manned 24 hours per day, 7 days per week. This number, details of this response program and the schedule of the long term testing, will be provided in another notice to be delivered in advance of the 7-day test, should the test proceed. Following report of a problem, a contractor who provides plumbing and water supply services for the Region will be immediately contacted. This contactor will be available 24 hours a day for the duration of the test and will undertake any action immediately. Following the provision of water, the well will be inspected by a licensed water well contractor to determine if the cause of the problem was water level decline due to the testing program. The provision of a temporary water source and inspection will be done at no cost to the well owner.

How will the potential for interference with private wells be assessed in the testing program?

During the 7-day pumping test on the large diameter test production well, water levels will be monitored at over 35 wells throughout the area including specially constructed overburden and bedrock monitoring wells and in representative private wells (about 10) where agreed to by the well owner. This monitoring information will be analyzed to determine the extent and degree of water level decline caused by the pumping. This information on the water level decline caused by pumping can then be used to assess the potential for interference with private wells.

What are the next steps after the testing program?

The Clyde Park field testing program will be completed by the end of 2008. The results of the field testing will be analyzed and incorporated into the overall Environmental Assessment of options to optimize groundwater taking from the three Cambridge East well fields, which will be presented to the public in late 2009. Following completion and approval of the environmental assessment, the Region would apply for a Permit To Take Water for any new wells to the Ministry of the Environment prior to construction of any infrastructure (pipeline, well house etc.) associated with a new municipal well.

If the Region is to proceed with a municipal well at this location, would this mean the Village of Clyde would be supplied with municipal water?

There is no plan to supply the village of Clyde with municipal water. A municipal well, should it be constructed here at Clyde Park, would deliver water to the Shades Mills Treatment plant in Cambridge.

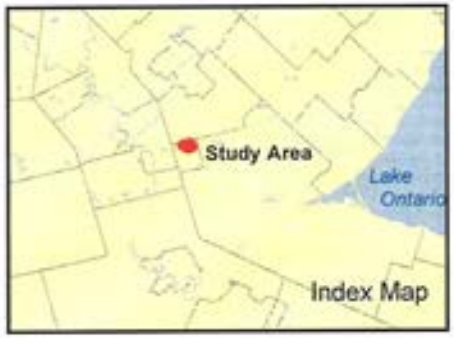
What guarantee is there that my well will not be affected in the long-term if Clyde Park eventually becomes the site of a municipal well?

If the results of the Environmental Assessment process show that expected impacts are acceptable, the Region will develop and implement a comprehensive program to monitor water levels on an ongoing basis, as part of the process of construction and operation of a new municipal well at this site. Such monitoring would be a requirement of the Permit To Take Water issued to the Region by the Ministry of the Environment for any new municipal well at this site. The Region of Waterloo also has a well interference policy that guarantees that the Region will restore water supplies if any municipal taking has caused a water level decline that interferes with the use of a private well. Additional details on the Region's well interference policy will be provided in future correspondence.

If you have any additional questions that have not been addressed in this notice, please contact Jim Robinson at 519-575-4424.

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LEGEND

- Test Well
- Railway
- Watercourse, Permanent
- Parcel Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003, Region of Waterloo 2005
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2008
Datum: NAD83 Projection: UTM Zone 17

0 50 100 200 300 400
Meters

PROJECT: MUNICIPALITY OF WATERLOO IUS PROJECT

TITLE: CLYDE TEST WELL LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:10,000 REV. 0
DESIGN	CC	01 Jun. 2005	FIGURE: 1
GIS	ASB	22 Jul. 2008	
CHECK	AU	25 Sep. 2008	
REVIEW		22 Jul. 2008	

REGION OF WATERLOO
SECOND NOTICE OF WELL CONSTRUCTION AND TESTING
VILLAGE OF CLYDE

Dear Resident,

The Regional Municipality of Waterloo is conducting a drilling and pumping test program at two test well sites in Clyde Park, Township of North Dumfries (locations shown on attached map). A public meeting was held on September 11, 2008 to inform residents about this test well program. The test well program is part of the Integrated Urban System Groundwater Supply Optimization and Expansion Project that the Region is conducting to improve the efficiency of the current water supply system and look for additional water supply wells to meet future demand in Waterloo Region. This second notice follows the initial notice of well construction and testing delivered to residents in late September, which provided schedule information on the construction and testing of two six-inch diameter test wells located in Clyde Park. The results of the testing of these two test wells were favourable and the program will continue with the drilling and testing of a large diameter test production well in the park and associated monitoring wells.

The purpose of this second notice is to inform residents of the schedule for the drilling of the test production well and two monitoring well nests. The monitoring well locations are shown on the attached map. The test production well will be drilled adjacent to one of the existing test wells at Clyde Park. A third monitoring well nest will also be installed in one of the existing test wells at Clyde Park.

It is expected that the drilling of the monitoring well nests will take place in late October and the drilling of the test production well will take place during the first two weeks of November, 2008. We anticipate that the construction of all three wells will be completed before the end of the month of November, 2008. The drilling contract work will be supervised by Golder Associates Ltd. on behalf of the Region. The work will be conducted between the hours of 7 am to 6 pm, Monday to Friday.

A 7-day pumping test will be carried out following the construction of the test production well. A comprehensive monitoring program will be established in advance of this 7-day testing program that will include monitoring of private wells, ponds, wetlands. As part of this program, shallow overburden monitoring well nests will be installed within the area. A third notice will be delivered to local residents advising of the schedule for the 7-day pumping test.

The results of the 7-day pumping test will be provided in future correspondence. The water level record obtained from private wells/ponds will be provided to the owner.

We thank you for your patience and cooperation during this program. If you have any questions about the project or the work being done in your area that have not been addressed, please contact Amy Domaratzki, the Region's project manager, or John Piersol the consultant's project manager. Contact information is provided below.

Amy Domaratzki
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
Kitchener, Ontario
N2G 4J3
Phone: 519-575-4829
Fax: 519-575-4452
E-mail: domamy@region.waterloo.on.ca

John Piersol
Golder Associates Ltd.
2390 Argentia Rd.
Mississauga, Ontario
L5N 5Z7
Phone: 905 576-4444
Fax: 905 576-6561
E-mail jpiersol@golder.com

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LEGEND

- New Deep Monitoring Well Nest
- Test Well
- Railway
- Watercourse, Permanent
- Parcel Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v7.3 2003, Region of Waterloo 2005
Produced by Golder Associates Ltd under licence from Ontario Ministry
of Natural Resources, © Queens Printer 2008
Datum: NAD83 Projection: UTM Zone 17

0 50 100 200 300 400
Meters

PROJECT
MUNICIPALITY OF WATERLOO
IUS PROJECT

TITLE
CLYDE TEST WELL LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT No. 05-1112-010			SCALE 1:10,000 REV. 0
DESIGN	CC	01 Jun. 2005	FIGURE: 1
GIS	JO	21 Oct. 2008	
CHECK	AI	21 Oct. 2008	
REVIEW		22 Jul. 2008	

REGION OF WATERLOO
MONITORING WELL SITING
East Cambridge Area

Dear Resident,

The Regional Municipality of Waterloo (Region) needs to expand their monitoring well network to collect groundwater level measurements as part of a baseline monitoring program to support the installation and testing of new production water wells in Cambridge. On behalf of the Region, Golder Associates Ltd. may be contacting you to inquire about the possibilities of installing a monitoring well on your property. To clarify, the monitoring well will be used for monitoring purposes only, and not as a water supply well. The well will be incorporated into the Region's existing long-term monitoring well network in the area. Personnel from the Region, or their consultants, will need to access the monitoring well periodically and the location of the well could be chosen in a manner most convenient for you. Although this is completely voluntary on your part, we request your cooperation in this important component of the Region's water supply project.

If you have any questions about the project in general or the work being done in your area in particular, please contact Jim Robinson, the Region's project manager, or John Petrie the consultant's project manager. Contact information is provided below.

Jim Robinson
Regional Municipality of Waterloo
Water Services Division
150 Frederick Street, 7th Floor
Kitchener, Ontario N2G 4J3
Phone: 519-575-4424
Fax: 519-575-4452
E-mail: rjim@region.waterloo.on.ca

John Petrie
Golder Associates Ltd.
2390 Argentia Road
Mississauga, Ontario L5N 5Z7
Phone: 905-567-4444
Fax: 905-567-6561
E-mail: jpetrie@golder.com

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Golder Associates Ltd.

2390 Argentia Road
Mississauga, Ontario, Canada L5N 5Z7
Telephone: (905) 567-4444
Fax: (905) 567-6561

May 2006 05-1112-010

RE: MONITORING OF GROUNDWATER LEVELS
RESIDENTIAL WELLS IN CAMBRIDGE EAST AND PUSLINCH TOWNSHIP
IUS GROUNDWATER SUPPLY OPTIMIZATION AND EXPANSION PROJECT

Dear Homeowner:

In 2005, the Regional Municipality of Waterloo (Region) initiated the Integrated Urban System Groundwater Supply Optimization and Expansion Project (IUS Project) to increase the municipal water supply for the Tri Cities area. This project is being carried out by the consulting team of Golder Associates, Triton Engineering and Blackport Hydrogeology.

As part of the IUS study, the construction of three large diameter bedrock test supply wells in East Cambridge is currently underway at locations on the following sites (Figure 1).

1. 100 Arthur Fach Drive (Witmer Park) in Cambridge
2. 870 Townline Road, Cambridge (Portuguese Club)
3. Road allowance behind 60 Cedarbrook Court, Cambridge

In addition, the construction of at least five additional monitoring well nests is planned for this spring in East Cambridge and Puslinch Township. The locations of these planned monitoring wells are also shown on Figure 1.

A test pumping program will be conducted in August and September 2006 for the three test supply wells mentioned above. An important aspect of the testing program will be to monitor any influence that test well pumping might have on the performance of private residential wells in the area. In this regard, the Region and the consulting team would like to monitor groundwater levels in a number of private residential wells before, during and after the test pumping program.

The purpose of this letter is to seek your permission to install a temporary access pipe in your well so that groundwater levels can be monitored during the testing program. The monitoring equipment will consist of a small self-contained automatic data logger. The access pipe would be installed after receiving your approval and removed in late September 2006 after completion of the testing program. There would be little, if any, disruption to your water supply during the brief time while the access pipe is installed and later removed. This monitoring process would not affect the water quality in your well or it's performance. You will be contacted in advance to arrange a convenient time to complete the installation and removal of the access pipe. Your well will be left in it's current condition when the monitoring equipment is removed.

All work associated with the installation and removal of this monitoring equipment would be conducted by a licensed well contractor retained by the Region. Golder Associates would be responsible for collecting water level data at some times during the monitoring period. You will be contacted in advance to arrange a suitable time for such monitoring visits. At the completion of the test pumping program, a copy of the water level data obtained from your well will be provided to you.

We hope you will consider this request and grant us permission to install an access pipe and temporarily monitor groundwater levels in your well during the testing program. Your cooperation in this matter will allow the Region to obtain the data necessary for a comprehensive evaluation of groundwater resources in the area. As has previously been discussed with representatives of the Township of Puslinch, water level data developed during this program will be shared with the Township.

If you have any questions, please contact Mr. John Petrie at Golder Associates (905) 567-4444, or Mr. Jim Robinson at the Region of Waterloo (519) 575-4424.

Yours truly,

GOLDER ASSOCIATES LTD.

John Petrie, P.Geo.
Project Manager – Associate

Attachments: Approval for Access Pipe Installation in Residential Well
Figure 1

Approval for Access Pipe Installation in Residential Well

IUS Project

Owner: _____

Telephone: _____

Address: _____

_____

_____

_____

_____

I hereby authorize the Region of Waterloo, its consultant and its contractor, to install an access pipe and data logger in my water supply well for the purpose of monitoring groundwater levels during August and September 2006 for the pumping tests at three new test wells.

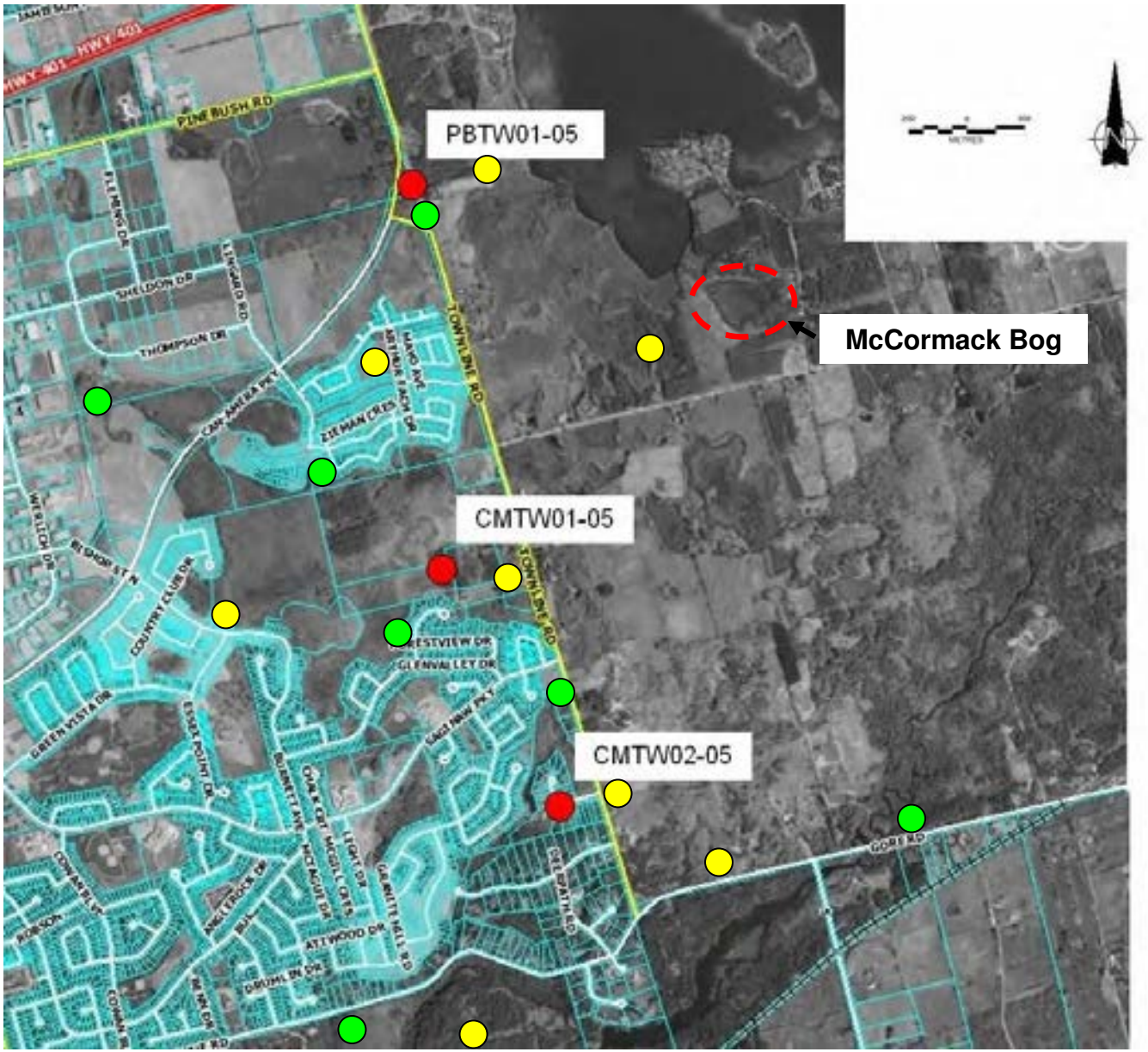
Signature: _____

Name (please print): _____

Date: _____

Figure 1- Cambridge East Test and Monitoring Wells

- Existing Monitoring Well
- Planned Monitoring Well
- Test Well



Golder Associates Ltd.

2390 Argentia Road
Mississauga, Ontario, Canada L5N 5Z7
Telephone: (905) 567-4444
Fax: (905) 567-6561

December 1, 2006 05-1112-010

Mr. and Mrs. Homeowner
Address
Cambridge, Ontario
NIT 2J3

RE: RESULTS OF WATER LEVEL MONITORING AT 111 TOWNLINE RD.
REGION OF WATERLOO- CAMBRIDGE EAST LONG TERM PUMPING TEST

Dear Mr. and Mrs. Homeowner:

As you are aware, the Region of Waterloo is conducting an assessment of the groundwater potential in the area of East Cambridge. As part of this assessment, a long term pumping test of three test production wells was conducted from September 5 to October 2, 2006. We appreciate your cooperation in allowing the Region to monitor water levels in your domestic well during the testing program. This letter provides the results of the water level measurements obtained at your well during this period.

The three test production wells pumped in the test are completed in the bedrock aquifer to depths of about 120 m below ground surface. The locations of these test production wells are shown in the attached Figure 1. Each of these wells has been constructed with a steel casing extending from ground surface into the top of the bedrock at depths that vary from about 30 to 40 m below ground. Pumping from these wells draws water from the bedrock aquifer.

The pumping schedule for the test was as follows:

- **Cedarbrook Crt. Test Well (CMPW02-06)** -pumping rate 595 US gpm beginning 12 noon September 5th;
- **Witmer Park Test Well (PBPW01-06)** -pumping rate 620 US gpm beginning 1:30 pm September 13th;
- **Portuguese Club Test Well (CMPW01-06)** -pumping rate 595 US gpm beginning 12:45 pm September 19th; and
- All three test wells were shut down on October 2nd at 12:30 pm.

During the testing period the Region observed changes in water levels for a total of 65 monitoring locations, including 15 private wells. Water level measurements were obtained both manually and using dataloggers (electronic water level monitoring devices).

The depth to water measurements in your well showed a small increase of about 0.2 m during the testing period. During the test, water level fluctuations of approximately 0.15 m were evident due to the operation of your pump. We understand that your well remained viable during the testing period.

Thank you again for allowing us to monitor your well during the Region of Waterloo's long term pumping test. If you have any questions, please contact Mr. John Petrie at Golder Associates (905) 567-4444, or Mr. Jim Robinson at the Region of Waterloo (519) 575-4424

Yours very truly,

GOLDER ASSOCIATES LTD.

Original signed by:

Jennifer Hancox, M.Sc.
Hydrogeologist

Original signed by:

John M. Petrie, M.Sc., P.Geo.
Project Manager, Principal

cc: Jim Robinson, Region of Waterloo

JLH/wlm

Attachments: Figure 1: Well Location Map
Figure 2: Water Levels in Private Well (Graph)

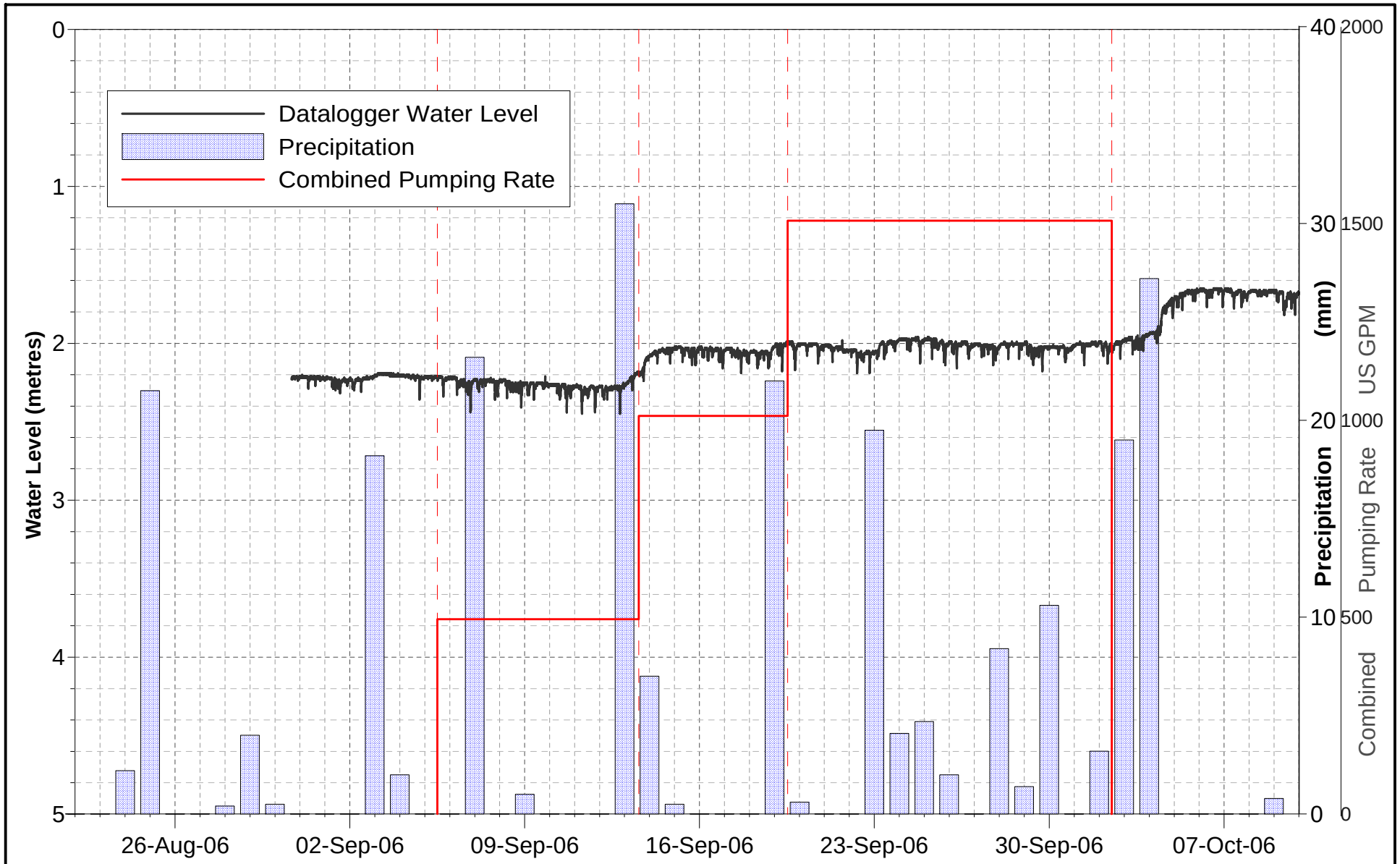
n:\active\2005\1112\05-1112-010 municip of waterloo-ius-waterloo\1000 - camb east hydrogeology\access private and public lands\letters to residents december 2006\05-1112-010 letter to mr. and mrs. zimmerman.doc

Figure 1



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1_EcologicalMonitoringLocations_d_portrait.mxd



Notes:
1) Pumping rate shown is a combined pumping rate for the three test wells. Cedarbrook started at 595 gpm on Sept 5, Witmer Park started at 620 gpm on Sept 13 and Portuguese Club started at 595 gpm on Sept 19.
2) Precipitation data is from the GRCA Shades Mill Site at the Cambridge Head Office.

Homeowner	Golder Associates
DRAWN: JLH	APPROVED: JAP	DATE: November 27, 2006
PROJECT NUMBER: 05-1112-010 (1000)	FIGURE 2: Water Level in Private Well

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
Tom Smith	2245 Rd	249-0495	
R. GORDON	PUSLINCH	6549849	

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
Doug Dawson	RR#2 Puslinch	658-8292	
Helen Purdy	Waterloo Ave Guelph	519 822-0376	
Bev Wagner	RR #22 Cambridge	822-4245	
Lynda Walters	Millcreek. CLT.	822-0112.	
Ken + Rose	Rhodes	658-1009	
Adrian O'Driscoll	Rhodes Rd.		
* Christine Furlong	Queen St West	519-843-3920	
DOUG SMITH	ARKELL RD. ARKELL	519-824-0217	
Graham Bowker James Bowker	SWASTIKA TRAIL	519 249 1833	

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
Al Meyerhofer	RHODES RD	519 651-1706	
KEVIN AXT	OAK DRIVE	519 658-1134	
Guy Boyd	Lake Ave.	6510893	
Garrett Burridge	Puslinch Lake Golf Course - Hespeler Centre to Cambridge	658-2292	plgc@bellnet.ca

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
KEN ELLIGSON	RR#2 PUSLINCH	519-658 5057	KELLIGSON@THEBOSGRTSGROUP.CA
Jim Moore	Ellis Rd	519 6589033	PLUCbrens@bellnet.ca
Stan Denhoed.	RR1 Moffat	519 826 0099	sdenhoed@hardeny.com
KATHY WHITE	COUNTY RD 35 R.R.6 GUELPH	519-763 5756	behindtheberm@gmail.com
MATTHEW BECKER			
Alan Henderson	Townline Rd.	5196584370	
Susan Fielding, Councillor	Puslinch	905 659 1050	hugh.fielding@sympatico.ca
Kim DENOUDEN	R.R. #4 CAMBRIDGE	519-882-1938	
MARCIA SMITH	ELLIS Rd RR2	519 ~~824~~ 249 0495	

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

+/- 60 business card

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
B. Miller	REGION Ellis Rd.		
Don Hunnicklaven	RR 22 Cambridge (H)	5196585601	
John Fitzgibbon	RR 2 Puslinch	519 822-2847	
Brian Riehl	Swastika Trail	519-658-5728	tracyriehl1@hotmail
Tracy Riehl	" "	" "	" "
Peter Wozniak	RR#2 Puslinch	519-622-5794	
JOHN PIERSOL	GOLDER		
LARRY HACKBART	LAKE AVE	519-651-1867	
MAUREEN HACKBART	"	"	

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
Carl + Elfriede Bunnikhoven	Clergy Lane RR#2 Pilsinch	658-5417	elfien@sympatico.ca
Yvonne Richardson	RR2 Puslinch Con 1	6582521	yoborich@golden.net
R. Richardson	RR2 Puslinch	6582521	11
Hank Nykamp	RR22 Lake Ave Camb.	651-1257	hnykamp@rogers.com
Jean Pierre Lalonde	Conc #1	654-9312	jplalondo@SNF-FLUEGOR.CO.
Aaron Jacobs	Flynn Ave. Puslinch	220-1485	aaron.jacobs@motomon.com
ANDY ELINOR & JOHN HUETON	RR2 PUSLINCH LAKESIDE DR	658-4876	ehueTon@yahoo.com.
Donald Paddock	Welker St Camb	658 7372	
Dan Armitage	Lake Ave	658-1045	david.armitage@sta.on.ca.

Region of Waterloo

CAMBRIDGE EAST IUS PROJECT

RESULTS OF DRILLING AND TESTING PROGRAM

OPEN HOUSE FOR RESIDENTS OF PUSLINCH
JANUARY 29, 2006

SIGN IN SHEET

Name	Address	Phone Number	e-Mail
FRED & JEAN STAHLBAUM	GUELPH	519-824-0957	
Brenda Watson	Cambridge	519-658-6309	
Mike + Sherry Centa	Lake Ave E. Cambridge, Ont	519-658-2219	
Barb Stella Griffin	Lake ave beach On	519658-1767	
Barb M Kay	Queen St RR2 Puslinch	519 8222984	
WAYNE STOKLEY	PUSLINCH	519-621-9346	
DAN + GERRI QUINNELL	TOWNLINE RD	519-658-5590	
Brian Holt Brenda Hammond	Gore Rd.	519-620-2150	

FRIC

FAX
John Petrie
Golder Associates
905-567-6561
Eric Hodgins RMOW
3 DATE: July 10/06

Cambridge East Environmental Assessment

Participants of July 6 Public Meeting

Number	Name	Address
1	U. Parresahy	Puslinch Rd #34
2	Ken Rocet	RR #2 Puslinch, Rhodus Road
3	David Freure	RR #22 Cambridge Ontario,
4	Konrad Kelle	RR 2 Puslinch
5	Don Roszell	RR #22 Cambridge Ontario
6	Alan Henderson	RR 2 Puslinch
7	James Etienne	GRCA
8	Barbara Bulmer	RR 22 Cambridge
9	John Luciano	Gore Road RR 2 Puslinch
10	Kathy Philips	Wellington Road 32
11	Dr. Barry White	Wellington Road 35, RR 6 Guelph,
12	Kathy White	Wellington Road 35, RR 6 Guelph,
13	Claudette Miller	Region of Waterloo
14	Don Nunnikhoven	Ellis Road RR 22 Cambridge Ontario
15	Brad Whitcombe	Twp of Puslinch
16	A Herman	RR 22 Cambridge
17	J. Buczynski	RR 22 Cambridge
18	John and Elinor Heuton	Lakeside Dr. RR 22 Puslinch
19	Jim Robinson	RMOW
20	John Piersol	Golder Associates
21	Alex Ivanoff	Golder Associates
22	Bob Richardson	RR 22 Puslinch
23	E. Nunnikhoven	RR 22 Puslinch
24	Bill Reeve	Gore Road RR 2 Puslinch
25	Dorothy McCauley	RR 2 Puslinch
26	Pauline Schneider	Puslinch,
27	John Petrie	Golder Associates
28	John and Joy Mondy	Ellis Road
29	Roger Will	Townline Road
30	Chris Daponte	Wellington Advertiser (Fergus)
31	Ed St. Pierre	Lake Road
32	Oscar Majonke	1st Concession
33	Doug Dowson	1st Concession
34	Tony Fieder	Rhodes Road

35	Carrie Mage	Swastika Trail
36	Jennifer Gilks	Swastika Trail
37	Jacqueline Flowers	Wellington Road 34
38	Steve Flowers	Wellington Road 34
39	Jan and Ray Hunt	Gore Road
40	Maddie Szczerski	Clergy Lane
41	Adrian O'Driscoll	Rhodes Rd.
42	Jack Hanian	Lake Road
43	Kathy Kinzic	Townline Road
44	Brian Stott-Camm	Ellis Road
45	Peter Wozniak	Gore Road
46	Dianne	Eagles Puslinch Lake
47	Nancy Walker	Townline Road, Cambridge
48	Jim Huber	Con. 2 Puslinch
49	Helen Purdy	Mill Creek Subwatershed Community Liaison
50	Ken Chute	Eagle Lane
51	Tom Smith	Ellis Road
52	Alf Meyerhofer	Rhodes Road RR 2
53	Kevin Axt	Oak Dr. RR 2 Puslinch
54	Larry O'Krafka	Swastika Trail RR 22 Cambridge
55	Bob O'Krafka	Lake Avenue
56	Susan Fielding	Councillor Twp of Puslinch
57	J & S Bowman	Lake Road
58	Donnalee Cook	Oak Dr. RR #2 Puslinch
59	Bob Cook	Oak Dr.
60	Helen Majunke	1st Conc. RR 2 Puslinch
61	Mike McBrearty	Lake Avenue RR 22
62	G. Atwal	Con. 1 RR 2 Puslinch
63	D. Lawson	Rhodes Rd. RR 2 Puslinch
64	S. Bartels	Gore Road Puslinch
65	John and Sharon	RR 22 Cambridge
66	Fernando Pinheiro	RR 22 Cambridge
67	Pasquah Romeo	Avenue Road Cambridge
68	Dan and Gerri Quinnell	Townline Road Cambridge
69	Rob and Lisa Frosch	Con. 1
70	Donna Jacklin	RR 22 Cambridge
71	Roger Murawski	RR 2 Concession 1
72	Kevin Johnson	Concession 2 Puslinch
73	Barb McKay	Twp. of Puslinch
74	Stan Denhoed	Puslinch

75	Robert Leader	Concession 2 Cambridge
76	Nancy Cidusik	Saginaw Cambridge
77	Glen Harris	RR 2 Puslinch
78	John Dunnet	RR 2 Puslinch
79	Bev Wozniak	RR 22 Cambridge
80	Fred and Jean Stahlbaum	RR 7 Guelph
81	Amy Domeranski	Region of Waterloo
82	Nancy Kadousek	Region of Waterloo
83	Dave Belanger	City of Guelph
84	Dick Visser	Township of Puslinch
85	Mathew Bulmer	Township of Puslinch
86	J. Schcuerman	Lake Road
87	Vernon and Mary	Lake Road

Testing for New Municipal Water Supply Wells in East Cambridge

Questions & Answers for Puslinch Residents

A public meeting was held on July 6, 2006 to inform Puslinch residents about the Region of Waterloo's drilling and testing of new municipal water supply wells in east Cambridge. This work is part of the Integrated Urban System Groundwater Supply Optimization and Expansion Project that the Region is doing to improve the efficiency of the current water supply system and look for additional water supply wells to meet future demand in Waterloo Region.

This package includes background information on the upcoming testing of potential supply wells in this area and answers to questions that were asked at the public meeting or submitted later to Regional staff. Additional information on the results of the testing and any potential long-term impacts of the pumping will be provided in future correspondence.

If you have any questions on this topic that have not been addressed, please contact Jim Robinson at 519-575-4424.

Background Information

In Waterloo Region, we get our drinking water from two sources – groundwater (wells) and the Grand River. The Region is working hard to ensure that our residents continue to have a clean and safe water supply.

To guide the management of our water resources, a Long Term Water Strategy was developed and approved by Regional Council in May 2000. The strategy includes the Integrated Urban System (IUS) Groundwater Supply Optimization and Expansion Project which will assess or expand the capacity of our municipal water supplies in several different areas of the Region.

The wells in the Cambridge East area are no longer able to pump water at their design rate of pumping despite maintenance and remediation efforts; therefore new wells are necessary. For this reason, in early 2005, the Region started evaluating potential new well locations. An engineering consulting firm (Golder Associates) was hired to help with identifying potential sites, drilling, and testing three new test production wells. These wells will be pumped and the surrounding area will be studied to determine what, if any, impacts are observed for municipal and private wells, wetlands, and other water bodies in the area.

Why is the Region drilling to find water in Cambridge East?
The wells in Cambridge East were constructed in the early 1990s. Since their construction, the ability of the wells to pump water has declined despite extensive well maintenance and remediation efforts and consistent underground water levels. (The rock fractures from which the wells draw water have become partially plugged through natural processes) Three additional wells are now needed to restore the well fields to their permitted capacity, which is determined by the Ministry of the Environment.

How were the locations of the potential supply wells identified?
Potential supply well locations were selected to minimize impacts on private wells and surface water. Locations were also chosen based on groundwater flow models and their distance from existing supply wells. Finally, the majority of potential supply wells were located on public or Grand River Conservation Area land to improve access.

What is a pumping test?
A pumping test consists of continuously pumping groundwater from a supply well at a constant rate for an extended period of time and measuring water levels in several nearby wells, surface water bodies and other water resources that could be affected. These measurements provide a way to determine the capacity of the aquifer in which the well is constructed. (An aquifer is an underground layer of gravel or rock fractures that holds water.) The pumping test determines if there are connections between the aquifer and the surface water features in the area. It also provides a way of predicting the effects of long-term municipal pumping.

When are the tests and at what rates will the wells be pumped?
The test is scheduled to begin in late August and continue for about four weeks. Three test production wells will each be pumped during the test at approximately 500 gallons per minute (39 L/sec), for a combined total of approximately 1,500 gallons per minute (114 L/sec). The locations of the three test production wells are shown in Figure 1. Previous short-term pumping of the wells indicated that each of them was capable of being pumped at these rates.

Where is the water from the pumping test to be discharged?
Pumped water will be discharged into the sewer system in Cambridge. No pumped water will be discharged to ground surface in Puslinch Township.

Will the testing impact private deep wells in the area?
The test production wells are constructed in the same deep, fractured limestone aquifer that the Region uses to provide water to all of Cambridge. This is a very high-yield aquifer that is capable of providing abundant water supply for area residents. Water levels in this deep aquifer are not expected to decline significantly during testing, based on the results of a similar long-term pumping test conducted in 1994 in Cambridge and based on ongoing monitoring of water levels over the last decade. Private, deep wells, therefore are not expected to be impacted significantly

Will water levels decline in ponds and shallow private wells during testing?
In this area, the deep aquifer that is being pumped extends to depths of greater than 140 m (400 ft) and is topped by clay and silt till materials that limit connection to shallow aquifers and

surface water features. Based on the results of the 1994 pumping test, impacts to private ponds and wells will be minimal or non-existent. It is possible that within 1 km of the test wells, shallow wells may be slightly more sensitive to subtle and temporary water level declines because of low depths of pump submergence or low well capacity. This area of concern for private wells is outlined in Figure 1. Deeper wells are not expected to be affected within this area. It is highly unlikely that well testing will influence water levels in private ponds or Puslinch Lake.

The Region will be measuring water levels in various observation wells, private wells, and ponds during testing to confirm that any changes are within acceptable limits. Following completion of the test, water levels will return to their pre-testing levels.

Where will water levels be measured?
Water levels will be measured at over 100 stations in the area. These stations include specially constructed overburden and bedrock observation wells, mini-piezometers (small wells adjacent to surface water features), private wells and surface water level stations in wetlands, ponds, creeks and in Puslinch Lake and Little Lake. The monitoring includes 25 observation wells located east of Townline Road in the Township of Puslinch. Water level measurements will be obtained using both electronic and manual measuring instruments prior to, during, and following the pumping test period to provide a three-dimensional picture of any changes.

How were private wells and ponds selected for monitoring?
Potential sites for monitoring were identified based on: the results of a door-to-door inventory of private wells conducted within the 1 km radius of the wells; requests from residents who expressed concern about their water wells or ponds; and through the technical analysis undertaken in preparation for the pumping test. The water level monitoring will help ensure that there is not a disruption to private water supplies during testing. Over 15 private wells will be monitored.

Who do I contact if I have a problem with my well or notice a decline in my pond?
The Region anticipates that those residents closest to the supply wells are the most likely to experience lower water levels in their private wells during testing. To address the concerns of these residents, a special arrangement has been made to ensure there is no impact on the availability of water to these residents.

Residents within a one kilometre radius of the test wells as shown in Figure 1.
If you experience water supply problems in your well, please call the following Region Number which is manned 24 hours per day, 7 days per week:

- Region Number: 519 571-6208.

A contractor, Weitzel Pumps & Water Treatment who provides plumbing and water supply services for the Region will be immediately contacted. This contactor will be available 24 hours a day for the duration of the test and will undertake any action to immediately restore the affected water supplies. Following the provision of water, the well will be inspected to determine if the cause of the problem was water level decline.

If you are in this area and your pond level declines such that fish or aquatic plants are at risk, call the same number and non-potable water will be supplied to the pond.

Provision of water, well inspections, and any repairs related to the well testing will be provided by the Region at no cost to the resident.

Residents within the one kilometre area will have received a notification letter from the Region.

Residents of Puslinch outside the one kilometre area as shown in Figure 1.
If you experience a water shortage or significant pond level decline, please contact one of the following people:

- Jim Robinson, Region of Waterloo, 519-575-4424
- John Petrie, Golder Associates, 519-567-4444

Normal business hours are Monday to Friday, 8:30 a.m. to 4:30 p.m. Staff will respond to your concerns as soon as possible following notification. If you experience a water supply problem on the weekend, please leave a message and we will return your call within 24 hours.

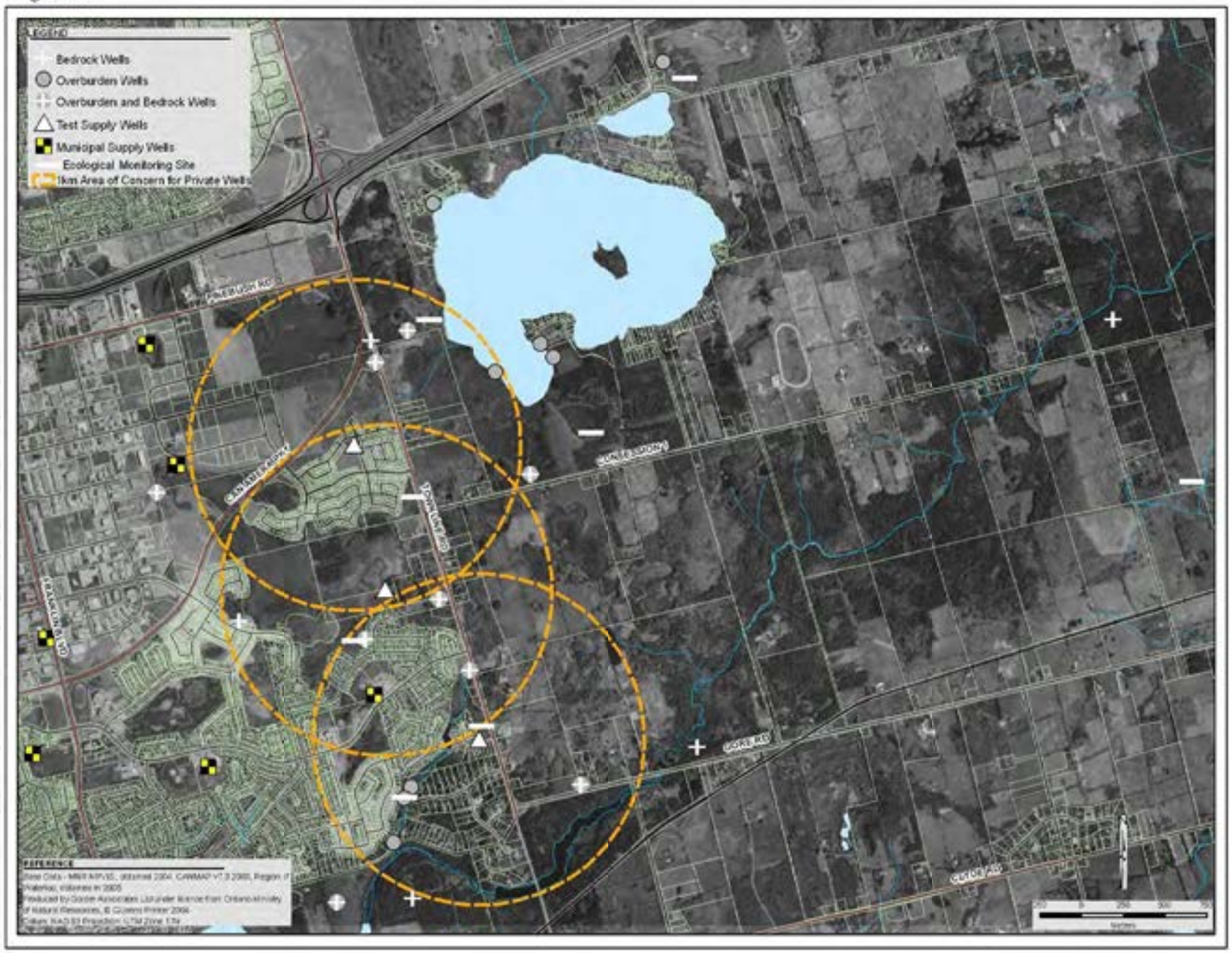
Although it is highly unlikely that wells outside of this area will be affected, water will be supplied at no cost to the resident if the pumping test does prevent with normal well use.

How will the Region advise residents of water level changes during the pumping test?
A summary of water level trends will be prepared and e-mailed to the Puslinch Township office at the end of each week during the test. The summary will present water levels from the previous week and compare them to pre-pumping levels. The Township of Puslinch has agreed to make this information available to residents.

When will Puslinch residents be informed of the results of the testing?
It is anticipated that the pumping test will be completed close to the end of September. Intensive monitoring will continue as long as one month afterwards to measure water level recovery. After that, all data will be compiled and water level graphs will be prepared. This information will be provided to residents at a follow-up public information centre to be held late in 2006 or early 2007.

What assurance do I have that my well or pond will be safeguarded in the long term?
Following the conclusion of the pumping test and provision of the data at the public meeting, the Region and our consultant will carefully evaluate the results. The data will be input into a three-dimensional groundwater flow model that will be used to predict the impact of long term pumping. The results of this analysis will be provided to Puslinch Township for review and comment. Further details on this process will be provided in future correspondence.

Figure 1


LEGEND
Bedrock Wells
Overburden Wells
Overburden and Bedrock Wells
Test Supply Wells
Municipal Supply Wells
Ecological Monitoring Site
1km Area of Concern for Private Wells
REFERENCE

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Sign in Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name	Address	Phone #	email
Robertson	RR6		
ENZO TERESI	RR # 6	621 7766	
Bev Pascoe	RR-6		
PATRICIA HEWITT	LANGFORD DR. R.R.NO.6	680-9134	
Heather Kleinsteuber	RR6	621-4930	
PETER KLUGAS	CLYDE RD	519-623-4492	
LYNDA RICHARDSON	CLYDE RD	519.621.6945	
MARLENE HILL	LANGFORD DR.	519-621-9329	
NORMA SUE FERNEGEL	CLYDE RD	519-621-6105	
HEATHER SCHMITZ	LANGFORD DR	519-622-7265	
WM. H. MILLAR	Clyde Rd	519-624-5069	
BOB LAURENCE	VILLAGE RD	519-623-2256	hyflyne hsfx.ca
Beverly Hill	Clyde Rd	519-621-6719	
Morley Hill	Clyde Rd	519-621-6719	
HANK VANDERGELD	clyde Rd.	519.624-4880	shallow well
C Furlong	Queen St Fergus	519-843-3920	
Susan Rees	Clyde Rd	(519)623-4492	
Deborah Graham	Clydebank Dr. RR6	519-623-0656	graham.clyde@sympatico.ca
Elizabeth Locke	Village Rd RR6	519-621-4672	
Hilda Welfing	Clyde Rd - RR#6	519-621-7627	
Kathy Selleck	Langford Dr., RR6	519-620-2249	Kselleck@hsfx.ca.
BEATRICE HALLMAN	VILLAGE RR #6	519-623-2946	
BILL HEWITT	LANGFORD DR RR#6	519-620-9134	
PAUL RICHARDS	CLYDE RD	519-621-6945	

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name	Address	Phone #	email
[illegible]	Clydebank	519-740 0116	
[illegible]	Langford	519-622-4085	
Tom Butler	Village Rd.	519-621-2179	
Janice Frank	Clydebank Dr	519-623-1299	
Susan Fielding	Puslinch Twsp Council	5197631226	
Dick Visser	" "	"	
Howard Hill	Langford Dr RR#6	519-624-9329	
STEVE PAWLITZKI	CLYDE RD.	519 624-9183	
DARREN TERVEER	LANGFORD DR RR#	5197403650	terveerd@MSFX.CA

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
	What guarantees do we have? Historic centre of village needs consideration disruption of serene country life environmental damage
Peter Lloyds L4Y0A0	I feel ultimately the uncontrolled growth in the Region and Cambridge will cause us major interruptions in our water supply in Clyde and I am against water taking from this area. Slow the growth and back up water conservation.

Please record questions or comments on this sheet and leave it with Regional Staff

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
W. R. MILLER	OK TO MONITOR OUR WELL + SPRING. - OLD SPRING ON PROPERTY OF JOHN WELCH
BOB LAURENCE VILLAGE RD CAMBRIDGE	REQUEST MY WELL MONITORED

Please record questions or comments on this sheet and leave it with Regional Staff

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
Susan Rivers. Clyde Rd.	would request our pond to be monitored.
Deborah Graham	- please send 'time line' for process - guaranteed that water supply in wells not affected

Please record questions or comments on this sheet and leave it with Regional Staff

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
Kathy Selleck	- concerns about my septic bed being close to well! - pumping house location ~~rear~~ back of our property
Elizabeth Lockie Village Rd	request well be monitored during testing

Please record questions or comments on this sheet and leave it with Regional Staff

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
Glen Snyder	guarantee my well water is not effected monitor my well
Letitia Moore Langford	concerned about watertable and the effects of low water levels.

Please record questions or comments on this sheet and leave it with Regional Staff

Regional Municipality of Waterloo
Cambridge East Environmental Assessment
Questions or Comments Sheet

North Dumfries Groundwater Investigation
Clyde Park Public Information Session
September 11, 2008

Name Address Phone # Email	Question(s)
PAUL RICHARDSON	check well
	Clyde RD.

Please record questions or comments on this sheet and leave it with Regional Staff

ATTACHMENT A8
Water Quality Results

Table A8.1
Inorganic Water Quality - Test Wells

Record #	ODWS		85418	92886	93398	85658	85945	175898	160452	160828	178310	178516	178887	209551	209274
Sampling Location			**CMTW1-05**	**CMTW2-05**	**CMTW3-05**	**PBTW1-05**	**SMTW1-05**	**PBTW3-07**	**SMTW2-07**	**SMTW3-07**	**SMTW4-08**	**SMTW4-08**	**SMTW4-08**	**NDTW1-08**	**NDTW2-08**
Sampling Date	**MAC**	**AO/OG**	13-Sep-05	18-Nov-05	23-Nov-05	15-Sep-05	19-Sep-05	07-Feb-08	18-Sep-07	20-Sep-07	03-Mar-08	04-Mar-08	05-Mar-08	20-Oct-08	16-Oct-08
Inorganic parameters															
Alkalinity as $CaCO_3$ (mg/L)		30-500	219	225	265	254	226	235	206	206	215	220	215	228	225
Aluminium (mg/L)		0.1	<0.005	<0.005	0.006	0.005	0.092	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.011	<0.010
Calcium (mg/L)			88.5	155	80.9	83.9	235	85.1	598	504	256	259	263	203	149
Chloride (mg/L)		250	8.38	11.5	4.49	12.2	11.8	2.01	31.1	18.6	17.5	17.9	19.3	28.8	23.6
Dissolved Organic Carbon (mg/L)		5	0.6	<0.5	1.1	1.7	0.9	0.6	1.1	< 0.5	0.5	0.6	0.5	0.8	0.6
Hardness (mg/L)		80-100	343	602	318	310	791	329	1900	1630	961	974	980	755	574
Iron (mg/L)		0.3	0.044	0.049	0.089	0.552	0.227	0.034	0.132	0.12	0.114	0.087	0.084	0.129	0.097
Magnesium (mg/L)			29.7	52.3	28.1	24.5	49.5	28.4	97.7	89.4	78.2	79.5	78.4	60.3	49.1
Manganese (mg/L)	0.1**	0.02**	0.002	0.005	0.048	0.038	0.015	0.003	0.015	0.012	0.005	0.005	0.005	0.008	0.004
Nitrate-N (mg/L)	10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	<0.10	<0.10
Nitrite-N (mg/L)	1		<0.010	<0.010	<0.010	<0.010	<0.010	<0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	<0.015	<0.015
pH (pH Units)		6.5-8.5	7.57*	7.03*	8.15*	7.45*	7.43*	7.24*	7.35*	7.29*	7.30*	7.30*	7.26*	6.99*	7.16*
Potassium (mg/L)			1.11	1.48	0.85	0.88	1.02	0.88	2.05	1.75	1.6	1.6	1.63	1.82	1.62
Sodium (mg/L)		200	7.39	9.34	3.53	5.23	11.4	4.6	26.5	20.3	15.9	16.1	16.5	18.8	14.8
Sulphate (mg/L)		500	80.9	358	28.1	23.7	492	72.8	1530	1300	603	684	734	465	281

NOTES:
ODWS - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2006
MAC - Maximum Acceptable Concentration
AO/OG - Aesthetic Objective and/or Operational Guideline
bold - indicates parameter exceeds MAC
- indicates parameter exceeds AO/OG
* pH estimated due to exceeded holding time.
** MAC and AO for manganese based on draft Canadian Drinking Water Guidelines (CDWG) likely to be adpoted by Ontario under the Safe Drinking Water Act.
1TU = 0.11919 Bq/l per IAEA, 2000 Report

Table A8.2
Inorganic Water Quality
28-Day Pumping Test (CMPW1-06, CMPW2-06 and PBPW1-06)

Record #	ODWS		124343	124603	124795	125314	125389	123842	123913	124344	1244605	124796	125313	125388
Sampling Location			**CMPW1-06**	**CMPW1-06**	**CMPW1-06**	**CMPW1-06**	**CMPW1-06**	**PBPW1-06**	**PBPW1-06**	**PBPW1-06**	**PBPW1-06**	**PBPW1-06**	**PBPW1-06**	**PBPW1-06**
Sampling Date	**MAC**	**AO/OG**	20-Sep-06	22-Sep-06	25-Sep-06	28-Sep-06	29-Sep-06	15-Sep-06	18-Sep-06	20-Sep-06	22-Sep-06	25-Sep-06	28-Sep-06	29-Sep-06
Inorganic parameters														
Alkalinity as $CaCO_3$ (mg/L)		30-500	246	228	230	228	232	240	244	236	248	250	240	250
Aluminium (mg/L)		0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium (mg/L)			83.4	86.3	85.8	89.2	87	105	102	101	99.7	96.6	95.8	94.1
Chloride (mg/L)		250	18.7	13.2	13.4	13.8	13.5	17.6	17.9	12.1	16	16.6	15.9	15.5
Dissolved Organic Carbon (mg/L)		5	0.9	0.6	<0.5	0.7	0.7	0.6	0.7	0.8	0.8	0.6	0.8	0.9
Hardness (mg/L)		80-100	332	343	341	356	351	404	389	385	379	368	367	364
Iron (mg/L)		0.3	0.138	0.101	0.136	0.113	0.121	0.21	0.27	0.253	0.238	0.258	0.25	0.244
Magnesium (mg/L)			30.1	31	30.9	32.3	32.4	34.5	32.5	32.3	31.7	30.8	31	31.3
Manganese (mg/L)	0.1**	0.02**	0.002	0.002	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Nitrate-N (mg/L)	10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite-N (mg/L)	1		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
pH (pH Units)		6.5-8.5	7.52*	7.54*	7.52*	7.26*	7.29*	7.20*	7.63*	7.51*	7.46*	7.46*	7.13*	7.22*
Potassium (mg/L)			1.09	1.15	1.15	1.21	1.2	1.27	1.19	1.15	1.15	1.14	1.16	1.16
Sodium (mg/L)		200	8.9	9.5	9.6	9.9	9.8	11.2	11	10.7	10.5	9.8	9.7	9.5
Sulphate (mg/L)		500	120	86.6	88.4	92.4	90.1	139	122	76.5	101	99.3	91.6	89.4
Field Parameters														
pH		6.5-8.5	7.19	7.15	7.24	7.19	7.43	7.32	7.19	7.15	7.29	7.22	7.38	7.34
Electrical Conductivity (mS/cm)			0.63	0.66	0.68	0.66	0.65	0.76	0.74	0.73	0.74	0.71	0.68	0.68
Temperature (0C)		15	9.8	9.8	9.9	9.8	9.8	10	12.7	9.7	10.3	9.8	9.7	9.9

Record #	ODWS		122697	122876	123134	123411	123843	123912	124342	124604	124974	125315	125390	125317	125316
Sampling Location			**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**CMPW2-06**	**TW10-78**	**6699 CONCESSION 1**
Sampling Date	**MAC**	**AO/OG**	6-Sep-06	8-Sep-06	11-Sep-06	13-Sep-06	15-Sep-06	18-Sep-06	20-Sep-06	22-Sep-06	25-Sep-06	28-Sep-06	29-Sep-06	28-Sep-06	28-Sep-06
Inorganic parameters															
Alkalinity as $CaCO_3$ (mg/L)		30-500	224	228	226	219	224	230	222	224	228	226	232	307	273
Aluminium (mg/L)		0.1	<.010	<.010	<.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium (mg/L)			124	120	122	117	116	115	110	119	124	118	118	90.4	82.1
Chloride (mg/L)		250	9.95	25.70	10.40	10.20	9.54	8.98	8.96	9.73	9.89	9.87	8.82	16.7	15.9
Dissolved Organic Carbon (mg/L)		5	0.9	0.6	0.6	0.8	0.5	0.6	0.6	0.5	0.6	0.7	0.8	1.3	<0.5
Hardness (mg/L)		80-100	485	483	486	473	469	468	451	475	488	474	473	357	334
Iron (mg/L)		0.3	0.279	0.196	0.180	0.206	0.174	0.182	0.235	0.179	0.274	0.197	0.192	0.025	0.020
Magnesium (mg/L)			42.6	44.5	44.0	43.8	43.5	3.8	42.7	43.1	43.4	43.5	43.4	31.8	31.4
Manganese (mg/L)	0.1**	0.02**	0.007	0.006	0.006	0.006	0.006	0.006	0.009	0.007	0.010	0.006	0.006	0.056	<0.001
Nitrate-N (mg/L)	10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	3.33	0.53
Nitrite-N (mg/L)	1		<0.015	<0.075	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
pH (pH Units)		6.5-8.5	7.69*	7.67*	7.42*	7.13*	7.26*	7.54*	7.54*	7.55*	7.71*	7.22*	7.62*	7.24*	7.41*
Potassium (mg/L)			1.20	1.23	1.22	1.26	1.25	1.18	1.22	1.18	1.21	1.22	1.24	1.39	1.2
Sodium (mg/L)		200	8.0	8.3	8.4	8.4	8.4	8.9	8.5	8.6	8.7	8.4	8.4	9.7	9.0
Sulphate (mg/L)		500	207	10.8	221	229	188	217	208	197	214	211	208	24.4	29.1
Field Parameters															
pH		6.5-8.5	7.27	7.45	7.32	6.96	7.24	7.3	7.24	7.3	7.36	7.14	7.32	6.74	6.88
Electrical Conductivity (mS/cm)			0.85	0.85	0.88	0.85	0.88	0.85	0.85	0.87	0.88	0.87	0.85	0.65	0.64
Temperature (0C)		15	12.2	11.7	10.2	11.1	9.6	10.5	9.6	9.5	9.5	9.5	9.7	8.4	9.4

NOTES:
ODWS - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2003
MAC - Maximum Acceptable Concentration
AO/OG - Aesthetic Objective and/or Operational Guideline
bold - indicates parameter exceeds MAC
- indicates parameter exceeds AO/OG
* pH estimated due to exceeded holding time.
** MAC and AO for manganese based on draft Canadian Drinking Water Guidelines (CDWG) likely to be adpoted by Ontario under the Safe Drinking Water Act.
1TU = 0.11919 Bq/l per IAEA, 2000 Report

Table A8.3
Inorganic Water Quality
Additional Pumping Tests (PBPW2-08 and NDPW1-08)

Record #	ODWS		185958	186313	186507	219535	219926	251779	252157	252595
Sampling Location			**PBPW2-08**	**PBPW2-08**	**PBPW2-08**	**NDPW1-08**	**NDPW1-08**	**NDPW1-08**	**NDPW1-08**	**NDPW1-08**
Sampling Date	**MAC**	**AO/OG**	5-May-08	7-May-08	8-May-08	14-Jan-09	19-Jan-09	24-Sep-09	28-Sep-09	30-Sep-09
Inorganic parameters										
Alkalinity as $CaCO_3$ (mg/L)		30-500	247	255	257	227	222	276	223	223
Aluminium (mg/L)		0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium (mg/L)			86.2	89.5	89.8	133	126	142	129	141
Chloride (mg/L)		250	5.22	8.41	9.18	23.2	25	24.7	27.4	24.5
Dissolved Organic Carbon (mg/L)		5	1	1.2	0.7	1.7	1	0.9	0.6	0.9
Hardness (mg/L)		80-100	335	345	346	537	523	554	525	558
Iron (mg/L)		0.3	0.055	0.037	0.041	0.06	0.535	0.1	0.071	0.073
Magnesium (mg/L)			29.1	29.6	29.6	49.8	50.6	48.4	49.2	50.1
Manganese (mg/L)	0.1**	0.02**	0.006	0.007	0.008	0.004	0.009	0.004	0.004	0.004
Nitrate-N (mg/L)	10		<0.10	<0.10	<0.015	<0.1	<0.1	<0.10	<0.10	<0.10
Nitrite-N (mg/L)	1		<0.015	<0.015	<0.115	<0.015	<0.015	<0.015	<0.015	<0.015
pH (pH Units)		6.5-8.5	7.39*	7.56*	7.52*	6.90*	7.23*	7.67*	7.58*	7.54*
Potassium (mg/L)			1.05	1.04		1.56	1.71	1.51	1.58	1.64
Sodium (mg/L)		200	4.9	5.1	5.3	14.7	15.1	13.6	13.8	13.4
Sulphate (mg/L)		500	62.6	61	58.2	250	279	338	393	278
Field Parameters										
pH		6.5-8.5	7.7	7.75	7.78	8.56	7.97	7.62	7.56	7.58
Electrical Conductivity (mS/cm)						0.93	8.5	0.96	0.96	0.99
Temperature (^{0}C)		15	11.4	11.8	10.1	6.5	0.89	9.9	10.0	10.0

NOTES:

ODWS - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2003

MAC - Maximum Acceptable Concentration

AO/OG - Aesthetic Objective and/or Operational Guideline

bold - indicates parameter exceeds MAC

- indicates parameter exceeds AO/OG

* pH estimated due to exceeded holding time.

** MAC and AO for manganese based on draft Canadian Drinking Water Guidelines (CDWG) likely to be adpoted by Ontario under the Safe Drinking Water Act.

1TU = 0.11919 Bq/l per IAEA, 2000 Report

Table A8.4
Inorganic Water Quality
Shades Mills Bedrock Wells

Sampling Location	ODWS		SMTW3A-07	SMTW3B-07	SMTW3C-07	SMTW2A-07	SMTW2B-07	SMTW2C-07	SM3A-07	SM3B-07	SM3C-07
Sampling Date	MAC	AO/OG	30-Oct-07	30-Oct-07	30-Oct-07	30-Oct-07	30-Oct-07	30-Oct-07	31-Oct-07	31-Oct-07	31-Oct-07
Inorganic parameters											
Alkalinity as $CaCO_3$ (mg/L)		30-500	213	206	205	206	211	209	211	210	225
Aluminium (mg/L)		0.1	0.025	0.028	0.034	< 0.010	< 0.010	0.012	9.35	4.64	0.677
Calcium (mg/L)			452	518	495	569	565	450	567	535	208
Chloride (mg/L)		250	20.8	12.7	5.0	29.1	20.8	26.3	12.3	10.5	6.4
Dissolved Organic Carbon (mg/L)		5	1.2	0.9	1.0	0.8	0.6	1.1	0.9	2.4	1.3
Hardness (mg/L)		80-100	1500	1760	1640	1850	1860	1510	1860	1790	710
Iron (mg/L)		0.3	0.412	0.231	0.151	0.129	0.132	1.05	9.34	5.38	1.30
Magnesium (mg/L)			89.5	113	97.8	104	109	92.6	107	109	46.3
Manganese (mg/L)	0.1**	0.02**	0.055	0.018	0.014	0.015	0.016	0.025	**0.245**	**0.162**	**0.104**
Nitrate-N (mg/L)	10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrite-N (mg/L)	1		< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
pH (pH Units)		6.5-8.5	6.99*	7.04*	7.10*	7.10*	7.14*	7.10*	7.18*	7.12*	7.30*
Potassium (mg/L)			1.49	1.87	1.44	2.10	1.82	1.95	5.21	2.42	1.04
Sodium (mg/L)		200	24.0	17.9	15.5	26.6	24.0	23.5	33.3	44.5	46.3
Sulphate (mg/L)		500	1150	1340	1300	1480	1470	1180	1400	1420	487
Field Parameters											
pH		6.5-8.5	7.30	7.27	7.30	7.31	7.29	7.30	7.38	7.33	7.59
Electrical Conductivity (mS/cm)			2.30	2.56	2.45	2.78	2.73	2.33	2.60	2.66	1.34
Temperature (^{0}C)			8.2	9	11.5	11.3	12.8	12.9	9.3	10.9	9.9

Sampling Location	ODWS		CMOW2A-06	CMOW2B-06	CMOW2C-06	SMTW1A-05	SMTW1B-05	SMTW1C-05
Sampling Date	MAC	AO/OG	1-Nov-07	1-Nov-07	1-Nov-07	2-Nov-07	2-Nov-07	2-Nov-07
Inorganic parameters								
Alkalinity as $CaCO_3$ (mg/L)		30-500	219	202	259	212	222	263
Aluminium (mg/L)		0.1	0.023	0.016	< 0.010	0.066	0.028	0.064
Calcium (mg/L)			141	360	87.5	420	249	78.7
Chloride (mg/L)		250	14.2	4.3	3.7	11.8	1.0	23.2
Dissolved Organic Carbon (mg/L)		5	0.8	0.8	1.9	1.5	1.9	2.8
Hardness (mg/L)		80-100	585	1260	351	1360	858	316
Iron (mg/L)		0.3	0.075	0.149	0.18	0.239	0.134	0.597
Magnesium (mg/L)			56.6	87.8	32.1	75.5	57.4	29
Manganese (mg/L)	0.1**	0.02**	0.003	0.007	0.021	0.011	0.006	0.013
Nitrate-N (mg/L)	10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrite-N (mg/L)	1		< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
pH (pH Units)		6.5-8.5	7.14*	7.10*	7.37*	7.33*	7.32*	7.55*
Potassium (mg/L)			1.48	1.10	1.01	1.24	0.89	0.87
Sodium (mg/L)		200	10.7	11.2	4.9	14.9	7.7	6.2
Sulphate (mg/L)		500	355	1060	83.9	1130	616	33.8
Field Parameters								
pH		6.5-8.5	7.66	7.50	7.83	7.61	7.63	7.92
Electrical Conductivity (mS/cm)			1.10	2.07	0.66	2.19	1.48	0.60
Temperature (^{0}C)			9.3	9.3	8.6	7.2	7.7	6.9

NOTES:
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bold - indicates parameter exceeds MAC
- indicates parameter exceeds AO/OG
** MAC and AO for manganese based on draft Canadian Drinking Water Guidelines (CDWG) likely to be adpoted by Ontario under the Safe Drinking Water Act.
* pH estimated due to exceeded holding time.

Organic Water Quality

Sampling Location	UNIT	CMPW1-06	CMPW2-06	PBPW1-06	PBPW2-08	NDPW1-08
Sampling Date		29-Sep-06	29-Sep-06	29-Sep-06	08-May-08	29-Sep-09
Organic Parameters						
(M+P) - XYLENE	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00
1,1,1,2-TETRACHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	-
1,1,1-TRICHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-TETRACHLOROETHANE	ug/L	<0.5	<0.5	<0.5	-	<0.5
1,1,2-TRICHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-DICHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-DICHLOROETHYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-DIBROMOETHANE	ug/L	<0.5	<0.5	<0.5	-	-
1,2-DICHLOROBENZENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-DICHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-DICHLOROPROPANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-DICHLOROBENZENE	ug/L	<0.5	<0.5	<0.5	-	-
1,4-DICHLOROBENZENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4,5-TETRACHLOROPHENOL	ug/L	-	-	-	-	<0.1
2,3,4,6-TETRACHLOROPHENOL	ug/L	<10.0	<10.0	<10.0	<10.0	<0.1
2,4,5-T	ug/L	<10.0	<10.0	<10.0	<10.0	<0.5
2,3,4-TRICHLOROPHENOL	ug/L	-	-	-	-	<0.1
2,3,6-TRICHLOROPHENOL	ug/L	-	-	-	-	<0.1
2,4,6-TRICHLOROPHENOL	ug/L	<0.5	<0.5	<0.5	<0.5	<0.1
2,3-DICHLOROPHENOL	ug/L	-	-	-	-	<0.1
2,4-D	ug/L	<10.0	<10.0	<10.0	<10.0	<0.5
2,4-DICHLOROPHENOL	ug/L	<5.0	<5.0	<5.0	<0.3	<0.1
2,4-DIMETHYLPHENOL	ug/L	-	-	-	-	<1
2,4-DINITROPHENOL	ug/L	-	-	-	-	<1
2,5-DICHLOROPHENOL	ug/L	-	-	-	-	<0.1
2.6-DICHLOROPHENOL	ug/L	-	-	-	-	<0.1
2-CHLOROETHYLVINYL ETHER	ug/L	<5.0	<5.0	<5.0	<5.0	-
2-HEXANONE	ug/L	<5.0	<5.0	<5.0	-	-
2-CHLOROPHENOL	ug/L	-	-	-	-	<0.1
2-NITROPHENOL	ug/L	-	-	-	-	<1
3,4,5-TRICHLOROPHENOL	ug/L	-	-	-	-	<0.1
3,4-DICHLOROPHENOL	ug/L	-	-	-	-	<0.1
3,5-DICHLOROPHENOL	ug/L	-	-	-	-	<0.1
4,6-DINTRO-2-METHYLPHENOL	ug/L	-	-	-	-	<1
4-CHLORO-3-METHYLPHENOL	ug/L	-	-	-	-	<0.1
4-CHLOROPHENOL	ug/L	-	-	-	-	<0.1
4-NITROPHENOL	ug/L	-	-	-	-	<1
ACETONE	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0
ACROLEIN	ug/L	<5.0	<5.0	<5.0	-	-
ACRYLONITRILE	ug/L	<5.0	<5.0	<5.0	-	-
ALACHLOR	ug/L	<0.5	<0.5	<0.5	<0.5	<0.25
ALDICARB	ug/L	<3.5	<3.5	<3.5	<1.0	<0.5
ALDRIN	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05
ALDRIN + DIELDRIN	ug/L	<0.07	<0.07	<0.07	<0.07	<0.07
ALPHA BHC	ug/L	<0.4	<0.4	<0.4	<0.3	<0.13
Alpha-Chlordane	ug/L	<0.2	<0.2	<0.2	<0.2	<0.13
AMINOMETHYLPHOSPHONIC ACID	ug/L	<2.0	<2.0	<2.0	<2.0	-
AROCLOR-1232	ug/L	<0.06	<0.06	<0.06	<0.06	<0.15

Organic Water Quality

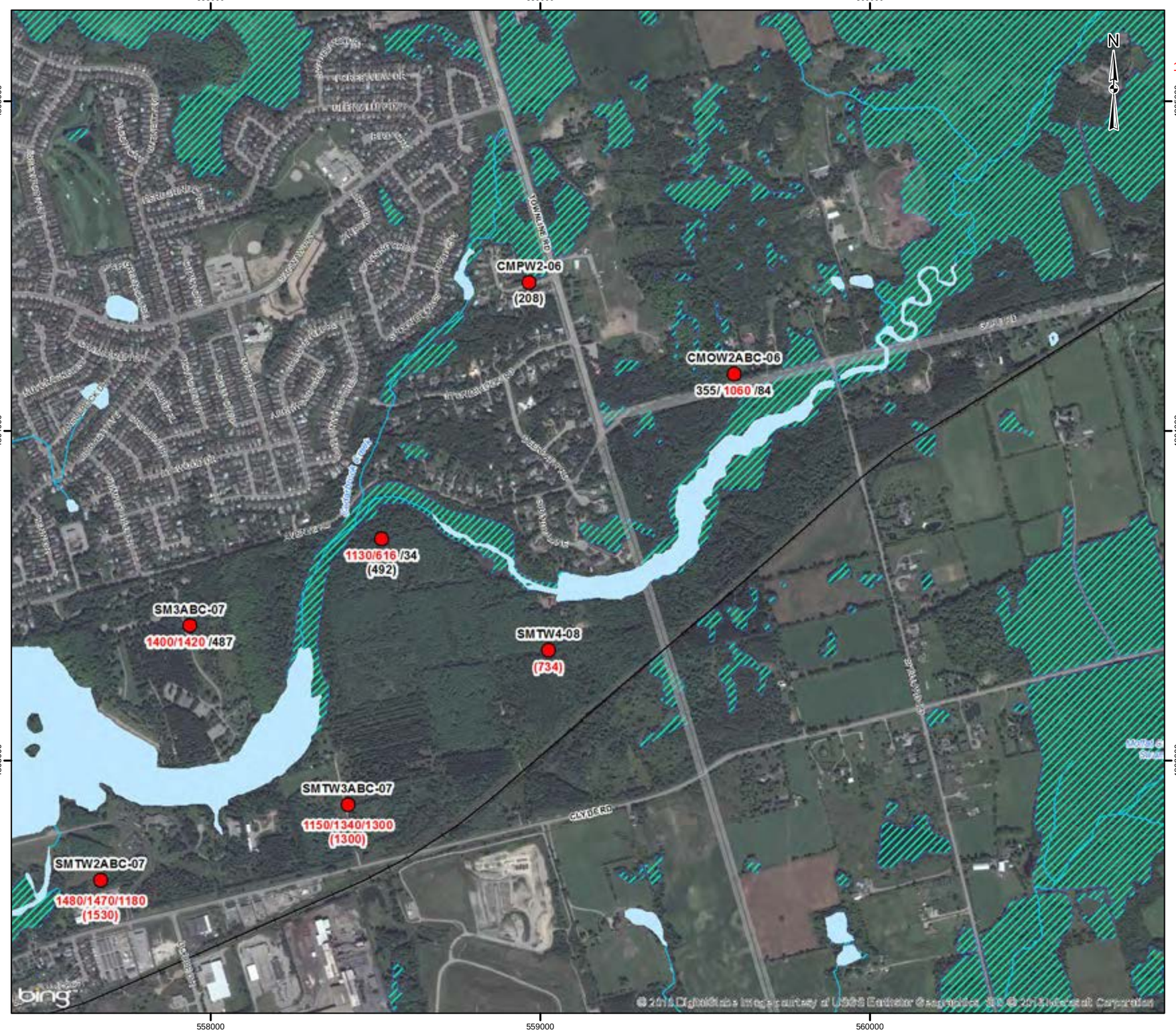
Sampling Location	UNIT	CMPW1-06	CMPW2-06	PBPW1-06	PBPW2-08	NDPW1-08
Sampling Date		29-Sep-06	29-Sep-06	29-Sep-06	08-May-08	29-Sep-09
Organic Parameters						
AROCLOR-1242	ug/L	<0.05	<0.05	<0.05	<0.06	<0.15
AROCLOR-1248	ug/L	<0.05	<0.05	<0.05	<0.06	<0.15
AROCLOR-1254	ug/L	<0.05	<0.05	<0.05	<0.06	<0.15
AROCLOR-1260	ug/L	<0.05	<0.05	<0.05	<0.06	<0.15
ATRAZINE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.25
ATRAZINE + DESETHYL -ATRAZINE	ug/L	<1.0	<1.0	<1.0	<1.00	<0.5
Azinphos-methyl	ug/L	<2.0	<2.0	<2.0	<2.0	<1.5
BENDIOCARB	ug/L	<3.0	<3.0	<3.0	<1.0	<0.2
BENZENE	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50
BENZO(a)PYRENE	ug/L	<0.01	<0.01	<0.01	<0.01	<0.01
BETA BHC	ug/L	<0.4	<0.4	<0.4	<0.3	<0.13
BROMODICHLOROMETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
BROMOFORM	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
BROMOMETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
BROMOXYNIL	ug/L	<0.5	<0.5	<0.5	<0.5	<0.05
CARBARYL	ug/L	<0.2	<0.2	<0.2	<1.0	<0.2
CARBOFURAN	ug/L	<4.0	<4.0	<4.0	<1.0	<0.2
CARBON DISULPHIDE	ug/L	<5.0	<5.0	<5.0	-	-
CARBON TETRACHLORIDE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CHLORDANE (TOTAL)	ug/L	<0.6	<0.6	<0.6	<0.60	<0.39
CHLOROBENZENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CHLOROETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CHLOROFORM	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CHLOROMETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CHLORPYRIFOS (DURSBAN)	ug/L	<1.0	<1.0	<1.0	<0.5	<0.25
CIS-1,2-DICHLOROETHYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CIS-1,3-DICHLOROPROPYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
CYANAZINE (BLADEX)	ug/L	<1.0	<1.0	<1.0	<0.5	<0.25
DDT + METABOLITES	ug/L	<3.0	<3.0	<3.0	<2.00	<0.78
DELTA BHC	ug/L	<0.4	<0.4	<0.4	<0.3	<0.13
DESETHYL- ATRAZINE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.25
DIAZINON	ug/L	<1.0	<1.0	<1.0	<0.5	<0.13
DIBROMOCHLOROMETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	-
DICAMBA	ug/L	<10.0	<10.0	<10.0	<10.0	<0.5
DICHLORODIFLUOROMETHANE	ug/L	<0.5	<0.5	<0.5	-	-
DICHLOROMETHANE	ug/L	<1.0	<1.0	<1.0	<1.0	35.2
DICLOFOP-METHYL	ug/L	<0.9	<0.9	<0.9	<0.9	<0.5
DIELDRIN	ug/L	<0.02	<0.02	<0.02	<0.02	<0.02
DIMETHOATE	ug/L	<2.5	<2.5	<2.5	<0.5	<0.25
DINOSEB	ug/L	<1.0	<1.0	<1.0	<1.0	<0.5
DIQUAT	ug/L	<0.1	<0.1	<0.1	<2.0	<2
DIURON	ug/L	<0.2	<0.2	<0.2	<1.0	<0.6
ENDOSULFAN SULFATE	ug/L	<0.5	<0.5	<0.5	-	-
ENDRIN	ug/L	<0.1	<0.1	<0.1	<0.1	<0.13
ETHYL BENZENE	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50
GAMMA CHLORDANE	ug/L	<0.2	<0.2	<0.2	<0.2	<0.13
GLYPHOSATE	ug/L	<2.0	<2.0	<2.0	<2.0	-
HEPTACHLOR	ug/L	<0.15	<0.15	<0.15	<0.1	<0.13

Organic Water Quality

Sampling Location	UNIT	CMPW1-06	CMPW2-06	PBPW1-06	PBPW2-08	NDPW1-08
Sampling Date		29-Sep-06	29-Sep-06	29-Sep-06	08-May-08	29-Sep-09
Organic Parameters						
HEPTACHLOR + HEPTACHLOR EPOXIDE	ug/L	<0.3	<0.3	<0.3	<0.20	<0.26
HEPTACHLOR EPOXIDE	ug/L	<0.15	<0.15	<0.15	<0.1	<0.13
LINDANE	ug/L	<0.4	<0.4	<0.4	<0.3	<0.3
MALATHION	ug/L	<3.0	<3.0	<3.0	<3.0	<1.25
METHOXYCHLOR	ug/L	<1.0	<1.0	<1.0	<1.0	<0.13
METHYL ETHYL KETONE	ug/L	<5.0	<5.0	<5.0	-	-
METHYL ISOBUTYL KETONE	ug/L	<5.0	<5.0	<5.0	-	-
METHYL t-BUTYL ETHER	ug/L	<5.0	<5.0	<5.0	-	-
METOLACHLOR	ug/L	<0.5	<0.5	<0.5	<0.5	<0.25
METRIBUZIN (SENCOR)	ug/L	<3.0	<3.0	<3.0	<0.5	<0.13
MICROCYSTIN	ug/L	-	-	-	<0.5	<0.5
NITRILOTRIACETIC ACID	mg/L	-	-	-	<0.05	<0.05
N-NITROSODIMETHYLAMINE	ug/L	-	-	-	<0.002	<0.002
o,p-DDD	ug/L	<0.5	<0.5	<0.5	<0.3	<0.13
o,p-DDE	ug/L	<0.5	<0.5	<0.5	<0.3	<0.13
o,p'-DDT	ug/L	<0.5	<0.5	<0.5	<0.3	<0.13
ORTHO XYLENE	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50
OXYCHLORDANE	ug/L	<0.2	<0.2	<0.2	<0.2	<0.13
p,p'-DDD	ug/L	<0.5	<0.5	<0.5	<0.3	<0.13
p,p'-DDE	ug/L	<0.5	<0.5	<0.5	<0.3	<0.13
p,p'-DDT	ug/L	<0.5	<0.5	<0.5	<0.5	<0.13
PARAQUAT	ug/L	<0.1	<0.1	<0.1	<1.0	<1.0
PARATHION ETHYL	ug/L	<1.0	<1.0	<1.0	<1.0	<1.25
Parathion Methyl	ug/L	<1.0	<1.0	<1.0	<1.0	<1.25
PCB - Total	ug/L	<0.30	<0.30	<0.30	<0.30	<0.75
PENTACHLOROPHENOL	ug/L	<5.0	<5.0	<5.0	<1.0	<0.1
PHENOL	ug/L	-	-	-	-	<0.5
PHORATE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.25
PICLORAM	ug/L	<10.0	<10.0	<10.0	<10.0	<1.0
PROMETRYNE	ug/L	<0.25	<0.25	<0.25	<0.1	<0.25
SIMAZINE	ug/L	<1.0	<1.0	<1.0	<0.5	<0.13
STYRENE	ug/L	<0.50	<0.50	<0.50	-	-
TEMEPHOS	ug/L	<10.0	<10.0	<10.0	<10.0	<1.25
TERBUFOS	ug/L	<0.5	<0.5	<0.5	<0.2	<0.25
TETRACHLOROETHYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
TOLUENE	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50
TOTAL TRIHALOMETHANE	ug/L	<2.0	<2.0	<2.0	<2.00	<2.0
TRANS-1,2-DICHLOROETHYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
TRANS-1,3-DICHLOROPROPYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
TRIALLATE	ug/L	<2.0	<2.0	<2.0	<1.0	<0.2
TRICHLOROETHYLENE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
TRICHLOROFLUOROMETHANE	ug/L	<0.5	<0.5	<0.5	<0.5	<0.5
TRIFLURALIN	ug/L	<1.0	<1.0	<1.0	<0.5	<0.25
VINYL CHLORIDE	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2
XYLENES (TOTAL)	ug/L	21.8	5.5	5.4	<1.50	<1.5

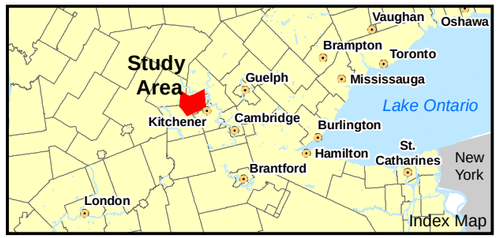
Table A8.6
Isotopes and Radionuclides

Sampling Location	CMPW1-06	CMPW2-06	PBPW1-06	6699 CONCESSION 1	TW10-78	NDPW1-08
Sampling Date	28-Sep-06	28-Sep-06	28-Sep-06	28-Sep-06	28-Sep-06	19-Jan-09
Isotope analysis						
Oxygen-18	-9.87	-10.03	-10.2	-10.13	-9.34	
Deuterium	-69.34	-69.3	-68.72	-68.21	-66.76	
Tritium (TU)	1.3 +/- 0.4	<0.8 +/- 0.4	5.7 +/- 0.6	13.1 +/- 1.0	14.5 +/- 1.1	
Sulphur-34						
Radionuclides						
Gross Alpha (Bq/l)	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Gross Beta (Bq/l)	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Tritium (Bq/l)	<1000	<1000	<1000	<1000	<1000	<1000



LEGEND

- Monitoring Well
- 1130/616/34 Sulfate Conc. at Monitoring Well A/B/C (mg/L)
- (492) Sulfate Conc. During Test Pumping (mg/L)
- Watercourse
- Waterbody
- GRCA Provincially Significant Wetlands
- Municipalities



REFERENCE

Base Data - MNRF LIO obtained 2016
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources and Forestry, © Queens Printer 2016
GRCA Wetlands - Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, obtained 2016
Datum: NAD 83 Projection: UTM Zone 17N

200 0 200 400 600 800
Meters

PROJECT
CAMBRIDGE EAST WATER SUPPLY
CLASS ENVIRONMENTAL ASSESSMENT

TITLE
SHADES MILLS SULPHATE ANALYSIS RESULTS

Golder Associates
Mississauga, Ontario

PROJECT NO. 05-1112-010			SCALE 1:12,000		REV. 1
DESIGN	CGG	10 Mar. 2005	FIGURE: A8.1		
GIS	PR	1 Jun. 2016			
CHECK	JLH	1 Jun. 2016			
REVIEW	JAP	1 Jun. 2016			

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