

2. Field Program

2.1 Health and Safety Plan

Prior to beginning the field program, CH2M HILL developed a health and safety plan (H&SP). The H&SP provided a summary of potential physical hazards that could be encountered by field staff during fieldwork. The plan included the following components:

- Tasks permitted (regulated tasks)
- Hazard controls
- Listing of CH2M HILL personnel performing site work
- Personal protective equipment to be used at the site
- Emergency response plan

The plan was communicated to CH2M HILL's subcontractors via pre-job on-site safety meetings. Subcontractors were required to sign the H&SP docket following the safety meeting, indicating that they fully understood the H&SP.

2.2 Drilling Program

Six boreholes were advanced during the hydrogeologic portion of the investigation. Soil samples were collected with a split-spoon sampler that measured 0.6 m in length. Soil samples were collected continuously to a depth of 3 m below ground surface after which point they were collected at 1.5 m intervals. Piezometers were installed within four of the boreholes. Table 2.1 below summarizes the drilling program. The new piezometers provide water table elevations to assess local groundwater flow conditions.

TABLE 2.1
BOREHOLE SUMMARY

Location ID	Depth (m bgs)	Diameter (mm)	Screen Length (m)	Details
P-06-8	9.9	51	1.7	Temporary piezometer
MW-06-5	9.1	51	3.15	Piezometer to remain in place
P-06-6	16.4	51	1.66	Temporary piezometer
MW-06-7S	12.5	25	3.0	Shallow piezometer to remain in place
MW-06-7D	23.6	51	1.5	Deep piezometer to remain in place
BH-06-13	25			No installation
BH-06-14	22.8			No installation

The hydrogeologic drilling was conducted between July 7 and July 12, 2006, under the supervision of CH2M HILL personnel. CH2M HILL retained Atcost Soil Drilling (Atcost) of Concord, Ontario, to drill the boreholes and install the piezometers. An additional deep

borehole (BH-06-14) was completed on August 25, 2006 to provide supplementary stratigraphic data. Drilling for the geotechnical portion of the investigation took place on July 13, 2006. Naylor Engineering Ltd. was subcontracted by CH2M HILL to conduct the geotechnical portion of the investigation. Details of the geotechnical investigation are presented under a separate report included in Appendix A. Naylor borehole designations differed from those of CH2M HILL and are outlined in Table 2.2 below.

TABLE 2.2
GEOTECHNICAL BOREHOLE IDENTIFICATION

CH2M HILL Borehole Designation	Naylor Designation
P-06-1	BH108
P-06-2	BH107
P-06-3	BH106
P-06-4	BH104
BH-06-9	BH105
BH-06-10	BH103
BH-06-11	BH102
BH-06-12	BH101

Borehole and piezometer locations are shown in Figure 2-1. All boreholes were advanced in the overburden. Piezometer construction details are shown on the well logs, included in Appendix B. Piezometers were constructed with threaded PVC pipes and machine slotted well screens. No. 3 silica sand was placed around the annulus of each well screen and extended above the top of the screen. A bentonite seal was placed around the piezometer above the sand pack and the remainder of the annulus was filled with bentonite grout to surface to prevent surface water from entering the well bore. All installations were completed with stick-up pipes and steel protective casings that were approximately 0.6 m high and equipped with locks. Boreholes BH-06-13 and BH-06-14, where no piezometers were installed, were backfilled with bentonite grout to surface.

Atcost, a licensed water well driller, installed all piezometers in accordance with R.R.O. 1990, Reg.903. A water well record was completed for permanent piezometer MW-06-7 and copies were retained by Owen, CH2M HILL, and the Ontario Ministry of Environment (MOE). A copy of the well record is included in Appendix E.

2.2.1 Surveying

The elevation of the ground surface was surveyed by PEIL and the piezometer stick-ups measured to provide vertical elevations and relate them to existing on-site monitoring wells (MW1, MW2, MW3).

2.3 Groundwater Measurement

All permanent on-site piezometers were developed on July 13 and 14, 2006 to remove fine grained sediments that may have accumulated along the well screens. Each piezometer was equipped with polyethylene tubing and a Waterra foot valve and was developed until dry or until at least three well volumes had been removed (volume of water in stand pipe screen plus sand pack). Following this water levels were measured at all onsite wells on July 19, 2006, to determine groundwater flow direction and magnitude of horizontal hydraulic gradients.

Groundwater sampling was not conducted at this time. CH2M HILL understands that PEIL will be conducting all future groundwater monitoring activities.

2.4 Hydraulic Testing

Single well response tests were carried out on selected piezometers to estimate the hydraulic conductivity of the geologic formation. Falling head tests were conducted in MW1, MW3, P-06-8, and MW-06-7D. Piezometer MW-06-5 had an insufficient water level to conduct a single well response test.

A static water level was taken at the well using a water level meter prior to commencing the single well response test. Solinst Level Loggers were programmed to measure groundwater changes at a one-second time interval before the testing began. The Level Logger was placed in the well before the test commenced and was allowed to record for approximately 3 to 5 minutes to provide baseline water level measurements. Depending on the piezometer diameter, a 1.5-inch or 3/4-inch diameter slug of known volume was quickly introduced into the well to raise the water level.

The rate of groundwater recovery (falling head) to static groundwater levels was measured using a Level Logger. Water levels were measured until they recovered to static conditions (or at least two-thirds of static conditions). Upon recovery to static conditions (or at least two-thirds of static conditions), the Level Logger was removed from the well and the single well response test was concluded.

Data was downloaded from the Level Logger using the optical reader (supplied by Solinst) and a laptop computer installed with the Level Logger software. This process was completed for each location.

Tests were repeated on two different occasions in MW-06-7D and MW3 to confirm that the results were consistent and reproducible.

2.5 Piezometer Abandonment

Once hydrogeologic measurements were completed, the temporary piezometers were abandoned in accordance with R.R.O. 1990, Reg. 903, s.21. Under the supervision of CH2M HILL, Atcost abandoned the piezometers on August 25, 2006.

2.6 Private Water Well Survey

Well records were obtained from the Region of Waterloo for two private wells found within the area of investigation. These wells were identified as the McNally well and well TR2-64-91. Four additional well logs were obtained from the Ontario Ministry of Environment (MOE) Water Well Information System database. Copies of the well logs are provided in Appendix E. Data from the private well logs were used to prepare geologic cross-sections that transect the site. The private well logs provided additional information about deeper stratigraphic units within 500 m of the site. The private wells in the vicinity of the site range in depth from 12.5 to 64.92 m. To supplement the private well data, CH2M HILL conducted a review of historical reports and compiled data from borehole logs on adjacent properties which were included in the cross-sections.