ONONDAGA LAKE PRE-DESIGN INVESTIGATION: WASTEBED 13 SETTLEMENT PILOT STUDY DATA SUMMARY REPORT Onondaga County, New York

Prepared For:

Honeywell

5000 Brittonfield Parkway
East Syracuse, NY 13057

Prepared By:

PARSONS

290 Elwood Davis Road, Suite 312
Liverpool, New York 13088
Phone: (315) 451-9560
Fax: (315) 451-9570

In Association with:

GEOSYNTEC CONSULTANTS

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144
Phone: (678) 202-9500
Fax: (678) 202-9501

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (CONTINUED)

LIST OF APPENDICES

SECTION 1

PROJECT BACKGROUND

1.1 INTRODUCTION

This *Onondaga Lake Phase I Pre-Design Investigation: Wastebed 13 Settlement Pilot Study Data Summary Report* (*Data Summary Report*) presents the field investigation, laboratory test results, instrumentation installation details, construction observations, and one-year field performance monitoring results from the Phase I Pre-Design Investigation (PDI) Wastebed 13 Settlement Pilot Study (Pilot Study). This study was implemented by Parsons in association with Geosyntec Consultants (Geosyntec) on behalf of Honeywell International, Inc. (Honeywell) to support future Onondaga Lake remediation activities. This study was performed in accordance with the Work Plan developed by Parsons and Geosyntec (2005).

A major component of the New York State Department of Environmental Conservation's (NYSDEC) and United States Environmental Protection Agency's (USEPA) selected remedy for Onondaga Lake, as specified in the Record of Decision for the Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site (NYSDEC and USEPA, 2005), includes the removal (i.e., dredging) and onsite consolidation of the majority of the removed sediments. Therefore, an onsite sediment consolidation area (SCA) is required. As discussed and concluded in the *Onondaga Lake SCA Siting Evaluation* (Parsons, 2006), Wastebed 13 is currently the recommended SCA location based on an evaluation of access considerations, capacity, current and future site use, geotechnical considerations, and potential community impacts. On the basis of this recommendation, several concurrent pre-design investigation activities were initiated. Working together with the NYSDEC, Honeywell will ensure that the local community remains informed as activities progress and new information becomes available. In addition, SCA-related activities will be coordinated with the local community to minimize the potential for community impacts and to provide opportunities for community input regarding future land reuse planning.

The activities performed during this Pilot Study were coordinated with the overall Leachate Minimization/End Use Program for Wastebeds 9 through 15. Specifically, this Pilot Study has not and will not affect the Biomass Pilot Study being conducted by the State University of New York College of Environmental Sciences and Forestry.

As discussed in the Work Plan (Parsons and Geosyntec, 2005), the purpose of the Pilot Study is to evaluate potential Solvay waste behavior during the anticipated SCA design phases (i.e., construction, operation, and closure). Therefore, the Pilot Study included placing approximately 10 feet (ft) of fill on a one-acre plot within the wastebed, monitoring the Solvay waste beneath the test plot, and excavating two test pits. Following this brief introduction, this section provides the site background information and the general organization for the remainder of this report.

1.2 SITE BACKGROUND INFORMATION

Wastebed 13 was originally designed as a settling basin for the disposal of Solvay waste, which is a by-product of sodium carbonate (soda ash) production via the Solvay process (i.e., process by which soda ash is formed from salt, limestone, carbon dioxide, and ammonia). Solvay waste is a combination of process residuals, unreacted material, and mineral salts that was deposited in a slurry exhibiting a very high pH. Solvay waste was produced by Honeywell's predecessor Allied Chemical between 1881 and 1986, and Wastebed 13 received the material from 1973 to 1985.

Wastebed 13 is located in the Town of Camillus, Onondaga County, New York (Figure 1.1). Wastebed 13 occupies approximately 163 acres and is bordered to the north by Ninemile Creek and CSX Railroad tracks; to the west by an Onondaga County Garage property, a former gravel excavation owned by Honeywell, and a few residential properties; and to the east and south by Wastebeds 12 and 14, respectively (Figure 1.2).

Additional background information, including site history and details regarding previous investigations is available in the Work Plan (Parsons and Geosyntec, 2005).

1.3 REPORT ORGANIZATION

Following this introductory section, Section 2 describes the pre-construction activities associated with the Pilot Study. Section 3 describes the construction activities, and Section 4 summarizes the data collected during the one-year monitoring program. Section 5 presents a summary, and Section 6 contains references. In addition, Appendices A through J provide detailed field and laboratory data, including cone penetrometer data; boring and piezometer logs; photographs; geotechnical laboratory data; piezometric data; settlement plate data; inclinometer results; extensometer data; and settlement profiler data.

SECTION 2

PRE-CONSTRUCTION ACTIVITIES

2.1 OVERVIEW

The pre-construction activities included the following:

- Cone penetrometer testing with porewater pressure measurements (CPTu);
- Geotechnical sampling and laboratory testing;
- Instrument installation; and
- Baseline site survey.

These activities are described below.

2.2 CONE PENETROMETER TESTING

Between August 16 and 18, 2005, ConeTec Inc. of West Berlin, New Jersey performed 18 CPTu soundings in Wastebed 13. During the first day of testing, tests at locations CPT-1 through CPT-7 (as shown on Figure 2.1) were performed at relatively evenly spaced intervals (approximately every 100 ft) between existing CPTu locations PW-13A and PW-13D to develop a transect within the wastebed that could be used to identify a potential test plot location. The location of this transect was selected based on the existing CPTu data that was obtained during a geotechnical investigation conducted in Wastebed 13 in 2004 to support the Settling Basins 9-15 Leachate Minimization/End Use Program (see Appendix A for a summary of the data collected). Upon completion of soundings at CPT-1 through CPT-7, the CPTu logs corresponding to these locations were reviewed by NYSDEC, Parsons, and Geosyntec. During a conference call on August 17, 2005 between Parsons and the NYSDEC, the NYSDEC requested that an additional sounding (i.e., CPT-1A) be performed between CPT-1 and CPT-7. In addition, NYSDEC agreed that based on the results, the plot could either be centered on CPT-1A or CPT-5. Since refusal was relatively shallow (i.e., 46 ft) at CPT-1A, CPT-5 was selected for the center of the one-acre test plot with CPT-4 and CPT-6 on the eastern and western edges, respectively.

The remaining ten CPTu soundings were advanced at the proposed instrument locations (specifically A-3 through A-9, A-11, A-12, and A-20) for the test plot. These locations are shown on Figure 2.2, and a summary of CPTu locations with respect to the specific instruments is provided in Table 2.1. In summary, 13 of the 18 CPTu soundings are co-located with boring/instrument locations.

In addition, as part of the CPTu test program, 12 porewater pressure dissipation tests were performed at various locations and depths. Table 2.2 summarizes the water table elevations estimated from these tests. Logs for the 18 CPT soundings, graphs for the 12 porewater pressure dissipation tests, and the raw data for these plots are provided in Appendix B.

2.3 GEOTECHNICAL SAMPLING AND LABORATORY TESTING

After the one-acre test plot location was established, 30 boreholes were drilled by Parratt Wolff of East Syracuse, New York for the purposes of collecting samples for geotechnical testing and installing instrumentation. Figure 2.2 shows the instrument/borehole locations. The borehole depths correspond to the instrument installation requirements, which are discussed in Section 2.4.

Standard penetration testing (SPT) was used to obtain blow count information with depth. At locations A-1, A-3, A-4, A-11, and A-12, continuous split-spoon sampling was performed; whereas, at locations A-2, A-7, A-8, A-10, and A-13, split-spoon sampling was performed at 5-ft depth intervals. At locations A-5, A-6, and A-9, augering without sampling was performed to meet the required depths for instrument installation. SPT and sampling were not performed at A-5, A-6, and A-9 because of the proximity of these locations to other locations where data was available. The NYSDEC agreed with this strategy prior to implementation. The boring logs are provided in Appendix C. Split-spoon samples were retained in jars, and a subset of these samples was selected for index testing. Many of the split-spoon samples were photographed, and these pictures are provided in Appendix D. In addition, Shelby tubes were collected at several locations and depth intervals to provide samples for undisturbed performance testing.

Table 2.1 provides a summary of the geotechnical laboratory testing performed by GeoTesting Express of Boxborough, Massachusetts. As can be seen in this table, the sample quantity tested exceeds the minimums listed in Table 2.1 of the Work Plan (Parsons and Geosyntec, 2005). Prior to selecting samples for undisturbed testing, the lab extruded and photographed the samples (see Appendix E). From the available samples, sampling intervals were selected to represent a range in material consistencies (which tended to correspond to colors) and depths. At location A-7, two samples from the same Shelby tube (15 to 17 ft) were selected for consolidation testing because of their seemingly contrasting characteristics over short spatial distances (i.e., one was medium grey, stiff, and dry and the other was tan, soft, and wet).

The index test results (i.e., water content, grain size, Atterberg limits, carbonate content, specific gravity, and bulk density) are summarized in Table 2.3, and the performance test results (i.e., unconsolidated undrained triaxial [UU], consolidated undrained triaxial with porewater pressure measurements [CIU tests], and one-dimensional consolidation) are summarized in Tables 2.4 through 2.6. The laboratory reports are provided in Appendix E.

2.4 INSTRUMENT INSTALLATION

As indicated previously, Table 2.1 provides a summary of the instruments installed at each location. The borehole depths for the piezometers are also indicated on this table.

Although the installation of the settlement profiler and settlement plates is described in this section, it should be noted that this activity occurred during the construction phase because an excavator was required.

2.4.1 Inclinometers and Extensometers

Six inclinometers and five extensometers were installed in the test plot as shown on Figure 2.2 and indicated in Table 2.1. The inclinometer/extensometer pairs are located at A-1, A-2, A-7, A-8, and A-10; whereas, only an inclinometer is located at A-13. The inclinometers were installed to measure potential lateral movement of the Solvay waste; whereas, the extensometers were installed to measure vertical movement at selected depths within the Solvay waste.

Each extensometer consists of a flexible corrugated polyethylene pipe with a three-inch inside diameter and stainless steel sensing rings at 0 ft (i.e., initial ground surface), 2 ft, 7 ft, 12 ft, 17 ft, 22 ft, 32 ft, and every 10 ft thereafter. The extensometers at locations A-1, A-7, A-8, and A-10 each have eleven sensing rings; whereas, the extensometer at location A-2 has only ten sensing rings. Each inclinometer consists of a 2.75-inch outer diameter plastic quick connect (QC) casing with two pairs of orthogonal tracking grooves for the wheels of the inclinometer probe. The set of grooves perpendicular to the slope were considered oriented in the A0 direction; and the grooves parallel to the slope were considered oriented in the B0 direction. Measurements were taken in both the A0 and B0 direction because there was the potential for movement in either direction. At all locations, the QC casing was inserted into the corrugated pipe and attached at the bottom. The only difference between the inclinometer/extensometer and the inclinometer-only installations was the presence of the sensing rings on the corrugated pipe at the inclinometer/extensometer locations.

For anchoring purposes, the borehole depths for all inclinometer and inclinometer/ extensometer installations were at least 5 ft into native material. For all installations, 6-inch diameter flush joint casing was used down to and through the native material to prevent the borehole from collapsing. After the borehole was sufficiently cleaned out, the QC casing and corrugated pipe were lowered to the bottom of the hole. After placement in the borehole, the drillers attempted to fill the annular space between the corrugated pipe and the Solvay waste with cement-bentonite grout. Initially a lean grout (as recommended by Slope Indicator [1997] for soft soils) was used. This grout was mixed at ratios of approximately 94 lbs Portland cement, 39 lbs bentonite, and 75 gallons water. After the first attempt at grouting, it became apparent that grout loss was going to be an issue. In some cases, the grout came to the surface and then rapidly decreased in elevation until it was 40 or more feet below the surface of the wastebed. Because of these observations, a thicker grout mix (i.e., increased bentonite content) and/or bentonite chips were used to plug the hole at various elevations. At all locations, multiple grouting attempts over a period of several days were required to fill the annular space.

Once installed, the depth to each of the extensometer rings was measured using a SONDEX probe and readout unit manufactured by Slope Indicator. The probe was lowered through the QC casing using a graduated cable, and the voltmeter on the readout unit peaked when the probe passed the midpoint of the ring. The depth of each ring from the top of the QC casing was then recorded. This procedure was repeated as the probe was retracted and returned to the ground surface; the two values of "depth from the top of casing" were averaged to get a depth for each ring. To obtain baseline readings for each ring, three readings were performed and averaged. These data are provided in Section 4.

The Digitilt Inclinometer Probe and the Digitilt DataMate readout unit were used to obtain and store casing inclination data, and DigiPro software for Windows was used to process the data. During inclinometer readings, the probe was lowered to the bottom of the casing. Then, as the probe was pulled upwards, readings were taken at 2-ft vertical intervals. This procedure was performed twice for both the A0 and B0 directions. These redundant measurements were taken because of uncertainty regarding the potential direction for lateral movement. To obtain a baseline survey, three reading sets were performed at each location. The average profile was selected as the baseline for all future readings. These data are presented in Section 4.

2.4.2 Piezometers

Twenty-four piezometers were installed in the test plot area to monitor porewater pressures before, during, and after fill placement. Three types of piezometers were installed, including ten typical vibrating wire (GeoKon Model 4500S), seven push-in vibrating wire (GeoKon Model 4500DP), and three standpipe piezometers. Originally there were only two standpipe piezometers; however, due to installation difficulties (i.e., the cable was cut) with the first push-in vibrating wire piezometer at A-2 (15 ft depth), a standpipe piezometer was installed as a replacement.

Six sets of nested vibrating wire piezometers and six single piezometers were installed. Each set of nested piezometers consisted of three piezometers set at different depths. Table 2.7 lists the depth of each piezometer, and the piezometer locations are provided on Figure 2.2. Since tree clearing did not occur until after piezometer installation, it was necessary to modify the proposed A-6 piezometer locations based on the presence of trees. Therefore, the actual location of the A-6 piezometers is slightly different than the proposed location shown in the Work Plan (Parsons and Geosyntec, 2005).

In general, the borehole depths required for the piezometer installation were achieved through augering in uncased boreholes. Casing was only used for the two piezometers installed in the native materials. At some locations, split-spoon samples and/or Shelby tubes were collected. Typically, the vibrating wire piezometer cables were threaded through PVC pipes prior to installation to protect the wires from damage. All the vibrating wire piezometers were calibrated in accordance with the manufacturer's directions.

One installation difference between the two types of vibrating wire piezometers is that the push-in type was pushed the last 5 ft; whereas, the conventional piezometers were lowered to approximately 6 inches above the bottom of the borehole and the sandpack was placed around it. In addition, during installation of the push-in vibrating wire piezometers, the transducer was hooked up to the readout unit (i.e., a GeoKon Model GK-403 readout unit) and monitored constantly. If the pressures induced during the installation process approached the instrument's operating range, pushing of the piezometer was stopped until the pressure could dissipate. The piezometer logs in Appendix C provide the installation details (i.e., thicknesses of sandpack, bentonite seal, and cement-bentonite grout) for each vibrating wire piezometer.

For the standpipe piezometers, the drillers augered down to the required set depth, and a screened 1-inch diameter PVC pipe was placed into the borehole. The length of the screen in each standpipe piezometer was approximately 3 ft. The sandpack was then installed, followed by the bentonite seal, and the cement-bentonite grout. The water levels in the standpipes were monitored using a Solinst Model 101 water level indicator.

For all types of piezometer installations, as with the inclinometer/extensometer installations, multiple grouting attempts were required to completely grout the holes to the surface.

The piezometers were monitored regularly after installation to establish when installation-induced porewater pressures had dissipated and steady-state (i.e., the baseline) water levels were reached. Table 2.7 lists baseline water elevations for the piezometers.

2.4.3 Settlement Plates

Twenty settlement plates were installed on the initial ground surface to monitor total settlement resulting from fill placement, as shown on Figure 2.2. Fourteen settlement plates, each consisting of a 1 ft x 1 ft square steel plate and steel riser pipe were installed within the footprint of the test plot. These settlement plates were placed on leveled gravel pads, and the verticality of their riser pipes was checked. It was determined during implementation that PVC protective pipe, as described in the Work Plan (Parsons and Geosyntec, 2005), was not needed. Six settlement plates consisting of wooden stakes were installed in the ground outside the fill placement area. Gravel was placed around the stakes as protection. A baseline survey that included the initial settlement plate elevations was performed on October 7, 2005.

2.4.4 Settlement Profiler

Two horizontal profiling lines were installed to assess the potential for total and differential settlement across the test plot using a proprietary settlement-profiling system developed by Geosyntec. Figure 2.2 shows the trench locations for the settlement profilers. After the trenches were advanced using an excavator, the 4-inch nominal diameter single-wall corrugated pipes manufactured by Advanced Drainage System (ADS) were placed in the trenches at a depth of approximately 1.5 ft below the wastebed surface. The trenches were then backfilled with Solvay waste, and a ¼-in. diameter polypropylene rope was advanced through the entire length of each pipe.

As described in the Work Plan (Parsons and Geosyntec, 2005), this system is designed to measure relative settlements at any location along the profile pipe by using a pressure transducer to measure the hydrostatic water pressure imposed on the transducer relative to a stationary water supply reservoir. The pressure transducer is housed in a "torpedo" that is pulled through the ADS pipe using the polypropylene rope. This transducer is connected by water-filled vinyl tubing that, in turn, is connected to a fluid reservoir maintained at a constant elevation. As the transducer and vinyl tubing are pulled through the pipe, any change in elevation (i.e., settlement) is recorded as a pressure change on the transducer.

Baseline readings for the settlement profiler were taken on October 8, 2005. Profile Line 1 from the northeast to southwest (i.e., A-9 to A-11) was measured first. The “torpedo” was pulled through the pipe using the polypropylene rope and measurements were taken and recorded at 2-ft longitudinal intervals along the pipe. Then, as the “torpedo” was pulled back through the pipe with the steel cable, readings were taken at 20-ft longitudinal intervals to verify the previous measurements. This same measuring procedure was used on Profile Line 2 from the northwest to the southeast (i.e., A-7 to A-12). These data, in conjunction with data that were collected during construction activities, are presented in Section 4.

2.5 BASELINE SURVEY

A 30 ft by 30 ft survey grid was established over the test plot footprint before fill placement, and the northing, easting, and elevation of each grid point were surveyed. The grid point locations are shown on Figure 2.2. In addition, the instrument locations (i.e., locations of the piezometers, inclinometers, extensometers, and settlement plates) were surveyed.

SECTION 3

CONSTRUCTION ACTIVITIES

3.1 OVERVIEW

After selection of the test plot location and installation of the instruments, as described in Section 2, the following construction activities were performed:

- site clearing and preparation;
- haul road construction;
- test pit excavation;
- fill placement; and
- hydroseeding.

These activities are discussed below. Appendix D contains photographs taken during construction. The following equipment was used during haul road construction, test pit excavation, and/or fill placement:

- articulated dump trucks (ADT): Volvo BM A25C, Terex TA30, John Deere 250D;
- low ground pressure (LGP) dozers: Caterpillar 550H, Caterpillar D5G;
- excavator: John Deere 230C, John Deere 120C, Caterpillar 350;
- front end loader: John Deere 744H (used at stockpile to load fill material into dump trucks); and
- smooth drum roller: Ingersoll Rand SD-100.

3.2 SITE CLEARING AND PREPARATION

During site clearing, existing trees located in the Pilot Study areas (i.e., test pit and test plot areas), buffer zones, and along the haul road were cleared. The cleared vegetation materials were stockpiled onsite. Grasses and the existing root mat were left in place to serve as an initial working surface.

Site preparation activities included the installation of silt fencing around the outside of the test fill area, as well as the installation of the settlement profiler and settlement plates, as described in Section 2. In addition, trenching was performed to route the cables from the vibrating wire piezometers at locations A-3 through A-6 to the edges of the test plot.

3.3 HAUL ROAD CONSTRUCTION

Haul road construction began on October 5, 2005 and was completed on October 7, 2005. During the first two construction days, the weather was clear, and the temperature was about $80^{o}F$. There were a few showers on the last day of haul road construction and the temperature was about 70^{o} F. The haul road was constructed from the outside dike towards the test plot using the following procedure:

- A layer of woven geotextile was placed on the cleared surface of the Solvay waste.
- Fill material (i.e., fine-grained soil) was dumped, spread, and compacted on the geotextile. A LGP dozer (i.e., Caterpillar 550H) was used for spreading, and a smooth drum roller was used in static mode for compaction.
- A layer of woven geotextile was placed on the compacted fill material.
- A gravel layer, approximately 6-inches thick, was placed, spread, and compacted on the second layer of geotextile.

Upon completion, the compacted haul road was approximately 3-ft thick with approximately 6 inches of gravel at the surface. Approximately 4,600 cy of fill and 1,625 cy of gravel were used to construct the haul road.

Cave-ins, drop-outs, mud waves, springs, and material liquefaction were not observed in the Solvay waste during haul road construction. As anticipated, the haul road required maintenance throughout the duration of the Pilot Study because of rutting. Rutted areas were repaired by placing, grading, and compacting additional gravel. Haul road rutting depths varied from less than 1 inch to 6 inches per day, and depended more on the weather than the number of trucks. Rutting in the upper fill material was most pronounced during and following rain events. Photographs of haul road construction are provided in Appendix D.

3.4 TEST PIT EXCAVATION

The first test pit was excavated on October 6, 2005. Although specific test pit dimensions were provided in the Work Plan (Parsons and Geosyntec, 2005), the operator excavated the pit based on field conditions encountered during excavation. The test pit was at least 10-ft deep. Photographs of the excavation are provided in Appendix D. As can be seen in the photographs, some of the excavated Solvay waste behaved like a granular material and tended to slough to its natural angle of repose upon excavation; whereas, in other areas, vertical cuts were possible. In addition, as the excavator attempted to advance, it occasionally encountered a harder layer, and it would meet obvious temporary resistance. These harder layers of Solvay waste would sometimes break off in hard plates that ranged in width and length from a couple of inches to several feet. Typically, these plates were at the most an inch or two thick, which is consistent with the layering that is observed in the test pits and split-spoon samples.

Based on our observations during the first test pit excavation and NYSDEC's recommendation, it was decided that a second test pit excavation would be performed near the

CPT-3 location. The second test pit was excavated on October 7, 2005 to dimensions of approximately 2-ft wide, 4-ft long, and 15-ft deep. In general, the Solvay waste in the second test pit behaved similarly to the material in the first pit; however, the material at the second location appeared to be slightly softer (i.e., the hard plates were not as well defined in the second test pit). Also, there was less sloughing along the walls of the excavation of the second test pit relative to the first test pit (i.e., the walls of the second test pit remained near vertical).

After the two test pits were excavated they remained open for several days, and it rained at several points during that time period. As can be seen in the pictures in Appendix D, the sidewalls did not collapse in either test pit as a result of the rain and exposure. There was ponding noted in the bottom of the first test pit; whereas, this was not noted in the second test pit. In addition, seepage from the side of the excavation was also noted in the first test pit, and appeared to be emanating along the plates (i.e., the visible layers in the test pit sidewalls).

Both test pits were backfilled on October 10, 2005 after observations were recorded.

3.5 FILL PLACEMENT

Fill placement began on October 10, 2005 and was completed on October 19, 2005. Based on observations during haul road construction, as well as concerns about site safety and equipment trafficability, a 3-ft thickness was selected for the first lift instead of the 1-ft lift indicated in the Work Plan (Parsons and Geosyntec, 2005). For this first lift, the fill was dumped at the end of the haul road, one LGP dozer spread the fill across the plot area, and a smooth drum roller in static mode was used to compact the fill. It should be noted that a geotextile was not placed under the test plot area. The first lift was completed on October 12, 2005. As with the haul road construction, no cave-ins, drop-outs, mud waves, springs, or material liquefaction in the Solvay waste were observed during placement of the first lift. During and following placement of this lift, the instruments were monitored as indicated in Section 4. In addition, upon completion of the lift, ten *in situ* density measurements of the test fill materials were performed across the test plot using a nuclear density gauge at relatively evenly spaced locations. The results are provided in Table 3.1.

Although the remaining lifts were placed in approximately 1-ft thick increments, for discussion purposes this report will focus on fill heights of 6 ft, 8 ft, and 10 ft. For all subsequent lifts, trucks unloaded the fill material on the test plot area. The plot reached the 6-ft fill height on October 17, 2005. Placement of the material from 3 ft to 6 ft high took significantly longer than the time it took to place materials from the 0 ft to 3 ft fill height due to the wet weather conditions that caused some rutting issues both on the test plot and the haul roads. Rutting depths of 1 ft to 1.5 ft were noted on the test plot on several occasions, and fill placement/grading was stopped as necessary. Cave-ins, drop-outs, etc. in the Solvay waste were not noted at any time.

The 8-ft and 10-ft fill heights were completed on October 18, 2005 and October 19, 2005, respectively. Nuclear density gauge testing was performed after both of these fill heights were completed. The nuclear density test results are provided in Table 3.1. Following placement, spreading, and compacting of the last lift, the slopes were graded to approximately 2 horizontal: 1 vertical using the excavator bucket.

In general, the fill placement rate was controlled by the trucking capacity and the LGP dozer operator's ability to keep up with the incoming material while spreading fill around numerous instruments. It was only during rain events that the haul road and test plot conditions were the controlling factor. In addition, it should be noted that fill placement was stopped, as necessary, for monitoring purposes. The piezometers could be monitored during construction activities; however, vibrations from equipment operations interfered with inclinometer, extensometer, and settlement profiler readings.

3.6 HYDROSEEDING

After fill placement was completed, the test fill area was hydroseeded to help control erosion.

SECTION 4

MONITORING

4.1 OVERVIEW

This section summarizes the data collected during and following construction of the test plot. Specifically, piezometer, survey, inclinometer, extensometer, and settlement profiler data collected from September 2005 to October 2006 (i.e., the one-year monitoring program) are presented.

4.2 PIEZOMETERS

The piezometers were measured at least once a day during test fill construction to monitor the porewater pressure changes due to fill placement. For short periods of time during fill placement adjacent to certain piezometers, measurements were taken every 15 minutes or less (e.g., A-6 [30 ft] on October 10, 2005) in an effort to observe the rate of porewater pressure change due to fill placement. To maintain access to the piezometers, the PVC pipes around each piezometer were extended, as necessary, during fill placement.

The piezometers were monitored as follows during the month after test fill completion:

- five times in the first week;
- four times in the second week; and
- twice a week in the third and fourth weeks.

From November 21, 2005 until the end of the one-year monitoring period, the piezometers were measured on a weekly basis. Piezometer data are provided in Appendix F. It should be noted that the standpipe piezometer located at A-12 (45-ft deep) appears to have buckled on October 21, 2005 due to settlement during fill placement, which caused the 1-inch PVC standpipe to break. Therefore, the data after this date are not considered reliable. This break, due to bending or buckling, is consistent with what was observed for the inclinometers and extensometers, and is discussed in more detail in Sections 4.4 and 4.5.

Figures 4.1 through 4.5 show the changes in water level with time for the different piezometer depths (with respect to baseline water levels). Precipitation data and start and end dates for fill placement are also included on these figures. The precipitation data were obtained from www.weather.com for zip code 13211 (Syracuse Hancock International Airport).

During two previous geotechnical investigations performed at Wastebed 13 in 2004 by O'Brien and Gere, three standpipe piezometers (i.e., BA-1S, PZ-01A, and PZ-01B) were installed near the test plot location. The approximate depths for BA-1S, PZ-01A, and PZ-01B are 20 ft, 47 ft, and 61.5 ft below the top of casing, respectively. Readings from these piezometers were taken starting October 15, 2005 to obtain background water level data. These data are also provided in Appendix F.

4.3 SETTLEMENT PLATES AND 30-FT GRID

The settlement plates and the 30-ft grid were surveyed before, during, and following fill placement. The verticality of the settlement plate riser pipes was corrected periodically during fill placement. Additional riser pipes were added as the fill height increased. Table 4.1 and Figure 4.6 summarize the settlement plate data, and Table 4.2 summarizes the 30-ft grid data. The 30-ft grid locations are provided on Figure 2.2. Settlement plate SP-17 was buried in the fill; therefore, only the initial measurement is available at this location.

As indicated on Tables 4.1 and 4.2, the data obtained on October 12, 2005 and October 17, 2005 appear to be anomalous because, upon review, it was observed that the data from that time period are inconsistent with field observations and baseline and subsequent readings performed by a licensed surveyor (i.e., a licensed surveyor performed the October 7, 2005 and October 25, 2005 readings). Therefore, these data are not included on Figure 4.6. From October 25, 2005 through the end of the one-year monitoring period, the settlement plates have been surveyed approximately every two weeks by Parsons using an automatic level and rod. A licensed surveyor also performed settlement plate measurements on March 8, 2006 and August 31, 2006 to confirm these readings (see Appendix G).

4.4 INCLINOMETERS

The inclinometers were monitored three times during fill placement. QC casing pipe extensions, each 5-ft long, were added to the inclinometer casings as the fill height increased. Inclinometer profiles were obtained after placement of approximately 3 ft, 6 ft, and 10 ft of fill. The inclinometer at location A-10 was damaged by the smooth drum roller during placement of the first lift of fill material, and it was repaired according to the manufacturer’s recommendations.

After fill placement was completed, the inclinometers were monitored every two weeks until November 14, 2005. Throughout the remainder of the one-year monitoring program, the inclinometers were monitored on a monthly basis. Figures 4.7 and 4.8 are example cumulative displacement plots with respect to time graphs for locations A-1 and A-13, respectively. Plots of cumulative and incremental displacement with time for each of the inclinometers are provided in Appendix H. For presentation purpose, the plots are divided into two sets. The first set contains plots from October 11, 2005 to March 15, 2006, and the second set contains plots from March 5, 2006 to October 18, 2006. As mentioned previously, redundant measurements were taken (i.e., both in the A0 and B0 directions) because of uncertainty regarding direction of potential movement. These additional readings are included in Appendix H.

Varying amounts of inclinometer bending along the vertical profile are apparent for all the inclinometers, except for A-13, which was the only one located outside of the test plot area. The most significant amount of bending is noted at locations A-1 and A-2 (especially A-1), which are located at the center of the test plot. This bending first appeared in measurements taken on (or after) October 17, 2005. These data are consistent with observations of significant and anomalous extensometer movement, which is discussed in more detail in Section 4.5. Parsons and Geosyntec have reviewed these data and do not believe that the bending in the inclinometer casing shown on the profiles represents indication of instability or lateral movement in the subsurface as a result of the test fill loading. An explanation is provided in the following paragraph.

As discussed in Section 2, there were significant issues associated with grouting the inclinometer/extensometer installations. Because of the staged approach and varying grout consistencies that were used to control grout loss, there were likely cold joints that formed during curing. In addition, in retrospect, it is apparent that even the lean grout mix was significantly stiffer than the Solvay waste. Therefore, as the Solvay waste settled, the grout was not able to move with it. Rather, the compressible Solvay waste likely settled with respect to the grout column around the inclinometer/extensometer casing. It appears that once the settlement became significant enough (i.e., greater than approximately 8 to 10 inches at A-1 and A-2), the transfer of downdrag forces from the Solvay waste to the grout caused the grout to fail in tension at its weakest location(s), which were most likely at the cold joints. At these locations where the grout continuity was disrupted, the inclinometer casing was allowed to move downward and bend, which likely transferred the tensile stresses to the upper reaches of the grout/pipe. As a result, there was likely a progressive tensile failure in the grout and local bending of the pipe. This mechanism suggests that the inclinometer bending was likely the result of Solvay waste settlement due to fill placement, not lateral movement in the Solvay waste.

4.5 EXTENSOMETERS

Similar to the inclinometers, the extensometers were monitored at three different times during fill placement (i.e., after 3 ft, 6 ft, and 10 ft of fill placement) and approximately every other week thereafter. In December 2005, the frequency was decreased to once a month; however, based on a request by NYSDEC, the monitoring frequency was increased, and from December 28, 2005 until the end of the one-year monitoring period, readings have been obtained every two weeks. The extensometers were approximately flush with the initial ground surface prior to fill placement and the height of the pipe was not extended during fill placement.

The extensometer data are provided in Appendix I. As discussed previously, there were significant issues related to grouting the inclinometer/extensometer pairs. Because the extensometer casing was integral to the inclinometer casing, the previously described problems with inclinometer pipe bending were “transferred” to the extensometers. Since the grout and the sensing rings were not able to settle with the Solvay waste, the rings were not able to provide settlement information at various depths. Instead, the corrugated pipe bent with the QC casing and resulted in some unusual readings, such as apparent negative (i.e., upward) readings at depth, which would typically indicate heave. It is worth noting that on the same day that the bending was first noticed in the inclinometers, the first upward heave was noticed in the extensometer rings. This is another line of evidence that supports the previously described mechanism for inclinometer movements. When the settlement of the top of the inclinometer casing is taken into account, it appears that the top extensometer ring is somewhat of an indicator of total settlement, as it nearly matches the response of the surface settlement plates. The QC casing elevations are included in Appendix I.

4.6 SETTLEMENT PROFILER

After 3 ft of fill had been placed, both settlement profile lines were checked for obstructions by attempting to pass a “dummy” probe through the pipe. Profile Line 1 did not have any obstructions; however, the probe would not pass through Profile Line 2. Since the obstruction was approximately 20 ft from the starting point at both ends, an excavator was used to dig up the profiler pipe. Partial crushing of the pipe was observed at both locations. The crushed location corresponded approximately to the transition between the sideslope of the fill and the crest of the slope.

After the pipe was repaired, gravel was used locally in the profiler pipe trench to improve the pipe bedding, and Profile Line 2 was read on October 13, 2005. Settlement profiler measurements were taken at 2-ft intervals and were verified with 20-ft interval readings as described for the baseline readings. Fill placement continued, but due to weather conditions, the next attempt to read the settlement profile lines occurred after 6 ft of fill height was achieved. Profile Line 1 was measured on October 17, 2005.

After these readings, the fill height was extended to 10 ft. Several attempts were made to pull the probe through both profile lines; unfortunately, none of the attempts were successful. Because of this, Geosyntec developed a smaller “dummy” probe. This smaller probe could not successfully be pulled through the profile lines either. Similar to what was observed for Profile Line 2 after 3-ft of fill placement; the obstruction appears to be directly below the transition from the sideslope of the test fill to the crest. It appears that the profile pipe could not handle the settlement difference that occurs at this location without significant local bending of the pipe. Previously, excavating the settlement profile pipe and repairing the damaged locations after completion of the one-year monitoring period were considered. However, excavation of the settlement profiler would render the test plot unusable for future monitoring. Since test plot monitoring has been extended through October 2007, potential excavation of the settlement profiler has been delayed for at least a year. The available data for Profile Lines 1 and 2, including baseline data, are provided in Appendix J.

SECTION 5

SUMMARY

5.1 OVERVIEW

This section presents a summary of the Pilot Study construction and one-year monitoring program. As appropriate, detailed evaluations and interpretations of the laboratory and field monitoring data will be provided in future design submittals.

As indicated in the Work Plan (Parsons and Geosyntec, 2005), the specific Pilot Study objectives were as follows:

- Observe and note behavior (e.g., cave-ins, drop-outs, mud waves, material liquefaction) of Solvay waste during the following construction activities:
  - clearing;
  - haul road construction and use;
  - fill placement;
  - Solvay waste test pit excavation; and
  - grading.
- Monitor behavior of Solvay waste under fill (load) placement:
  - Total and differential settlement (during and following load placement) – both primary and secondary (creep). If possible, this includes the identification of settlement zones with depth within the Solvay waste mass.
  - Porewater pressure changes in the Solvay waste (during and following load placement).
  - Time rate of settlement.
  - Lateral movement of Solvay waste.
- Evaluate how monitoring equipment, such as the vibrating wire piezometers, is affected by the Solvay waste's high pH.

The results of the Pilot Study, in terms of the objectives listed above, are summarized in the subsections that follow.

5.2 OBSERVATIONS DURING CONSTRUCTION ACTIVITIES

During haul road construction and fill placement, cave-ins, drop-outs, mud waves, springs, and/or material liquefaction in the Solvay waste were not observed. Rutting did occur on the haul road due to dump truck traffic during fill placement on the test plot; however, it was repaired, as necessary, using additional gravel.

During the test pit excavations, some of the excavated Solvay waste behaved like a granular material and tended to slough to its natural angle of repose upon excavation; whereas, in other areas, vertical cuts were possible. These vertical cuts appeared to remain stable following a precipitation event.

5.3 MONITORING RESULTS

At the end of the one-year monitoring period, all piezometric levels were still above their baseline readings. In general, piezometers at a given depth are all in phase with each other (i.e., have a similar shape); however, the 15-ft piezometers appear to be more sensitive to precipitation events than the deeper piezometers.

One year after fill placement, the settlement plate data indicate a maximum settlement of approximately 36 inches at the center of the test plot. The maximum differential settlement between two locations that were subject to approximately the same loading (i.e., two of the corners) is approximately 10 inches. A detailed settlement analysis (i.e., primary and secondary settlement, time rate of settlement) using the settlement plate and piezometer data will be provided in future design submittals.

As discussed in Sections 4.4 and 4.5, the extensometer data could not effectively be used to provide settlement data with depth because of unanticipated bending of the inclinometer/extensometer casing; however, the total settlement measured at the top extensometer ring appeared to be relatively consistent with the settlement plate measurements. In addition, because of obstructions in both settlement profiler lines, only limited data could be obtained from the settlement profiler (i.e., only initial and after 3-ft fill placement readings could be obtained).

Finally, although the inclinometer casing profiles indicate that bending occurred, they do not appear to indicate subsurface instability or lateral movement of Solvay waste due to fill placement. Instead, the inclinometer bending can likely be attributed to Solvay waste settlement due to fill placement, as described in Section 4.4.

5.4 MONITORING EQUIPMENT PERFORMANCE

The equipment, including the vibrating-wire piezometers and the inclinometer and extensometer probes, did not appear to be affected by the high pH of the Solvay waste. All the vibrating-wire piezometers and settlement plates functioned properly throughout the one-year monitoring period. Two out of the three standpipe piezometers could be used for water level measurements throughout the one-year monitoring period, whereas, the standpipe piezometer at A-12 could not be used for water level measurements because it buckled immediately following fill placement. As mentioned previously, the inclinometers, extensometers, and settlement profilers did not function as anticipated; however, they still provided some useful information.

5.5 FUTURE MONITORING

The one-year monitoring program was completed at the end of October 2006. Because the Pilot Study is still providing useful information, the following additional monitoring activities will be performed between November 1, 2006 and October 31, 2007:

- Piezometer measurements every other month;
- Settlement plate measurements every other month; and
- Inclinometer measurements every six months.

Monitoring data collected after October 2006 will be provided in future design submittals.

SECTION 6

REFERENCES

NYSDEC and USEPA. 2005. *Record of Decision Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site*. Town of Geddes and Salina, Villages of Solvay and Liverpool, and City of Syracuse, Onondaga County, New York.

Parsons. 2006. *Onondaga Lake Sediment Consolidation Area (SCA) Siting Evaluation.* Onondaga County, New York.

Parsons in association with Geosyntec. 2005. *Onondaga Lake Pre-Design Investigation: Wastebed 13 Settlement Pilot Study Final Work Plan.* Onondaga County, New York.

Slope Indicator. 1997. *QC Inclinometer Casing Installation Guide* 51150099.

TABLES

Table 2.1
Instrumentation and Testing Summary per Location

Location	CPTu ID	Inclinometer/ Extensometer ID	Piezometer ID[2]	Settlement Plate ID	Quantity of Laboratory Testing: Water Content (ASTM D2216)	Atterberg Limits[3] (ASTM D4318)	Grain Size (ASTM D422)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373)	Bulk Density (EM-1110-2-1906)	CU (ASTM D4767)	UU (ASTM D2850)	Consolidation (ASTM D2435)
A-1	SB915-CPT-5	SB915-INEX-A1	SB915-PZ-A1(15') SB915-PZ-A1(45') SB915-PZ-A1(Native)	SP-1	22	7[4]	9		7				
A-2		SB915-INEX-A2	SB915-PZ-A2(15') SB915-PZ-A2(30') SB915-PZ-A2(45')	SP-2	9	3	3	4	3	3	3	3	3
A-3	SB915-CPT-A3		SB915-PZ-A3(15') SB915-PZ-A3(30') SB915-PZ-A3(Native)	SP-3									
A-4	SB915-CPT-A4		SB915-PZ-A4(15') SB915-PZ-A4(30') SB915-PZ-A4(55')	SP-4	23								
A-5	SB915-CPT-A5		SB915-PZ-A5(15') SB915-PZ-A5(30') SB915-PZ-A5(55')	SP-5									
A-6	SB915-CPT-A6		SB915-PZ-A6(15') SB915-PZ-A6(30') SB915-PZ-A6(45')	SP-6									
A-7	SB915-CPT-A7	SB915-INEX-A7	SB915-PZ-A7(15')	SP-7	3			1		2	3	2	2
A-8	SB915-CPT-A8	SB915-INEX-A8	SB915-PZ-A8(30')	SP-8				1					1
A-9	SB915-CPT-A9		SB915-PZ-A9(15')	SP-9									
A-10	SB-915-CPT-4	SB915-INEX-A10	SB915-PZ-A10(45')	SP-10	7	2	2	1		1		1	1
A-11	SB915-CPT-A11		SB915-PZ-A11(30')	SP-11	12								
A-12	SB915-CPT-A12		SB915-PZ-A12(45')	SP-12									
A-13		SB915-IN-A13[1]		SP-13									
A-14				SP-14									
A-15				SP-15									
A-16	SB915-CPT-6			SP-16									
A-17				SP-17									
A-18				SP-18									
A-19				SP-19									
A-20	SB915-CPT-A20			SP-20									
Total Number of Tests					76	12	14	7	10	6	6	6	7

Notes:

1. Only an inclinometer was installed at this location.
2. Numbers in parentheses after IDs indicate the piezometer tip installation depth (i.e., feet below initial ground surface). Native indicates piezometers were installed in the native soil beneath the Solvay waste.
3. The Atterberg limits were determined using ASTM D4318. In addition, the liquid limit was also evaluated using the laboratory cone penetration method (BS 1377-2:1990).
4. At this location, ASTM D4318 was used to evaluate the Atterberg limits of all seven samples, and BS 1377-2:1990 (i.e., cone penetration method) was only performed on six of the samples.

Table 2.2
Estimated Water Table Levels from CPTu Porewater Pressure Dissipation Tests

CPTu Location	Measurement Depth (ft below waste surface)	Estimated Water Table Depth (ft below waste surface)
SB915-CPT-2	80.05	58.59
SB915-CPT-3	80.05	58.96
SB915-CPT-A3	15.09	16.58
	27.07	21.93
	30.02	26.54
	79.4	58.98
SB915-CPT-A4	80.05	59.04
SB915-CPT-A5	45.44	41.27
SB915-CPT-A7	73.82	59.37
SB915-CPT-A8	80.05	57.69
SB915-CPT-A9	80.05	58.56
SB915-CPT-A11	46.42	41.22

Table 2.3
Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216) (%)	Liquid Limit (Fall-cone Method BS 1377-2:1990) (%)	Atterberg Limits (ASTM D4318): Liquid Limit (%)	Atterberg Limits (ASTM D4318): Plastic Limit (%)	Atterberg Limits (ASTM D4318): Plasticity Index (%)	Grain Size (ASTM D422): Percent Gravel (%)	Grain Size (ASTM D422): Percent Sand (%)	Grain Size (ASTM D422): Percent Fines (clay & silt) (%)	Grain Size (ASTM D422): Clay-sized Particle Content (0.005 mm) (%)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373) (%)	Unit Weight: Bulk (pcf)	Unit Weight: Dry (pcf)
SB915-EXC-1	SB915-6001-05	10.0-12.0	11	127												
SB915-EXC-2	SB915-6001-06	10.0-12.0	11	258												
SB915-EXC-3	SB915-6001-07	10.0-12.0	11	40												
SB915-PZ-A1[1]	SB915-6005-01	0.0-6.0	3	134												
	SB915-6005-02	6.0-8.0	7	270												
	SB915-6005-03	8.0-10.0	9	331	198	226	126	100	0	0.8	99.2	34.4		57		
	SB915-6005-04	12.0-14.0	13	125												
	SB915-6005-05	16.0-18.0	15	155												
	SB915-6005-06	19.0-21.0	20	218	159	158	102	56	0	15	85	30.6		61		
	SB915-6005-07	24.0-26.0	15	190												
	SB915-6005-08	29.0-31.0	30	251	173	201	74	127	0	4	96	24.7		57		
	SB915-6005-09	33.0-34.0	33.5	171												
	SB915-6005-10	36.0-38.0	37	186												
	SB915-6005-11	39.0-41.0	40	154												
	SB915-6005-12	41.0-43.0	42	210	194	227	89	138	0	40.9	59.1	21.5		26		
	SB915-6006-01	44.0-46.0	45	193												
	SB915-6006-02	48.0-49.0	48.5	165												
	SB915-6006-03	49.0-51.0	50	284	209	234	105	129	0	5.9	94.1	2.0		39		
	SB915-6006-04	54.0-56.0	55	110	NA[4]	134	89	45	0	80	20	5.5		43		
	SB915-6006-05	58.0-59.0	58.5	93												
	SB915-6006-06	64.0-66.0	65	185	120	120	97	23	0	7.4	92.6	12.4		52		
	SB915-6006-07	68.0-69.0	68.5	294												
	SB915-6006-08	73.0-74.0	73.5	202												
	SB915-6006-09[2]	76.0-78.0	77	5					38.5	32.7	28.8	7.5				
SB915-INEX-A2	SB915-6001-01	10.0-12.0	11	466									2.47	52	67	12
	SB915-6001-02	20.0-22.0	21		178	182	89	93	0	9.8	90.2	11.7	2.5	52		
	SB915-6001-03	30.0-32.0	31	105											79	38
	SB915-6000-10	34.0-36.0	35	263									2.71		78	21
	SB915-6001-04	38.0-40.0	39	259									2.53	57		
	SB915-6000-11	44.0-46.0	45	166	164		Non-Plastic		0	4.9	95.1	17.5				
			45	236												
			45	162												
	SB915-6000-12	64.0-66.0	65	118	160		Non-Plastic		0	5.9	94.1	21.8				
			65	63												
			65	59												
	SB915-6006-10[2]	73.7-75.7	74.7	24					36.1	41.1	22.8	5.3				
SB915-PZ-A4	SB915-6003-01	0.0-2.0	1	181												
	SB915-6003-02	2.0-4.0	3	261												
	SB915-6003-03	6.0-8.0	7	417												
	SB915-6003-04	8.0-10.0	9	427												
	SB915-6003-05	10.0-12.0	11	286												
	SB915-6003-06	12.0-14.0	13	240												
	SB915-6003-07	14.0-16.0	15	219												
	SB915-6003-08	16.0-18.0	17	224												
	SB915-6003-09	18.0-20.0	19	254												
	SB915-6003-10	20.0-22.0	21	237												
	SB915-6003-11	22.0-24.0	23	243												
	SB915-6003-12	24.0-26.0	25	239												
	SB915-6004-01	26.0-28.0	27	240												
	SB915-6004-02	28.0-30.0	29	224												
	SB915-6004-03	30.0-32.0	31	212												
	SB915-6004-04	32.0-34.0	33	265												
	SB915-6004-05	36.0-38.0	37	181												
	SB915-6004-06	38.0-40.0	39	183												
	SB915-6004-07	40.0-42.0	41	209												
	SB915-6004-08	42.0-44.0	43	166												
	SB915-6004-09	44.0-46.0	45	172												
	SB915-6004-10	46.0-48.0	47	210												
	SB915-6004-11	48.0-50.0	49	245												
SB915-INEX-A7	SB915-6000-02	15.0-17.0	16	276									2.54		55	15
	SB915-6000-04	44.0-46.0	45	204											79	26
	SB915-6000-05	59.0-61.0	60	86												
SB915-INEX-A8	SB915-6000-01	15.0-17.0	16										2.7			

Table 2.3
Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216) (%)	Liquid Limit (Fall-cone Method BS 1377-2:1990) (%)	Atterberg Limits (ASTM D4318) Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Grain Size (ASTM D422) Percent Gravel (%)	Percent Sand (%)	Percent Fines (clay & silt) (%)	Clay-sized Particle Content (0.005 mm) (%)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373) (%)	Unit Weight Bulk (pcf)	Unit Weight Dry (pcf)
SB915-INEX-A10	SB915-6000-06	10.0-12.0	11	494	167	168	103	65	0	19.8	80.2	27.6				
			11	396												
			11	304												
	SB915-6000-07	24.0-26.0	25	267									2.72		74	20
	SB915-6000-08	39.0-41.0	40	203	179	183	89	94	0	11.8	88.2	24.7				
			40	214												
			40	243												
SB915-PZ-A11	SB915-6002-01	0.0-2.0	1	228												
	SB915-6002-02	2.0-4.0	3	165												
	SB915-6002-03	4.0-6.0	5	109												
	SB915-6002-04	8.0-10.0	9	222												
	SB915-6002-05	10.0-12.0	11	347												
	SB915-6002-06	12.0-14.0	13	912 [3]												
	SB915-6002-07	14.0-16.0	15	242												
	SB915-6002-08	16.0-18.0	17	134												
	SB915-6002-09	18.0-20.0	19	243												
	SB915-6002-10	20.0-22.0	21	205												
	SB915-6002-11	22.0-24.0	23	162												
	SB915-6002-12	24.0-26.0	25	130												
Minimum				40	120	120	74	23	0	0.8	20	2	2.47	26	55	12
Maximum				494	209	234	126	138	0	80	99	34	2.72	61	79	38
Average				216	173	183	96	87	0	17	83	20	2.61	49	72	22

Notes:

1. This location ID is consistent with the test results provided by GeoTesting Express; however, samples were actually taken from the SB915-INEX-A1 boring, which is very close to the SB915-PZ-A1 boring.
2. Native soils. These results are not included in the minimum, maximum, and average values.
3. This water content result is not included in the minimum, maximum, and average values.
4. NA indicates not available.

Table 2.4
Unconsolidated Undrained Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (%)	Dry Density (pcf)	Undrained Strength (psf)	Strain at Failure (%)
SB915-INEX-A2	SB915-6000-10	34-36	35	251	21	626	9.9
SB915-INEX-A2	SB915-6001-04	38-40	39	110	40	2045	10.2
SB915-INEX-A2	SB915-6001-04	38-40	39	172	29	1071	4.6
SB915-INEX-A7	SB915-6000-02	15-17	16	225	22	642	11.8
SB915-INEX-A7	SB915-6000-03	29-31	30	220	25	794	9.2
SB915-INEX-A10	SB915-6000-07	24-26	25	253	21	419	2.0

Table 2.5
Consolidated Undrained with Porewater Pressure Measurements Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Dry Density before Shear (pcf)	Initial Water Content (%)	Initial Confining Stress (psf)	Peak Deviator Stress (psf)	Undrained Strength (psf)	Strain at Failure (%)	CIU Total Stress		CIU Effective Stress	
										Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
2005 Pilot Study													
SB915-INEX-A2	SB915-6000-09	15-17	16	18	345	1209	1360	680	3.5	0	17	13	45
				24	205	2501	2046	1023	3.2				
				24	293	5001	3480	1740	2.0				
SB915-INEX-A2	SB915-6001-03	30-32	31	24	105	2001	2048	1024	4.1	68	17	NA [1]	
				26	135	4002	3358	1679	3.3				
				33	161	8001	6852	3426	15				
SB915-INEX-A2 [2]	SB915-6000-10	34-36	35		223	1999	2156	1078	3.7	304	15	125	42
						4001	3504	1752	2.8				
				54		7998	6240	3120	2.1				
SB915-INEX-A7 [2]	SB915-6000-02	15-17	16		214	1200	1577	789	1.9	301	15	267	45
						2496	2486	1243	1.5				
				23		4999	4150	2075	1.8				
SB915-INEX-A7 [2]	SB915-6000-03	29-31	30		206	1998	2212	1106	3.2	367	14	353	42
						3998	3680	1840	5.3				
				27		8001	6210	3105	2.3				
SB915-INEX-A7	SB915-6000-04	44-46	45	25	204	2000	1805	903	5.8	292	17	NA [1]	
				37	158	4000	4530	2265	15				
				32	173	7992	6704	3352	2.3				

Notes:
1. NA indicates that a cohesion value and friction angle could not be defined because the strength envelope had a negative intercept.
2. These tests were performed as staged triaxial tests; thus, the same sample was used for all three tests.

Table 2.6
Consolidation Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Compression Index (C_c)	Recompression Index (C_r)	Modified Compression Index ($C_{c\varepsilon}$)	Modified Recompression Index ($C_{r\varepsilon}$)	Initial Void Ratio (e_o)	Initial Water Content (%)	Preconsolidation Pressure (psf)
SB915-INEX-A2	SB-915-6000-10	34-36	35	5.3	0.07	0.51	0.0069	9.4	338	2200
SB915-INEX-A2	SB-915-6001-01	10-12	11	7.3	0.10	0.56	0.0074	12.1	466	1800
SB915-INEX-A2	SB-915-6001-04	38-40	39	3.0	0.05	0.40	0.0072	6.6	259	3400
SB915-INEX-A7	SB-915-6000-02	15-17	16	8.2	0.13	0.61	0.0100	12.4	453	1800
SB915-INEX-A7	SB-915-6000-02	15-17	16	3.4	0.03	0.41	0.0039	7.2	273	2800
SB915-INEX-A8	SB-915-6000-01	15-17	16	Disturbed Sample						
SB915-INEX-A10	SB-915-6000-07	24-26	25	4.6	0.06	0.49	0.0061	8.3	305	2600

Note:

Sample SB915-6000-01 is assumed to be a disturbed sample because the strain versus log effective stress curve is fairly flat without a distinct break.

Table 2.7
Baseline Piezometric Data

Location	Tip Depth from Initial Ground Surface (ft)	Piezometer ID	Elevation	Baseline Piezometric Elevation (ft)	Piezometer Type
A-1	15	SB915-PZ-A1 (15')	415.59	NA	Typ VW
A-1	45	SB915-PZ-A1 (45')	385.63	389.78	Typ VW
A-1	77.5	SB915-PZ-A1 (Native)	352.53	373.44	Typ VW
A-2	15	SB915-PZ-A2 (15')	415.35	NA	SP
A-2	30	SB915-PZ-A2 (30')	400.27	401.85	PI VW
A-2	45	SB915-PZ-A2 (45')	385.34	388.99	PI VW
A-3	15	SB915-PZ-A3 (15')	415.43	NA	Typ VW
A-3	30	SB915-PZ-A3 (30')	400.11	402.43	Typ VW
A-3	78.5	SB915-PZ-A3 (Native)	351.36	372.21	Typ VW
A-4	15	SB915-PZ-A4 (15')	414.45	NA	PI VW
A-4	30	SB915-PZ-A4 (30')	399.54	401.76	PI VW
A-4	55	SB915-PZ-A4 (55')	375.58	416.54	PI VW
A-5	15	SB915-PZ-A5 (15')	416.02	416.26	Typ VW
A-5	30	SB915-PZ-A5 (30')	401.07	403.91	Typ VW
A-5	55	SB915-PZ-A5 (55')	376.33	384.72	Typ VW
A-6	15	SB915-PZ-A6 (15')	415.79	NA	Typ VW
A-6	30	SB915-PZ-A6 (30')	400.88	404.52	Typ VW
A-6	45	SB915-PZ-A6 (45')	385.89	390.92	Typ VW
A-7	15	SB915-PZ-A7 (15')	414.92	NA	SP
A-8	30	SB915-PZ-A8 (30')	399.83	400.44	Typ VW
A-9	15	SB915-PZ-A9 (15')	414.42	NA	PI VW
A-10	45	SB915-PZ-A10 (45')	385.36	391.19	Typ VW
A-11	30	SB915-PZ-A11 (30')	400.58	402.93	PI VW
A-12	45	SB915-PZ-A12 (45')	386.44	390.03	SP

Notes:
1. Typ VW indicates typical vibrating wire piezometer (GeoKon Model 4500S).
2. PI VW indicates push-in vibrating wire piezometer (GeoKon Model 4500DP).
3. SP indicates standpipe.
4. NA indicates water was not present during baseline monitoring.

Table 3.1
Results of *In Situ* Density Testing

Approximate Location	Test Date	In-Place Wet Density (pcf)	Water Content (%)	In-Place Dry Density (pcf)
Center of A-10 and A-12	10/12/2005	138.6	12.2	123.5
35' SE of A-9	10/12/2005	132.6	15.1	115.2
3' E of A-8	10/12/2005	137.6	13.6	121.1
5' East of A-7	10/12/2005	132.3	10.9	119.3
55' S of A-2	10/12/2005	137.7	12	123
30' NW of A-11	10/12/2005	135.5	13.3	119.6
60' NW of A-11	10/12/2005	138.1	14.2	121
20' E of A-2	10/12/2005	130	11.3	116.8
25' NW of A-2	10/12/2005	136.4	11.6	122.2
30' W of A-2	10/12/2005	132.3	12	118.1
20' S of A-12	10/18/2005	136.5	9	125.2
20' SW of A-10	10/18/2005	132.5	9.7	120.8
15' SW of A-9	10/18/2005	130.5	13.4	115.1
30' E of A-8	10/18/2005	123.4	13.1	109.1
8' NW of A-8	10/18/2005	117.3	10.1	106.5
20' E of A-7	10/18/2005	129.9	11	117
30' E of A-14	10/18/2005	110.7	9.8	100.8
40' E of A-13	10/18/2005	111.7	11.3	100.3
45' E of A-11	10/18/2005	132.2	11.1	119
60' E-SE of A-11	10/18/2005	140.1	11.2	126
16' W of A-12	11/4/2005	135.2	9.7	123.3
15' W of A-10	11/4/2005	140.7	11.3	126.4
20' SW of A-9	11/4/2005	132.9	12.3	118.4
15' S of A-8	11/4/2005	139.2	9.4	127.1
20' NW of A-1	11/4/2005	136.6	10.8	123.2
25' SE of A-7	11/4/2005	135.3	9	124.1
15' N of A-2	11/4/2005	135.1	10.6	122.1
27' NE of A-11	11/4/2005	129.1	11.6	115.7
12' SW of A-2	11/4/2005	132.4	10.6	119.7
50' W of A-12	11/4/2005	138.5	9.9	126
Average		132.4	11.4	118.9

Table 4.1
Settlement Plate Data Summary

Date	10/7/2005	10/25/2005	11/2/2005	11/21/2005	12/6/2005	12/23/2005	1/4/2006	1/19/2006	2/1/2006	2/16/2006	3/2/2006	3/8/2006	3/16/2006	3/31/2006	4/13/2006
Time Elapsed (days)	**0**	**18**	**26**	**45**	**60**	**77**	**89**	**104**	**117**	**132**	**146**	**152**	**160**	**175**	**188**
SP-1	0	-18.68	NA	-26.96	-28.21	-30.12	-30.62	-31.12	-31.37	-31.62	-31.62	-31.87	-32.24	-32.25	-32.50
SP-2	0	-18.80	NA	-26.56	-28.06	-28.97	-29.47	-29.84	-29.97	-30.22	-30.22	-30.60	-30.72	-31.10	-31.10
SP-3	0	-20.48	NA	-26.65	-27.90	-29.56	-29.81	-29.31	-30.56	-30.68	-30.69	-30.94	-31.06	-31.19	-31.43
SP-4	0	-16.16	NA	-23.87	-26.12	-27.78	-28.28	-28.66	-28.91	-29.15	-29.16	-29.53	-29.53	-29.91	-30.16
SP-5	0	-16.28	NA	-21.69	-22.19	-23.35	-23.60	-23.85	-23.98	-24.10	-24.10	-24.35	-24.35	-24.73	-24.73
SP-6	0	-17.36	NA	-23.29	-24.29	-24.95	-25.45	-25.83	-25.95	-26.08	-26.08	-26.45	-26.58	-26.95	-26.95
SP-7	0	-11.48	NA	-15.17	-15.67	-16.08	-16.33	-16.58	-16.58	-16.70	-16.83	-17.08	-17.08	-17.08	-17.20
SP-8	0	-15.68	NA	-22.39	-23.14	-24.30	-24.80	-25.05	-25.18	-25.42	-25.42	-25.68	-25.80	-26.18	-26.17
SP-9	0	-11.36	NA	-14.75	-15.75	-16.66	-17.16	-17.29	-17.41	-17.66	-17.79	-18.04	-18.04	-18.29	-18.29
SP-10	0	-14.24	NA	-10.74	-21.99	-23.40	-23.90	-24.15	-24.28	-24.65	-24.52	-24.90	-24.90	-25.28	-25.40
SP-11	0	-6.32	NA	-8.57	-9.32	-9.48	-9.48	-9.48	-9.73	-9.86	-9.73	-9.98	-9.98	-10.11	-10.11
SP-12	0	-11.12	NA	-15.11	-16.36	-17.02	-17.27	-17.52	-17.52	-17.77	-17.65	-18.02	-18.02	-18.40	-18.40
SP-13	0	NA	-0.21	-0.21	-0.46	-0.21	-0.33	-0.46	-0.46	-0.46	-0.58	-0.46	-0.33	-0.46	-0.46
SP-14	0	NA	-0.10	-0.10	-0.35	-0.10	-0.23	-0.35	-0.23	-0.10	-0.35	-0.23	-0.23	-0.10	-0.10
SP-15	0	NA	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.29	-0.16	-0.03	-0.16	-0.04
SP-16	0	-12.80	NA	-17.11	-18.36	-18.77	-19.02	-19.27	-19.27	-19.39	-19.39	-19.77	-19.77	-19.90	-19.90
SP-17 (buried)	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SP-18	0	NA	-0.47	-0.47	-0.47	-0.47	-0.59	-0.72	-0.72	-0.59	-0.60	-0.60	-0.72	-0.72	-0.72
SP-19	0	NA	-0.12	-0.12	-0.12	0.13	-0.24	-0.24	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
SP-20	0	-14.96	NA	-19.58	-20.83	-21.74	-21.99	-22.24	-22.24	-22.49	-22.49	-22.74	-22.74	-23.12	-23.11

Date	4/26/2006	5/11/2006	5/25/2006	6/8/2006	6/22/2006	7/6/2006	7/20/2006	8/3/2006	8/17/2006	8/31/2006	9/14/2006	9/28/2006	10/12/2006	10/26/2006
Time Elapsed (days)	**201**	**216**	**230**	**244**	**258**	**272**	**286**	**300**	**314**	**328**	**342**	**356**	**370**	**384**
SP-1	-32.62	-32.75	-33.25	-33.37	-33.62	-33.87	-34.12	-34.24	-34.50	-34.75	-34.87	-34.99	-35.24	-35.50
SP-2	-31.22	-31.35	-31.85	-31.85	-32.22	-32.47	-32.84	-32.97	-33.10	-33.35	-33.47	-33.72	-33.85	-34.10
SP-3	-31.56	-31.56	-32.06	-32.06	-32.19	-32.68	-32.68	-32.81	-32.94	-33.31	-33.31	-33.56	-33.68	-34.06
SP-4	-30.28	-30.41	-30.78	-30.91	-31.16	-31.53	-31.78	-31.91	-32.03	-32.28	-32.41	-32.66	-32.90	-33.16
SP-5	-24.85	-24.85	-25.35	-25.35	-25.48	-25.85	-25.97	-26.10	-26.35	-26.48	-26.48	-26.72	-26.85	-26.98
SP-6	-27.08	-27.20	-27.70	-27.70	-27.95	-28.20	-28.83	-28.83	-29.08	-29.20	-29.20	-29.45	-29.70	-29.83
SP-7	-17.33	-17.33	-17.70	-17.58	-17.83	-18.08	-17.95	-18.21	-18.33	-18.58	-18.58	-18.70	-18.83	-19.08
SP-8	-26.42	-26.55	-26.80	-26.80	-27.18	-27.43	-27.43	-27.67	-27.80	-28.05	-28.05	-28.30	-28.55	-28.80
SP-9	-18.53	-18.66	-19.04	-19.04	-19.29	-19.54	-19.54	-19.66	-20.04	-20.16	-20.16	-20.41	-20.41	-20.66
SP-10	-25.52	-25.65	-26.15	-26.15	-26.65	-26.77	-27.15	-27.28	-27.53	-27.65	-27.77	-28.03	-28.15	-28.40
SP-11	-10.23	-10.23	-10.61	-10.48	-10.48	-10.86	-10.86	-10.98	-11.11	-11.36	-11.36	-11.48	-11.61	-11.61
SP-12	-18.52	-18.65	-19.27	-19.15	-19.39	-19.64	-20.27	-20.27	-20.40	-20.65	-20.65	-20.77	-20.89	-21.15
SP-13	-0.46	-0.46	-0.58	-0.46	-0.46	-0.58	-0.71	-0.58	-0.46	-0.71	-0.71	-0.71	-0.71	-0.83
SP-14	-0.10	-0.10	-0.23	0.02	0.02	-0.10	0.03	0.02	0.15	0.03	0.03	0.15	0.40	-0.10
SP-15	-0.03	-0.03	-0.16	0.09	0.21	0.09	0.09	0.21	0.22	0.09	0.09	0.34	0.34	0.22
SP-16	-20.02	-20.02	-20.40	-20.39	-20.52	-20.89	-20.89	-21.02	-21.15	-21.40	-21.40	-21.52	-21.77	-21.90
SP-17 (buried)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SP-18	-0.72	-0.72	-0.97	-0.72	-0.72	-0.97	-0.97	-0.97	-0.97	-1.22	-1.22	-1.22	-1.34	-1.47
SP-19	-0.12	-0.12	-0.25	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
SP-20	-23.36	-23.49	-23.86	-23.86	-24.12	-24.37	-24.86	-24.99	-25.12	-25.37	-25.36	-25.49	-25.61	-25.87

Notes:

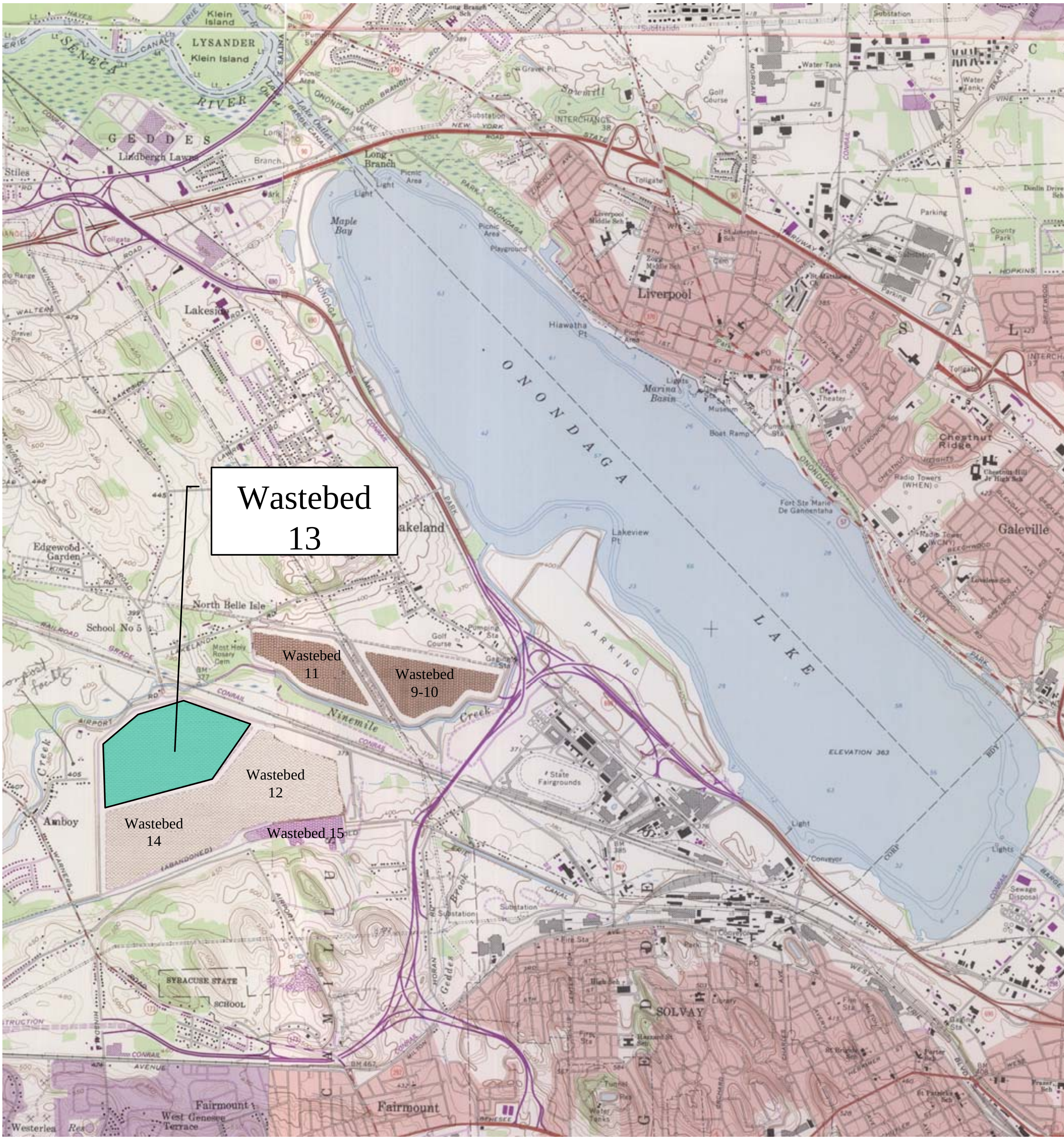
1. Settlement is in inches.
2. NA indicates data are not available.
3. Negative values indicate settlement, and positive values indicate upward movement.
4. SP-17 was buried during fill placement.
5. Data from October 17, 2005 appear to be anomalous because, upon review, it was observed that the data from that time period are inconsistent with field observations and baseline and subsequent readings performed by a licensed surveyor (i.e., a licensed surveyor performed the October 7, 2005 and October 25, 2005 readings). Therefore, these data are not included in this table or Figure 4.6.
6. Although some readings for SP-14, SP-15, and SP-19 are positive (i.e., they indicate upward movement), readings performed by a licensed surveyor on August 31, 2006 are not positive. As shown in Appendix F, all other settlement plate readings agreed relatively well with the licensed surveyor's readings.

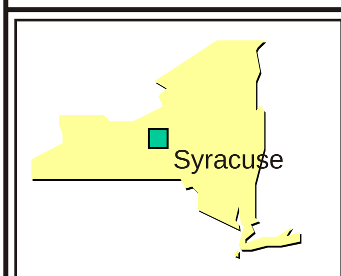
Table 4.2
30-ft Grid Data Summary

Grid Location	Elevation (ft)			
	10/7/2005	10/12/2005	10/17/2005	10/25/2005
1	429.78	NA	435.78	438.74
2	429.6	NA	436.36	439.4
3	429.94	NA	436.7	439.66
4	430.52	NA	437.24	439.94
5	430.64	NA	437.2	440.15
6	429.76	432.76	436.16	438.45
7	429.89	433.13	436.24	439.05
8	430.15	433.09	436.72	439.42
9	430.45	433.3	436.82	439.7
10	430.49	433.36	436.61	439.76
11	429.54	432.63	436.15	438.44
12	429.49	433.11	436.13	438.92
13	430.22	432.76	436.28	439.2
14	430.41	433.15	435.72	439.61
15	430.56	433.05	436.36	439.62
16	429.22	432.51	436.18	438.7
17	429.79	432.72	436.2	438.77
18	429.85	432.74	436.18	438.88
19	430.11	432.74	435.97	439.07
20	430.36	432.95	435.59	439.46
21	429.25	432.68	435.82	438.4
22	429.31	432.65	435.95	438.82
23	429.76	432.65	435.88	438.95
24	430.07	432.74	435.93	439.09
25	430.02	433.22	436.03	439.45

Notes:
1. NA indicates data is not available.
2. Data from 10/12 and 10/17 appear to be anomalous because, upon review, it was observed that the data from those dates are inconsistent with field observations and baseline and subsequent readings performed by a licensed surveyor (i.e., a licensed surveyor performed the October 7, 2005 and October 25, 2005 readings).

FIGURES





New York Quadrangle

LATITUDE: N 43° 5' 57"
LONGITUDE: W 76° 10' 41"

N

SOURCE: U.S.G.S. SYRACUSE WEST QUADRANGLE

FIGURE 1.1

Honeywell

Wastebed 13 Settlement Pilot Study
Data Summary Report
Onondaga County, New York

SITE LOCATION MAP

PARSONS

290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, NY 13088 PHONE: (315) 451-9560

P:\Honeywell-SYR\443665 Phase III PDI\09 Reports\Phase III WP\Phase III Addendum 3\sitemap-WB13.ppt

300 150 0 300 600

SCALE: 1"=300'

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PLOT DATE: 8/31/2007 3:14 PM PLOTTED BY: RUSSO, JILL

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CONTRACTOR'S JOB NO.
SCALE N/A

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

DATA SUMMARY REPORT
WASTEBED 13 SETTLEMENT PILOT STUDY
SYRACUSE, NEW YORK

WASTEBEDS 12–15
EXISTING SITE PLAN

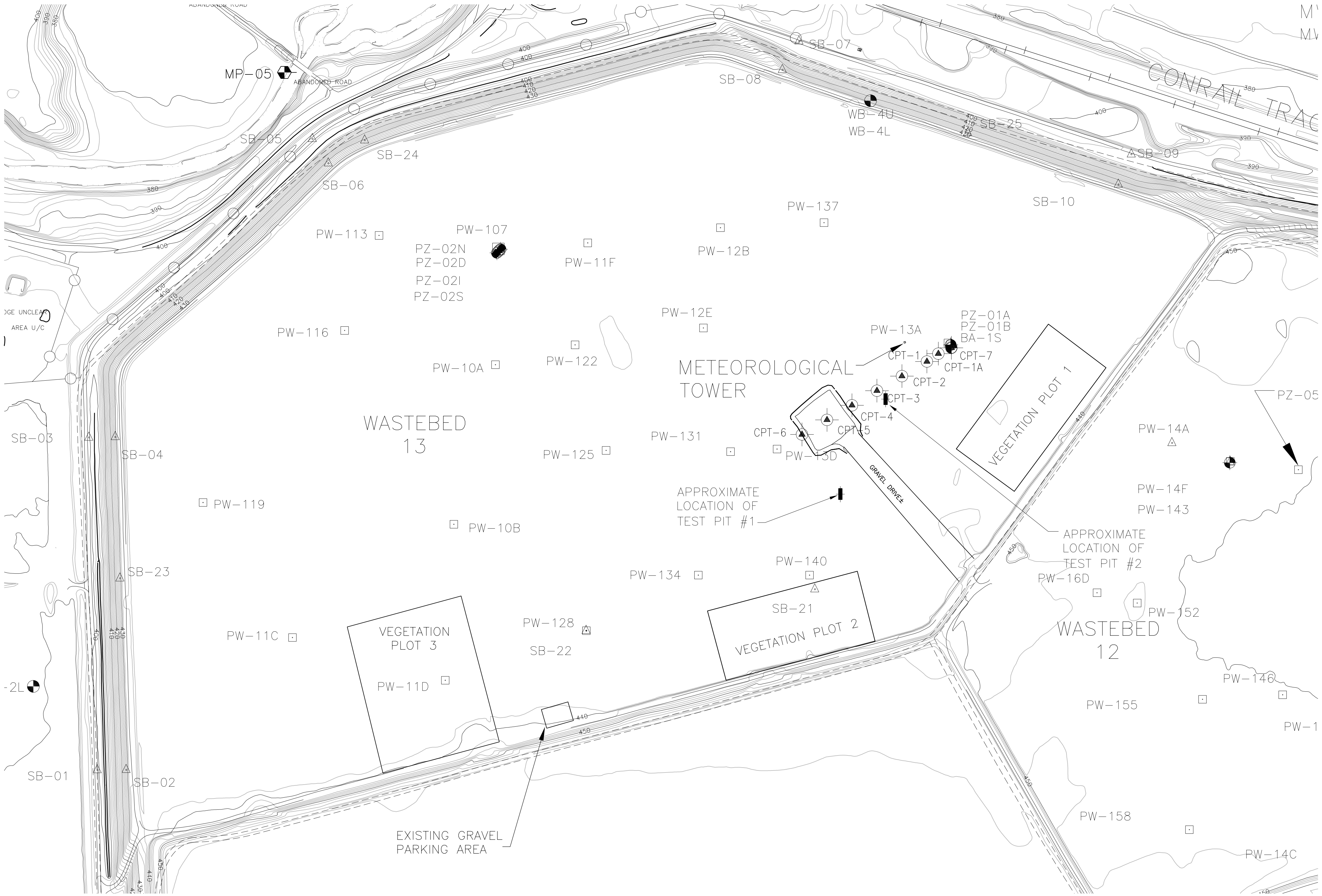
Honeywell
EMS ENGINEERING DEPARTMENT
101 COLUMBIA RD. BOX 2105
MORRISTOWN, NJ 07962

DRAWN	DATE	CHK.	DATE
JAR	11/06		

LOCATION

FIGURE 1.2

REV A



LEGEND:

- CPT LOCATIONS (2004)
- CPT LOCATIONS (2005)
- BORING LOCAITONS (2004)
- PIEZOMENER LOCATIONS (2004)

200 100 0 200 400

SCALE: 1"=200'

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A	ISSUED FOR REVIEW	JR	–	–			–

NO.	REVISION	BY	APPR.	APPR.	APPR.	APPR.	DATE

REFERENCE	DWG. NO.

APPROVALS	DATE

EQUIPMENT P.O. B/M NUMBERS:

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CONTRACTOR'S JOB NO.
SCALE N/A

Honeywell
EMS ENGINEERING DEPARTMENT
101 COLUMBIA RD. BOX 2105
MORRISTOWN, NJ 07962

DATA SUMMARY REPORT
WASTEBED 13 SETTLEMENT PILOT STUDY
SYRACUSE, NEW YORK

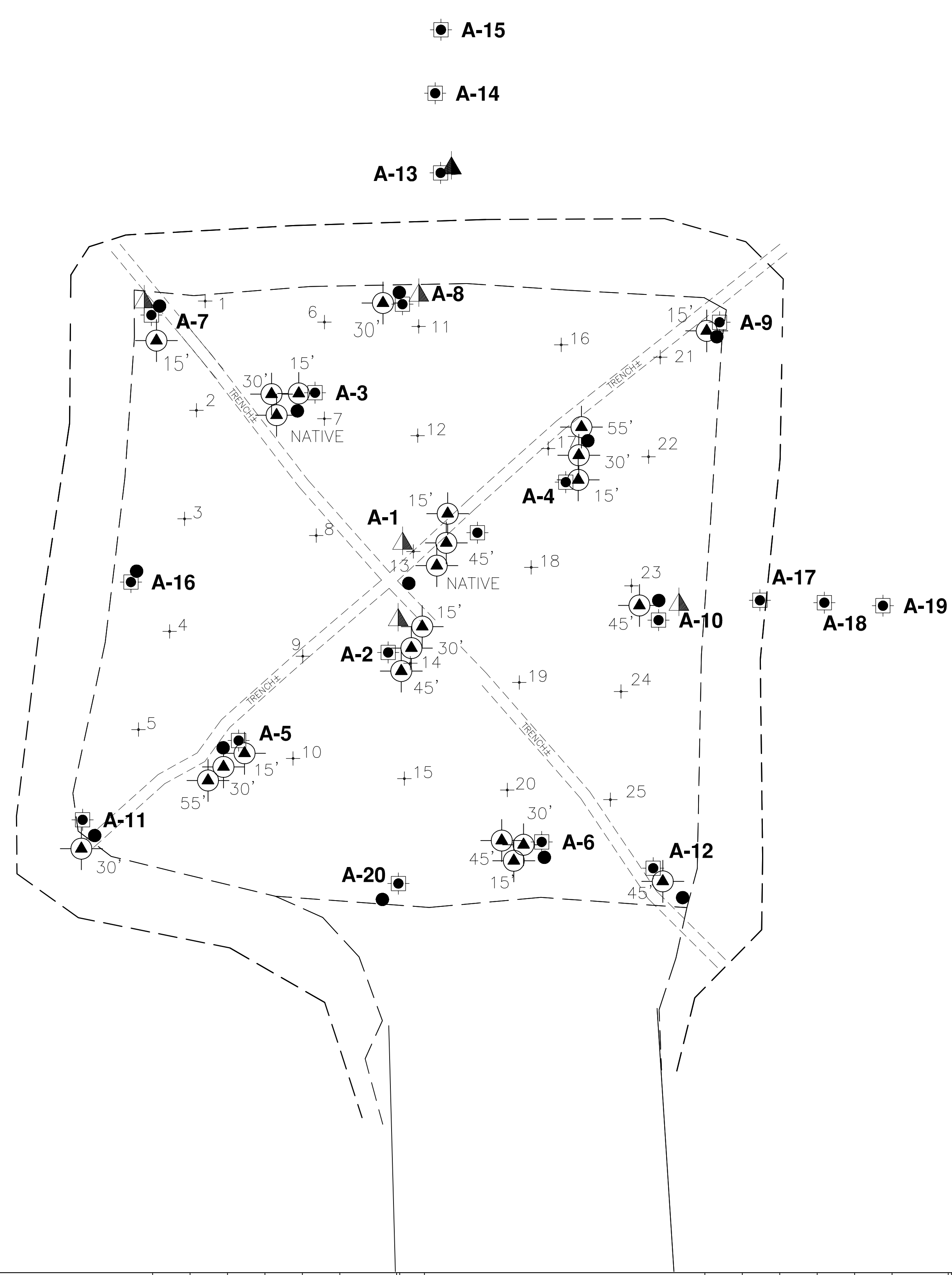
WASTEBED 13 SITE PLAN

JAR	04/05		
DRAWN	DATE	CHK.	DATE

LOCATION

FIGURE 2.1

REV A



LOCATION	CPT ID	INCLINOMETER/ EXTENSOMETER ID	PIEZOMETER ID[2]	SETTLEMENT PLATE
A-1	SB915-CPT-5	SB915-INEX-A1	SB915-PZ-A1(15') SB915-PZ-A1(45') SB915-PZ-A1(NATIVE)	SP-1
A-2		SB915-INEX-A2	SB915-PZ-A2(15') SB915-PZ-A2(30') SB915-PZ-A2(45')	SP-2
A-3	SB915-CPT-A3		SB915-PZ-A3(15') SB915-PZ-A3(30') SB915-PZ-A3(NATIVE)	SP-3
A-4	SB915-CPT-A4		SB915-PZ-A4(15') SB915-PZ-A4(30') SB915-PZ-A4(55')	SP-4
A-5	SB915-CPT-A5		SB915-PZ-A5(15') SB915-PZ-A5(30') SB915-PZ-A5(55')	SP-5
A-6	SB915-CPT-A6		SB915-PZ-A6(15') SB915-PZ-A6(30') SB915-PZ-A6(45')	SP-6
A-7	SB915-CPT-A7	SB915-INEX-A7	SB915-PZ-A7(15')	SP-7
A-8	SB915-CPT-A8	SB915-INEX-A8	SB915-PZ-A8(30')	SP-8
A-9	SB915-CPT-A9		SB915-PZ-A9(15')	SP-9
A-10	SB915-CPT-4	SB915-INEX-A10	SB915-PZ-A10(45')	SP-10
A-11	SB915-CPT-A11		SB915-PZ-A11(30')	SP-11
A-12	SB915-CPT-A12		SB915-PZ-A12(45')	SP-12
A-13		SB915-IN-A13[1]		SP-13
A-14				SP-14
A-15				SP-15
A-16	SB915-CPT-6			SP-16
A-17				SP-17
A-18				SP-18
A-19				SP-19
A-20	SB915-CPT-A20			SP-20

NOTES:

1. ONLY AN INCLINOMETER WAS INSTALLED AT THIS LOCATION.

2. NUMBERS IN PARENTHESES AFTER IDs INDICATE THE PIEZOMETER TIP INSTALLATION DEPTH (i.e., FEET BELOW INITIAL GROUND SURFACE). NATIVE INDICATES PIEZOMETERS WERE INSTALLED IN THE NATIVE SOIL BENEATH THE SOLVAY WASTE.

LEGEND:

- 45' PIEZOMETER AND DEPTH
- INCLINOMETER/EXTENSOMETER
- INCLINOMETER
- SETTLEMENT PROFILER TRENCH
- APPROXIMATE CPT LOCATION
- SETTLEMENT PLATE
- 11 GRID LOCATION

20 10 0 20 40

SCALE: 1"=20'

HONEYWELL – RESTRICTED
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FILE NAME: P:\HONEYWELL -SYR\441598 - SCA FFS\10 TECHNICAL CATEGORIES\10.1 CAD\SK-41598C002.DWG
PLOT DATE: 11/7/2007 2:00 PM PLOTTED BY: RUSSO, JILL

NO.	REVISION	BY	APPR.	APPR.	APPR.	APPR.	DATE
A	ISSUED FOR REVIEW	JR	–	–			–

NO.	REVISION	BY	APPR.	APPR.	APPR.	APPR.	DATE	REFERENCE	DWG. NO.	APPROVALS	DATE

EQUIPMENT P.O. B/M NUMBERS:

JOB NO. 441598
CONTRACTOR'S JOB NO.
SCALE N/A

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

DATA SUMMARY REPORT
WASTEBED 13 SETTLEMENT PILOT STUDY
SYRACUSE, NEW YORK

PILOT STUDY INSTRUMENTATION LAYOUT

Honeywell
EMS ENGINEERING DEPARTMENT
101 COLUMBIA RD. BOX 2105
MORRISTOWN, NJ 07962

DRAWN	DATE	CHK.	DATE
JAR	11/06		

LOCATION

FIGURE 2.2

REV A

Figure 4.1 15-ft Piezometers - Change in Piezometric Level with Time

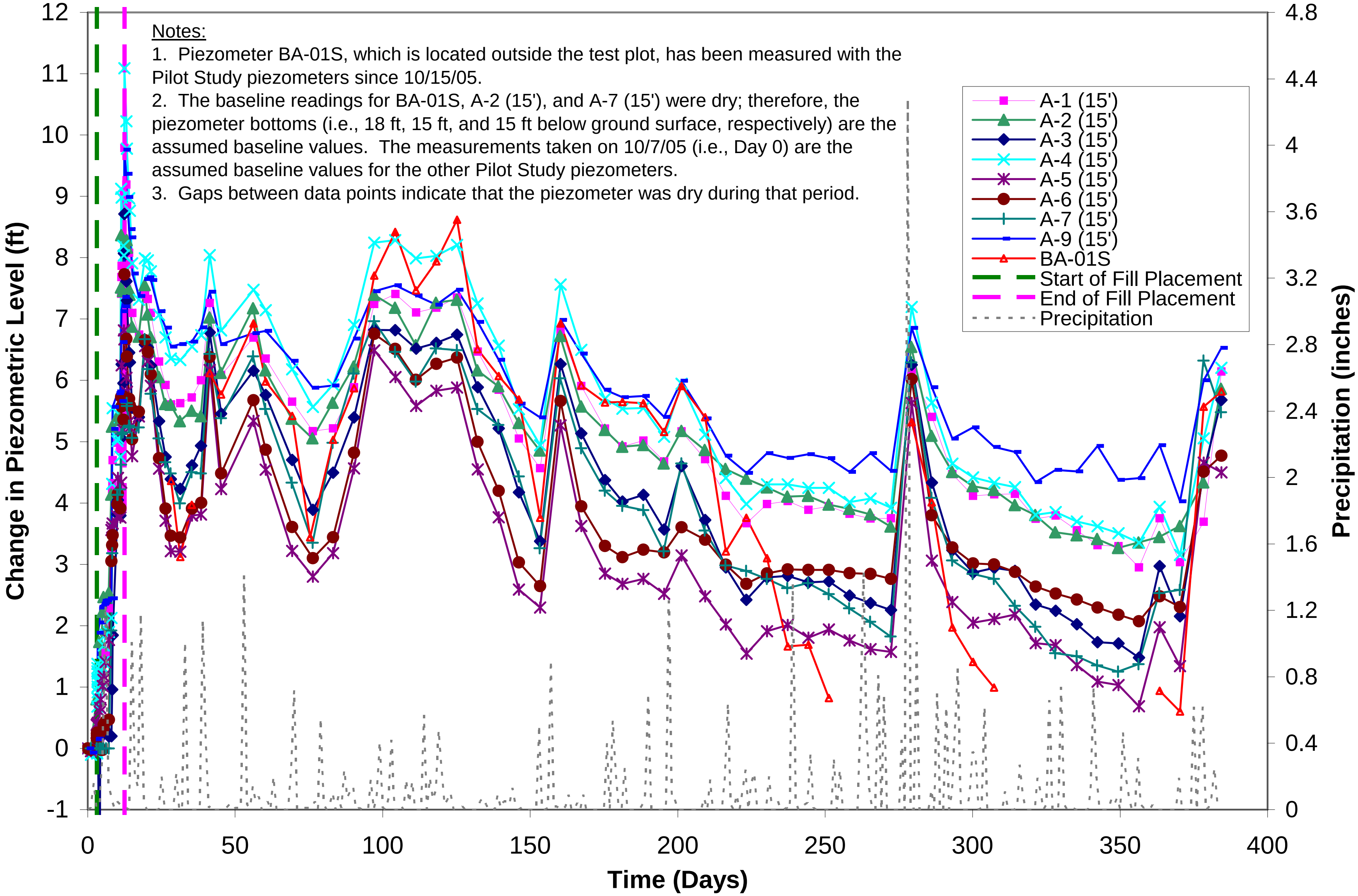


Figure 4.2 30-ft Piezometers - Change in Piezometric Level with Time

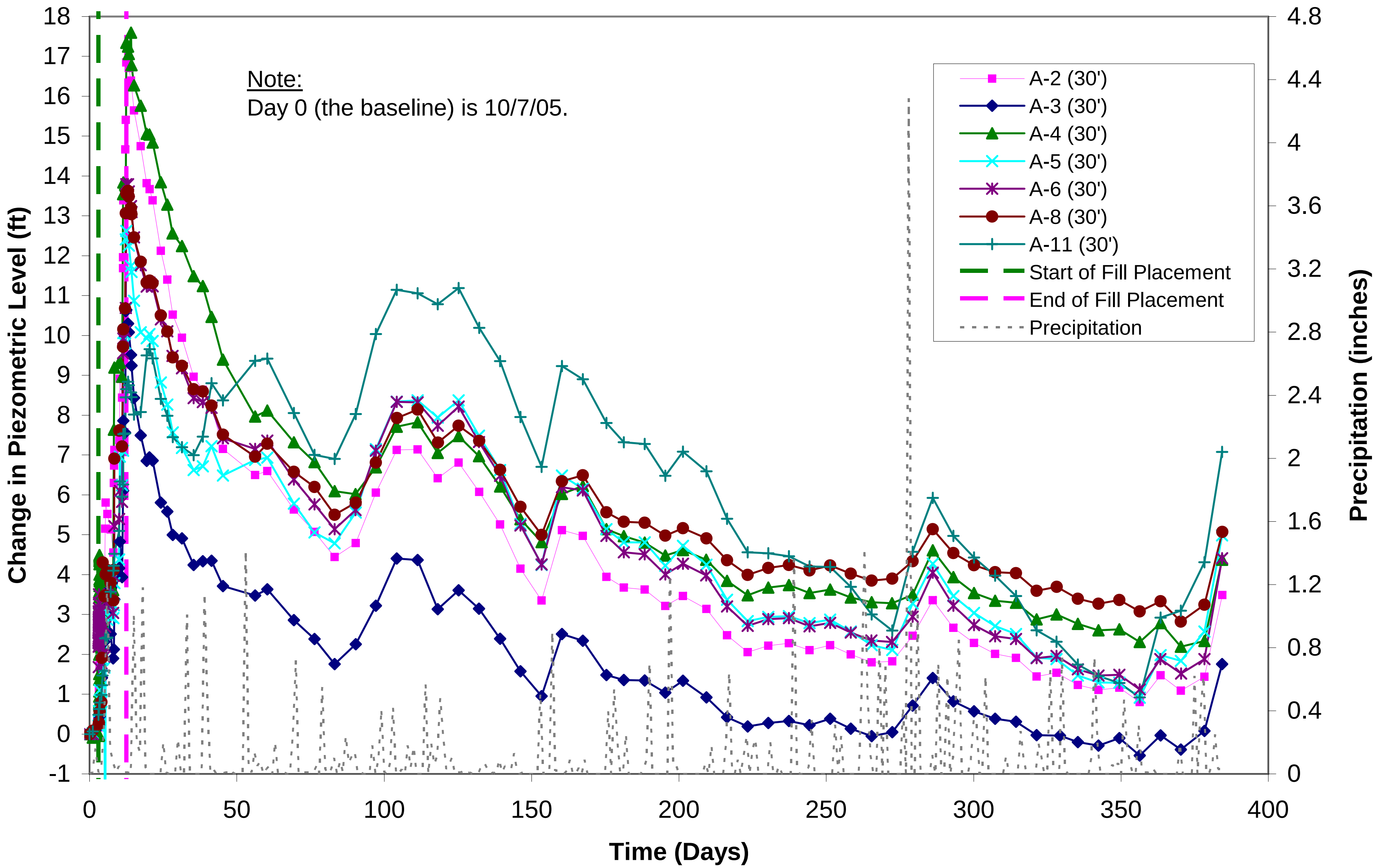


Figure 4.3 45-ft Piezometers - Change in Piezometric Level with Time

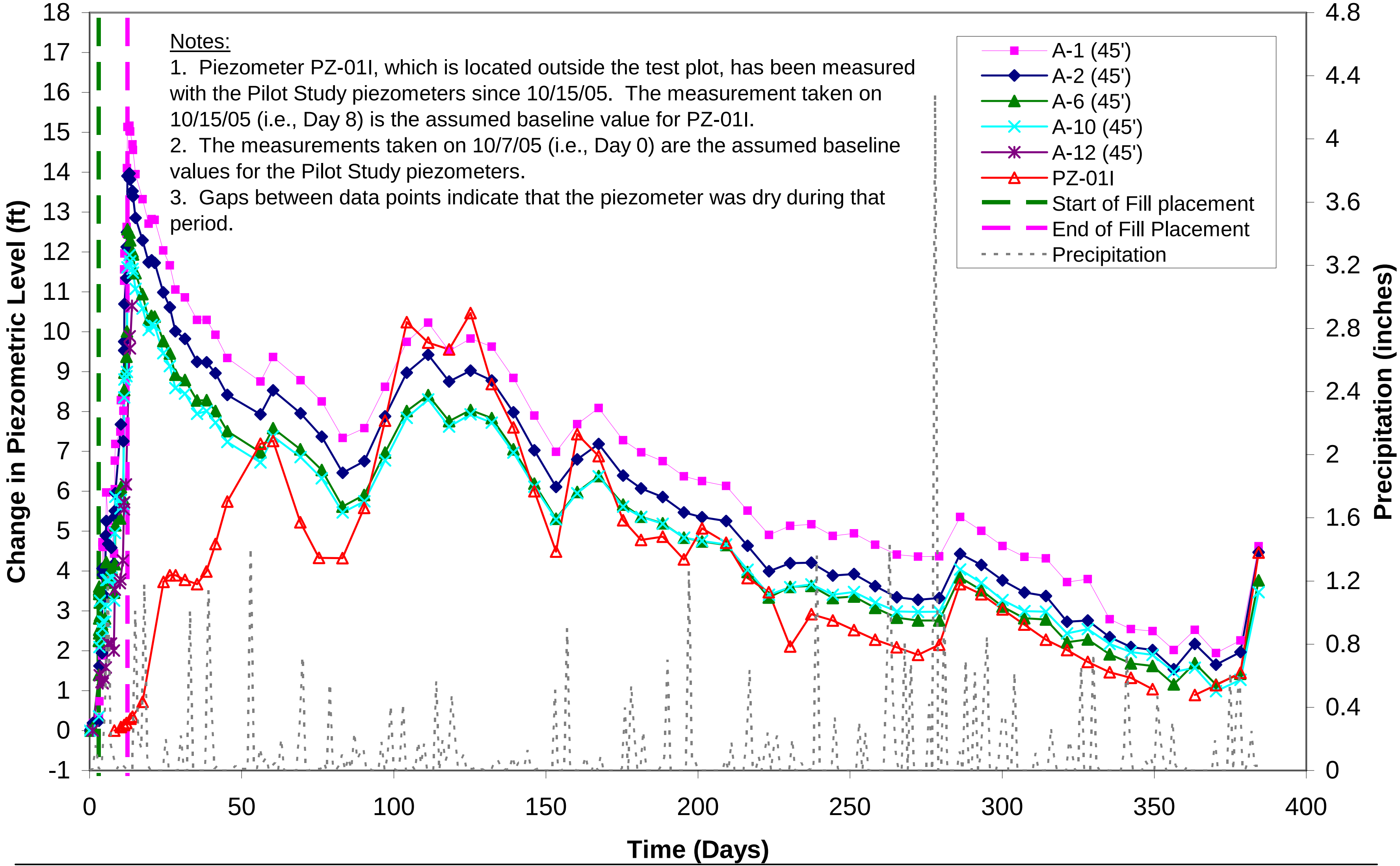


Figure 4.4 55-ft Piezometers - Change in Piezometric Level with Time

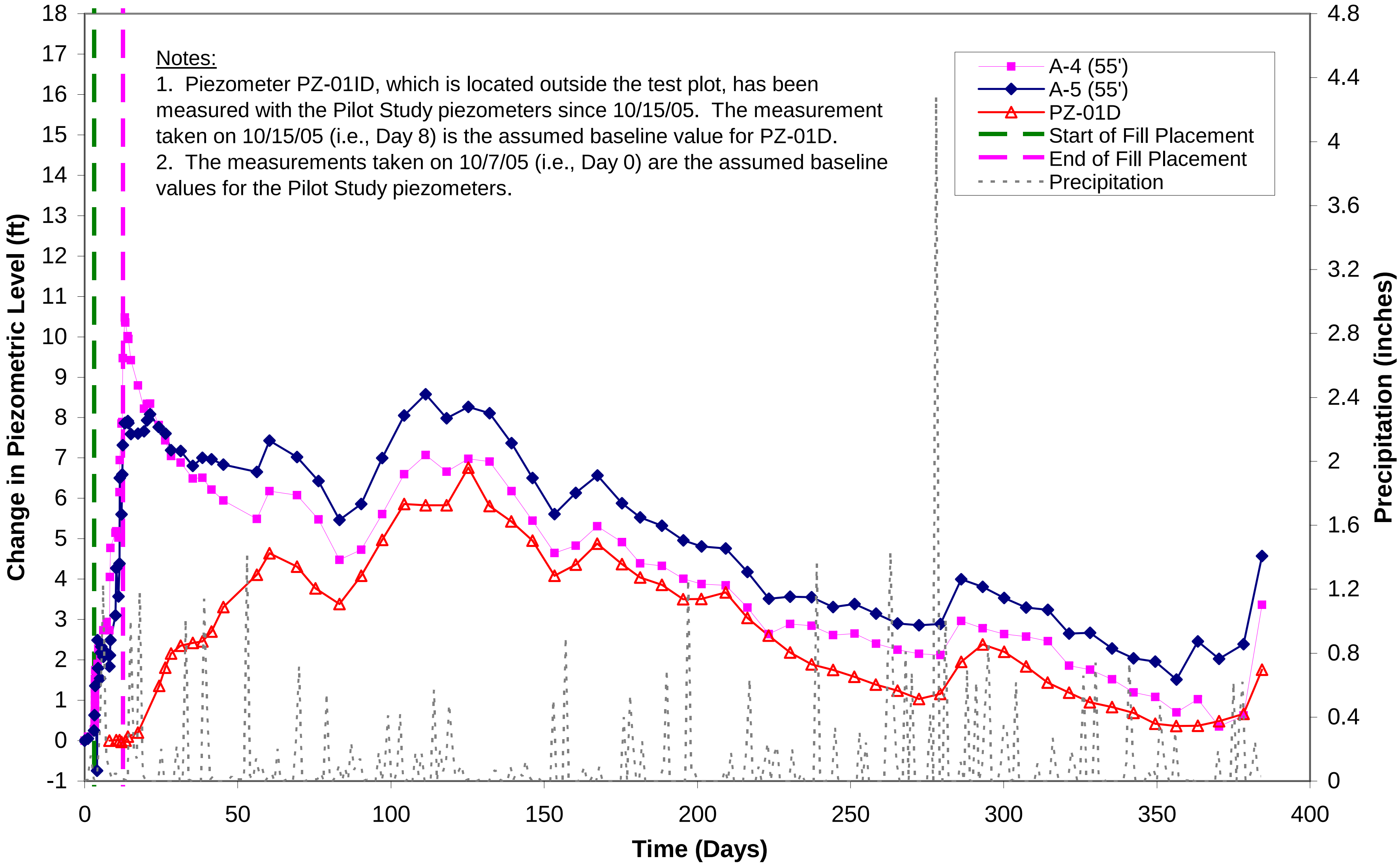


Figure 4.5 Native Piezometers - Change in Piezometric Level with Time

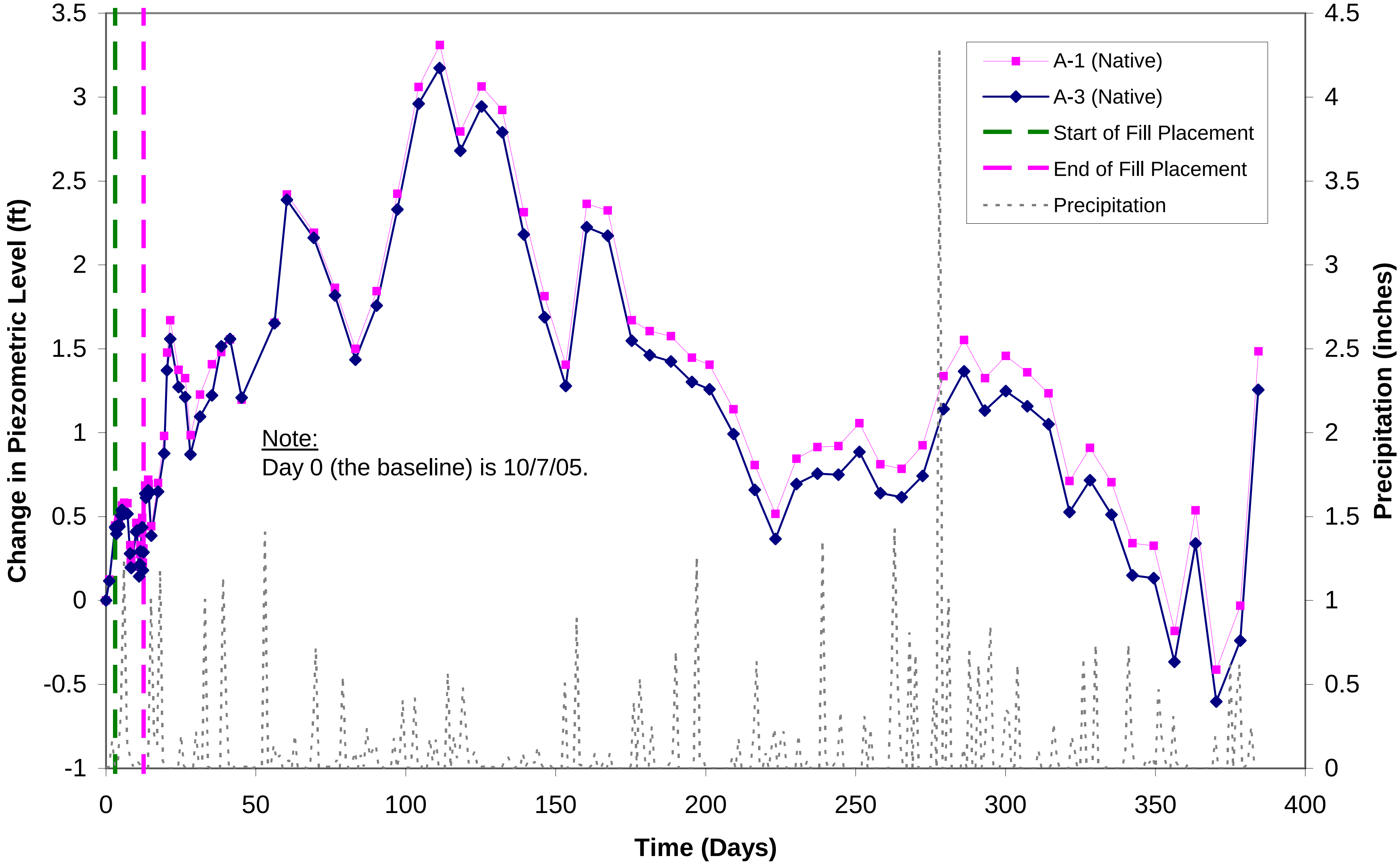
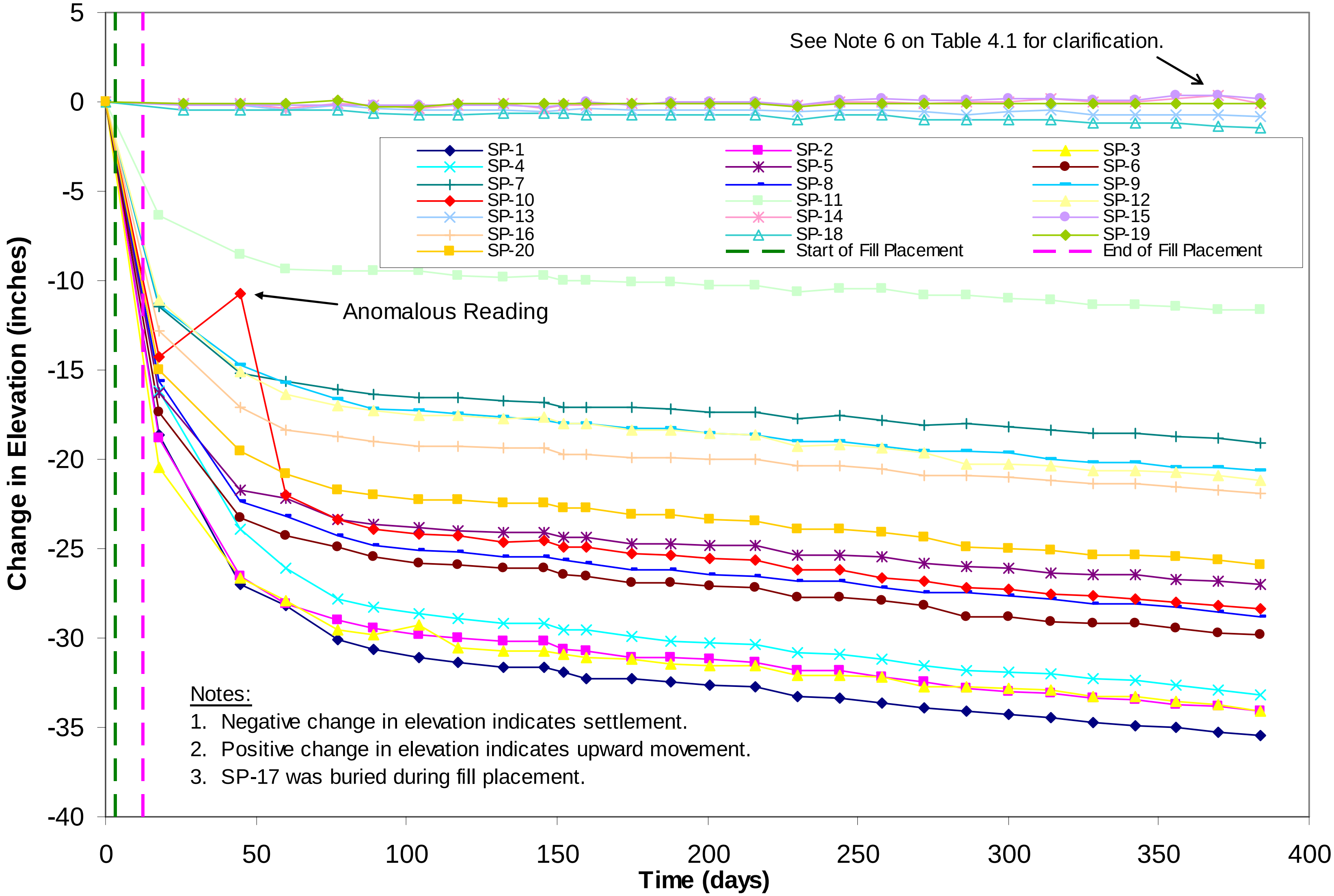
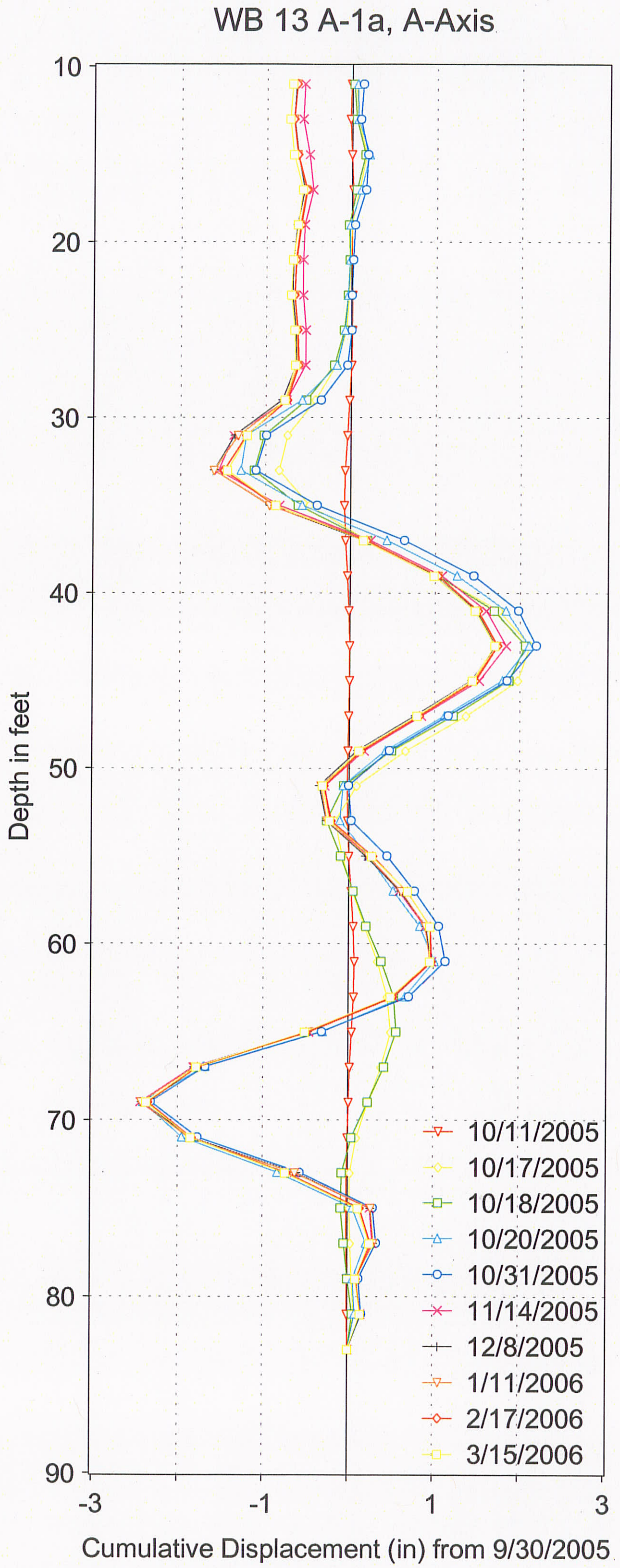


Figure 4.6 Settlement Plate Data with Time





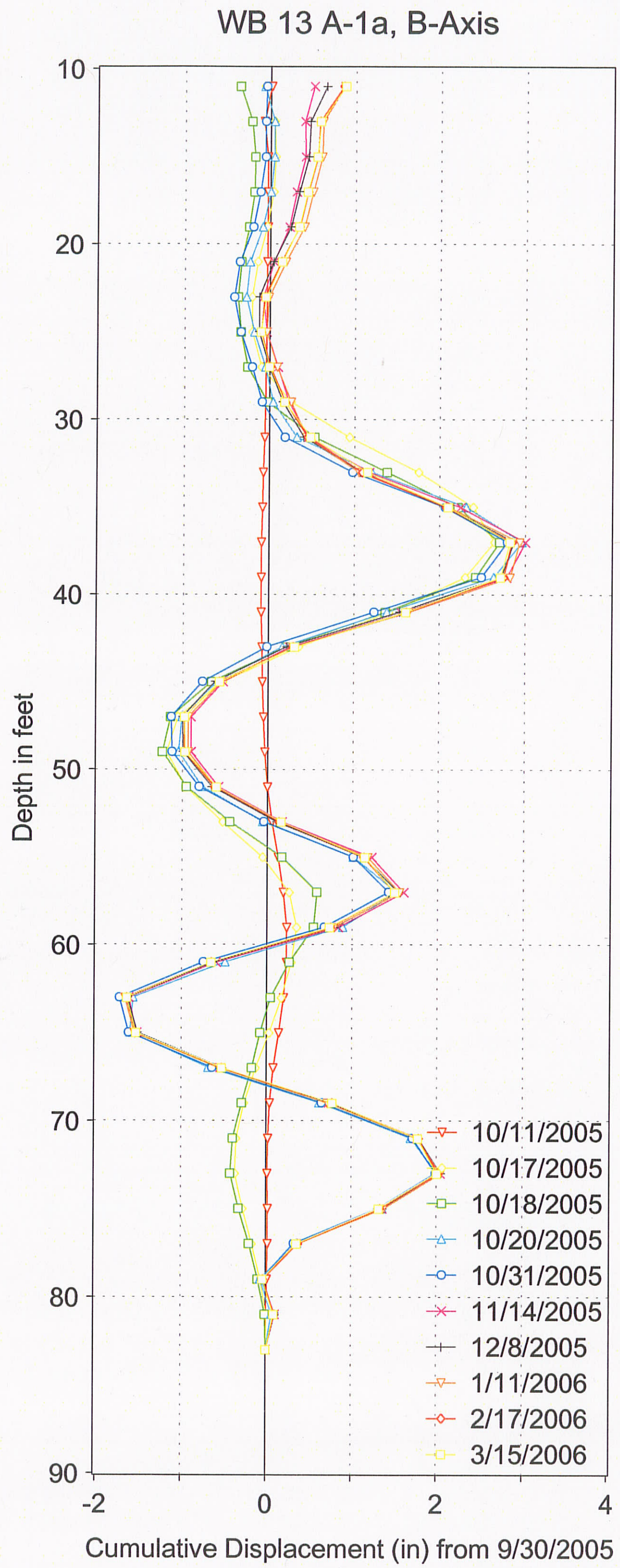


Figure 4.7 A-1 Inclinometer Cumulative Displacement with Time
Wastebed 13 Pilot Study Data Summary Report
March 2006
PARSONS

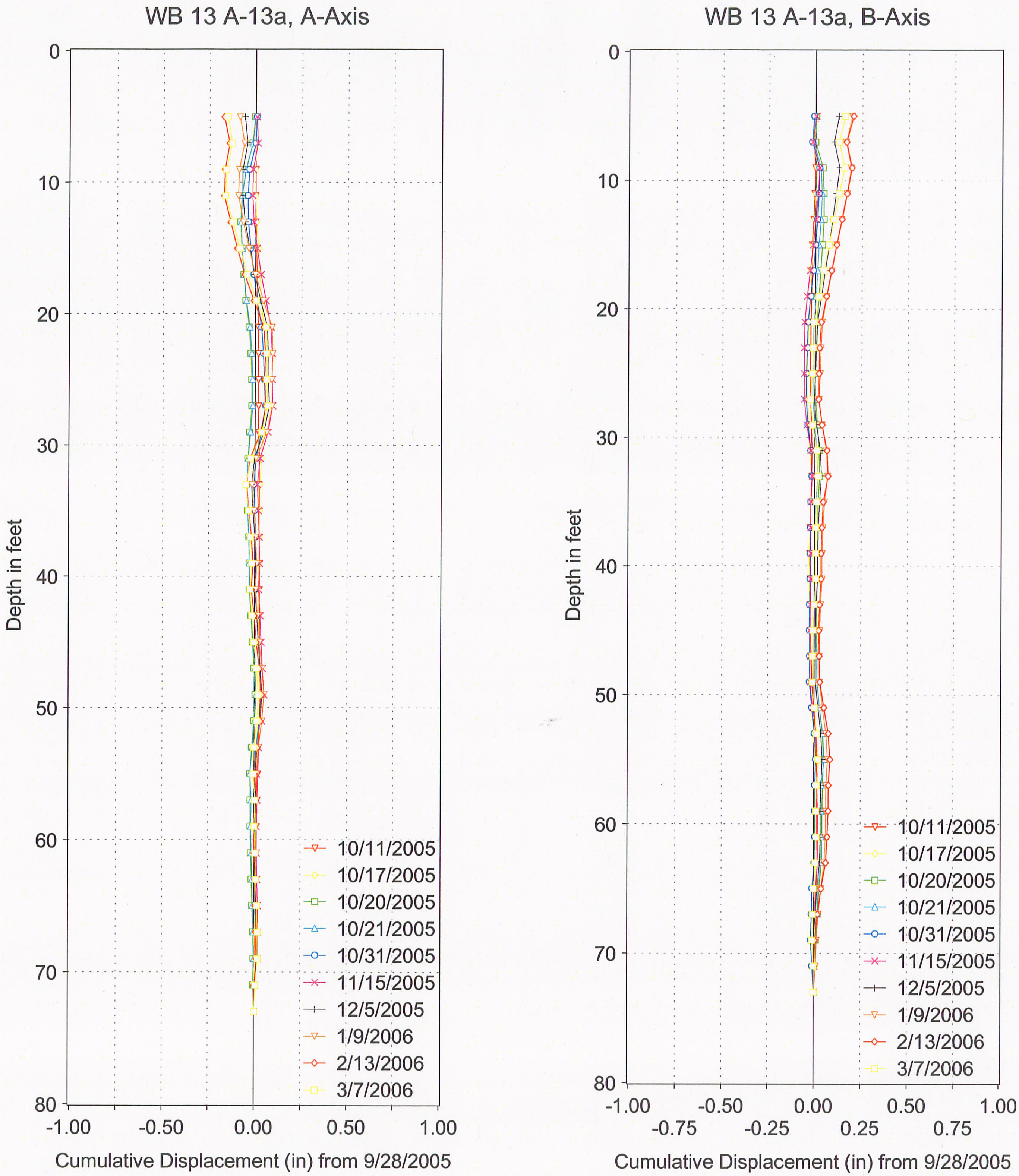


Figure 4.8 A-13 Inclinometer Cumulative Displacement with Time
Wastebed 13 Pilot Study Data Summary Report
March 2006
PARSONS

APPENDIX A

DATA SUMMARY REPORT GEOTECHNICAL CHARACTERIZATION OF WASTEBED 13

APPENDIX B

CONETEC FIELD REPORT

APPENDIX C

BORING AND PIEZOMETER LOGS

APPENDIX D

PHOTOGRAPHS

APPENDIX E

GEOTESTING EXPRESS LABORATORY TEST RESULTS

APPENDIX F

PIEZOMETRIC DATA

APPENDIX G

SETTLEMENT PLATE DATA

APPENDIX H

INCLINOMETER RESULTS

APPENDIX I

EXTENSOMETER DATA

APPENDIX J

SETTLEMENT PROFILER DATA

Table 2.1
Instrumentation and Testing Summary per Location

Location	CPTu ID	Inclinometer/ Extensometer ID	Piezometer ID[2]	Settlement Plate ID	Quantity of Laboratory Testing								
					Water Content (ASTM D2216)	Atterberg Limits[3] (ASTM D4318)	Grain Size (ASTM D422)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373)	Bulk Density (EM-1110-2-1906)	CU (ASTM D4767)	UU (ASTM D2850)	Consolidation (ASTM D2435)
A-1	SB915-CPT-5	SB915-INEX-A1	SB915-PZ-A1(15')	SP-1	22	7[4]	9		7				
			SB915-PZ-A1(45')										
			SB915-PZ-A1(Native)										
A-2		SB915-INEX-A2	SB915-PZ-A2(15')	SP-2	9	3	3	4	3	3	3	3	3
			SB915-PZ-A2(30')										
			SB915-PZ-A2(45')										
A-3	SB915-CPT-A3		SB915-PZ-A3(15')	SP-3									
			SB915-PZ-A3(30')										
			SB915-PZ-A3(Native)										
A-4	SB915-CPT-A4		SB915-PZ-A4(15')	SP-4	23								
			SB915-PZ-A4(30')										
			SB915-PZ-A4(55')										
A-5	SB915-CPT-A5		SB915-PZ-A5(15')	SP-5									
			SB915-PZ-A5(30')										
			SB915-PZ-A5(55')										
A-6	SB915-CPT-A6		SB915-PZ-A6(15')	SP-6									
			SB915-PZ-A6(30')										
			SB915-PZ-A6(45')										
A-7	SB915-CPT-A7	SB915-INEX-A7	SB915-PZ-A7(15')	SP-7	3			1		2	3	2	2
A-8	SB915-CPT-A8	SB915-INEX-A8	SB915-PZ-A8(30')	SP-8				1					1
A-9	SB915-CPT-A9		SB915-PZ-A9(15')	SP-9									
A-10	SB-915-CPT-4	SB915-INEX-A10	SB915-PZ-A10(45')	SP-10	7	2	2	1		1		1	1
A-11	SB915-CPT-A11		SB915-PZ-A11(30')	SP-11	12								
A-12	SB915-CPT-A12		SB915-PZ-A12(45')	SP-12									
A-13		SB915-IN-A13[1]		SP-13									
A-14				SP-14									
A-15				SP-15									
A-16	SB915-CPT-6			SP-16									
A-17				SP-17									
A-18				SP-18									
A-19				SP-19									
A-20	SB915-CPT-A20			SP-20									
Total Number of Tests					76	12	14	7	10	6	6	6	7

Notes:
1. Only an inclinometer was installed at this location.
2. Numbers in parentheses after IDs indicate the piezometer tip installation depth (i.e., feet below initial ground surface). Native indicates piezometers were installed in the native soil beneath the Solvay waste.
3. The Atterberg limits were determined using ASTM D4318. In addition, the liquid limit was also evaluated using the laboratory cone penetration method (BS 1377-2:1990).
4. At this location, ASTM D4318 was used to evaluate the Atterberg limits of all seven samples, and BS 1377-2:1990 (i.e., cone penetration method) was only performed on six of the samples.

Table 2.2
Estimated Water Table Levels from CPTu Porewater Pressure Dissipation Tests

CPTu Location	Measurement Depth (ft below waste surface)	Estimated Water Table Depth (ft below waste surface)
SB915-CPT-2	80.05	58.59
SB915-CPT-3	80.05	58.96
SB915-CPT-A3	15.09	16.58
	27.07	21.93
	30.02	26.54
	79.4	58.98
SB915-CPT-A4	80.05	59.04
SB915-CPT-A5	45.44	41.27
SB915-CPT-A7	73.82	59.37
SB915-CPT-A8	80.05	57.69
SB915-CPT-A9	80.05	58.56
SB915-CPT-A11	46.42	41.22

Table 2.3
Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216) (%)	Liquid Limit (Fall-cone Method BS 1377-2:1990) (%)	Atterberg Limits (ASTM D4318) Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Grain Size (ASTM D422) Percent Gravel (%)	Percent Sand (%)	Percent Fines (clay & silt) (%)	Clay-sized Particle Content (0.005 mm) (%)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373) (%)	Unit Weight Bulk (pcf)	Dry (pcf)
SB915-EXC-1	SB915-6001-05	10.0-12.0	11	127												
SB915-EXC-2	SB915-6001-06	10.0-12.0	11	258												
SB915-EXC-3	SB915-6001-07	10.0-12.0	11	40												
SB915-PZ-A1[1]	SB915-6005-01	0.0-6.0	3	134												
	SB915-6005-02	6.0-8.0	7	270												
	SB915-6005-03	8.0-10.0	9	331	198	226	126	100	0	0.8	99.2	34.4		57		
	SB915-6005-04	12.0-14.0	13	125												
	SB915-6005-05	16.0-18.0	15	155												
	SB915-6005-06	19.0-21.0	20	218	159	158	102	56	0	15	85	30.6		61		
	SB915-6005-07	24.0-26.0	15	190												
	SB915-6005-08	29.0-31.0	30	251	173	201	74	127	0	4	96	24.7		57		
	SB915-6005-09	33.0-34.0	33.5	171												
	SB915-6005-10	36.0-38.0	37	186												
	SB915-6005-11	39.0-41.0	40	154												
	SB915-6005-12	41.0-43.0	42	210	194	227	89	138	0	40.9	59.1	21.5		26		
	SB915-6006-01	44.0-46.0	45	193												
	SB915-6006-02	48.0-49.0	48.5	165												
	SB915-6006-03	49.0-51.0	50	284	209	234	105	129	0	5.9	94.1	2.0		39		
	SB915-6006-04	54.0-56.0	55	110	NA[4]	134	89	45	0	80	20	5.5		43		
	SB915-6006-05	58.0-59.0	58.5	93												
	SB915-6006-06	64.0-66.0	65	185	120	120	97	23	0	7.4	92.6	12.4		52		
	SB915-6006-07	68.0-69.0	68.5	294												
	SB915-6006-08	73.0-74.0	73.5	202												
	SB915-6006-09[2]	76.0-78.0	77	5					38.5	32.7	28.8	7.5				
SB915-INEX-A2	SB915-6001-01	10.0-12.0	11	466									2.47	52	67	12
	SB915-6001-02	20.0-22.0	21		178	182	89	93	0	9.8	90.2	11.7	2.5	52		
	SB915-6001-03	30.0-32.0	31	105											79	38
	SB915-6000-10	34.0-36.0	35	263									2.71		78	21
	SB915-6001-04	38.0-40.0	39	259									2.53	57		
	SB915-6000-11	44.0-46.0	45	166	164		Non-Plastic		0	4.9	95.1	17.5				
			45	236												
			45	162												
	SB915-6000-12	64.0-66.0	65	118	160		Non-Plastic		0	5.9	94.1	21.8				
			65	63												
			65	59												
	SB915-6006-10[2]	73.7-75.7	74.7	24					36.1	41.1	22.8	5.3				
SB915-PZ-A4	SB915-6003-01	0.0-2.0	1	181												
	SB915-6003-02	2.0-4.0	3	261												
	SB915-6003-03	6.0-8.0	7	417												
	SB915-6003-04	8.0-10.0	9	427												
	SB915-6003-05	10.0-12.0	11	286												
	SB915-6003-06	12.0-14.0	13	240												
	SB915-6003-07	14.0-16.0	15	219												
	SB915-6003-08	16.0-18.0	17	224												
	SB915-6003-09	18.0-20.0	19	254												
	SB915-6003-10	20.0-22.0	21	237												
	SB915-6003-11	22.0-24.0	23	243												
	SB915-6003-12	24.0-26.0	25	239												
	SB915-6004-01	26.0-28.0	27	240												
	SB915-6004-02	28.0-30.0	29	224												
	SB915-6004-03	30.0-32.0	31	212												
	SB915-6004-04	32.0-34.0	33	265												
	SB915-6004-05	36.0-38.0	37	181												
	SB915-6004-06	38.0-40.0	39	183												
	SB915-6004-07	40.0-42.0	41	209												
	SB915-6004-08	42.0-44.0	43	166												
	SB915-6004-09	44.0-46.0	45	172												
	SB915-6004-10	46.0-48.0	47	210												
	SB915-6004-11	48.0-50.0	49	245												
SB915-INEX-A7	SB915-6000-02	15.0-17.0	16	276									2.54		55	15
	SB915-6000-04	44.0-46.0	45	204											79	26
	SB915-6000-05	59.0-61.0	60	86												
SB915-INEX-A8	SB915-6000-01	15.0-17.0	16										2.7			

Table 2.3
Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216) (%)	Liquid Limit (Fall-cone Method BS 1377-2:1990) (%)	Atterberg Limits (ASTM D4318) Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Grain Size (ASTM D422) Percent Gravel (%)	Percent Sand (%)	Percent Fines (clay & silt) (%)	Clay-sized Particle Content (0.005 mm) (%)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373) (%)	Unit Weight Bulk (pcf)	Unit Weight Dry (pcf)
SB915-INEX-A10	SB915-6000-06	10.0-12.0	11	494	167	168	103	65	0	19.8	80.2	27.6				
			11	396												
			11	304												
	SB915-6000-07	24.0-26.0	25	267									2.72		74	20
	SB915-6000-08	39.0-41.0	40	203	179	183	89	94	0	11.8	88.2	24.7				
			40	214												
			40	243												
SB915-PZ-A11	SB915-6002-01	0.0-2.0	1	228												
	SB915-6002-02	2.0-4.0	3	165												
	SB915-6002-03	4.0-6.0	5	109												
	SB915-6002-04	8.0-10.0	9	222												
	SB915-6002-05	10.0-12.0	11	347												
	SB915-6002-06	12.0-14.0	13	912 [3]												
	SB915-6002-07	14.0-16.0	15	242												
	SB915-6002-08	16.0-18.0	17	134												
	SB915-6002-09	18.0-20.0	19	243												
	SB915-6002-10	20.0-22.0	21	205												
	SB915-6002-11	22.0-24.0	23	162												
	SB915-6002-12	24.0-26.0	25	130												
Minimum				40	120	120	74	23	0	0.8	20	2	2.47	26	55	12
Maximum				494	209	234	126	138	0	80	99	34	2.72	61	79	38
Average				216	173	183	96	87	0	17	83	20	2.61	49	72	22

Notes:

1. This location ID is consistent with the test results provided by GeoTesting Express; however, samples were actually taken from the SB915-INEX-A1 boring, which is very close to the SB915-PZ-A1 boring.
2. Native soils. These results are not included in the minimum, maximum, and average values.
3. This water content result is not included in the minimum, maximum, and average values.
4. NA indicates not available.

Table 2.4
Unconsolidated Undrained Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (%)	Dry Density (pcf)	Undrained Strength (psf)	Strain at Failure (%)
SB915-INEX-A2	SB915-6000-10	34-36	35	251	21	626	9.9
SB915-INEX-A2	SB915-6001-04	38-40	39	110	40	2045	10.2
SB915-INEX-A2	SB915-6001-04	38-40	39	172	29	1071	4.6
SB915-INEX-A7	SB915-6000-02	15-17	16	225	22	642	11.8
SB915-INEX-A7	SB915-6000-03	29-31	30	220	25	794	9.2
SB915-INEX-A10	SB915-6000-07	24-26	25	253	21	419	2.0

Table 2.5
Consolidated Undrained with Porewater Pressure Measurements Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Dry Density before Shear (pcf)	Initial Water Content (%)	Initial Confining Stress (psf)	Peak Deviator Stress (psf)	Undrained Strength (psf)	Strain at Failure (%)	CIU Total Stress		CIU Effective Stress	
										Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
2005 Pilot Study													
SB915-INEX-A2	SB915-6000-09	15-17	16	18	345	1209	1360	680	3.5	0	17	13	45
				24	205	2501	2046	1023	3.2				
				24	293	5001	3480	1740	2.0				
SB915-INEX-A2	SB915-6001-03	30-32	31	24	105	2001	2048	1024	4.1	68	17	NA [1]	
				26	135	4002	3358	1679	3.3				
				33	161	8001	6852	3426	15				
SB915-INEX-A2 [2]	SB915-6000-10	34-36	35		223	1999	2156	1078	3.7	304	15	125	42
						4001	3504	1752	2.8				
				54		7998	6240	3120	2.1				
SB915-INEX-A7 [2]	SB915-6000-02	15-17	16		214	1200	1577	789	1.9	301	15	267	45
						2496	2486	1243	1.5				
				23		4999	4150	2075	1.8				
SB915-INEX-A7 [2]	SB915-6000-03	29-31	30		206	1998	2212	1106	3.2	367	14	353	42
						3998	3680	1840	5.3				
				27		8001	6210	3105	2.3				
SB915-INEX-A7	SB915-6000-04	44-46	45	25	204	2000	1805	903	5.8	292	17	NA [1]	
				37	158	4000	4530	2265	15				
				32	173	7992	6704	3352	2.3				

Notes:
1. NA indicates that a cohesion value and friction angle could not be defined because the strength envelope had a negative intercept.
2. These tests were performed as staged triaxial tests; thus, the same sample was used for all three tests.

Table 2.6
Consolidation Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Compression Index (C_c)	Recompression Index (C_r)	Modified Compression Index ($C_{c\varepsilon}$)	Modified Recompression Index ($C_{r\varepsilon}$)	Initial Void Ratio (e_o)	Initial Water Content (%)	Preconsolidation Pressure (psf)
SB915-INEX-A2	SB-915-6000-10	34-36	35	5.3	0.07	0.51	0.0069	9.4	338	2200
SB915-INEX-A2	SB-915-6001-01	10-12	11	7.3	0.10	0.56	0.0074	12.1	466	1800
SB915-INEX-A2	SB-915-6001-04	38-40	39	3.0	0.05	0.40	0.0072	6.6	259	3400
SB915-INEX-A7	SB-915-6000-02	15-17	16	8.2	0.13	0.61	0.0100	12.4	453	1800
SB915-INEX-A7	SB-915-6000-02	15-17	16	3.4	0.03	0.41	0.0039	7.2	273	2800
SB915-INEX-A8	SB-915-6000-01	15-17	16	Disturbed Sample						
SB915-INEX-A10	SB-915-6000-07	24-26	25	4.6	0.06	0.49	0.0061	8.3	305	2600

Note:
Sample SB915-6000-01 is assumed to be a disturbed sample because the strain versus log effective stress curve is fairly flat without a distinct break.

Table 2.7
Baseline Piezometric Data

Location	Tip Depth from Initial Ground Surface (ft)	Piezometer ID	Elevation	Baseline Piezometric Elevation (ft)	Piezometer Type
A-1	15	SB915-PZ-A1 (15')	415.59	NA	Typ VW
A-1	45	SB915-PZ-A1 (45')	385.63	389.78	Typ VW
A-1	77.5	SB915-PZ-A1 (Native)	352.53	373.44	Typ VW
A-2	15	SB915-PZ-A2 (15')	415.35	NA	SP
A-2	30	SB915-PZ-A2 (30')	400.27	401.85	PI VW
A-2	45	SB915-PZ-A2 (45')	385.34	388.99	PI VW
A-3	15	SB915-PZ-A3 (15')	415.43	NA	Typ VW
A-3	30	SB915-PZ-A3 (30')	400.11	402.43	Typ VW
A-3	78.5	SB915-PZ-A3 (Native)	351.36	372.21	Typ VW
A-4	15	SB915-PZ-A4 (15')	414.45	NA	PI VW
A-4	30	SB915-PZ-A4 (30')	399.54	401.76	PI VW
A-4	55	SB915-PZ-A4 (55')	375.58	416.54	PI VW
A-5	15	SB915-PZ-A5 (15')	416.02	416.26	Typ VW
A-5	30	SB915-PZ-A5 (30')	401.07	403.91	Typ VW
A-5	55	SB915-PZ-A5 (55')	376.33	384.72	Typ VW
A-6	15	SB915-PZ-A6 (15')	415.79	NA	Typ VW
A-6	30	SB915-PZ-A6 (30')	400.88	404.52	Typ VW
A-6	45	SB915-PZ-A6 (45')	385.89	390.92	Typ VW
A-7	15	SB915-PZ-A7 (15')	414.92	NA	SP
A-8	30	SB915-PZ-A8 (30')	399.83	400.44	Typ VW
A-9	15	SB915-PZ-A9 (15')	414.42	NA	PI VW
A-10	45	SB915-PZ-A10 (45')	385.36	391.19	Typ VW
A-11	30	SB915-PZ-A11 (30')	400.58	402.93	PI VW
A-12	45	SB915-PZ-A12 (45')	386.44	390.03	SP

Notes:
1. Typ VW indicates typical vibrating wire piezometer (GeoKon Model 4500S).
2. PI VW indicates push-in vibrating wire piezometer (GeoKon Model 4500DP).
3. SP indicates standpipe.
4. NA indicates water was not present during baseline monitoring.
5. Datum: NAVD88 State Plane Grid.

Table 3.1
Results of *In Situ* Density Testing

Approximate Location	Test Date	In-Place Wet Density (pcf)	Water Content (%)	In-Place Dry Density (pcf)
Center of A-10 and A-12	10/12/2005	138.6	12.2	123.5
35' SE of A-9	10/12/2005	132.6	15.1	115.2
3' E of A-8	10/12/2005	137.6	13.6	121.1
5' East of A-7	10/12/2005	132.3	10.9	119.3
55' S of A-2	10/12/2005	137.7	12	123
30' NW of A-11	10/12/2005	135.5	13.3	119.6
60' NW of A-11	10/12/2005	138.1	14.2	121
20' E of A-2	10/12/2005	130	11.3	116.8
25' NW of A-2	10/12/2005	136.4	11.6	122.2
30' W of A-2	10/12/2005	132.3	12	118.1
20' S of A-12	10/18/2005	136.5	9	125.2
20' SW of A-10	10/18/2005	132.5	9.7	120.8
15' SW of A-9	10/18/2005	130.5	13.4	115.1
30' E of A-8	10/18/2005	123.4	13.1	109.1
8' NW of A-8	10/18/2005	117.3	10.1	106.5
20' E of A-7	10/18/2005	129.9	11	117
30' E of A-14	10/18/2005	110.7	9.8	100.8
40' E of A-13	10/18/2005	111.7	11.3	100.3
45' E of A-11	10/18/2005	132.2	11.1	119
60' E-SE of A-11	10/18/2005	140.1	11.2	126
16' W of A-12	11/4/2005	135.2	9.7	123.3
15' W of A-10	11/4/2005	140.7	11.3	126.4
20' SW of A-9	11/4/2005	132.9	12.3	118.4
15' S of A-8	11/4/2005	139.2	9.4	127.1
20' NW of A-1	11/4/2005	136.6	10.8	123.2
25' SE of A-7	11/4/2005	135.3	9	124.1
15' N of A-2	11/4/2005	135.1	10.6	122.1
27' NE of A-11	11/4/2005	129.1	11.6	115.7
12' SW of A-2	11/4/2005	132.4	10.6	119.7
50' W of A-12	11/4/2005	138.5	9.9	126
Average		132.4	11.4	118.9

Table 4.1
Settlement Plate Data Summary

Date	10/7/2005	10/25/2005	11/2/2005	11/21/2005	12/6/2005	12/23/2005	1/4/2006	1/19/2006	2/1/2006	2/16/2006	3/2/2006	3/8/2006	3/16/2006	3/31/2006	4/13/2006
Time Elapsed (days)	**0**	**18**	**26**	**45**	**60**	**77**	**89**	**104**	**117**	**132**	**146**	**152**	**160**	**175**	**188**
SP-1	0	-18.68	NA	-26.96	-28.21	-30.12	-30.62	-31.12	-31.37	-31.62	-31.62	-31.87	-32.24	-32.25	-32.50
SP-2	0	-18.80	NA	-26.56	-28.06	-28.97	-29.47	-29.84	-29.97	-30.22	-30.22	-30.60	-30.72	-31.10	-31.10
SP-3	0	-20.48	NA	-26.65	-27.90	-29.56	-29.81	-29.31	-30.56	-30.68	-30.69	-30.94	-31.06	-31.19	-31.43
SP-4	0	-16.16	NA	-23.87	-26.12	-27.78	-28.28	-28.66	-28.91	-29.15	-29.16	-29.53	-29.53	-29.91	-30.16
SP-5	0	-16.28	NA	-21.69	-22.19	-23.35	-23.60	-23.85	-23.98	-24.10	-24.10	-24.35	-24.35	-24.73	-24.73
SP-6	0	-17.36	NA	-23.29	-24.29	-24.95	-25.45	-25.83	-25.95	-26.08	-26.08	-26.45	-26.58	-26.95	-26.95
SP-7	0	-11.48	NA	-15.17	-15.67	-16.08	-16.33	-16.58	-16.58	-16.70	-16.83	-17.08	-17.08	-17.08	-17.20
SP-8	0	-15.68	NA	-22.39	-23.14	-24.30	-24.80	-25.05	-25.18	-25.42	-25.42	-25.68	-25.80	-26.18	-26.17
SP-9	0	-11.36	NA	-14.75	-15.75	-16.66	-17.16	-17.29	-17.41	-17.66	-17.79	-18.04	-18.04	-18.29	-18.29
SP-10	0	-14.24	NA	-10.74	-21.99	-23.40	-23.90	-24.15	-24.28	-24.65	-24.52	-24.90	-24.90	-25.28	-25.40
SP-11	0	-6.32	NA	-8.57	-9.32	-9.48	-9.48	-9.48	-9.73	-9.86	-9.73	-9.98	-9.98	-10.11	-10.11
SP-12	0	-11.12	NA	-15.11	-16.36	-17.02	-17.27	-17.52	-17.52	-17.77	-17.65	-18.02	-18.02	-18.40	-18.40
SP-13	0	NA	-0.21	-0.21	-0.46	-0.21	-0.33	-0.46	-0.46	-0.46	-0.58	-0.46	-0.33	-0.46	-0.46
SP-14	0	NA	-0.10	-0.10	-0.35	-0.10	-0.23	-0.35	-0.23	-0.10	-0.35	-0.23	-0.23	-0.10	-0.10
SP-15	0	NA	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.29	-0.16	-0.03	-0.16	-0.04
SP-16	0	-12.80	NA	-17.11	-18.36	-18.77	-19.02	-19.27	-19.27	-19.39	-19.39	-19.77	-19.77	-19.90	-19.90
SP-17 (buried)	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SP-18	0	NA	-0.47	-0.47	-0.47	-0.47	-0.59	-0.72	-0.72	-0.59	-0.60	-0.60	-0.72	-0.72	-0.72
SP-19	0	NA	-0.12	-0.12	-0.12	0.13	-0.24	-0.24	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
SP-20	0	-14.96	NA	-19.58	-20.83	-21.74	-21.99	-22.24	-22.24	-22.49	-22.49	-22.74	-22.74	-23.12	-23.11

Date	4/26/2006	5/11/2006	5/25/2006	6/8/2006	6/22/2006	7/6/2006	7/20/2006	8/3/2006	8/17/2006	8/31/2006	9/14/2006	9/28/2006	10/12/2006	10/26/2006
Time Elapsed (days)	**201**	**216**	**230**	**244**	**258**	**272**	**286**	**300**	**314**	**328**	**342**	**356**	**370**	**384**
SP-1	-32.62	-32.75	-33.25	-33.37	-33.62	-33.87	-34.12	-34.24	-34.50	-34.75	-34.87	-34.99	-35.24	-35.50
SP-2	-31.22	-31.35	-31.85	-31.85	-32.22	-32.47	-32.84	-32.97	-33.10	-33.35	-33.47	-33.72	-33.85	-34.10
SP-3	-31.56	-31.56	-32.06	-32.06	-32.19	-32.68	-32.68	-32.81	-32.94	-33.31	-33.31	-33.56	-33.68	-34.06
SP-4	-30.28	-30.41	-30.78	-30.91	-31.16	-31.53	-31.78	-31.91	-32.03	-32.28	-32.41	-32.66	-32.90	-33.16
SP-5	-24.85	-24.85	-25.35	-25.35	-25.48	-25.85	-25.97	-26.10	-26.35	-26.48	-26.48	-26.72	-26.85	-26.98
SP-6	-27.08	-27.20	-27.70	-27.70	-27.95	-28.20	-28.83	-28.83	-29.08	-29.20	-29.20	-29.45	-29.70	-29.83
SP-7	-17.33	-17.33	-17.70	-17.58	-17.83	-18.08	-17.95	-18.21	-18.33	-18.58	-18.58	-18.70	-18.83	-19.08
SP-8	-26.42	-26.55	-26.80	-26.80	-27.18	-27.43	-27.43	-27.67	-27.80	-28.05	-28.05	-28.30	-28.55	-28.80
SP-9	-18.53	-18.66	-19.04	-19.04	-19.29	-19.54	-19.54	-19.66	-20.04	-20.16	-20.16	-20.41	-20.41	-20.66
SP-10	-25.52	-25.65	-26.15	-26.15	-26.65	-26.77	-27.15	-27.28	-27.53	-27.65	-27.77	-28.03	-28.15	-28.40
SP-11	-10.23	-10.23	-10.61	-10.48	-10.48	-10.86	-10.86	-10.98	-11.11	-11.36	-11.36	-11.48	-11.61	-11.61
SP-12	-18.52	-18.65	-19.27	-19.15	-19.39	-19.64	-20.27	-20.27	-20.40	-20.65	-20.65	-20.77	-20.89	-21.15
SP-13	-0.46	-0.46	-0.58	-0.46	-0.46	-0.58	-0.71	-0.58	-0.46	-0.71	-0.71	-0.71	-0.71	-0.83
SP-14	-0.10	-0.10	-0.23	0.02	0.02	-0.10	0.03	0.02	0.15	0.03	0.03	0.15	0.40	-0.10
SP-15	-0.03	-0.03	-0.16	0.09	0.21	0.09	0.09	0.21	0.22	0.09	0.09	0.34	0.34	0.22
SP-16	-20.02	-20.02	-20.40	-20.39	-20.52	-20.89	-20.89	-21.02	-21.15	-21.40	-21.40	-21.52	-21.77	-21.90
SP-17 (buried)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SP-18	-0.72	-0.72	-0.97	-0.72	-0.72	-0.97	-0.97	-0.97	-0.97	-1.22	-1.22	-1.22	-1.34	-1.47
SP-19	-0.12	-0.12	-0.25	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
SP-20	-23.36	-23.49	-23.86	-23.86	-24.12	-24.37	-24.86	-24.99	-25.12	-25.37	-25.36	-25.49	-25.61	-25.87

Notes:

1. Settlement is in inches.
2. NA indicates data are not available.
3. Negative values indicate settlement, and positive values indicate upward movement.
4. SP-17 was buried during fill placement.
5. Data from October 17, 2005 appear to be anomalous because, upon review, it was observed that the data from that time period are inconsistent with field observations and baseline and subsequent readings performed by a licensed surveyor (i.e., a licensed surveyor performed the October 7, 2005 and October 25, 2005 readings). Therefore, these data are not included in this table or Figure 4.6.
6. Although some readings for SP-14, SP-15, and SP-19 are positive (i.e., they indicate upward movement), readings performed by a licensed surveyor on August 31, 2006 are not positive. As shown in Appendix F, all other settlement plate readings agreed relatively well with the licensed surveyor's readings.

Table 4.2
30-ft Grid Data Summary

Grid Location	Elevation (ft)			
	10/7/2005	10/12/2005	10/17/2005	10/25/2005
1	429.78	NA	435.78	438.74
2	429.6	NA	436.36	439.4
3	429.94	NA	436.7	439.66
4	430.52	NA	437.24	439.94
5	430.64	NA	437.2	440.15
6	429.76	432.76	436.16	438.45
7	429.89	433.13	436.24	439.05
8	430.15	433.09	436.72	439.42
9	430.45	433.3	436.82	439.7
10	430.49	433.36	436.61	439.76
11	429.54	432.63	436.15	438.44
12	429.49	433.11	436.13	438.92
13	430.22	432.76	436.28	439.2
14	430.41	433.15	435.72	439.61
15	430.56	433.05	436.36	439.62
16	429.22	432.51	436.18	438.7
17	429.79	432.72	436.2	438.77
18	429.85	432.74	436.18	438.88
19	430.11	432.74	435.97	439.07
20	430.36	432.95	435.59	439.46
21	429.25	432.68	435.82	438.4
22	429.31	432.65	435.95	438.82
23	429.76	432.65	435.88	438.95
24	430.07	432.74	435.93	439.09
25	430.02	433.22	436.03	439.45

Notes:
1. NA indicates data is not available.
2. Data from 10/12 and 10/17 appear to be anomalous because, upon review, it was observed that the data from those dates are inconsistent with field observations and baseline and subsequent readings performed by a licensed surveyor (i.e., a licensed surveyor performed the October 7, 2005 and October 25, 2005 readings).
3. Datum: NAVD88 State Plane Grid.