ONONDAGA LAKE PRE-DESIGN INVESTIGATION:

PHASE III WORK PLAN - ADDENDUM 4
Syracuse, New York

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OCTOBER 2007

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PHASE III PDI WORK PLAN
ADDENDUM 4

1.0 INTRODUCTION

This addendum describes the additional data to be collected for the Sediment Consolidation Area (SCA) design as part of the Phase III Pre-Design Investigation (PDI) for Onondaga Lake (Parsons, 2007). Since this scope was not identified in the Phase III PDI Work Plan, the sample locations and details of the additional analyses are described in this document. Unless otherwise stated, the activities described in this addendum will be performed in accordance with the procedures outlined in the Phase I PDI Work Plan (Parsons, 2005; Parsons and Geosyntec, 2005).

1.1 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 exhibits a very high pH. Solvay waste was produced by Honeywell's predecessor Allied Chemical between 1881 and 1986, and Wastebed 13 received the material in slurry form from 1973 to 1985.

Wastebed 13 is located in the Town of Camillus, Onondaga County, New York (Figure 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 several residential properties; and to the east and south by Wastebeds 12 and 14, respectively (Figure 1). Figure 2 shows the locations of the State University of New York College of Environmental Science and Forestry (SUNY ESF) Biomass Pilot Study (vegetation plots) and the test plot from the Wastebed 13 Pilot Study (i.e., the Wastebed 13 Phase I PDI).

Historical information (Dames and Moore, 1975) indicates that prior to construction of the Wastebed 13 exterior dikes, three pits approximately 30-ft deep were excavated in the area. Figure 3 shows the configuration of the pits prior to construction of Wastebed 13 (i.e., 1972/1973). The excavated soils, mainly sands and gravels with some clay, were used for construction of the Wastebed 12 and 14 dikes. Native materials were also used to construct the Wastebed 13 dikes. The native materials in non-excavated areas consist of up to 2 ft of topsoil (brown clayey silt); up to 10 ft of interlayered silt with various amounts of sand and clay; and a layer of brown coarse to fine gravel, with small amounts of sand, occasional cobbles and boulders, and an occasional trace of silty clay. As shown on Figure 3, the native materials that were left in place between the pits formed "berms". During the initial stages of filling, these pits were filled with Solvay waste. As filling progressed, these “berms” were also covered by Solvay waste.

Four schematics of the subsurface soil profiles through Wastebed 13 have been developed and are provided as Figures 4 through 7. In addition to the “berms” described above, three different zones (i.e., Zones 1, 2, and 3) of Solvay waste, and the external dikes are shown on these figures. The three different zones of Solvay waste were defined based on the results of geotechnical testing from previous investigations. The Zone 1 Solvay waste is typically considered the coarsest grained and least compressible of the three zones; whereas, Zone 2 is typically considered the most compressible, with Zone 3 likely having properties somewhere between Zones 1 and 2. A preliminary summary of the characteristics of each zone and geotechnical testing results from Phase II are included in Appendix A of this report. Also included in the summary is a figure depicting the bottom elevation of the Solvay waste in Wastebed 13.

2.0 OBJECTIVES

This work plan addendum was developed to address several gaps within the existing data set, which is being used to prepare the SCA design. Since many of the details around the design have not been finalized, additional data, beyond the scope of this addendum, may be required to complete the design. If necessary, additional PDI work plans will be submitted to the New York State Department of Environmental Conservation (NYSDEC) in 2008. Specifically, the objectives of this work plan addendum are as follows:

- <u>Conduct a survey of Wastebed 13 including the external dikes.</u> The purpose of the survey is to obtain recent surface elevation data for the wastebed and the dikes. This information will be used to develop the design drawings (e.g., grading design).
- <u>Establish the Solvay waste thickness where current data are inconclusive, especially along certain areas of the buried “berms” discussed in Section 1.1.</u> The thickness data obtained in these areas will be used to further refine the consolidation estimates. This information will also potentially be used for locating new berms that will be a necessary component of a geotextile tube and/or settling basin SCA design.
- <u>Obtain additional consolidation data on the Zone 3 Solvay waste material.</u> The results from previous investigations provided seven consolidation test results from Zone 1, 14 consolidation results from Zone 2, and one consolidation test result from Zone 3. Based on the amount of Solvay waste material in these zones, there currently appears to be sufficient consolidation data to establish the characteristics of the Zone 1 and 2 materials; however, additional Zone 3 data are required. A determination of whether additional data are needed in each of these three zones will be made, in consultation with NYSDEC, following review of these Phase III data
- <u>Obtain additional geotechnical data from the perimeter dikes.</u> Additional geotechnical data will be collected from the perimeter dikes to confirm that relatively consistent material is present in the external dike structure. The stratigraphy of the dikes between

Wastebeds 12 and 13 and between Wastebeds 14 and 13 will also be confirmed. Finally, since previous investigations indicated the presence of Solvay waste within the dike at the northeast and southwest corner of Wastebed 13, one goal of this investigation will be to delineate the extent of the Solvay waste at the corners of the site.

The objectives discussed above will be achieved through field investigation activities including field testing, drilling, sampling, and laboratory testing. These activities are discussed in the following sections.

3.0 MOBILIZATION AND LOGISTICS

3.1 Health and Safety

Parsons ranks health and safety as the highest priority. The Wastebed 13 Settlement Pilot Study Project Safety Plan (PSP) and our Subcontractor's Safety Plans (SSP) prepared for previous activities will be used for this investigation and will be strictly followed by all personnel. Any task outside of the current scope defined in the PSP will have a new Job Safety Analysis (JSA) completed before the task begins. Copies of the PSP and SSPs will be maintained at the support zone. A copy of the memo outlining changes to the PSP for this scope and an additional JSA regarding the use of the GUS sampler is included as Appendix B.

3.2 Site Facilities, Decon and Waste Handling

The support zone and facilities adjacent to Wastebed 13 established during the previous investigations will be used for the Phase III investigation. The Onondaga lake trailers will also be utilized as a base of operations for this scope of work. All decontamination and waste management activities will be conducted in accordance with the Phase I PDI Work Plan (Parsons, 2005).

4.0 FIELD ACTIVITIES

The following subsections describe the surveying, field testing, drilling, sample collection, and laboratory testing to be performed during the Phase III PDI.

4.1 Survey

To meet the first objective presented in Section 2.0, D.W. Hannig L.S., P.C. Surveyors, Planners, and Consultants will perform a survey at Wastebed 13. The survey will include Wastebeds 12 through 15 and both banks of Ninemile Creek adjacent to Wastebeds 12 and 13. First, preliminary field work will be performed to establish horizontal and vertical controls. Next, aerial photographs of the site will be taken. Based on these photographs, locations will be selected for a detailed survey. The data from these locations will be used in combination with the aerial photographs to provide maps with accurate surface elevations.

4.2 CPTu Soundings Within Wastebed 13

Approximately 28 piezocone penetrometer tests with pore water pressure measurements (CPTu) will be advanced along four transects and near two previously investigated locations to identify or confirm Solvay waste thickness in these areas. All the soundings, as shown in Figure 8, are located in areas where the buried "berms" appear to be present based on old aerial photographs; however, previous CPTu and boring data are either not available or do not confirm the presence of these "berms". All the CPTu soundings are proposed in an effort to address the second objective listed in Section 2.0.

The first transect includes CPT-88 through CPT-94 with existing location PW-11F near the center. This location was selected because the interpretation of PW-11F, in terms of Solvay waste thickness, is unclear. It is currently believed that this transect goes across one of the buried "berms" discussed in Section 1.1. Gaining a better understanding of the thickness of the Solvay waste in this area will allow for refinement of the settlement calculations, which could impact internal berm placement during SCA cell design.

The second transect of interest includes CPT-102 through CPT-108 with existing locations CPT-74 and PW-131 near the ends. This transect was selected in an effort to establish the Solvay waste thickness and thus the geometry of the buried "berm" that appears to be present in this area. As with the first transect, it is anticipated that this information would be used to select locations for berm placement during SCA cell design. The third transect (CPT-95 through CPT-101, with PW-137 and CPT-51/SB915-PZ-13-01 near the ends) and fourth transect (CPT-109 through CPT-113) were located for the same reasons as described for the second transect. CPT-114 was located in an effort to identify the "buried" berm between CPT-1 and CPT-2, which were advanced during the Phase I PDI. Finally, CPT-115 was located to confirm the Solvay waste thickness near CPT-54.

Each CPTu sounding will be advanced approximately 15 ft into native material or until refusal. One sounding will be at the middle of the transect with soundings at 50-ft spacings in both directions, as shown on Figure 8. Depending on the results of the soundings, additional locations may be selected. A licensed surveyor will stake initial CPTu locations. If relocation of the CPTu soundings is required during the investigation, a GPS unit will be used to provide revised coordinates. CPTu soundings will be performed with a track mounted rig and a cone with a 15 cm^2 tip and 225 cm^2 friction sleeve, which is consistent with previous investigations (i.e., Parsons and Geosyntec, 2005; 2006a). Test holes will be filled with bentonite chips upon completion. The following measurements will be recorded with depth (approximately every 2 inches):

- Tip resistance;
- Sleeve friction; and
- Dynamic pore water pressure.

Shear wave velocity measurements will also be performed at approximately eight of the locations (i.e., two at each transect). These measurements will be taken at approximately 3.3 ft (i.e., 1-meter) intervals. Shear wave velocity measurements will be used to supplement the information gained from other in-situ tests and laboratory index, consolidation, and strength tests to enhance the understanding of Solvay waste properties.

4.3 Borings Within Wastebed 13

Ten soil borings (SB915-SB13-14 through SB915-SB13-23) will be advanced within Wastebed 13 to meet the second and third objectives listed under Section 2.0. Eight of these borings (two at each transect) will be co-located with CPTu locations to confirm results of the CPTu soundings. Six of these eight locations (SB915-SB13-18 through SB915-SB13-23) will be selected based on the CPTu results; however, it is anticipated that one boring will be advanced at the center of each transect. Final locations of borings SB915-SB13-18 through SB915-SB13-23 will be determined in consultation with NYSDEC. The locations of the other two borings (i.e., SB915-SB13-16 and SB915-SB13-17) have been predetermined, as shown on Figure 8.

The purpose of these borings will be to confirm the Solvay waste thickness interpreted from the CPTu log, to collect disturbed samples for index testing, and to obtain undisturbed samples from the deep Solvay waste (i.e., Zone 3) for consolidation testing. The purpose of the remaining two borings (SB915-SB13-14 and SB915-SB13-15) is to collect Zone 3 Solvay waste samples for consolidation testing. All the borings will be advanced 10 ft into the underlying native material. A track mounted drill rig will be used to advance 3.25 inch augers, and a 2 inch diameter split spoon will be utilized to collect disturbed samples every 5 ft at each boring location, which is consistent with previous investigations (Parsons and Geosyntec, 2006b). A minimum of two undisturbed samples will also be collected utilizing a GUS sampler from the deep Solvay waste (i.e., Zone 3) at locations SB915-SB13-14 through SB915-SB13-17. The depth of the undisturbed samples will be estimated based on the CPTu results.

Boreholes will be grouted with a cement/bentonite grout upon completion of sampling activities. Drill cuttings will be spread inside of Wastebed 13. Drill tools will also be cleaned of gross soils between locations inside the wastebed. Any generated decon water will be allowed to run out inside the wastebed.

The disturbed soil samples will be archived onsite until it is determined which sample intervals will be sent for index testing (Table 1). It is anticipated that at least two samples from each location will be sent to the laboratory for index testing (i.e., one Solvay waste sample and one native material sample). To be consistent with previous investigations, the geotechnical laboratory testing will be performed by Geotesting Express in Boxborough, MA.

4.4 Perimeter Dike Borings

Fifteen soil borings will be advanced in the perimeter dike that surrounds Wastebed 13 to collect additional geotechnical information (Figure 8), thus meeting the fourth objective listed in Section 2.0. At boring locations SB915-SB13-24 through SB915-SB13-32, borings will be advanced a minimum of 10 ft into the native material unit. A truck mounted or track mounted drill rig will advance 3.25 inch augers to the terminal depth. Disturbed split spoon samples will be collected on 5 ft intervals with a 2 inch diameter split spoon sampler. Samples will be archived onsite until it is determined which intervals will be submitted for index testing. As indicated in Table 1, it is currently anticipated that at least one sample from each boring will be submitted for index testing. After completion of the boring, the borehole will be filled with a cement-bentonite grout.

In addition, borings will be advanced along the top of the dike in the northeast corner of Wastebed 13 where Wastebeds 12 and 13 meet; and in the southwest corner where Wastebeds 13 and 14 meet (Figure 8). During previous investigations, the presence of Solvay waste was noted in the dikes at these corners. It is proposed that borings at the corners be used to delineate the extent of Solvay waste in the perimeter dikes. At the northeast corner, the first delineation boring will be advanced approximately 100 ft northwest from existing location SB915-PZ13-07 along the Wastebed 13 dike. If Solvay waste is present, additional delineation borings will be advanced at 50 ft intervals along the Wastebed 13 dike until the extent of the Solvay waste is delineated. If Solvay waste is not present at the initial boring location, an additional boring will be advanced between SB915-PZ13-07 and the initial boring. Similarly, at the southwest corner, the first delineation boring will be advanced approximately 100 ft north of SB915-PZ13-13 along the Wastebed 13 dike. If Solvay waste is present, additional borings will be advanced at 50 ft intervals along the Wastebed 13 dike until the extent of the Solvay waste is established. If Solvay waste is not present at the initial delineation boring, an additional boring will be advanced between SB915-PZ13-13 and the initial boring. The boreholes will be advanced as described above for dike borings SB915-SB13-24 through SB915-SB13-31, except that a minimum of two sets of disturbed samples from each corner cluster will be sent to the laboratory for index testing.

5.0 DATA MANAGEMENT AND REPORTING

An electronic database will be developed for the Phase III PDI to ensure consistency in field sample ID assignments and compatibility with the Locus Focus data management system. The data collection program prepared for the Phase III field program will be similar to the one used during the Phase I and II PDI. Samples will be collected and handled according to the procedures outlined in the Phase I PDI WP and associated appendices (Parsons, 2005). Once the Phase III investigation and evaluation has been completed, a data summary report will be prepared and submitted to NYSDEC.

6.0 REFERENCES

Dames & Moore. 1975. *Soil Engineering Studies Waste Embankment 13 Allied Chemical* Solvay, New York.

Parsons and GeoSyntec. 2005. *Onondaga Lake Pre-Design Investigation: Wastebed 13 Settlement Pilot Study Final Work Plan.* Onondaga County, New York.

Parsons, 2005, *Onondaga Lake Pre-Design Investigation: Phase I Work Plan*. Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York.

Parsons and Geosyntec, 2006a, *Onondaga Lake Pre-Design Investigation : Phase II Work Plan Addendum 2*. Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York

Parsons and Geosyntec, 2006b, *Onondaga Lake Pre-Design Investigation : Phase II Work Plan Addendum 3*. Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York

Parsons, 2007, *Onondaga Lake Pre-Design Investigation: Phase III Work Plan.* Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York.

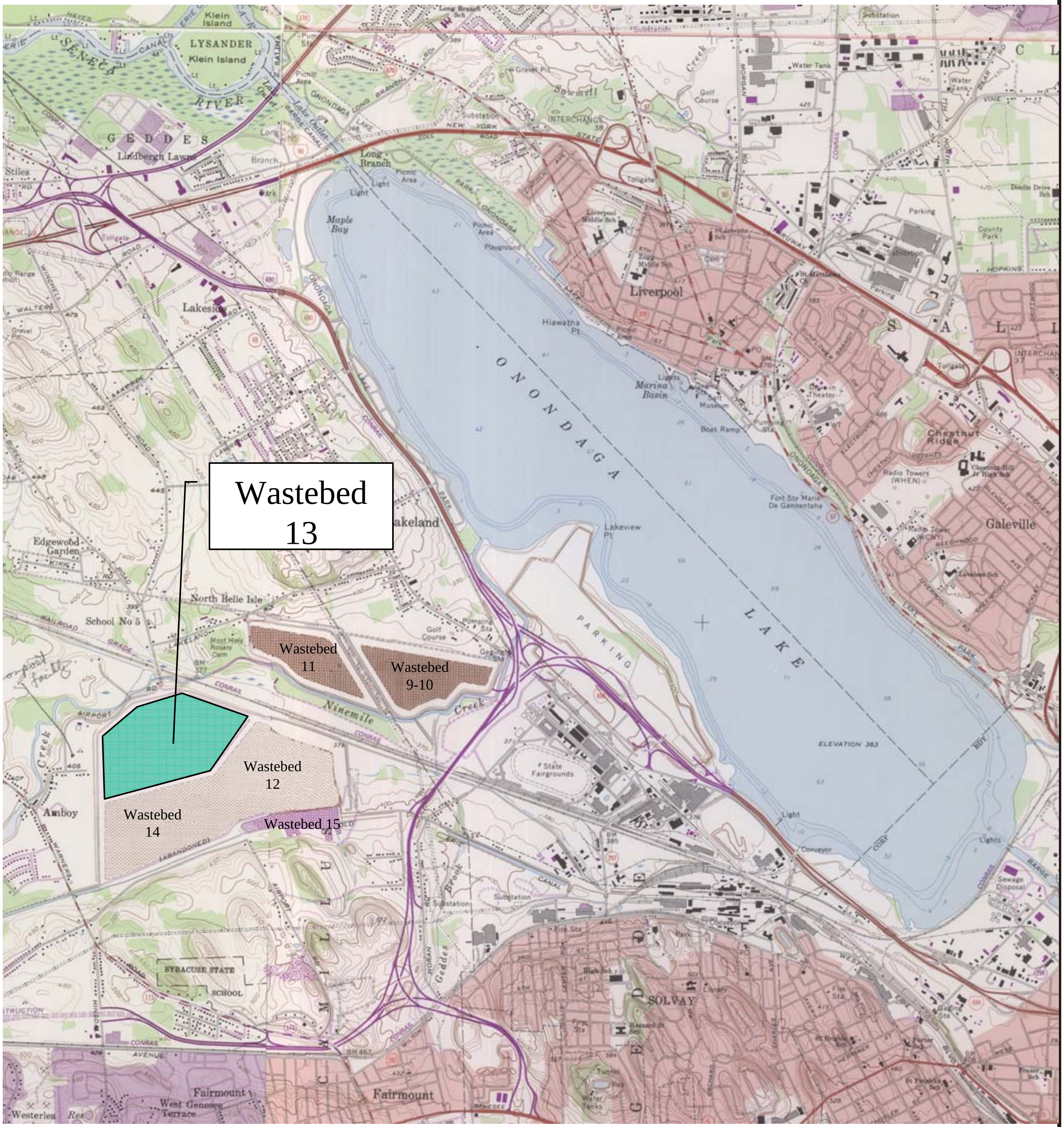
TABLE

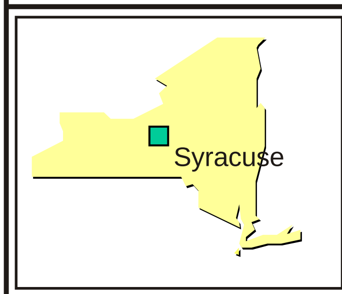
TABLE 1
Geotechnical Testing Summary

Sampling Location	Moisture Content ASTM D2216	Grain-Size with Hydrometer ASTM D422	Atterberg Limits ASTM D4318	Specific Gravity ASTM D854	Carbonate Content ASTM D4373	Consolidation ASTM D2435	Bulk Density ASTM D2937
Within Wastebed 13							
SB915-SB13-14	2	2	2	2	2	1	1
SB915-SB13-15	2	2	2	2	2	1	1
SB915-SB13-16	2	2	2	2	2	1	1
SB915-SB13-17	2	2	2	2	2	1	1
SB915-SB13-18 through SB915-SB13-23	12 [1]	12 [1]	12 [1]	12 [1]	12 [1]	0	0
In the Dikes							
SB915-SB13-24 through SB915-SB13-32	9 [2]	9 [2]	9 [2]	9 [2]	0	0	0
Wastebeds 12 and 13 Corner Cluster[3]	2	2	2	2	0	0	0
Wastebeds 13 and 14 Corner Cluster[3]	2	2	2	2	0	0	0

Notes:
1. Two samples from each boring will be sent to the laboratory for testing.
2. One sample from each boring will be sent to the laboratory for testing.
3. The number of borings in each cluster will be dependent on the number of borings needed to delineate the SOLW in each corner. Two samples from each cluster will be sent to the laboratory for testing.

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

Honeywell

Wastebed 13 Phase III Pre-Design Investigation Addendum 4 Work Plan
Onondaga County, New York

SITE LOCATION MAP

PARSONS

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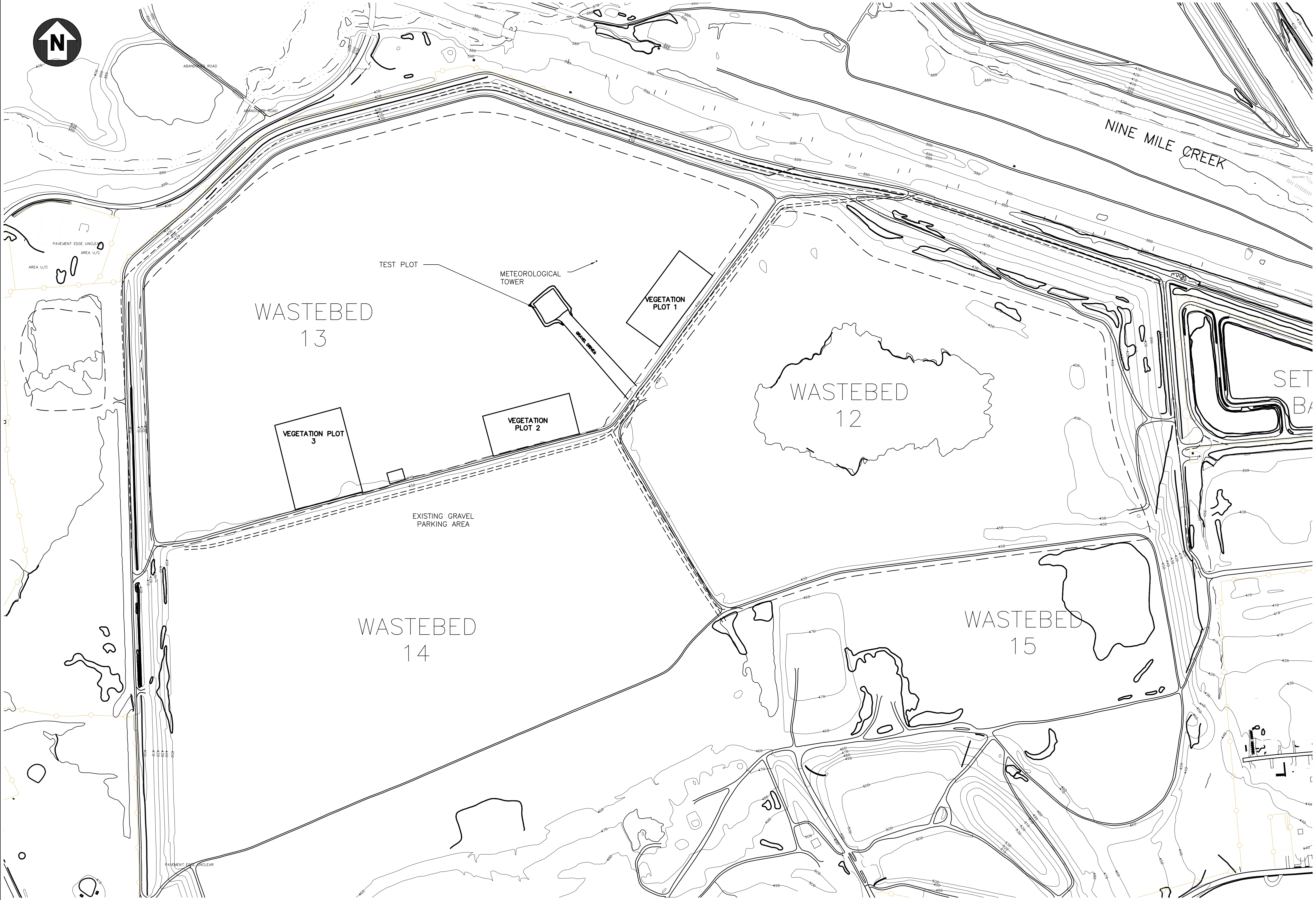

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APPROVALS	DATE

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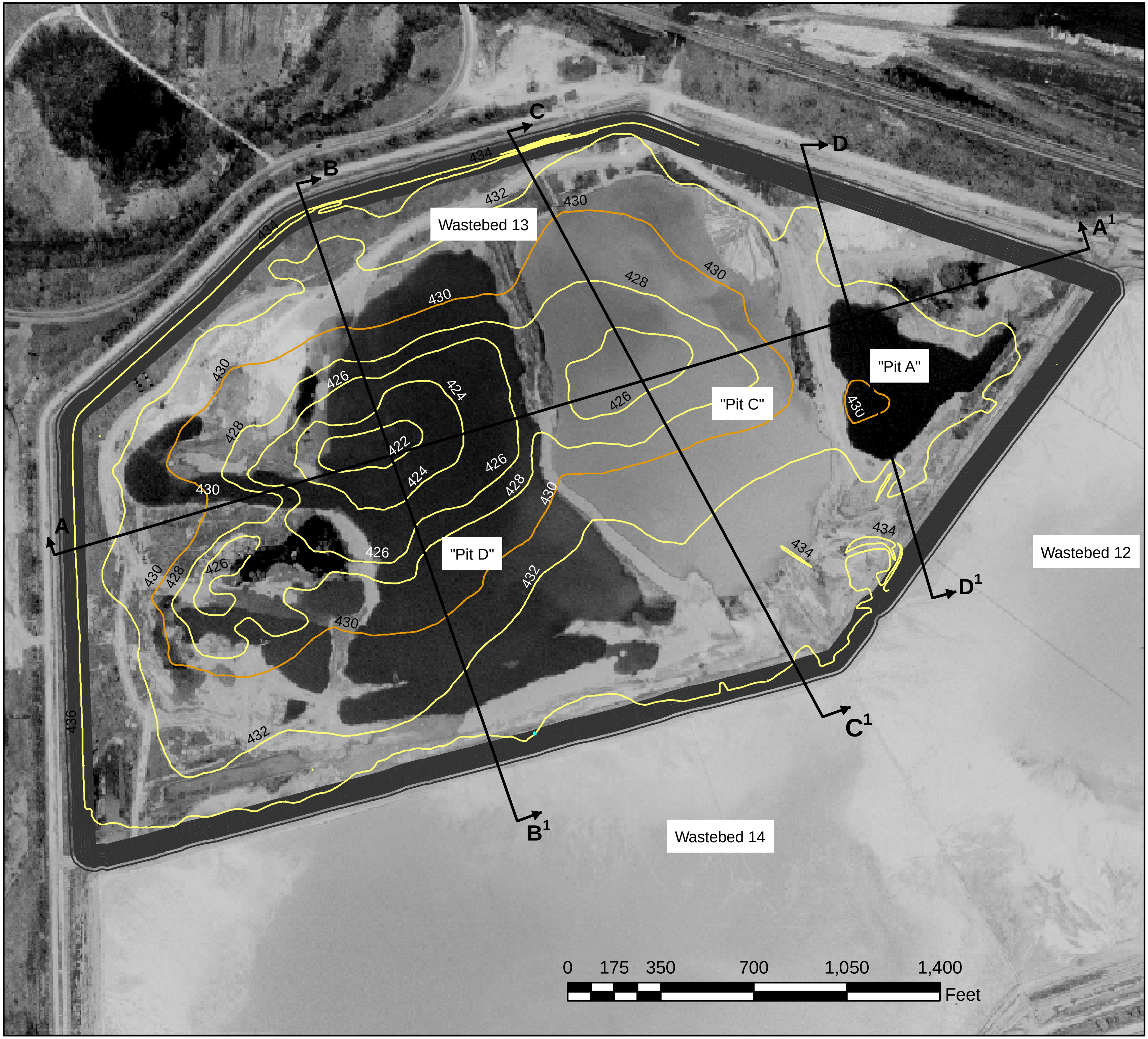
WASTEBED 13 PHASE III PRE-DESIGN
INVESTIGATION WORKPLAN
ONONDAGA COUNTY, NEW YORK

EXISTING SITE PLAN

DRAWN	DATE	CHK.	DATE
JAR	11/06		

LOCATION: FIGURE 2

REV: A



Note:
1. Aerial photo dated 1972.
2. Pit names are historical designations, and "Pit B" was not defined.

Figure 3

Wastebed 13 Historical Pit Excavation

Honeywell

Parsons

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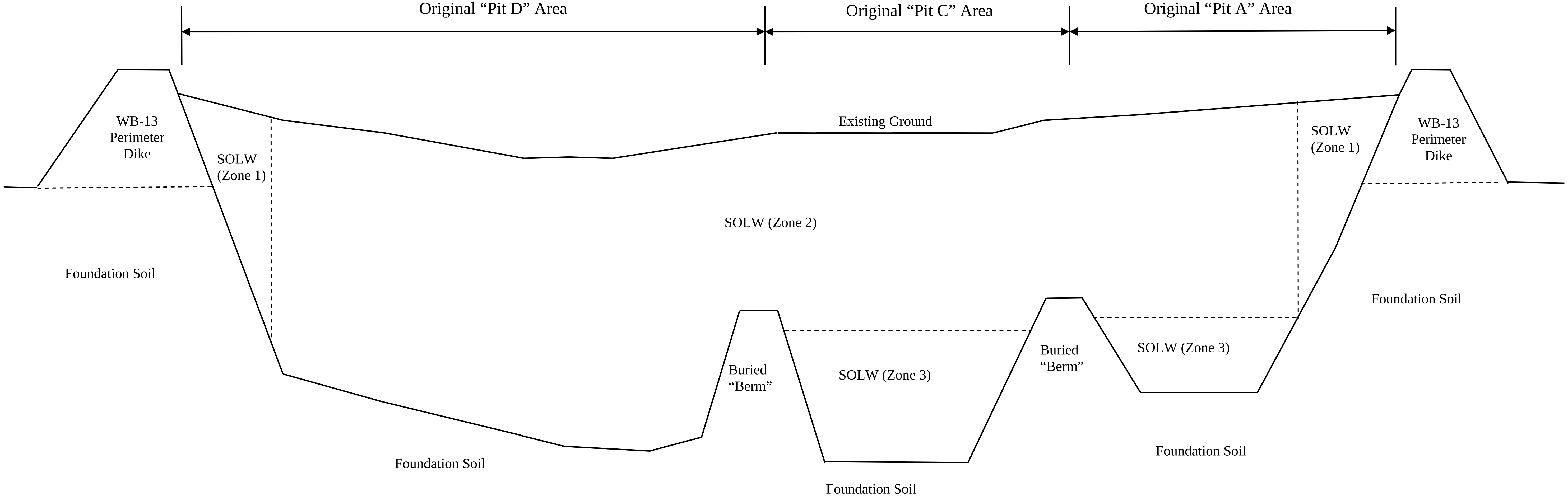
Figure 4 - Schematic of Subsurface Soil Profile at Cross Section A-A’

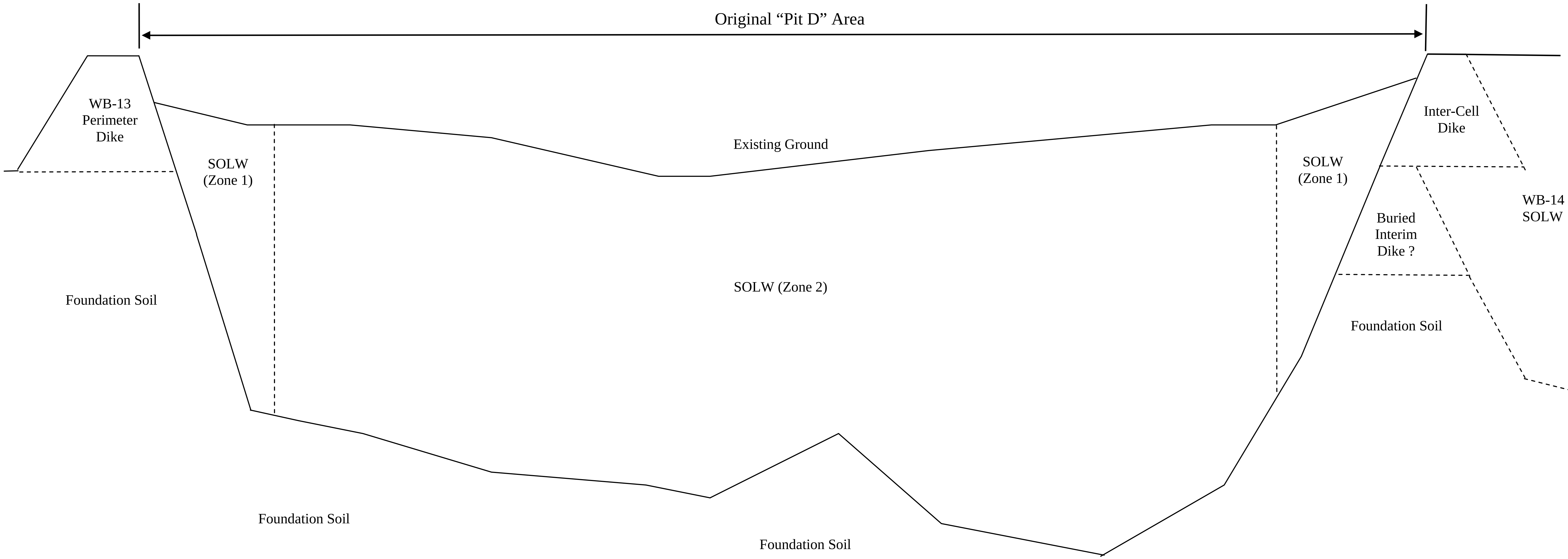


Notes:

1. SOLW (Zone 1): Solvay waste near perimeter dike.
2. SOLW (Zone 2): Solvay waste in “Pit D” Area and top 40 ft in “Pit A” and “Pit C” Areas.
3. SOLW (Zone 3): Solvay waste below 40 ft to top of foundation soil in “Pit A” and “Pit C” Areas. The depth of 40 ft is selected as the boundary between Zone 2 and Zone 3 Solvay waste based on the observation that CPT and SPT profiles generally show abrupt increases around this depth in “Pit A” and “Pit C” Areas.
4. Buried “berm” soil is considered part of the foundation soil.
5. The cross section shown above is cut across Wastebed 13 from west to east as shown in Figure 3.

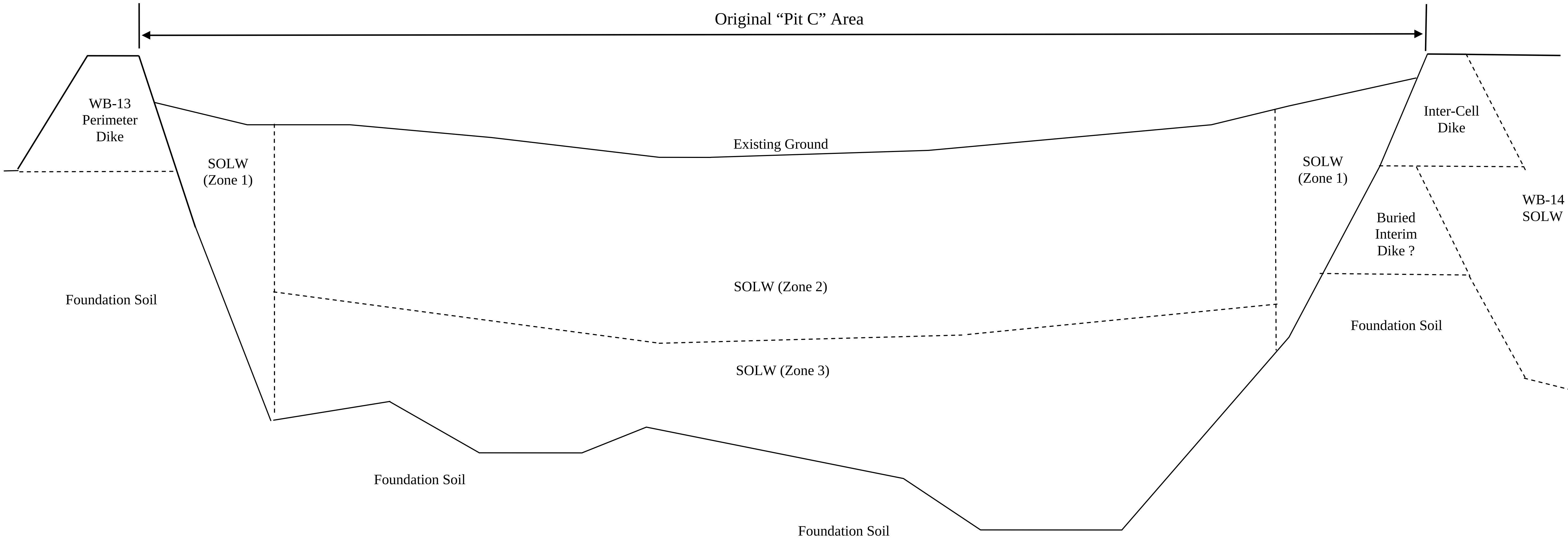
Geosyntec consultants ATLANTA, GEORGIA	FIGURE NO.	4
	PROJECT NO.	GD3944
	DOCUMENT NO.	
	FILE NO.	

Figure 5 - Schematic of Subsurface Soil Profile at Cross Section B-B'



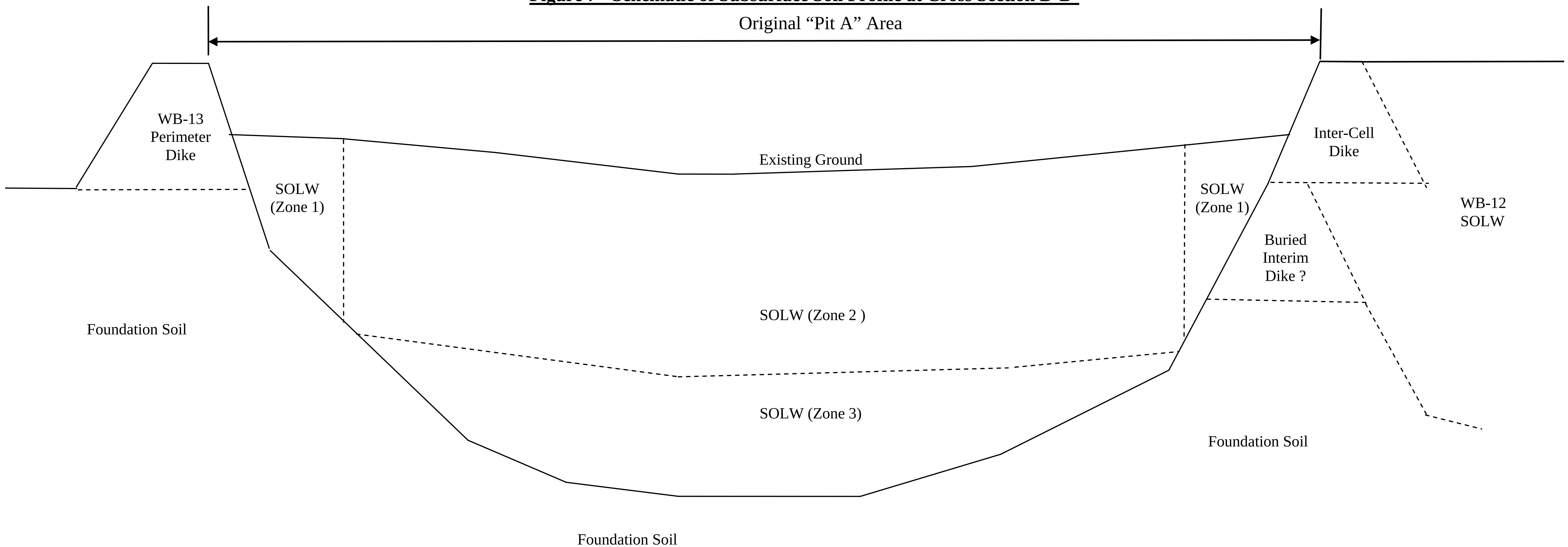
Geosyntec consultants ATLANTA, GEORGIA	FIGURE NO. 5
	PROJECT NO. GD3944
	DOCUMENT NO.
	FILE NO.

Figure 6 - Schematic of Subsurface Soil Profile at Cross Section C-C'

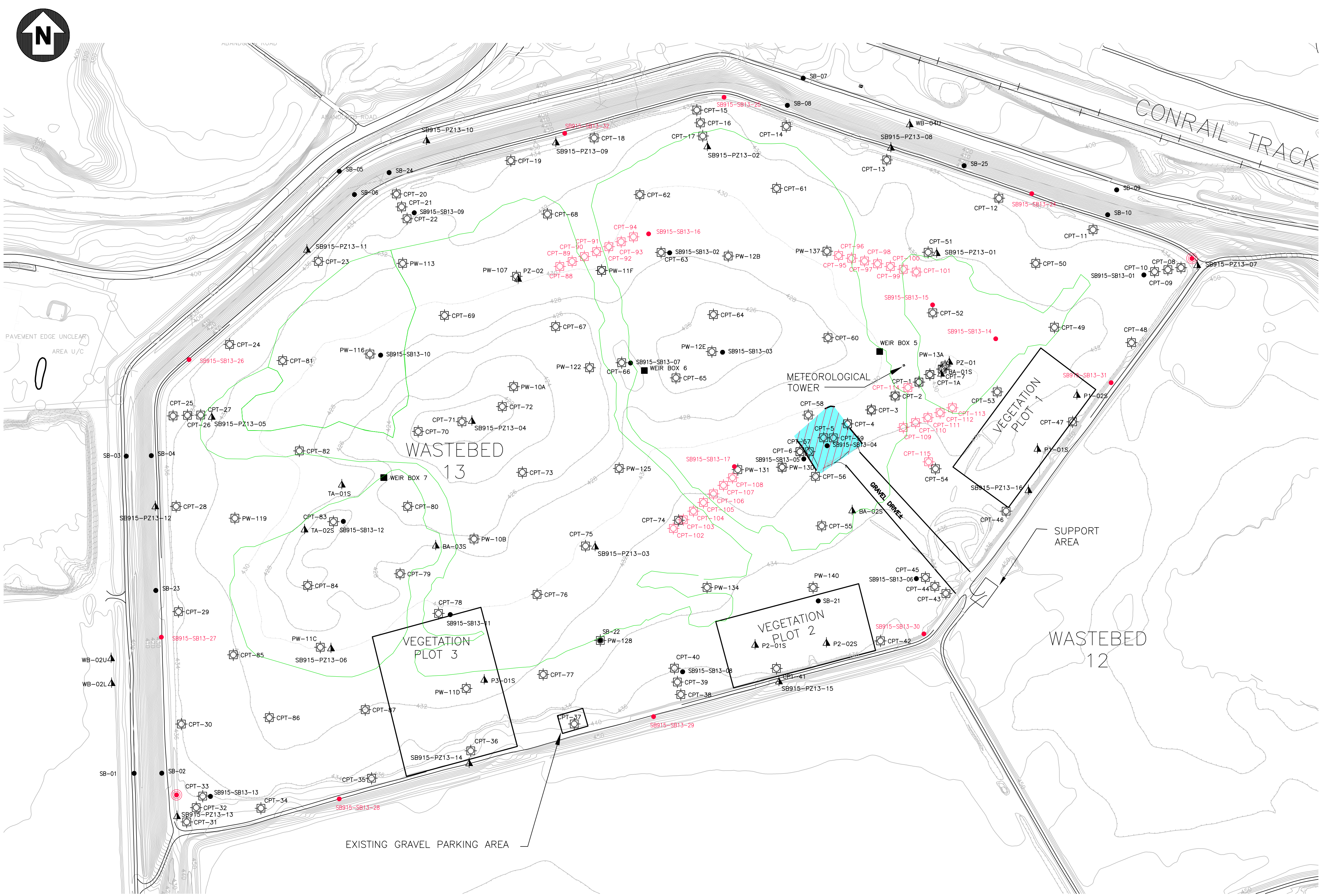


Geosyntec consultants	
ATLANTA, GEORGIA	FIGURE NO. 6
	PROJECT NO. GD3944
	DOCUMENT NO.
	FILE NO.

Figure 7 - Schematic of Subsurface Soil Profile at Cross Section D-D’



Geosyntec consultants	FIGURE NO. 7
	PROJECT NO. GD3944
	DOCUMENT NO.
ATLANTA, GEORGIA	FILE NO.



LEGEND:

- SETTLEMENT PILOT STUDY (2005)
- HISTORIC CPTU LOCATIONS
- HISTORIC BORING LOCATIONS
- HISTORIC PIEZOMETER LOCATIONS
- EXISTING WEIR BOX LOCATIONS
- PROPOSED CPTU LOCATIONS
- PROPOSED PHASE III BORING LOCATIONS
- DELINEATION BORINGS (ID NUMBERS TO BE DETERMINED IN THE FIELD)
- APPROXIMATE DELINEATION OF PITS (1972/ 1973)

NOTE:
1. BORING LOCATIONS SB915-SB13-18 THROUGH SB915-SB13-23 WILL BE SELECTED BASED ON CPTU RESULTS (NOT SHOWN ON FIGURE)

200 100 0 200 400

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SCALE N/A

WASTEBED 13
PHASE III PRE-DESIGN INVESTIGATION WORK PLAN
ONONDAGA COUNTY, NEW YORK

WASTEBED 13 PROPOSED CPTU AND BORING LOCATIONS

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

DRAWN	DATE	CHK.	DATE
JAR	08/07		

LOCATION

FIGURE 8

REV A

APPENDIX A

SOLVAY WASTE ZONES 1 THROUGH 3 DESCRIPTIONS

(Draft and Preliminary)

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

SOLVAY WASTE ZONES IN WASTEBED 13

This package is prepared to present details of three zones of Solvay Waste (SOLW) identified in Waste Bed 13 (WB-13). Historical information indicates that three large pits (i.e., Pits A, C, and D as shown in Figure 1) were excavated in the WB-13 area and filled with Solvay waste during the period from 1973 to 1985. Numerous site investigations were conducted at WB-13 from 1985 to 2006. In particular, detailed site investigations were performed between 2004 and 2006.

Schematics of the subsurface profiles at four cross sections in WB-13 were developed based on the previous site investigation results. The locations of these cross sections are shown in Figure 2 and the subsurface profiles are illustrated in Figures 3, 4, 5, and 6. The subsurface stratigraphy consists primarily of three types of material: SOLW, the dike soil, and the foundation soil. This summary focuses on the stratigraphy of Solvay waste.

The thickness of SOLW varies across WB-13 and is related to the shape of the three original pits that were divided by two buried inter-cell berms. Figure 7 shows the bottom elevation contours of SOLW that were developed based on the estimated SOLW thickness from CPTs and borings. The SOLW thickness ranges between approximately 50 ft and 90 ft in the central areas of the three original pits.

SOLW in WB-13 can be divided into three zones based on different characteristics indicated by the results of CPTs (Figures 8, 9, 10, and 11) and SPT blow counts (N values) (Figure 12) in different areas of WB-13:

- Zone 1 is defined as the “ring” area that is within approximately 150 ft from the inner edge of the WB-13 dike. SOLW in Zone 1 was generally described in the boring logs as gray, soft to medium dense, silt- and sand-sized particles in paste-like or semi-cemented matrix. CPT profiles of SOLW in Zone 1 show relatively high tip resistance, high sleeve friction, and small excess porewater pressure, which are characteristics of dense coarse grained material (Figure 8). Results of borings show much larger SPT N values for SOLW in Zone 1 than SOLW in the other two zones. During the operation of WB-13, SOLW was placed mainly from pipes placed along the dikes. The coarser particles of SOLW would have settled out first which can explain the observed matrix in Zone 1.

- Zone 2 is defined as the original Pit D area and the top 40 ft of the original Pit A and Pit C areas that are beyond the limit of Zone 1. The depth of 40 ft is selected as the boundary of Zone 2 in the Pit A and Pit C areas because the profiles of CPT (Figure 11) and SPT N values (Figure 12) generally show sudden increase at this depth. SOLW in Zone 2 was generally described in the boring logs as white to gray, very soft to soft, silt-sized particles in paste-like matrix. CPT profiles of SOLW in Zone 2 generally show relatively low tip resistance, low sleeve friction, and large excess porewater pressure, which are characteristics of soft fine grained material. Results of borings indicate zero to very small SPT N values for SOLW in Zone 2 (Figure 10).

- Zone 3 is defined as the area from 40 ft below ground surface (bgs) to the top of foundation soil in the original Pit A and Pit C areas that are beyond the limit of Zone 1. Unlike SOLW in Zone 2 that is relatively uniform, SOLW in Zone 3 varied from very soft to dense silt-sized particles according to the boring logs. Inter-layered soft and hard layers of SOLW in Zone 3 result in a wider range of the tip resistance and the sleeve friction (Figure 11) and the SPT N values (Figure 12) than SOLW in Zone 2. The reason for the apparent absence of Zone 3 in Pit D is currently unknown.

A summary of the SPT N values of SOLW in the three zones obtained from the site investigations between 2004 and 2007 is presented in Table 1. As indicated in the table, the SPT N value of SOLW in Zone 1 ranges from 0 to 74 with an average value of 17; the SPT N value of SOLW in Zone 2 ranges from 0 to 18 with an average value of 1; and the SPT N value of SOLW in Zone 3 ranges from 0 to 32 with an average value of 7. The SPT N values of SOLW in the three zones are also plotted in Figure 13 as a function of depth.

Using the correlations between the SPT N values and the consistency for cohesive soils shown in Table 2, SOLW in Zone 1, Zone 2, and Zone 3 can be classified as “very stiff”, “very soft”, and “medium stiff”, respectively, based on the calculated average SPT N values. The classification is consistent with the observations from the CPTs and the borings.

Tables

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

Table 1. Summary of SPT N Values

Material		SPT N Values		
		Range	Average	Standard Deviation
SOLW	Zone 1	0 - 74	17	16
	Zone 2	0 - 18	1	2
	Zone 3	0 - 32	7	8
Dike Soil		6 - 127	35	21
Foundation Soil		2 - 120	40	23

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

Table 2. Correlation of Consistency for Cohesive Soils [AASHTO, 1988]

SPT N Value	Consistency
0~1	Very soft
2~4	Soft
5~8	Medium Stiff
9~15	Stiff
16~30	Very Stiff
31~60	Hard
>60	Very hard

Onondaga Lake Phase II Pre-Design Investigation Phase II
Geotechnical Data Summary
Syracuse, New York

Wastebed 13 Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216)	Liquid Limit (BS 1377-2:1990) (%)	Atterberg Limits (ASTM D4318)			Grain Size (ASTM D422)					Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373)	Bulk Density (EM-1110-2-1906)
						Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percent Gravel (%)	Percent Sand (%)	Percent Fines (clay & silt) (%)	Clay-sized Particle Content (0.005 mm) (%)	Clay-sized Particle Content (0.002 mm) (%)			
SB915-PZ13-01	OL-0295-01	10-12	11	347.6	214.5	176	133	43	0	7.9	92.1	51	20	2.59	35	68
SB915-PZ13-01	OL-0295-03	24-26	25	125.8	164.5	143	113	30	3.8	33.1	63.1	6	3	2.35	26	73
SB915-PZ13-01	OL-0295-04	26-28	27	218	215.5	187	131	56	17.6	16.5	65.9	4	1		35	
SB915-PZ13-01	OL-0300-16	34-36	35	252	205.5	181	139	42	0	11.1	88.9	49	17	2.52	30	77
SB915-PZ13-01	OL-0301-07	55-57	56	54.5		57	42	15	0	39.2	60.8	18	15	2.68		
SB915-PZ13-02	OL-0295-06	10-12	11	91.3	118	102	84	18	0	27.3	72.7	18	8	2.6	22	
SB915-PZ13-02	OL-0295-08	27-29	28	85.6	130	112	93	19	17.4	48.3	34.3	5	2	2.43	17	
SB915-PZ13-02	OL-0301-08	43-45	44	10.2			Non-Plastic		43.9	41.8	14.3	5	4	2.58		
SB915-PZ13-03	OL-0295-11	10-12	11	120.5	151.5	168	124	44	26.7	27.9	45.4	5		2.6	26	
SB915-PZ13-03	OL-0295-13	30-32	31	143.4	136	158	119	39	9	22.4	68.6	10	3	2.44	30	
SB915-PZ13-03	OL-0301-09	68-75	71.5	12.6		23	17	6	34.1	44.5	21.4	6	3	2.66		
SB915-PZ13-04	OL-0295-16	8-10	9	352.4											43	
SB915-PZ13-04	OL-0295-17	10-12	11	9.6	283.5	220	161	59	0	2.8	97.2	11	6	2.6	35	
SB915-PZ13-04	OL-0295-18	28-30	29	292.5	222.5	184	123	61	0	6.4	93.6	17	11	2.71	26	
SB915-PZ13-04	OL-0295-19	33-35	34	359.6	219	193	151	42	0	1.2	98.8	31	24	2.71	52	
SB915-PZ13-04	OL-0301-10	63-65	64	13.1			Non-Plastic		0.8	73.4	25.8	10	6	2.73		
SB915-PZ13-04	OL-0301-11	108-110	109	14.3			Non-Plastic		11.4	80.4	8.2	4	3	2.72		
SB915-PZ13-04A	OL-0295-20	53-55	54	70.9	104.5	89	62	27	25.2	32.1	42.7	16	9	2.73	35	
SB915-PZ13-05	OL-0296-01	8-10	9	106.3	164	141	108	33	23.7	23.5	52.8	13	4	2.61	26	
SB915-PZ13-05	OL-0296-04	25-27	26	87.4	165	195	144	51	51.5	43.5	5	2	1	2.63	13	
SB915-PZ13-05	OL-0301-12	48-50	49	19.7		34	18	16	16.8	35.1	48.1	22	16	2.63		
SB915-PZ13-06	OL-0296-06	10-12	11	349.4	265	182	136	46	0	3.5	96.5	12	6	2.61	35	67
SB915-PZ13-06	OL-0296-08	32-34	33	271	222.5	220	151	69	0.8	8.7	90.5	61	34	2.62	39	69
SB915-PZ13-06	OL-0296-10	46-48	47	252.6	192	186	139	47	0	0.7	99.3	62	41	2.68	43	75
SB915-PZ13-06	OL-0301-13	55-65	60	19.1		44	35	9	43.6	44.4	12	3	2	2.54		
SB915-PZ13-07	OL-0301-16	25-27	26	33.1		66	49	17	11	57	32	3	1	2.63		
SB915-PZ13-08	OL-0301-17	15-17	16	11		26	15	11	18.7	21.7	59.6	37	29	2.62		
SB915-PZ13-09	OL-0301-18	10-17	13.5	10.1		21	12	9	5.8	31.4	62.8	30	24	2.78		
SB915-PZ13-11	OL-0301-19	25-27	26	9.7		23	13	10	9.4	26.1	64.5	35	26	2.79		
SB915-PZ13-12	OL-0301-20	35-37	36	17.1		28	15	13	0	37.9	62.1	26	22	2.78		
SB915-PZ13-13	OL-0302-03	10-12	11	8.5		22	12	10	12.1	33.8	54.1	28	21	2.71		
SB915-PZ13-13	OL-0301-14	40-42	41	24.4		45	22	23	0	0.8	99.2	51	37	2.76		
SB915-PZ13-14	OL-0296-17	22-24	23	256.4	247	203	144	59	3.6	5.2	91.2	43	26	2.59	35	
SB915-PZ13-14	OL-0296-18	47-49	48	24.9	55	54	24	30	0	0.1	99.9	78	59	2.76	9	
SB915-PZ13-14	OL-0302-04	50-52	51	23.4		21	16	5	0	7.7	92.3	15	11	2.7		
SB915-PZ13-15	OL-0302-01	55-57	56	37.5		57	40	17	2.2	34.5	63.3	25	11	2.67		
SB915-PZ13-16	OL-0302-02	0-7	3.5	8.4		25	18	7	38.7	35.3	26	9	6	2.59		
SB915-PZ13-16	OL-0301-15	55-57	56	24.5		26	19	7	0	3.1	96.9	19	14	2.69		
SB915-SB13-01	OL-0297-01	8-10	9	126.5	204	172	116	56	31	14.9	54.1	11	7		35	
SB915-SB13-01	OL-0297-02	10-12	11	154.4	147.5	131	100	31	21.4	25.2	63.4	13	8	2.54	35	
SB915-SB13-01	OL-0297-05	28-30	29	181.6	137.5	145	114	31	19.8	28	52.2	7	2	2.57	22	
SB915-SB13-01	OL-0301-01	53-60	56.5	12.2		23	16	7	28.2	48.4	23.4	9	6	2.59		
SB915-SB13-01	OL-0301-02	118-120	119	8.2		14	10	4	9.4	43.2	47.4	20	13	2.73		
SB915-SB13-02	OL-0297-06	8-10	9	353.7	227	209	144	65	0	1.4	98.6	52	23	2.54	43	67
SB915-SB13-02	OL-0297-08	25-27	26	328.5	247.5	211	156	55	0	4.5	95.5	47	24	2.51	39	69
SB915-SB13-02	OL-0297-10	42-44	43	142.8	178.5	154	116	38	35.5	41.6	22.9	12	7	2.67	35	80
SB915-SB13-02	OL-0301-03	65-67	66	8.2			Non-Plastic		63.1	28.3	8.6	3	1	2.71		
SB915-SB13-03	OL-0297-13	4-6	5	363	214	181	131	50	0	0.5	99.5	11	8	2.73	43	
SB915-SB13-03	OL-0297-14	30-32	31	334.4											39	
SB915-SB13-03	OL-0297-15	32-34	33	318.6	234	227	159	68	0	2.8	97.2	14	7	2.55	35	
SB915-SB13-03	OL-0297-17a (SOLW)	58-60	59	271.9	230	230	111	119	0	2	98	58	30	2.59	35	

Onondaga Lake Phase II Pre-Design Investigation Phase II
Geotechnical Data Summary
Syracuse, New York

Wastebed 13 Index Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Water Content (ASTM D2216)	Liquid Limit (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) (%)	Clay-sized Particle Content (0.002 mm) (%)	Specific Gravity (ASTM D854)	Carbonate Content (ASTM D4373)	Bulk Density (EM-1110-2-1906)
SB915-SB13-03	OL-0297-17b (Clay)	58-60	59	72	61.5	60	43	17	6.6	30.2	63.2	27	15	2.74		
SB915-SB13-04A	OL-0297-18	12-14	13	283.8	209	177	129	48	0	1.6	98.4	36	15	2.63	22	
SB915-SB13-04A	OL-0297-19	17-19	18	371.8											35	
SB915-SB13-04A	OL-0297-20	38-40	39	151.6	152	129	100	29	14.5	28.7	56.8	4	3	2.55	30	
SB915-SB13-04A	OL-0298-01	44-46	45	216.1											26	
SB915-SB13-04A	OL-0298-02	70-72	71	220.8	147.5	152	117	35	0	10.1	89.9	15	5	2.59	39	
SB915-SB13-04A	OL-0298-03	72-74	73	168.4											48	
SB915-SB13-05	OL-0298-04	14-16	15	302	182	158	119	39	0	1.9	98.1	15	10	2.62	22	
SB915-SB13-05	OL-0298-05	17-19	18	249.1											35	
SB915-SB13-05	OL-0298-07	30-32	31	226.7	157	161	109	52	0	1.7	98.3	52	30	2.52	26	
SB915-SB13-05	OL-0298-09	52-54	53	208.6											26	
SB915-SB13-06	OL-0298-12	8-10	9	110.9	133.5	109	83	26	28.7	35.3	36	9	5	2.6	26	
SB915-SB13-06	OL-0298-13	28-30	29	166.6											35	
SB915-SB13-06	OL-0298-14	30-32	31	121.1	141.5	241	167	74	28.7	26.6	44.7	10	4	2.64	17	
SB915-SB13-06	OL-0298-15	46-48	47	28.1	192										0	
SB915-SB13-06	OL-0301-04	103-105	104	65.6		22	17	5	20.3	59.2	20.5	4	2	2.7		
SB915-SB13-07	OL-0298-17	8-10	9	302.7	178.5	162	124	38	0	0	100	32	9	2.59	39	
SB915-SB13-07	OL-0298-20	30-32	31	181.4	159	158	125	33	0	7.9	92.1	47	30	2.49	52	
SB915-SB13-08	OL-0299-01	9-11	10	68	111.5	101	79	22	27.7	64.4	7.9	3	1		35	85
SB915-SB13-08	OL-0299-03	22-24	23	174.4	201.5	151	116	35	0	18	82	28	9		35	76
SB915-SB13-08	OL-0299-05	39-41	40	300.3	193.5	194	150	44	0	2.5	97.5	10	5		35	72
SB915-SB13-08	OL-0301-05	68-70	69	8.3			Non-Plastic		13.2	64.8	22	5	2	2.75		
SB915-SB13-09	OL-0299-06	8-10	9	237.2											39	
SB915-SB13-09	OL-0299-07	10-12	11	170.7	156.5	120	93	27	21.4	28.4	50.2	10	4	2.47	22	
SB915-SB13-09	OL-0299-09	30-32	31	121.1	168	151	120	31	75.2	19.4	5.4	2	2	2.63	26	
SB915-SB13-09	OL-0299-10	48-50	49	186.7	169	146	96	50	8	13.5	78.5	22	5	2.65	30	
SB915-SB13-09	OL-0301-06	58-65	61.5	12.8			Non-Plastic		34.9	54	11.1	3	2	2.52		
SB915-SB13-10	OL-0299-12	5-7	6	142.4	166.5	147	107	40	20.9	7.8	71.3	27	10		30	
SB915-SB13-10	OL-0299-14	15-17	16	333.3	197	217	158	59	0	3.4	96.6	10	3		35	
SB915-SB13-10	OL-0299-18	38-40	39	236.6	166.5	163	131	32	0	1.1	98.9	11	6		30	
SB915-SB13-11	OL-0300-01	10-12	11	278.6	195	182	134	48	0	2.4	97.6	44	21		43	72
SB915-SB13-11	OL-0300-03	32-34	33	227.9	148	131	101	30	0	7.1	92.9	15	5		43	77
SB915-SB13-11	OL-0300-05	60-62	61	226	187	172	140	32	0	4.1	95.9	27	8		35	72
SB915-SB13-12	OL-0300-06	8-10	9	273.6											35	
SB915-SB13-12	OL-0300-08	12-14	13	363	259	181	133	48	0	3.7	96.3	36	13	2.6	43	
SB915-SB13-12	OL-0300-09	30-32	31	271.9	228.5	197	146	51	0	2.1	97.9	24	6	2.55	43	
SB915-SB13-12	OL-0300-10	42-44	43	279.8											39	
SB915-SB13-12	OL-0300-11	44-46	45	301.1	227.5	194	152	42	0	1.5	98.5	18	7	2.54	35	
SB915-SB13-13	OL-0300-12	10-12	11	244.1	193.2	171	125	46	0	4.7	95.3	38	15	2.41	35	
SB915-SB13-13	OL-0300-14	20-22	21	65.8	90.2	80	68	12	14.2	59.9	25.9	5	2	2.64	17	

Onondaga Lake Pre-Design Investigation
Phase II Geotechnical Data Summary
Syracuse, New York

Wastebed 13 UU 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-SB13-01	OL-0297-02	10-12	11	190.9	27.02	565.4	6.03
SB915-SB13-01	OL-0297-05	28-30	29	120.4	35.53	916.4	7.34
SB915-SB13-03	OL-0297-15	32-34	33	318.1	17.47	852.3	9.89
SB915-SB13-03	OL-0297-17a[1]	58-60	59	265.5	19.75	320	15
SB915-SB13-04A	OL-0297-18	12-14	13	259.9	18.15	601.6	2.78
SB915-SB13-04A	OL-0297-20	38-40	39	189	27.35	474.9	13.5
SB915-SB13-05	OL-0298-04	14-16	15	300	18.27	747.7	4.79
SB915-SB13-06	OL-0298-12	8-10	9	98.3	46.13	5125	2.22
SB915-SB13-09	OL-0299-07	10-12	11	218.8	24.07	766.6	5.14
SB915-SB13-09	OL-0299-09	30-32	31	135.1	36.07	991	5.76
SB915-SB13-13	OL-0300-12	10-12	11	244.7	21.01	443.7	4.07
SB915-SB13-13	OL-0300-14	20-22	21	71.4	54.84	1431	5.84
SB915-PZ13-02	OL-0295-08	27-29	28	70.2	52.86	3007	5.3
SB915-PZ13-03	OL-0295-13	30-32	31	179.1	28.33	1353	7.25
SB915-PZ13-04	OL-0295-17	10-12	11	472.5	11.62	602.5	4.13
SB915-PZ13-05	OL-0296-04	25-27	26	64.1	55.78	3693	12.7

Note:
1. This sample was part Solvay waste and part clay. The test results provided here are from the Solvay waste portion of the sample.

Onondaga Lake Pre-Design Investigation
Phase II Geotechnical Data Summary
Syracuse, New York

Wastebed 13 CIU Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Initial Water Content (%)	Initial Confining Stress (psf)	Dry Density before Shear (pcf)	Peak Deviator Stress (psf)	Undrained Strength (psf)	Strain at Failure (%)	CIU Total Stress Cohesion (psf)	CIU Total Stress Friction Angle (degrees)	CIU Effective Stress Cohesion (psf)	CIU Effective Stress Friction Angle (degrees)
SB915-SB13-01	OL-0297-01	8-10	9	323.2	2500	19.73	1883.2	941.6	4.43	NA		NA	
				110.9	4998	41.78	8168	4084	7.46				
SB915-SB13-03	OL-0297-14	30-32	31	278.7	2001	24.35	2164	1082	8.58	359	14	307	34.8
				334.4	4000	19.91	3254	1627	3.62				
				334.4	7999	26.2	6006	3003	8.81				
SB915-SB13-04A	OL-0297-19	17-19	18	320.6	1499	15.45	2042	1021	4.95	421	16.1	270	44
				348.3	2999	19.31	3576	1788	5.73				
				371.8	6000	21.14	4760	2380	6.29				
SB915-SB13-04A	OL-0298-01	44-46	45	216.1	2000	32.06	2434	1217	11.4	461	14.8	41.1	42
				227.2	4000	29.55	3642	1821	5.72				
				160.7	7999	34.49	6676	3338	5.07				
SB915-SB13-04A	OL-0298-03	72-74	73	183.1	3000	29.94	3208	1604	3.63	NA		NA	
				168.4	6000	25.24	5208	2604	3.56				
				173.3	11990	30.01	6222	3111	0.929				
SB915-SB13-05	OL-0298-05	17-19	18	255.7	1500	17.39	2270	1135	3.99	456	15.8	485	34
				454.8	3000	18.07	3460	1730	5.13				
				407.8	5999	21.12	5378	2689	5.96				
SB915-SB13-05	OL-0298-09	52-54	53	204.6	2501	27.26	2842	1421	15	718	15	575	42.5
				132.3	5000	39.86	6646	3323	15				
				204.8	10000	30.42	7424	3712	2.84				
SB915-SB13-09	OL-0299-06	8-10	9	289.9	1199	22.68	2168	1084	15	753	9	524	31.5
				280.2	2499	18.07	2648	1324	3.05				
				367.3	5003	23.15	3612	1806	15				
SB915-SB13-09	OL-0299-10	48-50	49	229.3	2500	25.46	3536	1768	3.83	1160	12	772	35.9
				176.4	5000	34.77	6502	3251	10.1				
				148.2	9998	32.93	7688	3844	3.64				
SB915-SB13-12	OL-0300-06	8-10	9	273.6	1200	16.55	1526	763	5.47	365	12.8	205	36.5
				327.9	2500	21.45	2162	1081	3.34				
				415.6	4999	26.92	3142	1571	2.81				
SB915-SB13-12	OL-0300-10	42-44	43	279.8	1998	21.51	2848	1424	5.35	751	14.2	104	46.4
				273.2	3999	22.64	4580	2290	4.32				
				270.5	7987	26.87	6998	3499	7.47				

Onondaga Lake Pre-Design Investigation
Phase II Geotechnical Data Summary
Syracuse, New York

Wastebed 13 CIU Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Initial Water Content (%)	Initial Confining Stress (psf)	Dry Density before Shear (pcf)	Peak Deviator Stress (psf)	Undrained Strength (psf)	Strain at Failure (%)	CIU Total Stress Cohesion (psf)	CIU Total Stress Friction Angle (degrees)	CIU Effective Stress Cohesion (psf)	CIU Effective Stress Friction Angle (degrees)
SB915-PZ13-01	OL-0295-04	26-28	27	374	2000	20.39	2674	1337	3.52	467	15.4	667	36.6
				216.6	3998	22.52	3862	1931	4.06				
				274.6	8001	27.75	5346	2673	3.39				
SB915-PZ13-04	OL-0295-16	8-10	9	352.4	1200	14.24	1484.8	742.4	3.24	397	10.8	49.4	39.7
				319.1	2498	17.94	2018	1009	4.1				
				351.2	4999	27.53	3334	1667	7.78				
SB915-PZ13-04	OL-0295-18	28-30	29	341.8	1999	19.99	2744	1372	8.36	943	9.7	995	22
				331.8	3998	20.91	4406	2203	8.39				
				320.5	8001	25.01	5014	2507	4.64				
SB915-PZ13-14	OL-0296-17	22-24	23	159.2	2000	42.03	2634	1317	5.03	598	12.4	278	40.7
				186	4003	21.88	3598	1799	2.39				
				224.1	7998	26.57	6074	3037	4.01				
SB915-PZ13-14	OL-0296-18	47-49	48	16	2499	101.6	6124	3062	5.47	2080	10.4	1420	17.8
				21.2	5000	99.78	7210	3605	6.21				
				23.2	9999	100.3	9440	4720	11.3				

Note:

1. NA indicates not applicable. Additional interpretation is needed to use these test results.

Onondaga Lake Pre-Design Investigation
Phase II Geotechnical Data Summary
Syracuse, New York

Wastebed 13 Consolidation Test Results Summary

Location ID	Field Sample ID	Depth (ft)	Average Depth (ft)	Initial Water Content (%)	Initial Void Ratio	Compression Index (Cc)	Recompression Index (Cr)	Modified Compression Index (Cce)	Modified Recompression Index (Cre)	Preconsolidation Pressure (psf)	Preconsolidation Pressure (tsf)
SB915-PZ13-02	OL-0295-06	10-12	11	236.1	7.46	3.35	0.10	0.40	0.012	2322	1.2
SB915-PZ13-02	OL-0295-08	27-29	28	62.4	1.74	Disturbed Sample					
SB915-PZ13-03	OL-0295-11	10-12	11	192.1	5.17	1.65	0.08	0.27	0.012	2729	1.4
SB915-PZ13-03	OL-0295-13	30-32	31	249.2	6.11	3.31	0.09	0.47	0.013	4000	2.0
SB915-PZ13-04	OL-0295-17	10-12	11	536.8	14.44	9.26	0.29	0.60	0.019	1958	1.0
SB915-PZ13-04	OL-0295-19	33-35	34	377.4	10.47	4.89	0.27	0.43	0.024	1361	0.7
SB915-PZ13-04A	OL-0295-20	53-55	54	235.0	6.48	2.08	0.08	0.28	0.011	3597	1.8
SB915-SB13-01	OL-0297-02	10-12	11	111.0	3.09	Disturbed Sample					
SB915-SB13-01	OL-0297-05	28-30	29	101.2	3.11	0.77	0.04	0.19	0.010	2042	1.0
SB915-SB13-03	OL-0297-13	4-6	5	366.3	10.46	5.85	0.13	0.51	0.011	1936	1.0
SB915-SB13-03	OL-0297-15	32-34	33	394.4	10.32	6.88	0.21	0.61	0.018	2582	1.3
SB915-SB13-03	OL-0297-17a[1]	58-60	59	225.1	5.83	Disturbed Sample					
SB915-SB13-04A	OL-0297-18	12-14	13	236.8	6.99	3.47	0.13	0.43	0.016	2223	1.1
SB915-SB13-04A	OL-0297-20	38-40	39	300.7	7.83	5.44	0.20	0.62	0.023	2904	1.5
SB915-SB13-04A	OL-0298-02	70-72	71	245.0	6.7	2.56	0.08	0.33	0.011	3681	1.8
SB915-SB13-05	OL-0298-04	14-16	15	363.0	9.83	5.22	0.17	0.48	0.016	1936	1.0
SB915-SB13-05	OL-0298-07	30-32	31	187.8	5.05	2.10	0.09	0.35	0.014	2636	1.3
SB915-SB13-06	OL-0298-12	8-10	9	82.0	1.4	0.85	0.04	0.36	0.016	2500	1.3
SB915-SB13-06	OL-0298-14	30-32	31	168.0	4.97	0.90	0.07	0.15	0.011	2582	1.3
SB915-SB13-09	OL-0299-07	10-12	11	405.7	10.54	5.76	0.23	0.50	0.020	1633	0.8
SB915-SB13-09	OL-0299-09	30-32	31	238.7	6.56	2.34	0.15	0.31	0.020	3000	1.5
SB915-SB13-12	OL-0300-08	12-14	13	427.5	11.48	6.73	0.27	0.54	0.021	1875	0.9
SB915-SB13-12	OL-0300-09	30-32	31	322.7	8.65	6.88	0.25	0.71	0.025	3597	1.8
SB915-SB13-12	OL-0300-11	44-46	45	324.4	8.29	3.34	0.23	0.36	0.025	2254	1.1
SB915-SB13-13	OL-0300-12	10-12	11	498.1	12.65	6.43	0.21	0.47	0.015	900	0.5
SB915-SB13-13	OL-0300-14	20-22	21	127.9	3.66	Disturbed Sample					

Note:

1. This sample was part Solvay waste and part clay. The test results provided here are from the Solvay waste portion of the sample.

Figures

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

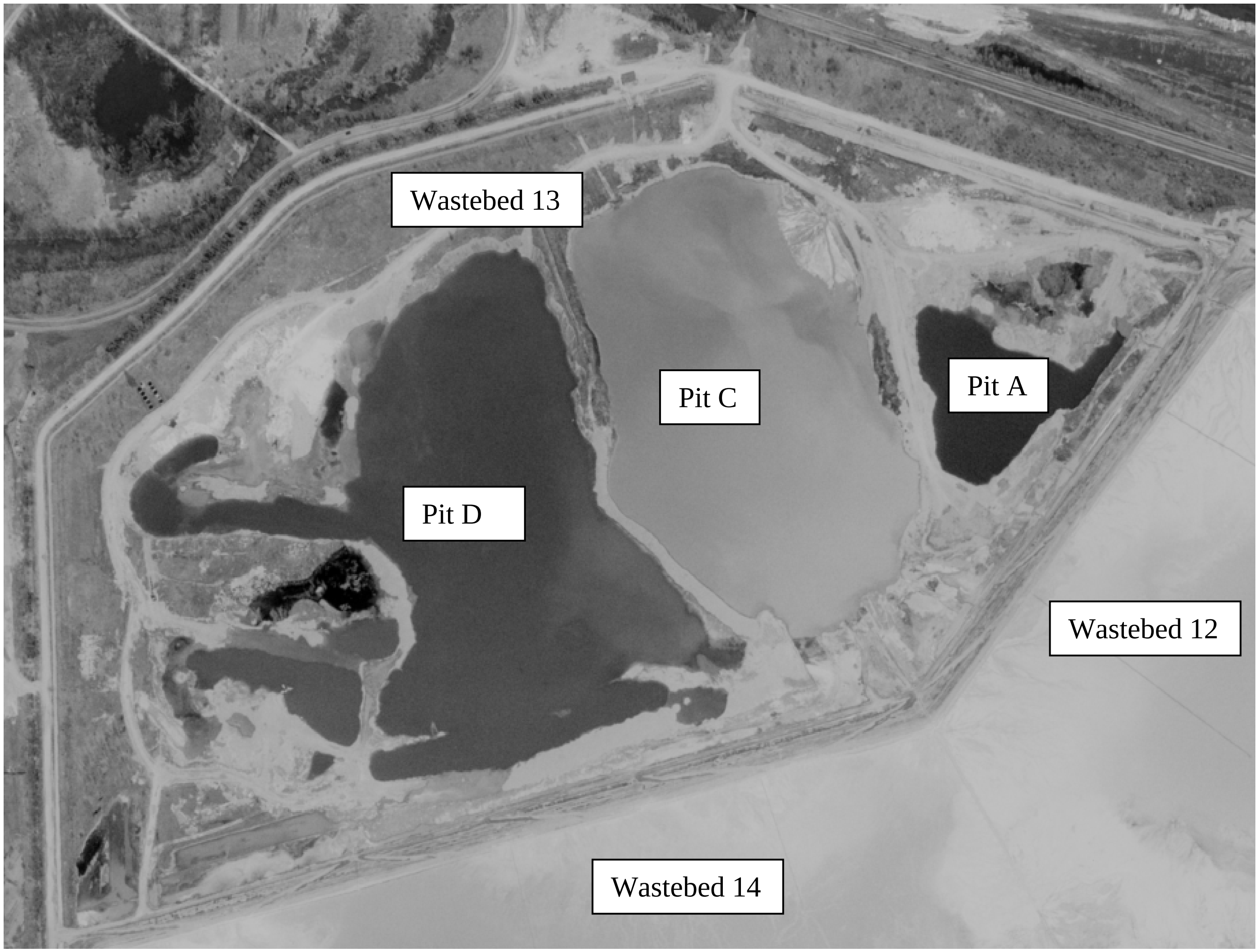

Figure 1. 1972 Aerial Photo Showing Three Pits

Geosyntec
consultants

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

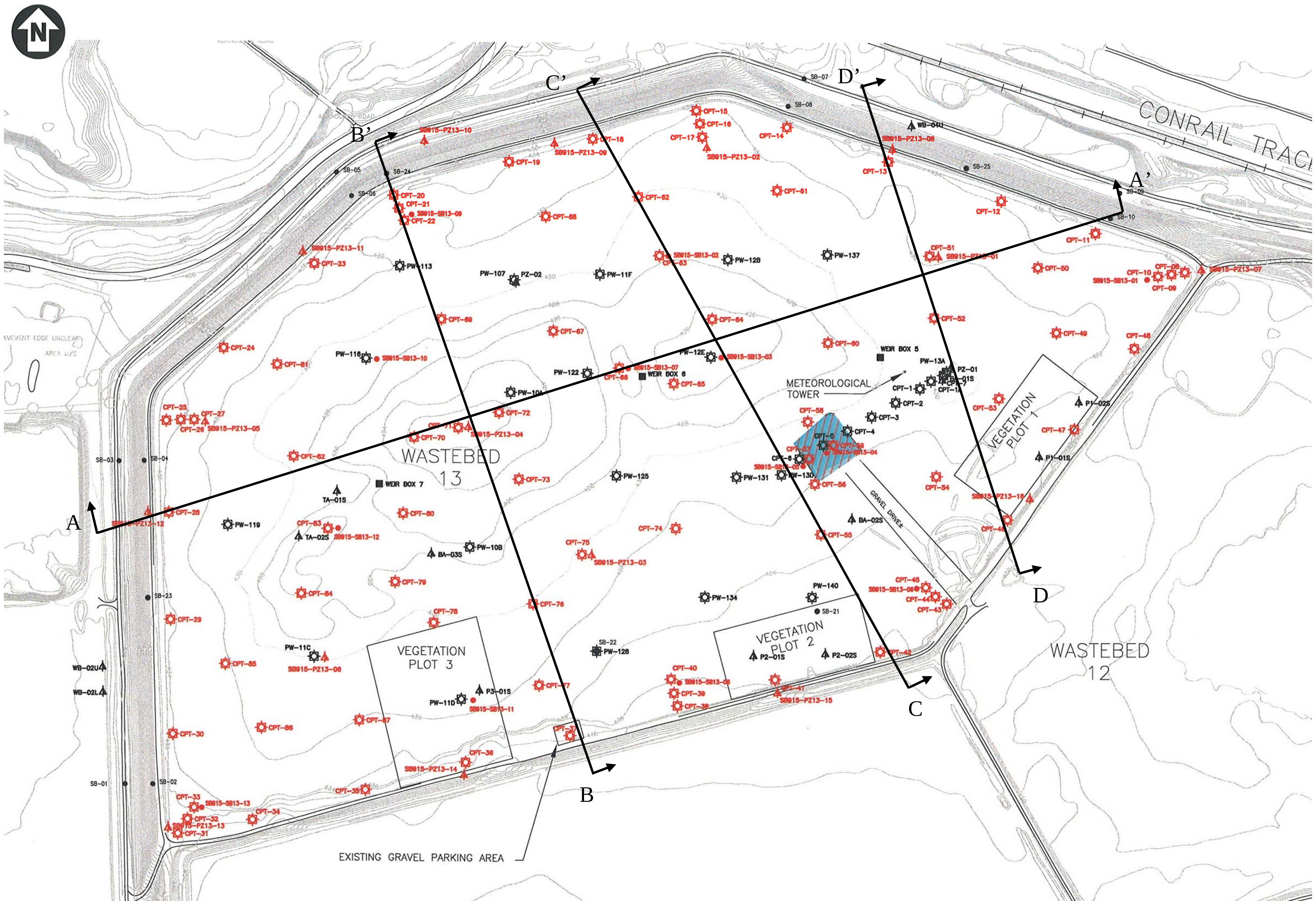

Figure 2. Locations of Cross Sections A-A' to D-D'

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

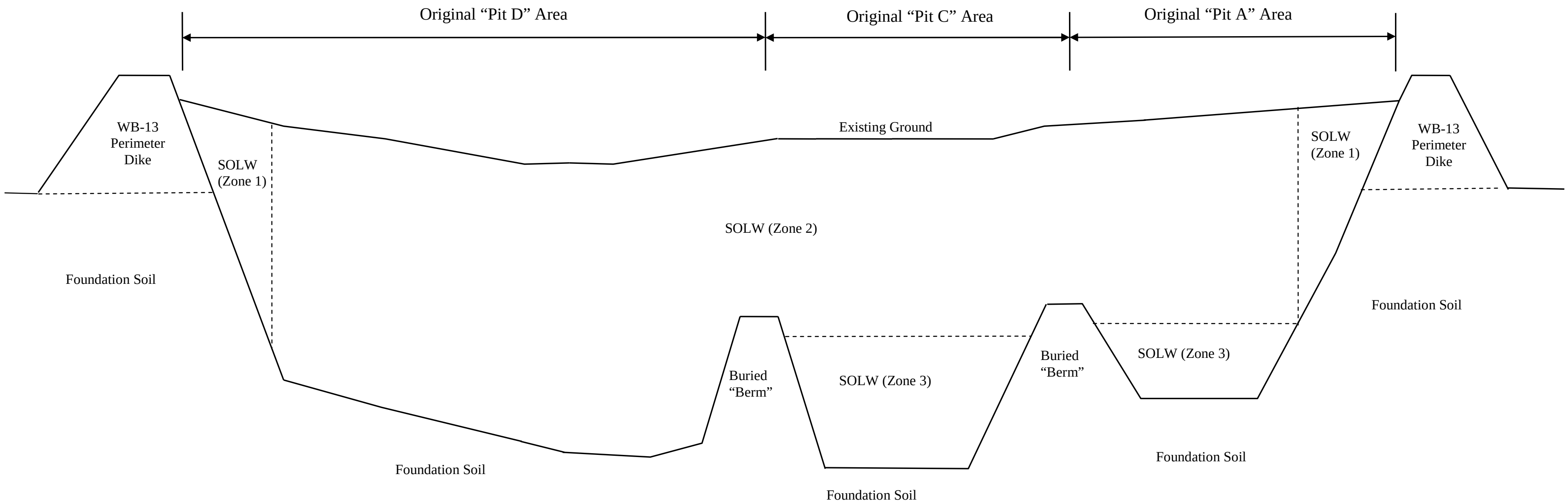

Figure 3. Schematic of Subsurface Profile at Cross Section A-A'

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

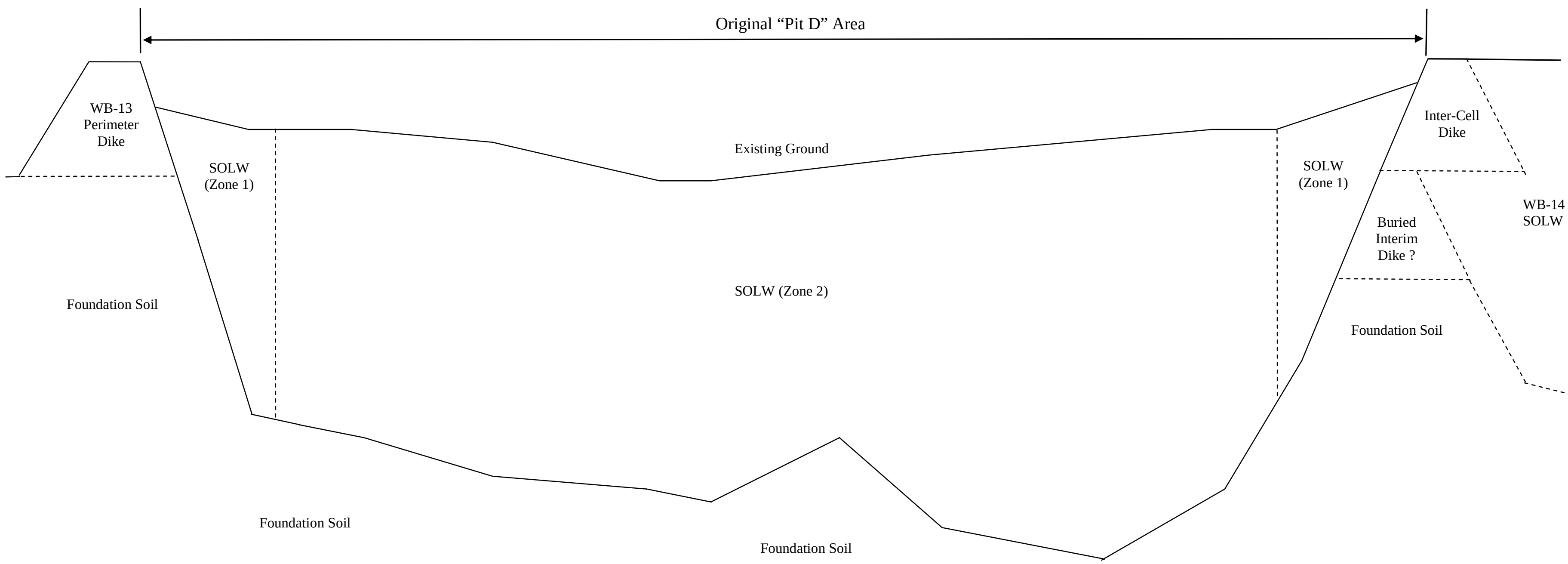

Figure 4. Schematic of Subsurface Profile at Cross Section B-B'

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

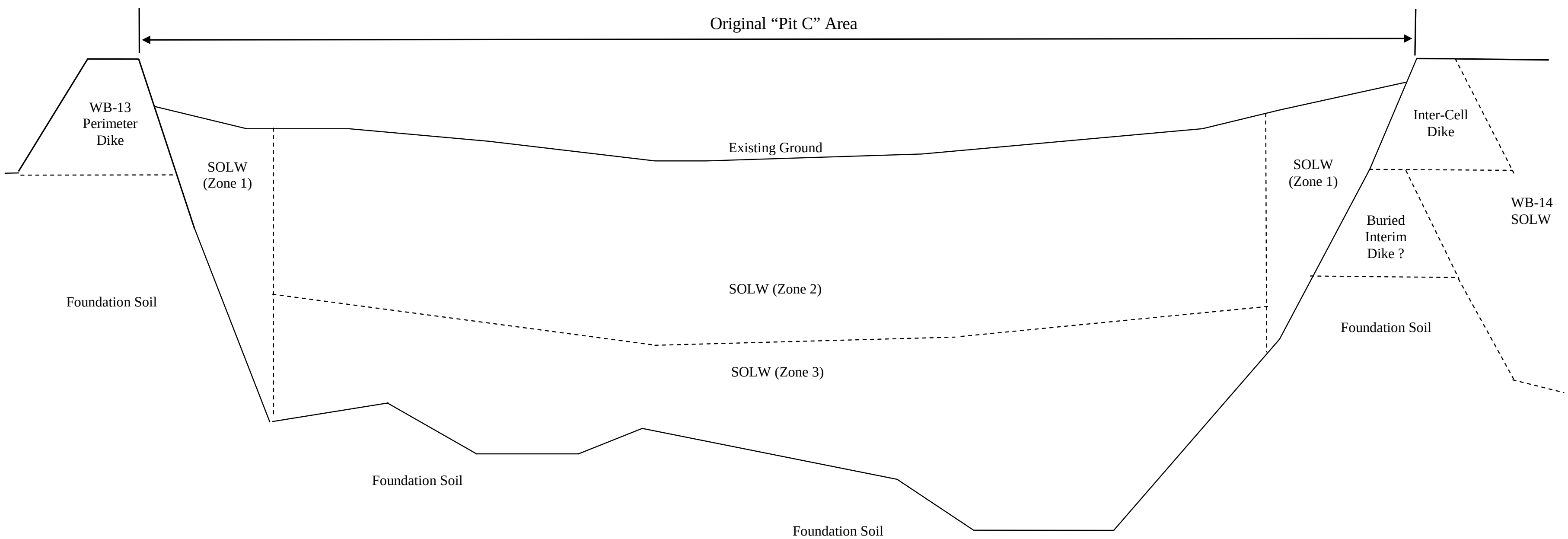

Figure 5. Schematic of Subsurface Profile at Cross Section C-C'

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

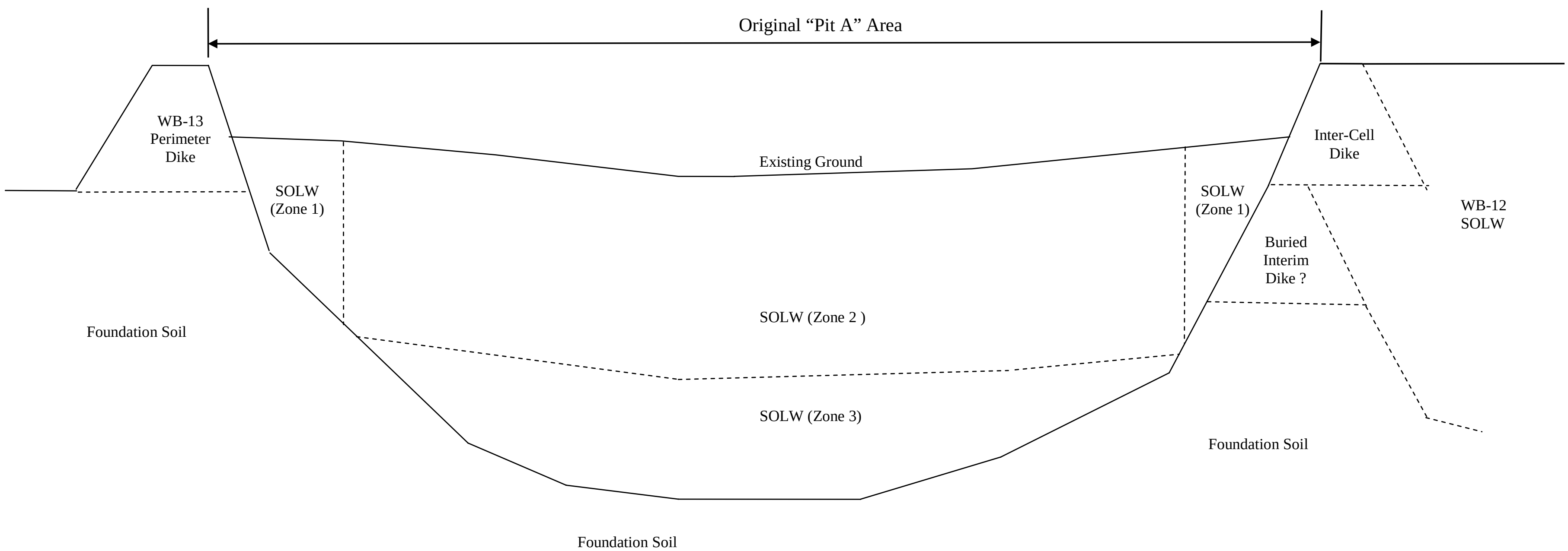

Figure 6. Schematic of Subsurface Profile at Cross Section D-D'

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Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

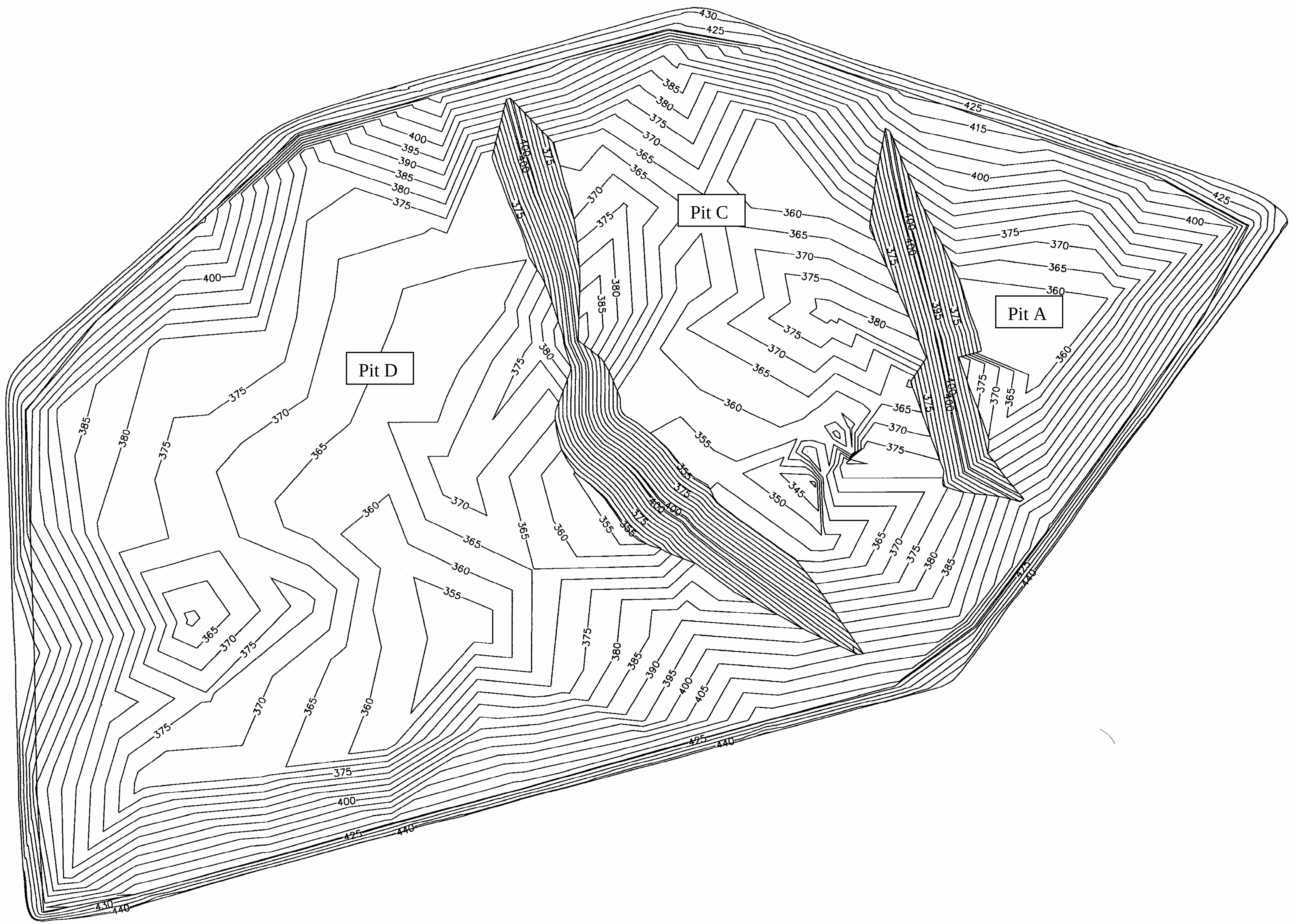


Figure7. Bottom Elevation Contours of SOLW in WB-13

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

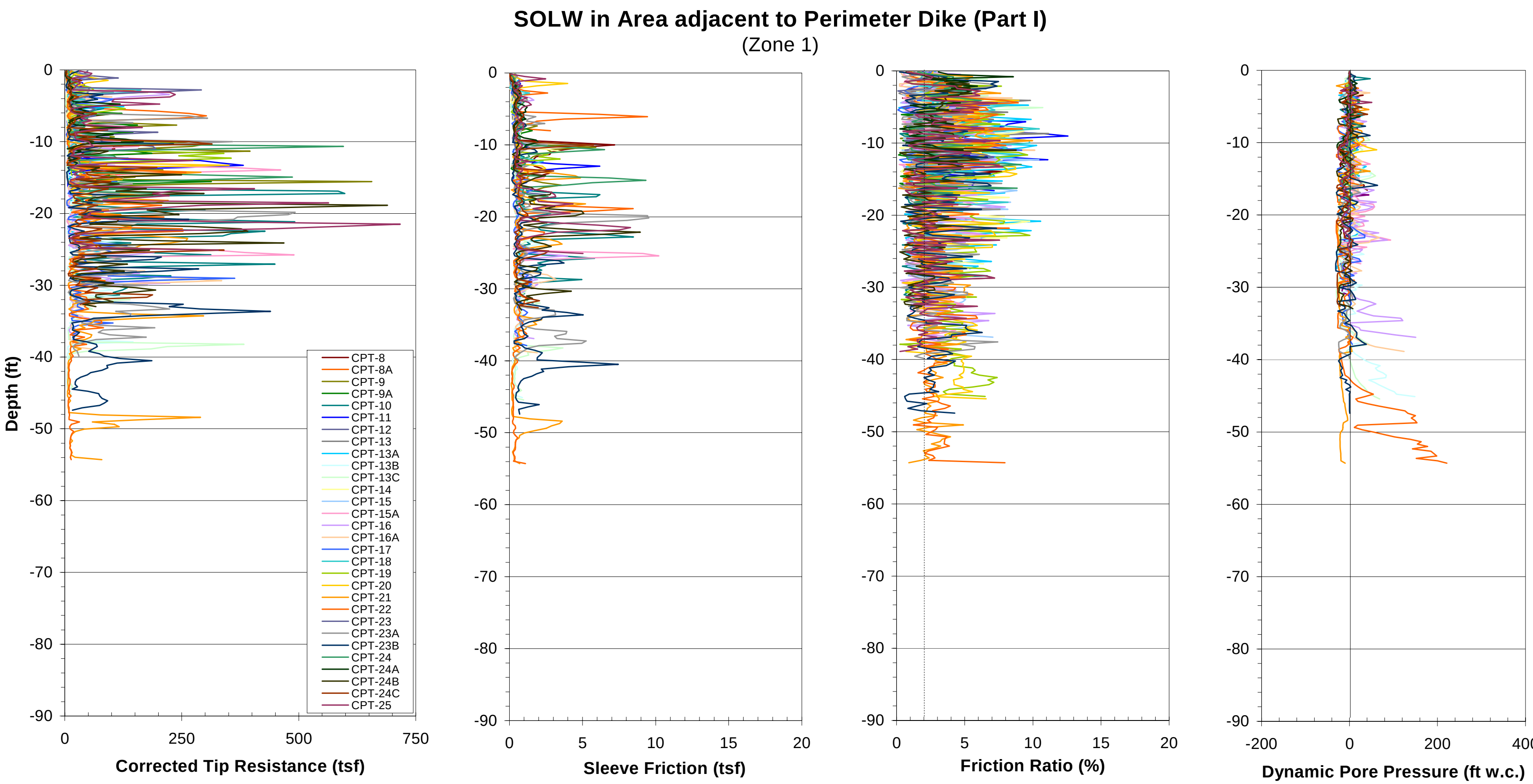


Figure 8. CPT Profiles of SOLW in Areas adjacent to the Perimeter Dikes of WB-13
[Based on CPT data provided to Geosyntec by Parsons]

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

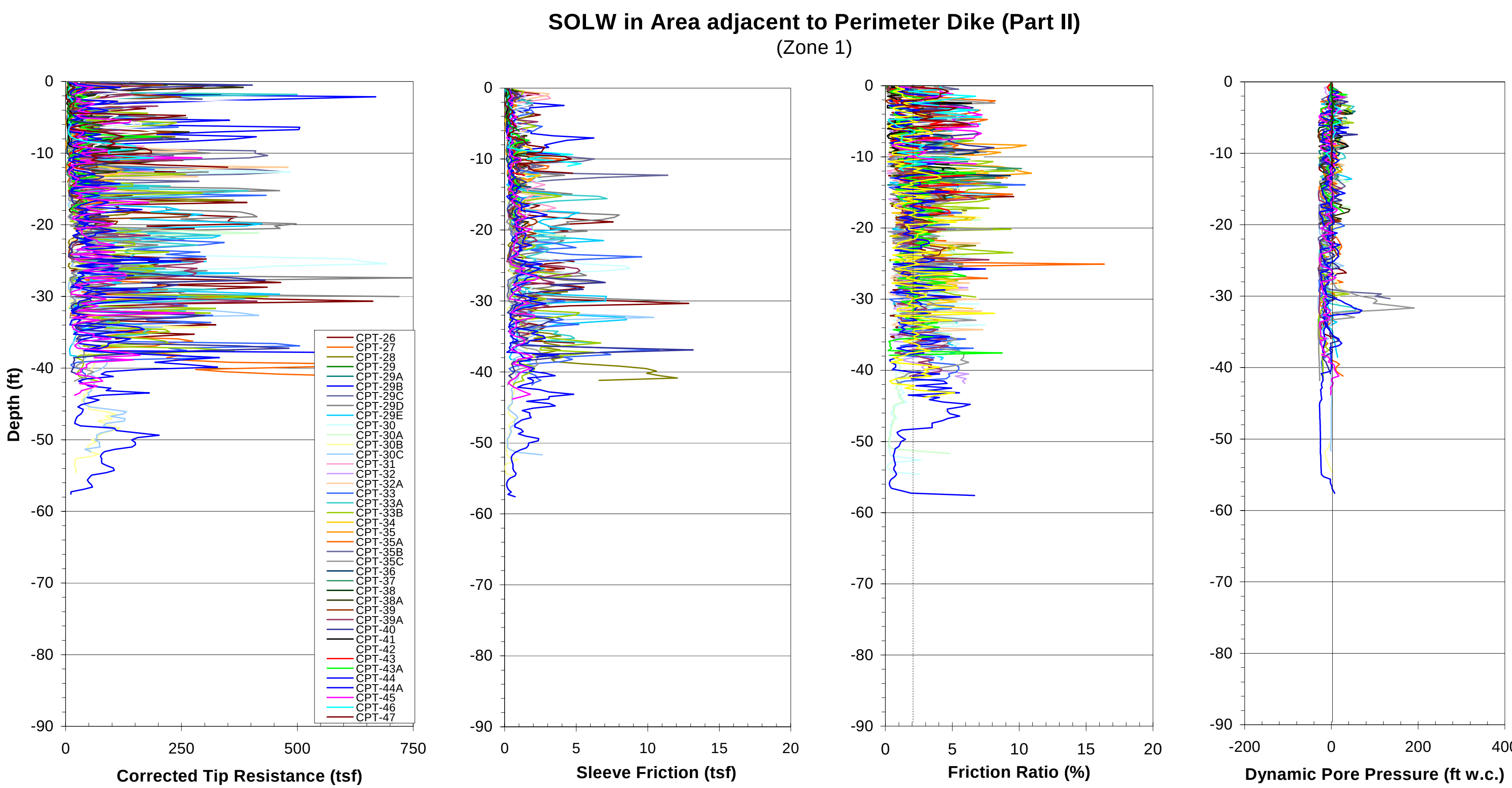


Figure 9. CPT Profiles of SOLW in Areas adjacent to the Perimeter Dikes of WB-13 (continued)
[Based on CPT data provided to Geosyntec by Parsons]

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

SOLW in Pit D Area
(Zone 2)

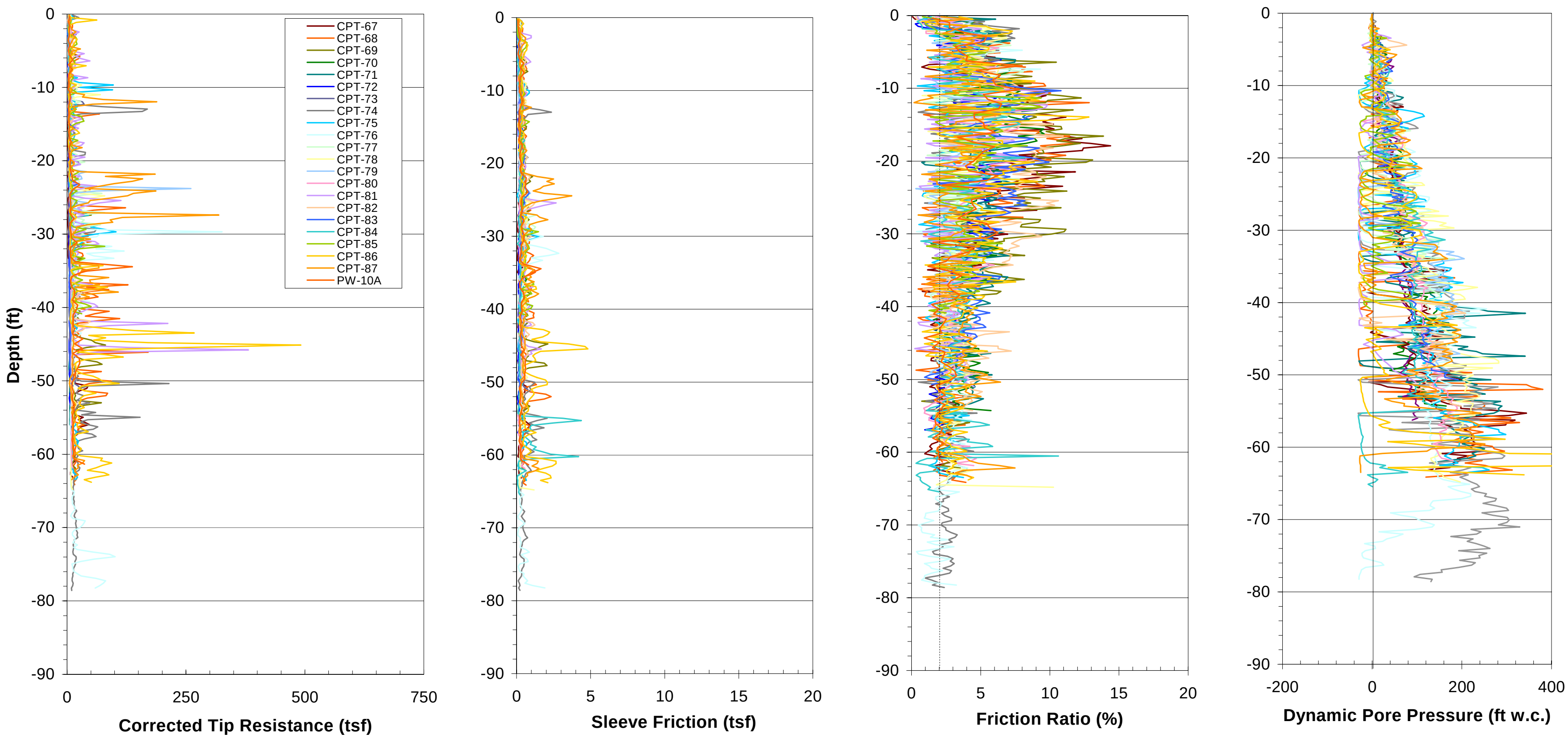


Figure 10. CPT Profiles of SOLW in Pit D Area of WB-13
[Based on CPT data provided to Geosyntec by Parsons]

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04

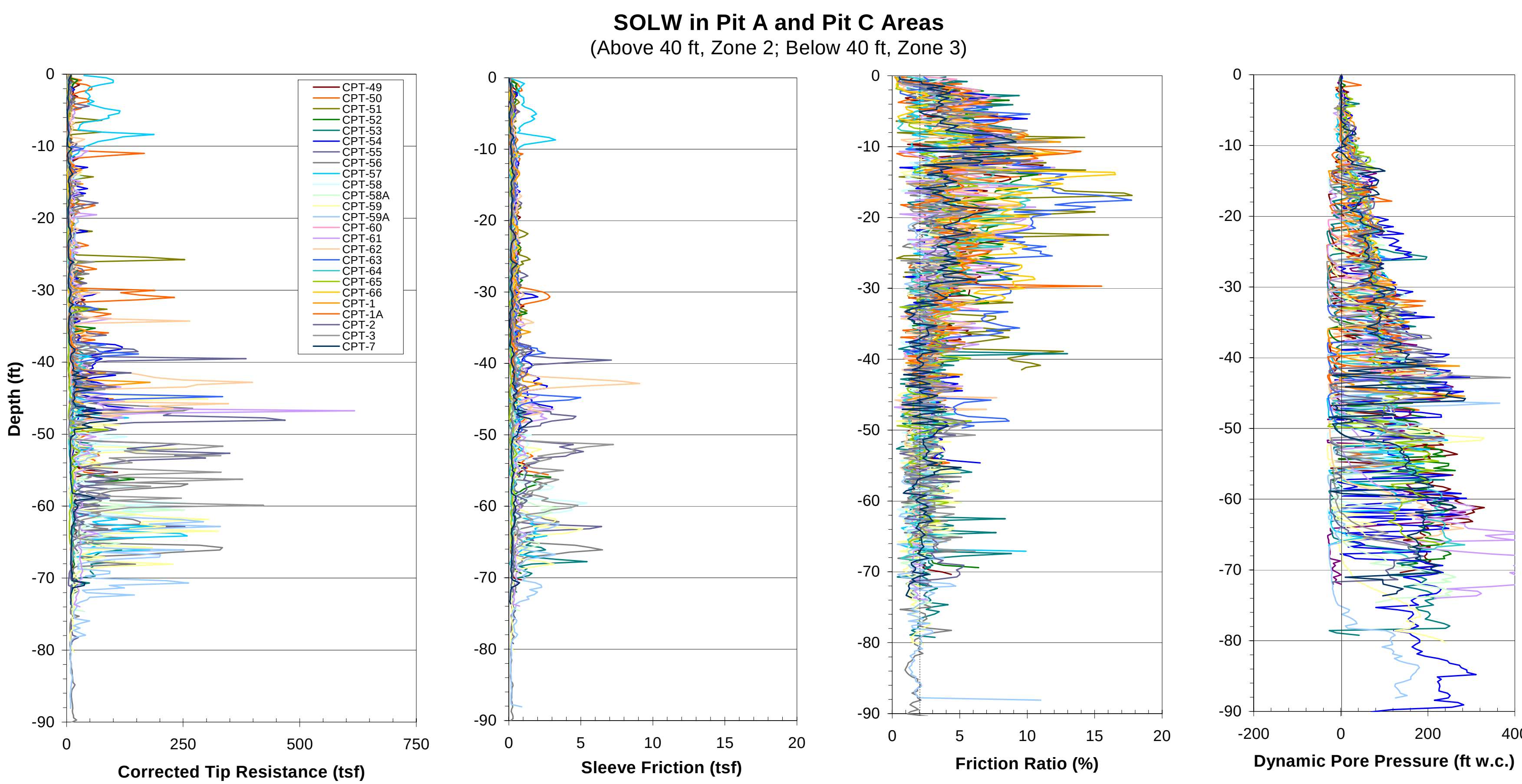


Figure 11. CPT Profiles of SOLW in Pit A and Pit C Areas of WB-13
[Based on CPT data provided to Geosyntec by Parsons]

Written by:	**Ming Zhu**	Date:	**09/17/2007**	Reviewed by:	**R. Kulasingam**	Date:	**09/28/2007**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 30% Design**	Project/ Proposal No.:	**GD3944**	Task No.:	**04**

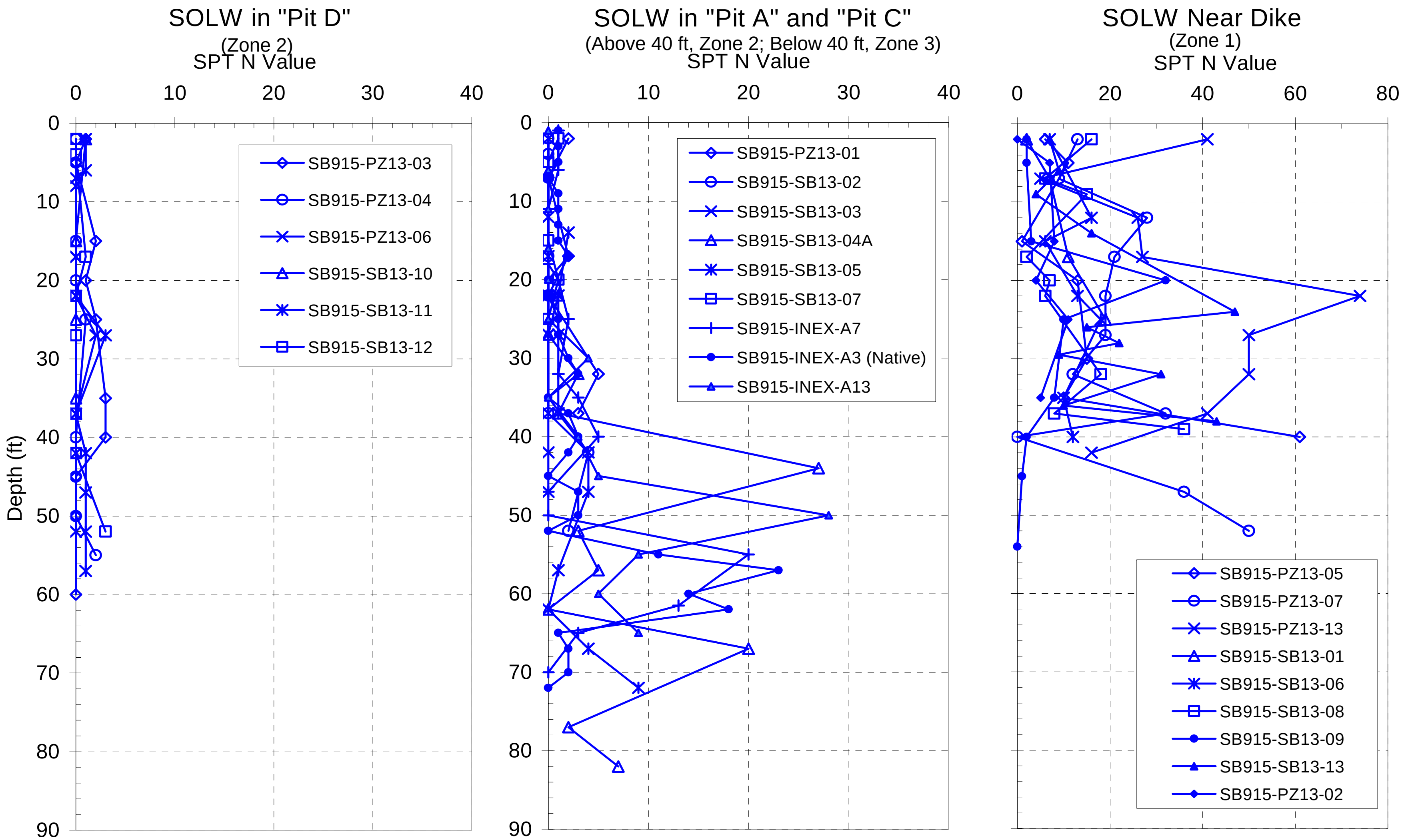
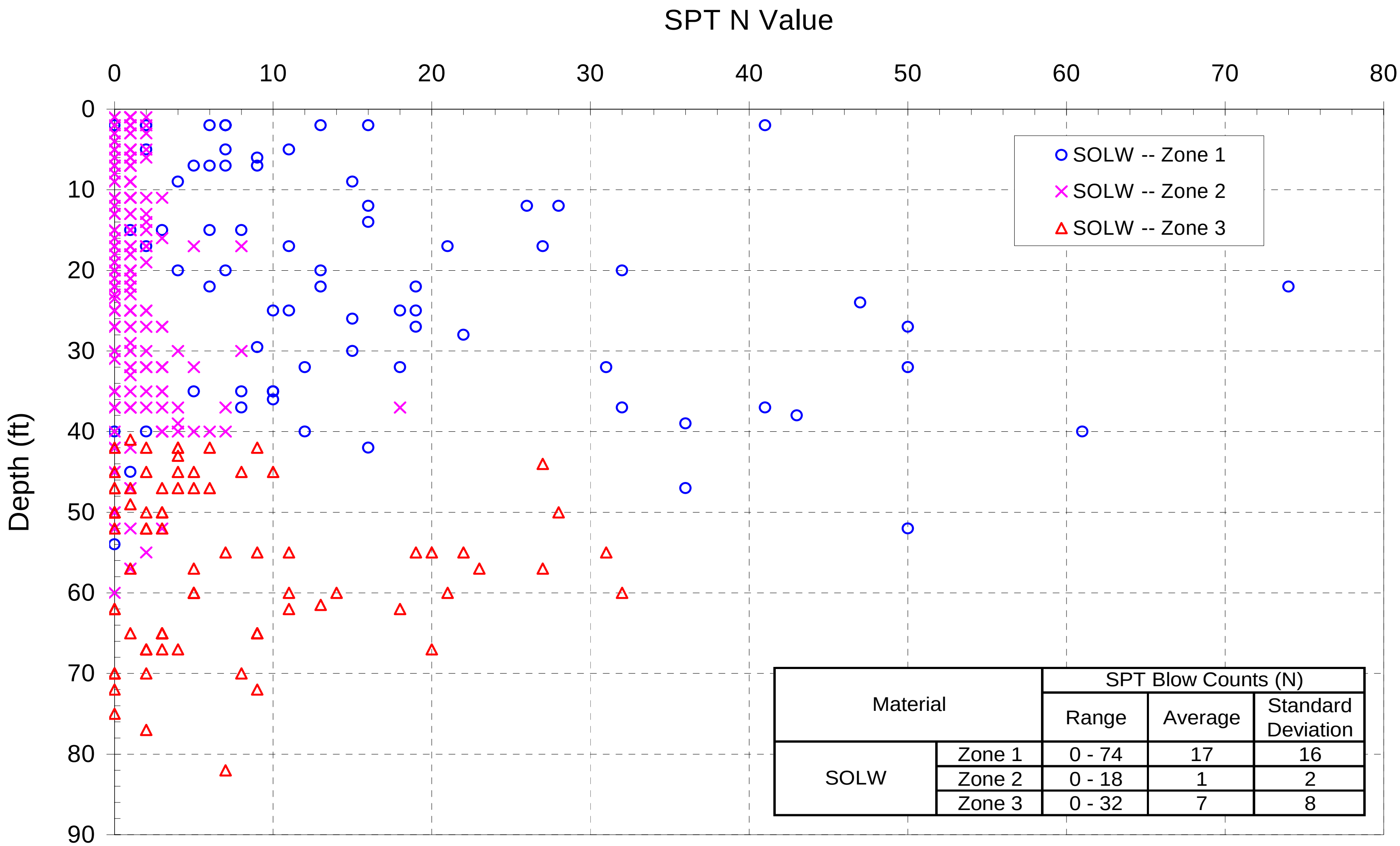


Figure 12. SPT N Value Profiles of SOLW at Selected Locations in WB-13

Written by:	Ming Zhu	Date:	09/17/2007	Reviewed by:	R. Kulasingam	Date:	09/28/2007
Client:	Honeywell	Project:	Onondaga Lake SCA 30% Design	Project/ Proposal No.:	GD3944	Task No.:	04



Material		SPT Blow Counts (N)		
		Range	Average	Standard Deviation
SOLW	Zone 1	0 - 74	17	16
	Zone 2	0 - 18	1	2
	Zone 3	0 - 32	7	8

Figure 13. SPT N Value Versus Depth of SOLW
[based on boring logs presented in Parson's 2005 and 2006 reports and/or provided electronically by Parsons]

APPENDIX B

PROJECT SAFETY PLAN REVISIONS

PARSONS
290 Elwood Davis Road, Suite 312, Liverpool, New York 13088 • (315) 451-9560 • Fax (315) 451-9570 • www.parsons.com

MEMORANDUM

September 13, 2007

To: Matt Vetter; Pete Petrone

From: Jerry Clark

Subject: Updates to Wastebed 13 Pilot Study for Onondaga Lake Project Safety Plan for the upcoming 2007 field work.

In anticipation of the continuation of field activities related to the Wastebed 13 Investigation, the Project Safety Plan (PSP) dated August 2005 and updated September 2006 was reviewed. Some administrative information was updated as described below and will become part of the PSP.

Section	**Update**
2.1	The new job number is 443665. The new project managers are Pete Petrone and Paul Blue.
3.1	Replaced Exhibit 3.1 with updated version
4.1	**<u>Safety Committee</u>** Safety Committee members will be: Project Manager/Project Safety Manager – Pete Petrone Project Engineer – Laura Brussels Field Team Leader – Matthew Vetter Subcontractor Reresentatives – Conetec, Parratt Wolff
4.10	**<u>Program/Project Level Authority and Responsibility</u>** Changes include the following: Project Managers: Paul Blue and Pete Petrone

	Projecrt safety manager: Pete Petrone Field Team Leader/Site Safety Officer: Matthew Vetter
6.8	Competent First Aid and CPR personnel will be: Matt Vetter Field Person – TBD for CPT and Drilling work (Parsons)
Appendices A and B	Updated to current versions
Appendix C	Add JSA for inspecting and using GUS sampler

cc:

JOB SAFETY ANALYSIS

Parratt-Wolff, Inc.	DATE 0721/06, 10/31/06, 8/10/07	☐ NEW ☒ REVISED	PAGE **1** of **1**

WORK ACTIVITY (Description)

Piston Type Shelby Tube Sampling – Shelby Tube Preservation with hot wax

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Jennifer A. Martin, CHMM Douglas Richmond	Corporate Safety Director Driller	Mike Ellingworth	Drilling Manager

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT

☒ HARD HAT; ☒ SAFETY GLASSES; ☒ GLOVES Leather/PVC dipped ☒ SAFETY SHOES Steel Toes & non slip soles ☒ PPE CLOTHING Orange shirt or traffic vest	☐ AIR PURIFYING RESPIRATOR ☒ HEARING PROTECTION If noise levels exceed 85 dBa. ☒ FACE SHIELD If flying particles are generated. ☒ EYE WASH

Required and/or Recommended Tools or Equipment

☒ Welding gloves ☒ Fire Extinguisher

JOB STEPS	POTENTIAL HAZARDS	CRITICAL ACTIONS
Deviations from the critical actions listed below may be required from time to time. All deviations require the approval of the Parratt-Wolff President and/or Safety Manager.		
1. Collect Shelby Tube sample	1a. Striking/recoiling 1b. Splashing	1a. Actuating of Piston Style sample requires 50-200 psi. All hoses and ends must be properly inspected and secured before use. 1b. Stand clear of borehole while the sample is being actuated.
2. Retrieving Sample	2a. Striking/cutting	2a. Wear gloves and handle tube with two hands when removing tube form drill tool string 2b. In the event that the Shelby tube piston will not release pressure through loosening the latch release; remove the piston by unscrewing it from the piston rod. Remove the piston from the Shelby tube head utilizing a venting tool.
3. Capping Shelby Tube	3a. Striking/cutting on ends of tube	3a.Wear gloves and handle tube with two hands when removing tube form drill tool string. Place steel tube gently on ground and put plastic caps, one at a time on top and bottom of tube while keeping top of tube facing upward. Label tube with sample ID no. and indicate which end is top.
4. Melting Wax	4a. Burns from torch flame 4b. Fire from combustible material or vegetation near torch	4a. Heat wax in a steel bucket or pitcher using 20 lb. or smaller propane cylinder with 10ft or longer hose and torch attachment. Apply gentle heat from torch head to bottom of bucket and allow wax to melt. Wear gloves and set up torch and bucket away from drill rig and on level surface free of flammable materials. 4b. Place fire extinguisher in easily accessible location near work area. Prepare work area to be free of combustible material including dry grass, leaves, brush etc. If possible work on pavement, clean soil or hard, flat surface. A fire resistant mat or similar protection should be used in highly vegetated areas, if possible. Apply low flame from torch and be sure to leave at least 3 feet of clear space around torch head and steel bucket.

5. Applying Wax to Shelby tube	5a. Burns from melted wax	5a. Turn off torch and remove torch and tubing from work area. Hold Shelby tube with gloved hands near end of tube. Dip the other end of the tube in the melted wax bucket and submerge tube so plastic end cap is covered with wax. Remove tube and allow to cool until wax is hard. Turn tube over and repeat dipping process.
6. Clean up extra wax and torch	6a. Burns from hot wax, torch and wax bucket	6a. Allow bucket containing melted was to cool until wax solidifies. Allow torch to cool. When wax and torch are cool to the touch, clean up work area and store equipment in drill rig or support vehicle.