US Army Corps of Engineers ®
Jacksonville District

Geotechnical Data Report

C-44 Reservoir/STA

Contract 2

W912EP-14-R-0016

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HDR

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List of Abbreviations

AB – Rotary-Auger
AMEC – AMEC Environment and Infrastructure Inc.
APT – aquifer performance test
ASTM – American Standard Testing Methods
BODR – Basis of Design Report
CB – Rotary-Wash Borings
CCR – Capacitively Coupled Resistivity
CERP – Comprehensive Everglades Restoration Plan
CDM – Camp, Dresser, and McGee
CL – low plasticity clay
CM - centimeters
CPT – Cone Penetrometer Tests
CPTU – Cone Penetrometer Tests with pore pressure measurements
DCM – Design Criteria Memorandum
DDE – Dichlorodiphenyldichloroethylene
DDT – Dichlorodiphenyltrichloroethane
EAA – Everglades Agricultural Area
EOP – end of primary
EPA – Environmental Protection Agency
EPZ – embankment piezometer
ESA – Environmental Site Assessment
FAC – Florida Administrative Code
FAS – Florida Aquifer System
FDEP – Florida Department of Environmental Protection
FDOT – Florida Department of Transportation
FGS – Florida Geological Survey
FM – Florida Method
GDR – Geotechnical Data Report
GPS – Global Positioning System
HDR – HDR Engineering Inc.
ID – inside diameter
IHSS – International Humic Substances Society
IRL-S – Indian River Lagoon South Project
KG – kilogram
KSF – kilopounds per square foot
LL – Liquid Limit
MCL – maximum contamination level
MG – milligram
NAD – North American Datum
NAVD – North American Vertical Datum
NAVFAC – Naval Facilities Command
NE – northeast
NFSL – Normal full storage level
NGVD – National Geodetic Vertical Datum
NRCS – Natural Resources Conservation Service

NTU – Nephelometric Turbidity Unit
NW – northwest
OD – outside diameter
PCU – Platinum-Cobalt Units
PEC – probable effects concentration
PI – Plasticity Index
PL – Plastic Limit
PSHA – probabilistic seismic hazards analyses
PSI – pounds per square inch
PVC – polyvinyl chloride
PZ – piezometer
RCV – dipole receivers
REC – recognized environmental condition
RQD – Rock Quality Designation
RTC – reservoir test cells
SAS – Surficial Aquifer System
SC – clayey sand
SCC – Seepage collection canals
SE – southeast
SEI – Subsurface Evaluations, Inc.
SFWMD – South Florida Water Management District
SM – silty sand
SP – spontaneous potential
SP-SC – poorly graded clean to clayey sands
SP-SM – poorly graded clean to silty sand
SPT – Standard Penetration Test
SQAG – sediment quality assessment guideline
SSSA – Soil Science Society of America
STA – stormwater treatment area
SW – southwest
TDS – Total dissolved solids
TEC – threshold effect concentration
TKN – Total Kjeldahl Nitrogen
TM – Technical Memoranda
TON – Threshold Odor Number
TP – Test Pits
TSF – tons per square foot
TX – dipole transmitter
UFA – Upper Floridian Aquifer
USACE – U. S. Army Corps of Engineers
USCS – Unified Soil Classification System
USDA – U.S. Department of Agriculture
USFWS – U.S. Fish and Wildlife Service
USGS – U.S. Geological Survey
VWP – vibrating wire piezometer
WES – Williams Earth Sciences, Inc.

1.0 INTRODUCTION

1.1 Project Description

The C-44 Reservoir/Stormwater Treatment Area Project (Project) is included in the Comprehensive Everglades Restoration Plan (CERP) as part of the Indian River Lagoon South (IRL-S) Project. The Project will attenuate the freshwater flow and improve the water quality of flow into the St. Lucie Estuary. The C-44 Basin has a contributing drainage area of approximately 202 square miles located in Martin County, Florida. The C-44 Canal is the primary conveyance that serves the C-44 Basin. The project site is located approximately 1 mile east of Indiantown, Florida and encompasses an area adjacent to and 7 miles to the north of the existing C-44 Canal (see Figure 1.1).

The recommended plan for the Project includes a reservoir to capture local runoff and flow from the C-44 Canal, and a stormwater treatment area (STA) to treat the flow from the reservoir before it is returned to the C-44 Canal. Inflow to the proposed reservoir from the C-44 Canal will be through an intake canal and a 1,100-cubic-feet-per-second pump station. The pump station will be located near the southeast portion of the reservoir. Water will be discharged by gravity from the reservoir through a discharge structure located in the northeast corner of the reservoir to a distribution canal that will deliver water to the STA cells. Water will then be discharged from the STA cells to the STA collection canals and from there to the C-44 Canal through a system of discharge structures. The Project configuration, as shown on Figure 1.2, was prepared by the US Army Corps of Engineers (USACE). The Project is split into separate contracts as follows:

- Contract 1 - Intake Canal, Project Access road, and C-133A and C-133 Canals.
- Contract 2 - Reservoir with appurtenant features.
- System Discharge Canal and Spillway
- STAs with appurtenant features (culverts, etc.).
- Pump Station and appurtenant features

Construction/bid documents have been completed for Contract 1 and that portion of the Project is currently under construction. Contract 1 and Contract 2 will be constructed by contractors working for the US Army Corps of Engineers (USACE). The System Discharge Canal and Spillway, the STAs and the Pump Station will be constructed by contractors working for the South Florida Water Management District (SFWMD).

1.2 Purpose and Scope of Work

The purpose of this Geotechnical Data Report (GDR) is to present historical and recent data obtained by HDR Engineering Inc. (HDR) and by others that describes the existing site and subsurface conditions related to Contract 2 of this Project. Contract 2 Project features are shown on Figure 1.3. This report contains field investigation data, laboratory and field test results, results of an environmental site assessment, and a characterization of the subsurface site conditions. This report may contain information pertaining to the project site that lies outside of the Contract 2 construction limits for reference purposes only. The following reports or investigations were utilized to prepare the GDR:

- 2003 Investigation - *Subsurface Exploration and Preliminary Geotechnical Engineering Evaluation, Troup Indiantown Water Control District Reservoir and Stormwater Treatment Area Project*, Ardaman & Associates, Inc. (Ardaman), December 2003. (included as Appendix H)

- 2004 Geotechnical Investigation - *Preliminary Subsurface Investigations and Geotechnical Analyses, C-44 Water Management Project,* Camp, Dresser, and McGee (CDM), April 2004. (included as Appendix I)
- 2004 Environmental Investigation - *Consolidated Citrus LP and Gardinier Florida Citrus, Inc. Properties, Martin County, Florida – Proposed C-44 Reservoir/Stormwater Treatment Area Phase I/II Environmental Site Assessment*, CDM, December 2004.
- 2005 Investigation - SEI, 2 September 2005, “Capacitively Coupled Resistivity Report.” (included as Appendix D)
- 2006 Site Characterization Report – *Site Characterization Report*, HDR, 2006.
- 2007 Test Cell Investigation - *Final Test Cell Analytical Report for Construction and Operations,* HDR, July 2007.
- 2012 Investigation - *Final Report of Geotechnical Exploration, Volume I,* AMEC Environment and Infrastructure Inc. (AMEC), December 2012; and *Final Report of Geotechnical Exploration, Volume II,* AMEC, January 2013.
- 2012 Well Rehab Report –CDM Smith, Inc., 2012. Well Rehabilitation, C-44 Reservoir and Stormwater Treatment Area Groundwater Monitoring Project, Final Completion Report. Report prepared for the USACE, Jacksonville District dated June 2012, 13 p. plus figures, tables, and appendices.
- 2012 TM 6&7 – *Technical Memoranda 6 & 7: Geotechnical Evaluation,* HDR, *2012.*

1.3 Limitations and Basis for Findings

The professional services of HDR have been performed and findings have been made in accordance with generally acceptable principles and practices for the respective professional disciplines.

The scope of the investigation is outlined in Section 1.2 and was intended to describe site and subsurface conditions for the proposed Project. The evaluations submitted in this report are based upon the geotechnical data obtained at the locations indicated at the date of exploration. Regardless of the thoroughness of a site exploration program, conditions between exploration locations may be different from those at specific exploration locations and there is the possibility that soil and groundwater conditions will not be as anticipated by the designers or by the contractors. In addition, the construction process itself may alter soil and groundwater conditions.

2.0 SITE HISTORY AND ENVIRONMENTAL CONDITIONS

2.1 Purpose

The purpose of this Section is to provide a summary of the known site history for the property associated with the Project.

2.2 Regional and Site Geology

2.2.1 Regional Physiography and Geomorphology

The IRL-S study area includes coastal lowlands formed during the inundation and subsidence of recent ice ages. The relatively uniform soils and groundwater characteristics in the IRL-S watershed are a product of these periods of oceanic submergence and emergence that shaped the region.

The soils in the area can be grouped into five major categories based on hydrologic and physical characteristics: 1) soils of the sand ridges and coastal islands, 2) soils of low ridges and knolls, 3) soils of the flatwoods, 4) soils of sloughs and freshwater marshes, and 5) soils of the tidal swamps. The St. Lucie Estuary watershed is dominated by pine flatwood, slough, and freshwater marsh soils. The remaining three categories comprise minor soil associations that occur in regions of major topographic change such as riverbeds. Each individual soil can be further classified into a hydrological soil group based on surface water runoff or infiltration characteristics (Florida Soil Survey Staff, 1992). The numerous land alterations in the area are chiefly due to erosion, and resulted in the accumulation of fine, organic rich sediments, commonly called “muck,” in the estuary. Construction and operation of major canals discharging into the estuary, starting in the late 1800’s, accelerated the natural process of muck formation at the fresh-water/salt-water interface.

2.2.2 Project Area Geology

Martin County lies within the Coastal Plain province of the southeastern United States, and includes three physiographic subdivisions: The Eastern Valley, the Osceola Plain to the northwest, the Atlantic Coastal ridge at the northeastern coastline, and a narrow extension of the Everglades marsh adjacent to Lake Okeechobee (White, W.A., 1970) as shown in Figure 2.1. The Eastern Valley consists of a broad, flat relict beach ridge plain. The Osceola Plain is a narrow terrace in Martin County, and appears to have been a narrow peninsula or a series of islands and shoals at one time (Adams, 1992).

More specific site geology based on the previous site subsurface investigations is discussed in Section 6.0, Geologic and Hydrogeologic Site Conditions.

2.3 Geologic Hazards Evaluation

Geologic hazards, or natural hazards, include all of those hazards that arise independent from human activity. Examples of hazards that affect Florida include sinkhole collapse, storms (hurricanes), floods, and less probably, earthquakes (Upchurch and Randazzo, 1997). A natural hazards screening evaluation was performed to determine whether a significant potential exists for seismic geologic hazards to affect the Project. Seismic hazards are associated with earthquake activity. The potential hazards associated with karst activity at the Project site were also evaluated. The intent of the screening evaluation is to utilize readily available data and criteria to ascertain the existence of a potential geologic hazard at the Project site.

2.3.1 Seismic Hazards

Earthquakes occur in Florida, however, none have been hazardous or caused significant damage. Florida is one of the few low-risk areas for earthquakes in the coterminous United States, and there is no evidence to suggest that Florida will ever suffer a major earthquake. Studies of the basement structure of Florida indicate that the region was faulted during the breakup of Pangaea. The surface traces of faults on land surface in Florida are minor, and there is little evidence of stress accumulation or slippage along these faults at present, however, earthquakes focused outside of the state have caused minor damage in Florida (Upchurch, S.B., and A.F. Randazzo, 1997).

The USACE has established guideline procedures for the evaluation of seismic geologic hazards. These hazards include: (a) surface fault rupture along an active fault, (b) soil liquefaction due to strong earthquake ground shaking, (c) soil differential compaction due to strong earthquake ground shaking, (d) landsliding, and (e) flooding due to earthquake activity. There are two screening procedures outlined by USACE. 1) A check is made as to whether a hazard has previously occurred at the site (or in the near vicinity) during historical earthquakes. This check may involve a review of published reports, or discussions with geologists knowledgeable of the prior earthquake performance of an area. 2) A check is made as to whether the site is included in an area for which a regional earthquake hazard map has been prepared by a federal or state agency.

Since the seismic hazards listed above are associated with earthquake activity, the screening process for the Project site included evaluating the former and probable future occurrence of earthquakes at or near the site, the U.S. Geological Survey (USGS) probabilistic seismic hazards analyses (PSHA) web site was utilized to evaluate the probability of a future earthquake at the site. For southern Florida, including the Project site, the PSHA probability of a magnitude >5.0 earthquake within 100 years and 50 kilometers of the site is between 0.005 and 0.01 (Figure 2.2). The probability of a magnitude >6.5 earthquake within 100 years and 50 kilometers of the site is between 0.00 and 0.001 (Figure 2.3). The maps indicate a very low to no likelihood of earthquakes in the Project area.

The USGS has developed maps showing earthquake ground acceleration for the United States. The peak acceleration with 2% probability of exceedance in 50 years (2475 year return interval) is approximately 2% to 3.6% gravity (g) (Figure 2.4). The most conservative value of 3.6 was chosen by the CERP for use in liquefaction analysis per Design Criteria Memorandum 6 (DCM-6).

A list of known earthquakes and tremors felt in Florida from 1727 to 1991 was compiled by Lane (1991). A total of twenty-seven were identified, with the foci of many being out of the state.

2.3.2 Karst

Dissolution of limestone and dolostone can create a landscape known as karst. Sinkholes, the most widely known karst feature, are funnel-shaped depressions that form as a result of dissolution of underlying fractured rock (Upchurch and Randazzo, 1997).

Sinclair, W.C., J.W. Stewart, 1985, produced a sinkhole development map for the state of Florida (Figure 2.5). The map places Martin County, including the Project site, in an area where sinkholes are few, shallow, of small diameter, and dominated by cover subsidence sinkholes. Sinkholes develop by subsidence in areas where the limestone is covered by materials that are relatively non-cohesive and permeable. In areas where the sand cover is 50 to 100 feet thick, as in the case of the Project site, few sinkholes generally occur. Subsidence sinkholes form when rainwater percolates through the non-cohesive sediments to underlying limestone, which dissolves. Under these conditions, individual grains of sand move downward in sequence replacing limestone that has dissolved. Since the sand is replacing the limestone in sequence, cavities in the limestone cannot develop to appreciable size, thus the sinkholes are generally of small diameter (Sinclair, W.C., J.W. Stewart, R.L. Knutilla, A.E. Gilboy, and R.L. Miller, 1985).

In order to determine if modern sinkholes have been reported in the vicinity of the Project site, the sinkhole database developed by the Florida Sinkhole Research Institute at the University of Central Florida, Orlando. (SEI, 1998) was queried. This database is available from the Florida Geological Survey and from Subsurface Evaluations, Inc. (SEI). The database includes locations (by Township and Range) and dates of occurrence of nearly 2,000 sinkholes that were reported in Florida between 1964 and 1992, with some more recent updates by Subsurface Evaluations, Inc. A survey of this database for occurrences at the Project site sections indicates no reported occurrences. No sinkholes were reported in Martin County as of 2004, as shown on Figure 2.6.

Upchurch and Littlefield (Upchurch, S.B. & Littlefield, J.R. 1988) developed a method for assigning risk of sinkhole activity to geographic areas. Sinkhole risk was measured by quantifying the number of modern (1964-1985) sinkholes reported per unit area per year. In terms of modern sinkhole reporting, the lowest risk was 0.003 square miles per year (mi^2/yr) and the highest was 0.083/mi^2/yr. Paleosinkholes were found to occur in proportion to modern sinkhole occurrences. Sinkhole risk was based on the percentage of an area occupied by ancient sinkholes. Low risk was found to exist where no paleosinkholes were reported, and highest risk was found to be where 10% or more of the area is occupied by ancient sinkholes. Through the efforts of several government agencies, a sinkhole risk map has been produced, which show the possibility of sinkhole development in Florida (Figure 2.5). The map shows that the Project site is located in an area of lowest sinkhole probability in the state.

2.4 Historical Information

A series of aerial photographs, dated 1940, 1952, 1958, 1970, 1981, and 1999 were obtained from the USGS, USACE, and the U.S Department of Agriculture (USDA). The following is a review of the available historical aerial photographs which include coverage of the Project site.

1940 – The site appears undeveloped and covered with numerous wetlands. The C-44 Canal is visible to the south of the site. (See Figure 2.7 for 1940 aerial)

1952 – Numerous wetland areas are present across the site. Some row crop farming practices are present on the central and southern portions of the site. The C-44 Canal is visible to the south of the site, and the town of Indiantown is present to the southwest of the site. (See Figure 2.8 for 1952 aerial)

1958 – The site appears much the same as in the 1952 aerial photograph with the exception of further development (ditches/canals and roads) on the west-central portion of the site. The C-44 Canal is visible to the south of the site. (See Figure 2.9 for 1958 aerial)

1970 – The numerous wetland areas which appeared on the 1952 and 1958 aerial photographs are no longer visible on the 1970 aerial. Roads and ditches/canals are apparent across the entire site. The site appears to have been drained and occupied primarily by citrus groves. A set of buildings is evident on the west central portion of the site in a location believed to be the "existing maintenance area" and also there appears to be a building to the south of the "existing maintenance area." This building is referred to by CDM in the Phase I/II Environmental Site Assessment (ESA) report as the former Pole Barn area. The existing Florida Power and Light transmission line easement appears to be present. Citrus Boulevard and the C-44 Canal are visible to the south of the site. (See Figure 2.10 for 1970 aerial)

<u>1981</u> – The site appears much the same as in the 1970 aerial photograph. A structure or structures appear to be visible in the east-central portion of the site in the approximate location referred to in the previously referenced Phase I/II ESA report as the "former Coca-Cola maintenance shop or area". (See Figure 2.11 for 1981 aerial)

<u>1999</u> – The site appears much the same as in the 1981 aerial photograph. However, the structure or structures which appeared in the approximate location of the "former Coca-Cola maintenance area" on the 1981 aerial photograph are no longer visible. (See Figure 2.12 for 1999 aerial)

The review of historical aerial photographs indicates that the Project area was occupied by numerous wetland features prior to the development as farmland. Based on the aerial review, it appears that the site was undeveloped until at least 1952, and occupied by numerous wetland features. Sometime between 1952 and 1970, the site was drained by ditching, and citrus operations began.

2.5 Environmental Site Assessments

The Phase I/II ESA report (December 2004) prepared by CDM includes the current proposed property configuration. The purpose of the Phase I ESA was to identify any "recognized environmental conditions" (RECs) at the site, which are defined in American Society for Testing and Materials (ASTM) E1527-00 as "the presence or likely presence of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property." Phase I identified 11 REC areas for further investigation. The information provided in this Section was previously submitted to the South Florida Water Management District (SFWMD) as a separate Technical Memorandum entitled *"Documentation of Existing Information, Site Conditions and Site History"* dated August 1, 2005, under Work Order 6, Task 1.

An initial Phase II ESA investigation was conducted in the REC areas in December of 2003. Based on the results of the initial Phase II ESA investigation, additional sampling was required to address constituents of potential concern and to allow application of the District, the U.S. Fish and Wildlife Service (USFWS) and the Florida Department of Environmental Protection (FDEP) protocols for evaluating properties with current and/or historical agricultural activities (with reported significant agrochemical use) that eventually will be inundated or partially inundated, either as components of regional water attenuation reservoirs, STAs, or restored wetlands.

All assessment sampling results were compared to the soil and groundwater cleanup target levels specified in Chapter 62-777 F.A.C. (generally human health standards), SQAGs (ecological risk), and ecological restoration targets established by FWS. Groundwater monitoring wells were installed in the cultivated areas of each property and sampled for the same agrochemical parameters sampled in cultivated area soils to assess potential for leaching from the soil to groundwater. There were no exceedances of groundwater cleanup target levels (Chapter 62-777 F.A.C) in the cultivated area within the C-44 RSTA footprint.

The results of the Phase I/II ESA are summarized in Table 2.1 and the locations of the RECs are shown on Figure 2.13. Additional detailed information can be found in "*Consolidated Citrus LP and Gardinier Florida Citrus, Inc. Properties, Martin County, Florida – Proposed C-44 Reservoir/Stormwater Treatment Area Phase I/II Environmental Site Assessment*" dated December 2004, prepared by CDM.

3.0 HISTORY OF SITE EXPLORATIONS

Beginning in 2005, the site characterization effort for the Project began under the direction of the SFWMD. This effort included review of the previously collected information (Ardaman, 2003 and CDM, 2004), as well as completion of new site explorations, collection and evaluation of ground water monitoring data, and laboratory testing. On-site explorations completed during the 2005 effort included: rotary-wash borings with Standard Penetration Test (SPT) sampling; cone penetrometer test soundings with pore pressure measurements; rotary-auger borings; bulk sample test pits; resistivity surveys to delineate the continuity and composition of shallow soil layers; monitoring wells; laboratory testing; and aquifer testing. Following is a summary of the 2003 and 2004 geotechnical investigations. The reports from these investigations are included as Appendix H and Appendix I, respectively. Figure 3.1 shows the location of the Ardaman and CDM investigations performed at the Project site.

1) The Ardaman subsurface investigation was conducted in Fall of 2003 and consisted of the following:

   - 41 SPTs conducted on mud rotary borings –
     - 8 test borings were drilled to a depth of 100 feet below ground surface;
     - 33 test borings were drilled to a depth of 45 feet below ground surface.

   - 68 exploratory solid stem auger borings – Borings drilled to a depth of 10 feet below ground surface for continuous sampling of the soil strata close to the ground surface.

   - 16 monitoring wells installed in clusters of 3 to 4 wells – Wells were installed with 5 foot screens with the bottom of screened interval depth ranging from 7.8 to 80 to feet below ground surface.

2) The CDM supplemental subsurface investigation was conducted from January through April of 2004 to identify the thickness of the surficial aquifer (i.e. depth to the Hawthorn Confining Zone), to further develop the hydraulic conductivity parameters of the subsurface strata and to investigate potential borrow materials. The CDM supplemental subsurface investigation consisted of the following:

   - 4 SPT borings by mud-rotary method
     - SPT samples collected continuously from ground surface to 10 feet, and on 5 foot intervals from 10 feet to the final depth of boring
     - Depths ranged from 135 to 150 feet below ground surface.
     - 4 undisturbed Shelby Tube samples collected in the clayey san layer at 7 to 11 feet below ground surface.

   - 3 aquifer performance test wells – 4 inch diameter wells constructed with 100 foot screens, and the bottom of the screened interval depth ranged from 130 to 136 feet below ground surface. The aquifer performance tests were conducted by pumping each fully penetrating aquifer performance test for approximately 24 hours and measuring the drawdown level in the companion 2 inch diameter monitoring well.

   - 11 monitoring wells of 2 inch diameter installed by mud-rotary
     - 3 monitoring wells constructed using a 100 foot screen with the bottom of the screen interval depth ranging from 135 to 137.5 feet below ground surface

   - 23 test pits ranging in depth from 10 to 16 feet below ground surface

- o 2 grab soil samples collected from each strata layer and analyzed for gradation, specific gravity, Atterberg Limits, moisture content, organic content, hydraulic conductivity, consolidated-undrained triaxial compressive strength (on remolded samples), and Unified Soil Classification System (USCS) classification

- Undisturbed soil samples - Testing of split barrel and undisturbed soil samples
  - o gradation, unit weight, specific gravity, Atterberg limits, moisture content, organic content, and soil classification by the (USCS),
  - o hydraulic conductivity,
  - o consolidated – undrained triaxial compressive strength (of remolded samples).

The information obtained during the 2005 phase of the Project was documented in the *Final Geotechnical and Geologic Site Characterization Report*, dated March 2006 (HDR 2006, referred to herein as either the Site Characterization Report or Site Characterization). The purpose of the Site Characterization Report was to evaluate the existing site and subsurface conditions to delineate the availability and distribution of soils for design and construction considerations, and to determine the geotechnical properties of these materials for engineering analyses. The report also focused on the lithologic engineering properties and hydrogeologic regime at the site to fully evaluate the design, construction and operational considerations for SFWMD.

Subsequent to the completion of the Site Characterization Report, additional site investigations and geotechnical laboratory testing were conducted in late 2006 and early 2007; to collect information related to modified Project features and to further investigate subsurface conditions at target locations. This series of explorations, referred to in this GDR as “post site characterization” included rotary-wash and auger borings, and laboratory tests. A formal report for this investigation was not issued but the data was presented in *TM 6 and 7 – Reservoir Vicinity Updated Geotechnical Evaluation* (HDR, 2012).

The construction and the results of one year of operations of the test cells are summarized in the *Final Test Cell Analytical Report for Construction and Operations* (HDR, July 2007). This information includes reservoir seepage rates, soil-cement lab and field production testing results, and evaluation of constructability issues and lessons learned. Additional geotechnical information came from the Test Cell Program construction and operation. In order to provide a large scale field test of the construction and operation of the Project, a test cell program was designed and constructed on a 475 acre portion of the reservoir at the location shown on Figure 3.2. The test cells were constructed between February and June of 2006 and operated through June 2007. The purpose of the Test Cell Program was to evaluate various aspects of the design, construction and operation of the Project, including:

- Availability, distribution, and suitability of on-site soil materials for various project components;
- Dewatering;
- Excavation methods and stability;
- Verification of the site characterization;
- Grading of the STAs; and
- Production/placement of soil-cement.

Test Cell Program operation also provided the opportunity to collect and evaluate piezometer (monitoring well) data to verify seepage models and confirm estimates of reservoir seepage. Information related to the Test Cell Program is discussed further in Section 8.0.

The most recent geotechnical information came from an investigation conducted in 2012 by AMEC. Four (4) additional borings were drilled and twenty-five (25) additional test pits were excavated. The data was used to further evaluate settlement concerns associated with the deeper foundation clay layer at the northern section of the embankment alignment and also to evaluate the suitability of target foundation soils and water sources for use in the soil-cement. The AMEC investigations are summarized in the reports *Final Report of Geotechnical Exploration,* Volumes I and II, dated December 2012 and January 2013, respectively.

This GDR presents results of all the previously collected exploration information, lab data, and field testing results from the Project site collected since 2005.

Table 3.1 includes a summary of the various types of explorations conducted at the site for each of the studies. The locations of the explorations conducted in the reservoir vicinity are shown on Figure 3.2. The locations of the explorations conducted in the Project site are shown on Figure 3.3. The locations of monitoring wells at the site are shown in Figure 3.4

4.0 FIELD INVESTIGATIONS

4.1 Introduction

This Section describes the exploration methods used to investigate the subsurface conditions at the Project site. Boring locations referenced throughout this Section are presented in Figures 3.1 through 3.3; the associated boring logs and lab results are included in Appendix A and Appendix B, respectively.

The contractor should read the boring logs with great care. Some of the boring logs show materials classified as sand or gravel but have in the description "sandstone pieces" or "sandstone" or "limestone" noted. However, the sand sized or gravel sized sandstone or limestone pieces recorded on the logs actually represent a coherent sandstone or limestone layer which was broken into pieces through the SPT procedure.

4.2 Field Exploration Methods

4.2.1 Sampling Methods

Field exploration programs were developed and performed by HDR and AMEC to supplement and verify previous investigations performed at the Project site. The field exploration programs were conducted between 2005 and 2012. HDR field activities were coordinated and observed by the HDR's field engineer, with support from geologists and engineers from Williams Earth Sciences, Inc. (WES) or Ardaman. Tables 4.1 through 4.4 list all of the explorations and their locations. The locations of field explorations are shown on Figures 3.2 and 3.3.

The following soil sampling methods were used in conjunction with the exploratory borings:

Boring Type	Sampling Method
Rotary-Wash Borings (CB)	SPT Thin-walled tube sampling
Rotary-Auger (AB) and Test Pits (TP)	Disturbed grab sampling

4.2.2 Rotary-Wash Borings with SPT

HDR Investigation

The rotary-wash soil borings (CBs) with SPT, along with thin-walled tube (Shelby tube) samples were used primarily to evaluate the soil material beneath the proposed reservoir embankment and throughout the Project site. The boring program consisted of a total of 219 CBs. The soil samples from the CBs were logged in the field and then the soil samples were examined by a geologist in the laboratory after completion of the laboratory testing program in order to verify and refine the field classifications. The locations of the CBs are shown on Figures 3.2 and 3.3. Copies of the boring logs are included in Appendix A-1.

Borings were conducted by WES and Ardaman. The borings were drilled using truck-mounted Central Mine Equipment 45 or 55 drill rigs. All drill rigs were equipped with a 140 pound manual SPT hammer. Both automatic and rope-cathead systems were used.

The borings were advanced to depth using mud-rotary drilling to form a 3 inch-diameter borehole. Split barrel samples with SPT were collected continuously from the ground surface to a depth of 10 feet and at 2.5 foot intervals thereafter until the final depth of the boring. The SPT procedure conformed to the methods described in ASTM D1568.

Two borings were performed at the site specifically to evaluate liquefaction potential following the District's guidelines on Geotechnical Seismic Evaluation of CERP Dam Foundations (DCM-6). The drill rig SPT sampling equipment was instrumented to measure transferred energy in conjunction with the performance of these borings. The results of the measurements testing can be found in Appendix A-1.

SPT split barrel sampling was accomplished with a 2.0 inch (outside diameter), 1-3/8 inch (inside diameter) standard split-barrel sampler and "N" size drilling rod. The sampler was typically driven 24 inches into the soils with a 140 pound hammer freely falling 30 inches. The number of blows required to drive the sampler one foot after seating it six inches in the soil provides the SPT resistance or N-value unless 50 blows or greater occurred for a 6 inch interval; this was considered "refusal". The sampler was driven an additional 6 inches, for a total of 24 inches, to obtain additional soil sample if refusal did not occur.

The SPT sampling was performed in general accordance with ASTM D1586. A representative portion of each soil sample recovered in the split barrel was placed in a labeled, wide-mouth, airtight clean plastic jar with a Teflon-faced screw top.

The borings were drilled with bentonite drilling mud and/or casing to support the borehole. After the planned depth interval was reached at each CB location, the open borehole was tremie grouted from the bottom up to the ground surface with a Portland cement mixture consisting of approximately one 94 pound bag of Portland cement and 3 pounds of bentonite per 6 gallons of water.

AMEC Investigation

In 2012, four additional CBs were drilled along the northern reservoir embankment location. The SPT borings were advanced by mud rotary drilling techniques using a combination of fish tail drag bits and tri-cone roller bits utilizing a bentonite drilling mud mixture as a borehole stabilizer and drilling aid. The drilling services incorporated traditional continuous sampling methods using standard penetration testing throughout the entire length of the borings. Four (4) inch diameter rock coring was performed for two consecutive 2 foot core runs (core depths ranged from approximately 14.25 feet to 18.25 feet) within core boring CB-472. The other field services were performed in general accordance with the Project contract. An All Terrain Vehicle-mounted drill rig was used to access all boring locations due to the low bearing and relatively loose surface soil conditions.

At the direction of the USACE representative, companion borings were performed at boring locations CB-473 and CB-474. The purpose of these companion borings was to obtain intact thin-wall samples, in accordance with ASTM D1587, of clays encountered within the SPT borings. Intact thin-wall samples were not collected at the request of the USACE's on-site representative for borings CB-471 and CB-472 due to the lack of cohesive material or due to an abundance of shell content within these boring profiles.

The boring locations were selected by USACE. AMEC was provided with State Plane Coordinates for each field test location. State Plane Coordinates were converted into Latitude/Longitude coordinates for use with hand-held Global Positioning System (GPS) device. The borings were located in the field by AMEC's survey personnel. The SPT borings were drilled by drilling subcontractor AMDRILL, Inc.

The approximate boring locations are shown on Figures 3.2 and 3.3. These locations were subsequently surveyed by AMEC's Orlando-based survey crew. Ground surface elevations in North American Vertical Datum (NAVD) 1988 and State Plane FL East NAD 1983/2007 northing and easting coordinates were also determined for each boring location by the Orlando office, and a survey report was provided, as presented in Appendix A-2. The coordinates are also presented on each drilling log in Appendix A-2 and in Table 4.1.

The drilling logs present the penetration resistances and the soil and rock descriptions for each SPT boring. The stratification lines and depth designations on the boring records represent the approximate boundaries between soil and rock types. In some instances, the transition between soil and rock types may be gradual.

<u>SPT Borings</u> – The SPT borings were performed in general accordance with ASTM D1586, "Penetration Test and Split-Barrel Sampling of Soils." The borings were advanced using a rotary drilling process and bentonite drilling fluid was circulated in the boreholes beyond the caprock to stabilize the sides and flush the cuttings. At the specified intervals (every 18 inches or at a 5 foot center to center spacing), the drilling tools were removed and soil and rock samples were obtained with a standard 1.4 inch inside diameter (ID), 2.0-inch outside diameter (OD), split-tube, unlined sampler. The sampler was first seated 6 inches and then driven an additional foot with blows of a 140 pound automatically tripped hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance." The length of each sample recovered in the split-tube sampler was measured for the determination of the percent recovery.

The samples were examined and classified by a professional geologist in the field during the drilling operations. Representative portions of the soil and rock samples, obtained from the sampler, were placed in plastic jars and transported to our laboratory.

Thin-Wall Tube Sampling – The relatively intact samples were obtained by pushing a section of 5 inch OD, 16 gauge steel tubing (Shelby tube) into the soil at the desired sampling level. The sampling procedure is described by ASTM D1587. The tube, together with the encased soil, was carefully brought up to the surface and the sleeve removed. Recovery of loose/soft soil was sometimes not achievable in the field. When this occurred, the tubes were not sealed.

<u>Rock Coring</u> – At varying elevations within the limestone, the standard drilling tools were removed from the borehole and a rock barrel was inserted. The limestone was cored using a diamond-studded bit fastened to the end of a hollow, 4 inch by 5½ inch double-tube core barrel. The coring procedure employed was similar to that described by ASTM D2113. The core barrel is rotated at high speeds and is capable of cutting the hardest rock. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface and the samples removed and placed in wooden boxes.

The rock was identified and the recovery determined by a professional geologist in the field. The recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The percent recovery is related to the rock soundness and continuity. In addition, the Rock Quality Designation (RQD) was determined. The RQD is defined as the sum of the lengths of recovered pieces equal to or larger than 4 inches divided by the length of rock cored, expressed as a percentage. The rock description, percent recovery, and RQD are shown on the appropriate drilling log in Appendix A-2. It should be noted that where hydraulic pressure for rock cores equates to zero, the pressure was not recorded.

4.2.3 Auger Borings

Rotary-auger borings (ABs) were performed at selected locations throughout the site to a depth of approximately 10 feet below ground surface to obtain bulk soil samples.

The borings were advanced to depth using 4 inch diameter continuous flight helical solid stem augers by rotating the auger into the ground at a relatively uniform rate of penetration at 3 foot intervals. Samples were recovered from the boring by withdrawing the auger out of the ground without rotating it and collecting the soil on the auger. This testing procedure closely conforms to the methods recommended in ASTM D1452.

This process was utilized to obtain representative soil samples for each approximate 3 foot interval, thus reducing the potential for soil mixing between intervals to occur. The soils encountered were identified in the field from cuttings brought to the surface on the auger flights. The entire auger was then placed back in the open hole and the process was repeated until the desired depth was reached. A soil sample for each 3 foot interval was placed in 5 gallon plastic buckets and stored on site prior to transport to the laboratory. Because of the relatively shallow depth of these explorations, the borings were backfilled with surficial soil and tamped with the auger.

A total of 111 auger borings were performed as summarized in Table 4.1. The locations of the ABs are shown on Figures 3.2 and 3.3. Copies of the boring logs are included in Appendix A-1.

4.2.4 Test Pits

Thirty-six test pits were excavated as part of the 2012 Investigation. Eleven were completed as part of the Site Characterization and twenty-five were completed by AMEC in 2012. Logs were not completed for the Site Characterization test pits. Logs for the AMEC test pits are provided in Appendix A-2. A list of the test pits completed is provided in Table 4.3. The locations of the test pits are shown on Figures 3.2 and 3.3.

4.3 Cone Penetrometer Tests

The boring program was supplemented with the use of Cone Penetrometer Tests with pore pressure measurements (CPTU) to provide better definition of the overburden soils beneath the Project site. A series of CPTU soundings were performed within the reservoir interior and along the reservoir alignment by Ardaman and Associates, and consisted of 65 soundings at the locations shown on Figures 3.2 and 3.3, and as summarized in Table 4.2. Logs of the soundings are included in Appendix C.

The CPTU is used to determine the tip resistance and sleeve friction, the components of penetration resistance that are developed during the steady penetration (2 centimeters per second) of the instrument into the soil. The CPTUs for this Project were performed in general accordance with ASTM D3441.

4.3.1 CPTU Testing Equipment and Procedures

The piezocone is a subtraction cone that measures the pore water pressure at the point, the tip resistance, and the sleeve friction 127 times during each meter of penetration (a reading each 3.2 inches of penetration). The penetration rate is 2 centimeters per second. At the end of each 1 meter section of rod, the data logger continues to collect pore pressure decay data. The decay data is read 3 times per second from 0 to 10 seconds, 2 times per second from 10 to 20 seconds, 1 time per second from 20 to 30 seconds, and 1 time every 5 seconds out to 1,000 seconds. Since a minimum of 30 seconds is required to add the next rod and prepare for the next push, at least 30 seconds of decay is obtained on each meter pushed.

The tip and sleeve sensors are designed for a maximum load of 4,000 kilograms (kg). The tip area is about 10.2 square centimeters (cm^2), and the sleeve area is about 150 cm^2. Area correction for the tip stress is calculated and is within 6% of the standard area (10 cm^2). At zero stress, the standard deviation on sensor signal is five microvolts or less. Using five times this standard deviation, the precision for each sensor is approximately as follows:

- Pore water pressure - 0.3 feet water (0.0084 tons/feet^2, tsf)
- Tip - 0.03 tsf
- Sleeve - same as tip because sleeve stress is calculated after subtraction of the tip load

A de-aired, porous, stainless steel element with a 7 micron pore size is used to obtain pore pressure data. Measuring pore pressure at the point of the cone makes for detection of small material changes prior to the soil disturbance produced by the tip and the sleeve.

4.3.2 Data Analysis

Corrected Tip Resistance (q_t)
The corrected tip resistance, q_t, accounts for the unbalanced pore water pressures acting on the cone tip and is equal to the sum of the measured tip resistance, q_c, and the product of the area ratio, A_r, and the measured penetration pore water pressure, u (i.e., $q_t = q_c + A_r, * u$). The area ratio is the ratio of the area of backside of the tip and the face of the tip. A_r, is less than 6% of the piezocone.

Friction Sleeve Resistance (f_s)
The friction sleeve resistance, f_s measured by the piezocone, is the difference between the resistance measured at the sleeve sensor and the corrected tip resistance. Higher values of f_s, generally indicate the presence of clayey soils while lower values are indicative of silty to sandy material.

Friction Ratio (R_f)
The friction ratio, R_f, is the ratio of the friction sleeve resistance to the corrected tip resistance ($R_f = f/q_t, * 100\%$). The friction ratio is an index ratio commonly used to provide a preliminary estimate of the subsurface stratigraphy. Higher friction ratios are generally indicative of clayey soil types, while lower values generally indicate the presence of silty and sandy soils.

Pore Pressure (u)
Pore pressure is measured using a porous element connected to a pressure transducer located at the apex of the 60° piezocone.

A-factor (Du/q_t)
The A-factor is the ratio of excess pore pressure to the corrected tip resistance, where the excess pore water pressure is equal to the measured penetration pore water pressure, **u,** less the equilibrium pore water pressure, u_o. The A-factor is also an index value used to provide a preliminary assessment of the subsurface stratigraphy. Higher A-factors are generally indicative of normally consolidated clays, while the presence of over-consolidated clay, silt, and sand layers are generally indicated by progressively lower A-factors.

Soil Type Number
The soil type number is an index value developed by Robertson, et. al. (1986) used to determine the subsurface stratigraphy. A chart based on the tip resistance and friction ratio, divides soils into 12 regions ranging from sensitive fine grained soils (Region 1; low q_t, low R_f) to cemented sands and clayey sands (Region 12; high q_t, medium R_f).

Equivalent SPT N-Value
An equivalent SPT N-value relationship was also developed by Robertson, et. al. (1986) and is used in conjunction with the soil type number. Soil type numbers are assigned experimentally from determined ratios of the tip resistance and N-values (q/N) ranging from one (organic matter or clay) to six (gravelly sand to sand). These ratios are divided by the uncorrected tip resistance to determine the equivalent SPT N-value.

Hydraulic Conductivity
CPTU pore pressure dissipation tests were performed to estimate the hydraulic conductivity values of the soils. To obtain an estimate of the coefficient of horizontal consolidation (c_h), an analytical solution developed by Levadoux and Baligh (1983) is used. Levadoux and Baligh present a graph of normalized pore pressure and the time factor, T, for the 60° piezocone tip where:

$$T = c_h * t/R^2$$

where:

T = time factor (non-dimensional)
c_h = coefficient of horizontal consolidation (cm/second)
t = time (seconds)
R = cone penetrometer radius (cm)

Knowing the radius of the 60° piezocone tip is approximately 1.8 cm, c_h can be back calculated. Permeability was estimated using an empirical relationship developed by Schmertmann (Schmertmann, J.H. 1978), who presents a graph of dissipation time vs. permeability for 50% and 90% dissipation. The pore pressure dissipation test data is provided in Appendix C. Permeability (hydraulic conductivity) values obtained from the dissipation tests are presented in Table 4.6. Hydraulic conductivity was also calculated utilizing methods described in Robertson, et al. (1986).

4.4 Geophysical Methods

4.4.1 Surface Geophysics

A Capacitively Coupled Resistivity (CCR) analysis was performed onsite in March and July-August of 2005 by Subsurface Evaluations, Inc (SEI). CCR is a geophysical method of obtaining a virtual cross-section of subsurface soil layers, and consists of two separate steps: 1) measuring the apparent (weighted average) electrical resistivity of the ground along a continuous survey line using a dipole-dipole array, and 2) computerized processing of apparent resistivity data to obtain a virtual cross-section of estimated true resistivity values.

In the field, an electric current is capacitively coupled to the earth by towing a cable array consisting of a dipole transmitter (TX) and a series of dipole receivers (RCV) spaced at successively greater distances from the transmitter along the cable array. The longer the dipole and spacing configuration, the greater the depth of the survey as the depth from which data is collected is equal to about 15 to 20% of the total array length. The ungrounded transmitter induces an alternating current in the ground at a particular frequency. The receivers measure the resulting voltage potential as the array is towed along the survey line. Data is collected continuously at a rate of 2 readings per second at four different depths corresponding to TX-RCV separations of 5, 10, 15, and 20 meters as the array is towed along the ground at a constant rate of speed. An apparent resistivity profile is produced and then processed by inverse modeling software to yield a true resistivity profile along the line (SEI, 2005).

Resistivity measurements were made along 267 transects covering a linear distance of approximately 233,165 feet. The location of the transects were along and adjacent to the proposed embankment centerline. The transects were kept to maximum lengths of approximately 100 feet. Where canals were encountered, transects were stopped and new transects began on the other side. Transects on the north and south embankments were run where continuous linear paths were available. The location of the transects, and the output maps and profiles as generated by SEI are included in Appendix D.

4.4.2 Downhole Geophysics

Downhole geophysical logs were run by Technos Inc. in 3 deep geologic borings on site, GL-272, GL-274, and GL-275, the locations for which are illustrated in Appendix D. Logs consisted of natural gamma, spontaneous potential (SP), single point resistance, resistivity, and electromagnetic induction. A 2 inch diameter polyvinyl chloride (PVC) well screen was placed in each of the boreholes to prevent caving while logging, and were grouted to land surface following completion of the logging. The well screens were flushed with clean water prior to logging to remove drilling mud. Copies of the logs are included in Appendix D.

4.5 Investigative Monitoring Wells

Monitoring wells at the Project site were installed between 2005 and 2008. In 2005, Ardaman installed 9 wells during the Site Characterization phase and each consisted of a single surficial aquifer monitoring wells and well nests with a variety of depths. These wells are identified as MW-272, MW-273, MW-274, MW-275, MW-289, MW-290, MW-338, MW-343, and MW-344. These monitoring wells were used to evaluate performance of Project features as part of the Test Cell Program. Data from the year-long operations of the Test Cell Program is presented in Section 8.0 of this report. The construction details for one additional monitoring well, MW-406, are not available. Monitoring well logs for the 2005 wells are provided in Appendix A-1.

There are also two former irrigation wells (Well A1 and Well A2) located along the Bar-B-Ranch access road which were plugged and abandoned in 2012.

Monitoring wells installed within the surficial aquifer include shallow (water table), shallow intermediate, deep intermediate and deep portions of the surficial aquifer. All of the wells are constructed of 2 inch diameter schedule 40 PVC pipe and well screen. SFWMD also has a Regional Floridan Aquifer Well (MF-52), which was constructed in 2001. Construction details for the wells are provided in Table 4.4. Several wells have been rehabilitated or plugged and abandoned (CDM Smith, 2012). The Well Rehabilitation Report is provided in Appendix J. Table 4.5 gives a list of the monitoring wells, their well nomenclature in the SFWMD Database DBHydro (which is further discussed in Section 6.3.1.2), the general location of the wells, and the current status of the wells. Monitoring Well locations are shown in previously referenced Figure 3.4.

4.5.1 Shallow Surficial Aquifer Monitoring Wells

Nine single surficial aquifer monitoring wells were installed around the site perimeter (target depth approximately 15 to 20 feet) as shown on Figures 3.2 and 3.3. Water level data collection methods included water level readings utilizing a pressure transducer (Insitu Level Troll™ 500).

The Level Troll™ 500 contains a level and temperature sensor, a data logger, and internal power in a 18.3 millimeter titanium housing. The transducer collects long-term data on a user-specified interval from 1 minute to 49 days. A discussion of the water level data is included in Section 6.0 of this report.

4.5.2 Well Nests

In addition to the 9 single surficial aquifer wells discussed above, 4 different types of well nests were installed at nine locations for a total of thirty-four wells as shown on Figures 3.2 and 3.3. Two of the well nests consist of four wells, including a shallow surficial (target depth approximately 15 to 20 feet), shallow intermediate (target depth approximately 40 to 60 feet), deep intermediate (target depth approximately 80 to 120 feet) and deep surficial monitoring wells (target depth approximately 140 to 150 feet). The target depths are the same for all well nests and these depths were confirmed in the field by a hydrogeologist prior to installation of the wells. Three of the nests consist of three wells, including a shallow surficial, shallow intermediate and deep intermediate well. Four nests consist of two wells, including a shallow surficial and a shallow intermediate. All of the wells are within the surficial aquifer, which extends to a depth of approximately 150 feet below ground surface at the site. No Floridan Aquifer wells were proposed because of the significant depth. The well nests are equipped with pressure transducers (Insitu Level Troll™ 500). A discussion of the water level data is included in Section 6.0 of this report.

4.6 USGS Monitoring Wells

The USGS website was reviewed (http://waterdata.usgs.gov) to determine if USGS monitoring wells are present within approximately 5 miles of the Project property boundary. The USGS website provided a listing of 64 monitoring wells from both the surficial and the Floridan aquifer systems. Twenty of the wells were identified as being screened in the surficial aquifer and ranged in depth from 7.3 to 160 feet below ground surface. Four of the wells were identified as being screened in the Floridan aquifer and ranged in depth from 880 to 1250 feet below ground surface. Other wells listed were not identified as being screened in the surficial or Floridan aquifer. Figure 4.1 shows the USGS wells in the vicinity of the Project site.

4.7 Aquifer Testing

The previous subsurface investigation by Ardaman (2003) and CDM (2004) included field hydraulic conductivity tests in well clusters to measure the in-situ hydraulic conductivity (K_h) of various subsurface layers, and aquifer performance testing to determine the hydraulic properties of the surficial aquifer. The hydraulic testing consisted of variable head hydraulic conductivity tests and slug tests in discrete soil layers.

Falling head hydraulic conductivity tests were performed in the clayey sand layer at depths ranging from about 5 to 7 feet below ground surface. These tests were conducted using a 10 foot length of casing installed 2 feet into the clayey sand layer next to wells W-104, W-105, W-106 and W-107 (shown on Figure 3.4). For the test, the casing was filled with water and the time and depth to the water surface was recorded as the water dissipated. The test was analyzed in accordance with the Department of the Navy, Naval Facilities Engineering Command NAVFAC 7.1, and the results are summarized in Table 4.7.

Borehole conductivity tests were performed by Ardaman (2003) that consisted of advancing an SPT boring to the desired depth interval, installing a temporary casing, drilling 5 feet below the bottom of casing, and performing an in-situ rising head hydraulic conductivity test in the open borehole. This test was completed by first evacuating standing water from the casing and then monitoring the rise in the water level over time. The boreholes used for these tests were W-1, W-2, W-3, W-4 and W-5 and are shown on Figure 3.4. The results of the borehole hydraulic conductivity tests are summarized in Table 4.8.

Slug tests were conducted in monitoring wells W-104A, W-104B, W-105A, W-105B, W-106A, W-106B, W-107A and W-107B (shown on Figure 3.4) by Ardaman (2003). The wells ranged in depth from 23 to 80 feet below ground surface. Each well was tested twice by performing a slug-in test and a slug-out test on each well. The tests were analyzed utilizing the Hvorslev method. Results of the slug testing are included in Table 4.9.

Three aquifer performance tests (APTs) were performed by CDM, and consisted of pumping a fully penetrating 4 inch diameter well (full penetration of surfical aquifer) for approximately 24 hours and measuring the drawdown in a companion 2-inch observation well. One of the three tests could not be analyzed due to insufficient drawdown in the observation well. The results of the APTs are summarized in Table 4.10. The APT wells used were APT-101, APT-102 and APT -103, and the observation wells used were W-101, W-102 and W-103, respectively. The locations of the wells are shown on Figure 3.4.

Additional site-specific horizontal hydraulic conductivity values for the surficial aquifer were obtained from slug tests performed at the Project site at all new monitoring wells to supplement the existing data. Results of these slug tests are presented in Table 4.11.

5.0 LABORATORY TESTING

5.1 Introduction

An extensive laboratory testing program was completed during the 2005–2007 site characterization effort. The laboratory testing was conducted by Ardaman and included particle size distribution including percent fines (fraction of materials that are smaller than the No. 200 sieve); specific gravity; Atterberg limits; standard and modified proctor compaction tests; permeability for both remolded and undisturbed samples; corrosivity; carbonate content; soil-cement durability and compressive strength; and interface direct shear for the geomembrane. Additionally, isotropically consolidated-undrained triaxial compression tests with pore pressure measurements were performed. Additional laboratory testing was performed in conjunction with the explorations performed after the Site Characterization Report was issued in 2006. This testing included particle size distribution and fines content; modified and standard proctor tests on bulk samples for soil-cement, and Atterberg limits testing for the clay at depth on the northern portion of the reservoir. The laboratory data for the Site Characterization and post site characterization are included in Appendix B-1.

As part of the 2012 AMEC investigation, additional laboratory classification tests were performed on representative soil and rock samples obtained from the SPT borings and test pits. The laboratory classification testing performed for this Project included sieve analysis; hydrometer analysis; visual percent shell classifications; geotechnical laboratory carbonate content; Atterberg limits; moisture content; specific gravity; and consolidation tests on undisturbed samples. The laboratory data for the AMEC investigation is included in Appendix B-2.

Soil-cement mix design, durability and compressive strength testing were completed as part of the Test Cell Program. The testing on bulk samples for soil-cement included carbonate content, fines content and calcium absorption. The Test Cell Program is discussed further in Section 8.0.

All tests were performed in accordance with the applicable ASTM test methods. Sample types obtained included both undisturbed using Shelby tubes, and disturbed samples from AB, CB and TP samples. Undisturbed samples were used for grain size, permeability, triaxial and Atterberg limit testing. Disturbed samples were remolded and used for proctor, permeability, organic and carbonate content, triaxial, direct shear, specific gravity, density, and soil-cement testing.

It should be noted that some of the samples used for laboratory tests as part of the Site Characterization were mislabeled. Many of the samples are labeled as TP samples and should have been AB samples. There were only eleven test pits excavated as part of the Site Characterization and they range from TP-354 to TP-364 as provided on Table 4.3. Any other samples labeled as TP that are not within this range were collected from AB borings. The results have been corrected to reflect the proper boring designation.

5.2 Testing Methods

5.2.1 Particle Size Analysis

Grain size distribution tests were performed in accordance with ASTM D422 to determine the particle sizes and distribution of each sample tested. Sieve analyses and hydrometer analyses were performed on a total of 55 Shelby tube and bulk samples of subsurface soils at various depths as part of HDR's investigation. The results of percent fines tests performed and grain size distribution curves for HDR's investigation are provided in Appendix B-1. Fifty-six (56) sieve analyses and 32 hydrometer analyses were performed as part of AMEC's investigation and are provided in Appendix B-2.

5.2.2 Water Content

The water content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test was conducted in general accordance with ASTM D2216. Water content test results are provided in Appendix B-1 and B-2.

5.2.3 Atterberg Limits

The Plasticity Index (PI) of the soil is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The LL is the moisture content at which the soil will flow as a heavy viscous fluid. The PI is the moisture content at which the soil begins to crumble when rolled into a 1/8 inch diameter thread. These tests were performed in accordance with ASTM D4318. The results of all Atterberg limit tests are provided in Appendix B-1 for the HDR investigation and in the summary tables in Appendix B-2 for the AMEC Investigation.

5.2.4 Density Tests

5.2.4.1 Specific Gravity Tests

The specific gravity of soil solids is the ratio of the weight in air of a given volume of soil particles to the weight in air of an equal volume of water. This test was conducted in accordance with ASTM D854. The HDR investigation specific gravity test results are provided in Appendix B-1, and are summarized in Table 5.1. The AMEC investigation specific gravity test results are provided in the summary tables in Appendix B-2.

5.2.4.2 Moisture-Density Relationship (Compaction) Tests

Standard Proctor and Modified Proctor compaction tests were performed on bulk samples to determine the moisture density relationships of the borrow materials to be used for the embankment construction. The Standard and Modified Proctor tests were performed in accordance with ASTM D698 and D1557, respectively. Specific parameters obtained in the test include the maximum dry density and optimum moisture content. Results of Proctor tests are presented in Appendix B-1, and are summarized in Table 5.2 and 5.3.

5.2.4.3 In-Situ Dry Density Tests

The in-situ dry density, moisture content, and fines content of various soil samples obtained by WES along the proposed embankment alignment and inside of the reservoir interior were determined from relatively undisturbed Shelby tube samples. The dry density is plotted on an arithmetic scale versus moisture content. The data are presented in Appendix B-1. An additional 70 in-situ density tests were performed by Ardaman in February 2006. Test results are summarized in Table 5.2. The density tests were completed at 1 foot and 3 feet below the existing ground surface in general accordance with ASTM Standard D2937.

5.2.4.4 One-Point Proctor Tests

In addition to the in-situ, modified and standard proctor tests, one-point proctor tests were also performed on 39 of the previously discussed samples by Ardaman. These results are also summarized in Table 5.2.

5.2.5 Hydraulic Conductivity Tests

The hydraulic conductivity, *K*, of selected soil samples was obtained in the laboratory using a flexible wall permeameter in accordance with ASTM D5084. The test samples were selected from portions of silty and clayey soil samples obtained from the Shelby tube samples, and remolded samples obtained from the auger borings. The test samples were encased in rubber membranes, placed in a chamber, consolidated by a confining pressure varying from about 5 to 55 pounds per square inch (psi), and then saturated. All samples were back pressure saturated prior to testing to achieve a B-coefficient of at least 0.95. Both the constant head and falling head test methods were utilized in accordance with ASTM D5084 test method A and test method B, respectively.

During hydraulic conductivity testing, a head differential was maintained on the sample in order to cause the water to flow through the test sample. After performing the test for a sufficient time period, the hydraulic conductivity was calculated as follows:

$$K = QL/Ath$$

where:

K = hydraulic conductivity
Q = quantity of water discharged
L = test sample length
A = cross-sectional area of specimen
t = total time of discharge
h = water head differential between sample ends

The results of the hydraulic conductivity tests are presented in Appendix B-1 for tests performed on undisturbed and remolded samples. The results are summarized in Table 5.4 for remolded samples and Table 5.5 for undisturbed samples.

5.2.6 Corrosivity Series Tests

Corrosivity series testing was performed in accordance with the Florida Department of Transportation (FDOT) standards and included the following tests: 1) pH in soil and water according to FM 5-550/E-70, 2) resistivity in soil and water according to FM 5-551, 3) chloride in soil and water according to FM 5-552, and 4) sulphate in soil and water according to FM 5-553. The corrosivity series testing results are provided in Appendix B-1, and are summarized in Table 5.6.

5.2.7 Carbonate Testing

Carbonate and organic content tests were determined for the surficial sand samples according to ASTM D4373 and D2974, respectively.

As part of HDR's investigation, carbonate content tests were run on materials obtained from bulk samples from the TPs at a depth of approximately 8 to 10 feet below ground surface and from bulk samples from the AB's. Results from the AB testing are included in Table 5.6. Results from the TP testing are included in Table 5.7.

Additional carbonate content testing was performed as part of AMEC's investigation. This test is conducted in accordance with a modified "insoluble residue" analysis using the 1941 method described by Twenhofel Tyler. The sample is oven dried to a constant weight and then washed over a No. 200 sieve. After drying to a constant weight, the sand-sized or greater portion of the sample is sieved and visual shell noted. The sample is then placed in a glass beaker and a diluted hydrochloric acid solution is slowly added. The sample is stirred and more acid solution added until there is no reaction, indicating that all carbonate matter has been digested. After digestion, the sample is washed over a #200 sieve to remove all residual acid, and dried to a constant weight. The percent loss (percent carbonate) is determined by subtracting the post acid weight from the dried, washed weight (after sieving), divided by the dried, washed weight. The results of the carbonate content tests are provided on the gradation curves in Appendix B-2.

5.2.8 Triaxial Shear Strength Tests

Shear strengths of the undisturbed and remolded soil samples were determined using triaxial compression tests on samples taken from TP-90, TP-91, TP-106, TP-108, TP112, TP-113, TP-118, TP-119, TP-124, TP-126, TP-129, TP-130, TP-133, TP-135, TP-138, CB-198, CB-201, CB-253, CB-256, CB-276, CB-281, and CB-283. Sixteen isotropically consolidated-undrained triaxial compression tests with pore pressure measurements were performed in accordance with ASTM D4767. The samples were remolded to 95% of their respective maximum dry densities and +0 to +2% of their optimum moisture contents, as determined by the Standard or Modified Proctor compaction test. Eight triaxial tests were also performed on relatively undisturbed Shelby tube soil samples obtained along the proposed reservoir embankment alignment.

An effective consolidation pressure of 0.72 kips per square foot (ksf) (0.35 kg/cm^2) was selected for the triaxial tests based on the expected range of in-situ pressures in the field. Where back pressure was required to achieve complete saturation to measure pore pressures, a value of approximately 24.5 ksf (12 kg/cm^2) was used prior to shear. Pore pressures were measured with a rigid, flush-mounted diaphragm pressure transducer. The signal from the pressure transducer was measured with a digital voltmeter. The samples were sheared, undrained at a constant rate of axial deformation of 0.0004 inches/minute (corresponding to a strain rate of about 1% per hour), and the load, axial deformation, shear induced excess pore pressure, and cell pressure were monitored with time. Upon completion of testing, particle-size analyses were performed on each specimen.

The triaxial test results from the remolded and undisturbed samples are presented in Appendix B-1, and summarized in Tables 5.8 and 5.9, respectively.

5.2.9 Consolidation Tests

Two consolidation tests were performed on undisturbed samples from CB-473 at Elevation 48-49.92 and from CB-474 at El. 56.5-57.6 as part of AMEC's investigation. A section of the undisturbed sample was extruded from sampling tubes for consolidation testing. The section was trimmed into a disc 2.8 inches in diameter and ¾ inch thick. The disc was confined in a stainless steel ring and sandwiched between porous plates. The sample was then subjected to incrementally increasing vertical loads of 0.063, 0.125, 0.25, 0.5, 1.0, 0.5, 0.25, and 0.125 tons per square foot (tsf), and the resulting deformations were measured with a micrometer dial gauge. The test results are presented in the form of a pressure-versus-void ratio curve, pressure-versus-percent strain curve, along with dial reading versus time curves and square root of time. It should be noted that all time rate values are based on end of primary (EOP) consolidation. This test was conducted in general accordance with ASTM D2435. Results for the tests are provided in Appendix B-2.

5.2.10 Visual Percent Shell Tests

The visual percent shell is a weighted average of the estimated percent shell retained on each individual sieve for a single sample and rounded to the nearest 5% for tests conducted in conjunction with a sieve analysis. For stand-alone estimates, the visual percent shell is a visual estimate of the shell content present in the sample, rounded to the nearest 5%. Visual percent shell test results are provided in the summary tables in Appendix B-2.

5.2.11 Geotextile Interface Resistance Tests

Three direct shear tests were performed to measure the interface resistance between a sample of sand and non-woven geotextile. The test results are provided in Appendix B-1.

6.0 GEOLOGIC AND HYDROGEOLOGIC SITE CONDITIONS

6.1 Introduction

HDR has updated the geologic site characterization based on all site exploration data. This Section describes the current understanding of the geologic and hydrogeologic conditions at the site.

6.2 Site Stratigraphy

Southern Florida, including Martin County and the Project area, is underlain by a thick sequence of unconsolidated to semiconsolidated Coastal Plain sedimentary rocks/sediments that range in age from Jurassic to Holocene. In southern Florida, the maximum thickness penetrated is approximately 18,600 feet. Coastal Plain sediments can be separated into two general facies: 1) predominantly clastic rocks/sediments containing minor amounts of limestone, and 2) a thick, continuous sequence of shallow-water platform rocks. Miocene and younger rocks comprise a clastic facies that, except where it has been removed by erosion, covers the older carbonate rocks (Miller, J.A., 1986).

The distribution of Pleistocene sediments on the Florida platform indicate that sea level did not rise higher than approximately 65 feet above the present level, and the Pleistocene seas did not inundate the entire Florida Platform. Low-lying parts of the platform, including most of southern Florida, were covered by shallow marine waters during transgressions of the sea. Pleistocene sediments in Florida once were included in “terrace formations” deposited in response to widely fluctuating sea levels; these terrace formations are no longer considered proper stratigraphic units. Due to the paucity of distinguishing features other than elevation, the sediments forming the terraces are often referred to as “undifferentiated sediments.” In areas where these sediments are fossiliferous, the fossil assemblages can be used to distinguish stratigraphic units (Scott, T.M., 1997).

The recognized siliclastic to mixed siliclastic-carbonate Pleistocene stratigraphic units in the Project area include the upper part of the Caloosahatchee Formation, and the Fort Thompson Formation. The Caloosahatchee contains well preserved, diverse fossil assemblages. The Anastasia formation is a multicyclic deposit consisting of a variably sandy coquinoid limestone, with a sand and shell facies farther inland, that formed during several transgressions of the sea (Scott, T.M., 1997) and outcrops in coastal areas of Martin County. The Anastasia is believed to pinch out approximately 20 to 30 miles inland from the coast (Lovejoy, 1998).

Following the late Pleistocene regression, sea level has risen during the Holocene to its present position. Holocene sediments form the present coastline of the state, and represent beach, dune, marsh, lagoon, fluvial environments, or are derived from the weathering of older rocks (Scott, T.M., 1997).

6.2.1 General Stratigraphic Units

The upper 25 feet of sediment is most relevant to the construction of the Project. These sediments range in age from Holocene-Pleistocene to Pliocene, or from present to about 4.2 million years. Holocene soils and undifferentiated Pleistocene sands and clayey sands occur at the top of the section, and are underlain by quartz sand, shell, and a few minor limestones within the late Pleistocene Fort Thompson Formation.

Undifferentiated Pleistocene/Holocene

The predominant Holocene process at the site is soil formation. Rainfall and meteoric water leach the uppermost sediments, resulting in decomposition of organic matter and leaching of soluble minerals. The soils are primarily mineral sands and fine sands, with Gator muck (an organic soil) being the principal exception. A small amount of excavated/redeposited soils (Arents series) is also present. Many of the soils are underlain at varying depths by finer textured materials (loamy fine sands and clayey loams). Pineda is the principal soil series represented on site (covering nearly 40% of the site), followed by Wabasso, Winder, Floridana, Oldsmar, and Riviera series. Eight other soils –Jupiter, Malabar, Waveland, Placid, Okeelanta, Sanibel, Chobee, and Samsula– have limited occurrence. Poorly drained soils predominate (63% site coverage), followed by somewhat poorly drained (18.7%), very poorly drained (17.7%), and well drained (0.7%). Hydric soils (comprising the very poorly drained and most of the poorly drained series) cover an estimated two-thirds of the site. All of these soils have been developed primarily by weathering of the shallow Pleistocene deposits. Figure 6.1 shows the distribution of various soil types in the Project area. Detailed descriptions of the soil series present on site, including variation by depth, drainage class, permeability, color and appearance description, can be found in the "Technical Resources" section of the Natural Resources Conservation Service (NRCS) website:

(http://www.mo15.nrcs.usda.gov/technical/tuds/tuds-intro.html).

Numerous wetlands were present on the site prior to being developed for farming. Wetlands form in depressions, where organic-rich Holocene sediments are deposited. As a result of the standing water and predominance of emergent vegetation, these features accumulate peat and muck. Data obtained during drilling shows organic-rich sediments are present in some areas of the Project site, although they do not appear to be widespread based on soil sample data.

A summary of generalized geology and hydrogeology of project area is provided in Table 6.1.

6.2.2 Informal Stratigraphic Units

Since the site formations above the Hawthorn Group are largely undifferentiated, a series of informal stratigraphic units were adopted for the Project site investigation. Stratigraphic units A through C were identified on the basis of predominant composition. The following summarizes the general composition of each of the site-specific informal units:

- Informal Unit A is predominantly brown to gray sand and silty sand;
- Informal Unit B is interfingering layers of sand with varying percentages of silt, clay and shell, and also cemented sand layers, limestone layers, and clay layers.
- Informal Unit C is predominantly a mixture of gray fine sand and/or silty sand with variable shell content, with some intervals being mostly shell, and with some cemented fragments and limestone.

The sediments of informal Units A and B extend approximately to a depth of 8 to 18 feet below ground surface. The predominantly shelly sand sediments of informal Unit C extend down to the maximum depth drilled over most of the site (30 to 50 feet below ground surface),. Some interbedded clayey sands, sandy limestones, and cemented sands are present within Unit C.

Three deep borings (CB-272, CB-274, CB-275) drilled at the site indicate that an olive-gray slightly clayey, silty fine sand with phosphate is present at depths of approximately 115 to 125 feet below ground surface, and represents the top of the Hawthorn Group confining layer.

Borings logs are included in Appendix A. A detailed discussion of the informal stratigraphic units is included in the following sub-sections.

6.2.2.1 Shallow Sand, Silty Sand, Clayey Sand (Units A and B)

Informal Stratigraphic Units A and B are predominantly light to dark brown, or tan in color and have a minimum fines content as low as about 7 percent and an average fines content of over 10 percent. They typically classify as sands with silt/clay (SP-SM/SP-SC), to silty and/or clayey sands (SM and/or SC) and may occasionally classify as low to high plasticity clays (CL to CH). The descriptions above are general and may vary in the field.

Unit A is primarily a dark brown to dark gray silty fine sand, with roots and a trace of clay in places. The predominant USCS classification for Unit A is silty sand (SM), and in some cases poorly graded clean to silty sand (SP-SM). Unit B consists predominately of brown to light grayish brown to gray clayey sand (SC) with clay inclusions and some shell, to light gray clay. The predominant USCS classification for Unit B is SC and occasionally CL (low plasticity clay).

6.2.2.2 Sand and Shell (Unit C)

The most critical delineation of subsurface materials remains the interface between the predominantly sandy, silty and clayey soils of Units A and B, and the more shelly sand material of Unit C. At the site, the clayey sand layer (Unit B), where present, is underlain by either silty sand with little to no shell content, or silty sand to poorly graded sand with some shell to mostly shell, or silty sand with cemented fragments. The predominantly shelly sand sediments extend down to the maximum depth drilled over most of the site (30 to 50 feet below ground surface), and are grouped as Informal Unit C. Some inter-bedded clayey sands, sandy limestones, and cemented sands are present within Unit C. The predominant USCS classification for Unit C materials is SM, SP-SM or SP with an average fines content of less than 10 percent.

In addition, a layer of clayey material was encountered in most borings and in CPTs completed in the northern half of the reservoir site. This clay layer occurs approximately 43 to 62 feet below the ground surface, ranges in thickness from 2 to 8 feet and varies from clayey sand to sandy clay to clay.

The CPTUs performed at the Project site indicate the presence of Unit C by an observed increase in the tip resistance. The silty and clayey sand (Unit A and B) has typical tip resistance values of less than 100 tons per square foot (tsf), while the shelly sand (Unit C) has typical tip resistances of approximately 100 to 500 tsf. The CPTUs show the increase in tip resistance at depths ranging from approximately 5 to 29 feet below ground surface, with an average depth of 13 feet below ground surface, which corresponds to the top of the shelly sand material as indicated by soil borings. The CPTU logs are included in Appendix C.

The deep borings drilled at the site indicate that the base of Unit C (top of Hawthorn Group sediments) is encountered at depths ranging from 110 to 125 feet below ground surface. Downhole geophysical logs were run by Technos Inc. in the three deep borings on site, and consisted of natural gamma, spontaneous potential, single point resistance, resistivity, and electromagnetic induction. A copy of the logging report is included in Appendix D. The natural gamma log indicates that Unit C is generally sandy (10 to 30 counts per second), with silty/clayey intervals noted throughout. The unit appears to become more silty/clayey in all borings below a depth of 120 feet below ground surface, which may indicate the top of the Hawthorn Group sediments. The spontaneous potential and resistance logs are largely affected by the presence of the screen and do not provide any significant data. The induction log shows variation in conductivity with the highest conductivity at depth, which are likely due to changes in water quality.

6.3 Site Hydrostratigraphy

Martin County, including the Project area, is underlain by two aquifer systems, the SAS and the Florida Aquifer System (FAS). A description of these aquifer systems in the Project area, and their relevance to the design of the C-44 reservoir and STAs is provided in the following sub-sections.

6.3.1 Surficial Aquifer System

The SAS in Martin County provides most of the potable water used in the county, and generally consists of a sand/soil zone (thickness ~20 to 50 feet) of low to medium permeability, underlain by a producing zone (thickness ~40 to 50 feet) capable of providing relatively large quantities of water (Butler and Padgett, 1995; Adams, 1992). The producing zone is underlain by a slightly lower permeability layer of calcareous mud, mudstone, sandstone and some limestone (thickness ~30 to 60 feet) (Adams, 1992).

The SAS at the Project site is consistent with the literature, and consists of an upper soil/sand to clayey sand (informal stratigraphic Units A and B) with a thickness of approximately 4 to 25 feet, underlain by a higher permeability sand and shell zone (informal stratigraphic Unit C) with a thickness of approximately 100 feet. The lower portion of the sand and shell units appear more clayey, and could represent the lower permeability portion of the production zone as reported by Adams (1992).

6.3.1.1 Hydraulic Properties

Based on aquifer testing performed throughout Martin County, the hydraulic conductivity of the upper sand/soil zone of the SAS ranges from approximately 10 to 20 feet per day (feet/day) in western Martin County, and the hydraulic conductivity of the producing zone ranges from approximately 30 to 90 feet/day (Butler and Padgett, 1995; Adams, 1992). The hydraulic properties of the SAS at the Project site, based on site-specific testing, are discussed below.

Table 6.2 summarizes the hydraulic conductivity testing performed at the Project site within various depth intervals of approximately 0 to 12 feet, 13 to 30 feet, and 40 to 80 feet below ground surface.

<u>Hydraulic Conductivity-Units A and B</u>

Falling head permeability tests were performed by Ardaman in 2003 and the results are provided in Table 4.7 and Table 4.8. The results show that the horizontal hydraulic conductivity (k_h) ranges from 0.10 to 4 feet/day and the vertical hydraulic conductivity (k_v) ranges from 0.02 to 0.04 feet/day for the depths specified.

Undisturbed (Shelby tube) samples were collected at various depth intervals within informal stratigraphic Units A + B at depths ranging from 0 to 12 feet below ground surface and tested for vertical hydraulic conductivity. Laboratory permeability test methods are summarized in Section 5.2.5. Results are provided in Table 5.5. The results show that vertical hydraulic conductivity ranges from 0.0003 to 1.2 feet/day; however, values lower than 0.003 feet/day are not considered to be representative of actual conditions.

Hydraulic Conductivity-Unit C

The field permeability tests performed by Ardaman in 2003 of the approximately 13 to 30 feet below ground surface show hydraulic conductivity ranging from approximately 7 to 17 feet/day. The hydraulic conductivity of the lower portion of Unit C (40 to 80 feet below ground surface) ranges from approximately 0.6 to 18 feet/day. The results of these tests are provided in Table 4.8.

Slug testing performed at the Project site (Ardaman, 2003) show the hydraulic conductivity in wells completed at depths from approximately 22 to 35 feet below ground surface ranges from 12 to 225 feet/day. Wells completed at depths from approximately 59 to 80 feet below ground surface show hydraulic conductivity ranging from 0.5 to 128 feet/day. The results from these tests are provided in Table 4.9.

CPTU pore pressure dissipation tests were performed to estimate the hydraulic conductivity values of the soils as described in Section 4.3 and summarized in Table 4.6. The depth range of the CPTU pore pressure tests were from approximately 12 to 25 feet below ground surface. The hydraulic conductivity was estimated using both the Baligh and Levadoux (1986) method and the Robertson (1990) method. The K values range from 0.002 to 0.28 feet/day (Robertson method), and 0.43 to 57 feet/day (Baligh and Levadoux method).

Slug testing was also performed by Ardaman as part of the 2003 Site Characterization as discussed in Section 4.8. The results are provided in Table 4.9. The hydraulic conductivity ranges from 2 to 27 feet/day for the depth interval of 13 to 30 feet below ground surface, and 2 to 30 feet/day for the depth interval of 38 to 58 feet below ground surface.

Aquifer performance tests performed at the site (CDM, 2004) show a calculated transmissivity of the entire thickness of the SAS ranging from 19,100 to 26,000 gallons per day per foot. The horizontal hydraulic conductivity was estimated at 20 to 28 feet/day, and the vertical hydraulic conductivity was estimated at 0.35 to 1 feet/day. The results of these tests are provided in Table 4.10.

6.3.1.2 Groundwater

Groundwater level data from on-site monitoring wells was obtained between August 2005 and February 2006 for the wells described in Table 4.4, with the exception of MW-406. The groundwater elevation data collected during this time period is provided in Table 6.3. Table 6.4 provides the range of groundwater elevations recorded for each well between August 2005 and February 2006. As shown on the table, the groundwater elevation may fluctuate as much as 5.7 feet, as is the case with MW-275S.

Additional data was collected from these wells since 2006 and is continually updated. The data is stored at the following website:

http://www.sfwmd.gov/dbhydroplsql/show_dbkey_info.main_menu. To access the data, click on "by Site Name," and enter in C-44. Note that the datum for these elevations is NGVD 29.

The nomenclature for the monitoring wells within DBHydro is different than the names of the wells as listed on Table 4.4. Table 4.5 gives the correlation between these different names.

Groundwater readings were taken at each boring location. Following completion of each boring, the groundwater level was measured with a tape prior to grouting. The measured groundwater readings are included on the boring logs in Appendix A-1 and A-2, and are summarized in

Table 6.5. It should be noted that these readings may not represent the stabilized conditions of the groundwater surface.

Groundwater readings were also taken at each of the test pits excavated as part of the 2012 AMEC Investigation. The measured groundwater readings are included on the test pit logs in Appendix A-2 and are summarized in Table 6.6. Again, it should be noted that these readings may not represent the stabilized conditions of the groundwater surface. Photos of the excavated test pits are provided in Appendix E.

As part of the Test Cell Program, new piezometers were installed and groundwater data was collected during operation of the test cells. Details of the Test Cell Program are discussed further in Section 8.0.

6.3.1.3 Groundwater Quality

Water quality of the surficial aquifer in Martin County varies, but is generally of potable quality except near tidally affected streams or where saltwater intrusion has taken place. HDR had implemented a “Pre-Basis of Design Report” (BODR) water quality monitoring program at the site, as described in the Pre-BODR Monitoring Plan submitted under Work Order 6, Task 2.2, which included two rounds of groundwater sampling at the Project site well nest locations. Sampling was performed in October and December 2005. A summary of the analytical results is provided in Table 6.7.

A discussion of the deeper site hydrostratigraphy is included in Attachment 5 of the DDR.

6.3.2 Surface Water

Surface water will be encountered at the site and localized inundation can be expected. Existing ditches, irrigation canals, drainage swales and low-lying features may contain surface water at different times of the year. The locations and typical cross sections of these features are shown on Volume I Drawings G0019 through G0032.

6.4 Geophysical Investigation

The surface geophysical investigation of the site was performed as described in Section 4.4. SEI has identified typical soil types per resistivity values from their experience in Florida, these soil types are presented in Table 6.8. A further discussion of methods and results can be found in the geophysical investigation report, including maps and profiles, which is included as Appendix D. Please note the vertical axis of geophysical survey profiles is in meters while the horizontal axis is in feet. The capacitively coupled resistivity (CCR) profiles generally show low resistivity soils with resistivity values typically less than 100 Ohm-meters, consistent with clays to clay/sand mixtures. The resistivities of the site soils are consistent with and support the soil types observed in borings drilled on site.

The CCR results were compiled and plotted for seven different depth intervals along or near to the proposed Reservoir embankment. The depth intervals include 1.4, 4.4, 7.6, 10.2, 13.4, 17.3, and 22.0 feet below ground surface. The plots are shown on Figures 6.2 through 6.8, respectively. A review of the resistivity maps indicate that the lowest soil resistivities are generally observed along the southwestern embankment alignment. Resistivities in this area appear to be predominantly below 30 Ohm-meters.

The CCR profiles near the northern embankment generally show relatively low resistivity soils (less that 100 Ohm-meters); soils with lower resistivity values are consistent with clay to clay/sand mixtures. The soils in the associated profiles generally show there to be resistivity values ranging from approximately 20 to 50 Ohm-meters. There are two tracts of approximately 1,000 and 2,000 feet near Easting of 839000 and 841000 (State Plane 1983 Coordinate System) respectively, where CCR tests were not run. There are several isolated locations with resistivity values greater than 100 Ohm-meters.

The CCR profiles along the eastern embankment generally show relatively low resistivity soils (less that 100 Ohm-meters). The soils in the associated profiles generally show resistivity values ranging from approximately 20 to 60 Ohm-meters. There are several isolated locations with resistivity values greater than 100 Ohm-meters representing sandier intervals. There is an approximately 1,000 foot tract near the northing 1001000 (State Plane 1983 Coordinate System) where resistivity values are consistently above 100 Ohm-meters. There is an approximately 800-foot tract near the northing of 997500 (State Plane 1983 Coordinate System) that shows resistivity values higher or near to 100 Ohm-meters, consistently, from the ground surface to approximately 7.6 feet below ground surface. Higher resistivity values (30-60 Ohm-meters) generally occur toward the northern limit of the eastern embankment.

The CCR profiles near the southern embankment in the associated profiles generally show there to be resistivity values ranging from approximately 20 to 50 Ohm-meters. There are several isolated locations with resistivity values greater that 100 Ohm-meters.

The CCR profiles along the western embankment generally show resistivity values ranging from approximately 20 to 60 Ohm-meters. There are several isolated locations with resistivity values greater than 100 Ohm-meters. There is an approximately 1,400 foot tract of soil near to the Northing of 1006000 (State Plane 1983 Coordinate System) with resistivity values higher or close to 100 Ohm-meters with significant variability between 0 and 5 ft of depth. Higher resistivity values (30 to 60 Ohm-meters) generally occur near the northern limit of the western embankment.

The geophysical survey confirms information obtained from borings that the shallow subsurface soils are predominantly silty and clayey. The survey did not show evidence of anomalous features that would indicate near surface karst activity in the area of the proposed reservoir embankment centerline.

7.0 GEOTECHNICAL SITE CONDITIONS

7.1 Introduction

This Section summarizes the geotechnical properties of the subsurface materials at the Project site. As discussed in Section 6.0, the most obvious delineation of subsurface materials is the presence of the predominantly sandy, silty and clayey soils, Units A and B, above the more shelly sand material, Unit C.

The purpose of this Section is to provide information used by the designers for the embankment design, evaluation of borrow material to be used as structural fill, and foundation characteristics for the support of structures. HDR has reviewed the information obtained during all site investigations to develop a range of representative engineering properties for the embankment foundation materials for use in seepage, stability, and soil-cement armor analysis. The soil-cement data is discussed in Section 9.0 of this report.

7.2 Engineering Properties of Subsurface Soils

As discussed in Section 6.0, Holocene and Pleistocene sediments mantle the Project site. These sediments were designated as Informal Stratigraphic Units A and B (A+B) and are predominantly sand with varying percentages of silt and clay. The USCS designation for soils encountered in Units A+B are: SP, SP-SM, SP-SC, SM, SC and CL. Underlying the silty and clayey sand sediments is a shelly sand material of Pleistocene and Pliocene age designated as Informal Stratigraphic Unit C. The Unit C soils are typically fine-grained sands with a low to high percentage of shell.

A geotechnical exploration and laboratory program was completed along the embankment alignment and in the reservoir interior, as well as throughout the STA areas, as discussed in Sections 5.0 and 6.0 of this report. CPTU and SPT data were evaluated to estimate the in-situ properties of the subsurface materials. Laboratory testing was performed to classify the soils, to determine the moisture-density relationship, and to determine the strength properties and hydraulic conductivity of the soils.

7.2.1 SPT Borings

Statistical analyses of SPT (ASTM D1568) data from 149 CBs were performed to evaluate uncertainty and variability associated with the data, and for use of this information in assessing the density and related strength characteristics of various types of materials considered in the engineering analyses. The four SPT borings drilled by AMEC where not included in this statistical analysis. Section 4.0 provides details of the exploration with rotary wash borings with SPT, including drilling methods and sampling procedures.

The analyses considered the statistical distribution of $(N1)_{60}$ values, spatial variation across the reservoir site, and distribution with depth. $(N1)_{60}$ values are the estimated number of SPT blows (N) required to penetrate a 1-foot interval (blows per foot) at a normalized over burden pressure of 1 ton per square foot and also corrected for hammer energy efficiency, the size of the boring, the type/size of rods used, and the type of sampler. Figure 7.1 shows the $(N1)_{60}$ values for the CB borings performed. Please note that the Site Characterization Report refers to the $(N1)_{60}$ values as N1. Additional statistical analyses on a subset of the uncorrected SPT N-values of less than 60 blows per foot indicate that 95% of the corresponding $(N1)_{60}$ values are greater than 6, with 85% greater than 11 (see Figure 7.2). The median $(N1)_{60}$ value at the site is close to 30. As shown on Figure 7.1, the lower SPT values tend to be in the upper 10 feet of the foundation and at a depth of 50 to 60 feet below ground surface.

The spatial distribution of the estimated $(N1)_{60}$ values was examined to identify any areas of the site with a potential for anomalously low or high density and corresponding strength characteristics. Plots of the average $(N1)_{60}$ values in depth intervals of 0 to 10 feet, 10 to 20 feet, 20 to 40 feet, and greater than 40 feet below ground surface, are shown on Figures 7.3 through 7.6, respectively. Note that the value plotted is the average over the entire depth interval (for example, 0 to 10 feet) for that boring and may include as few as four or as many as six $(N1)_{60}$ values.

The occurrence of $(N1)_{60}$ values that are less than or equal to 10, are shown on Figures 7.7 through 7.10. This data is summarized for the same depth intervals as the previously referenced figures. If more than one $(N1)_{60}$ value of less than or equal to 10 was measured in an interval, the value indicated on these figures is the average. For example, if $(N1)_{60}$ values of 2 and 6 were measured in the 0 to 10 foot depth interval, a value of 4 is shown on the figure. These figures show all boring locations (with the exception of the 4 AMEC borings), not just those with the occurrence of low $(N1)_{60}$ values. Boring locations where an $(N1)_{60}$ value of less than 10 was not measured in the indicated depth interval are shown with a “+” symbol.

The lower SPTs occur sporadically across the site with a slightly higher concentration in the southwest quadrant of the reservoir. In reviewing these plots, in conjunction with the boring logs, the softer clay layer at depth along the northern portion of the reservoir site also has lower blow counts. Additionally, a slightly softer zone of clayey sand exists at depth of approximately 45 feet below ground surface in the vicinity of the pump station, as evidenced by data from CB-378, CB-379, CB-380, CB-381 and CB-382.

7.2.2 Cone Penetration Soundings

The CPTU data was used to augment the SPT data with the following objectives:

- Delineate the break between the informal Units A+B and the shelly sand Unit C
- Discover presence of apparently weak soil layers
- Evaluate the undrained shear strength values based on CPTU tip resistance values
- Compare SPT N-values to N-values interpreted from the CPTU data
- Evaluate the drained friction angle based on CPTU tip resistance values, and
- Evaluate the secant modulus based on CPTU tip resistance values.

The delineation between Units A+B and the shelly sand Unit C was evaluated in the Reservoir area by grouping the CPTU soundings in the northeast (NE), northwest (NW), southeast (SE), and southwest (SW) areas of the Project reservoir. The tip resistance plots for these four areas are shown on Figure 7.11. Typically, a distinct increase in the cone tip resistance occurred at the change in materials. The silty and clayey sand (Unit A and B) has typical tip resistance values of less than 100 tons per square foot (tsf), while the shelly sand (Unit C) has typical tip resistances values of approximately 100 to 500 tsf.

As shown on Figure 7.11, the CPTU tip resistance values in the NW and NE quadrants indicates the presence of apparently weak soil at about elevation -20 to -34 feet. The CPTU plots for these soundings in Appendix C indicate the soil classification at this elevation is clay. This layer of relatively weak material (low SPT N-value) was also present in some of the soil borings along the north alignment of the reservoir. This apparently weak material was not identified by the CPTU in the soundings in the SW or SE quadrants. It should be noted that some of the soils that are classified as clay by the CPTU may not actually be clay because the CPTU determines soil classification indirectly based on force and pressure measurements not based on laboratory testing and visual classification.

The CPTU tip resistance can also be used to estimate the undrained shear strength of clay soils. For each CPTU sounding, the undrained shear strength was calculated for material that was classified as clay using the following equation:

$$S_u = (q_c - \sigma_{vo}')/N_k$$

where:
S_u = Undrained shear strength (tsf)
q_c = CPTU tip resistance (tsf)
σ_{vo}' = Effective overburden stress (tsf)
N_k = Cone factor (non-dimensional)

The cone factor is a function of a number of variables including soil plasticity and stress history. A value of 15 was selected to estimate S_u for this site.

The S_u values are plotted on Figure 7.12 for the four areas around the reservoir. These plots show that the soils classified as clay with the CPTU occur at a depth of about 0 to 14 feet in all four quadrants and in the lower zone for the NW and NE CPTUs as discussed above.

The estimated S_u values to a depth of about 14 feet below ground surface indicates the soils are generally firm to very stiff; however, the S_u values for the lower zone for the NE quadrant indicates that the clay soils may be normally consolidated with an undrained shear strength less than 0.5 tsf. On each plot shown on Figure 7.12, the estimated normally consolidated clay undrained shear strength line is shown as a point of reference. This line was calculated using an S_u/σ_{vo}' ratio of 0.25.

The N-values interpreted from the twenty-four CPTUs in the reservoir area are plotted on Figure 7.13. The method proposed by Robertson, et. al. (1986) was used to estimate N-values based on the q_c values, overburden stress, and material classification. The measured median N-values from the soil borings in the Reservoir area are also plotted on Figure 7.13. There is a similar trend in the N-values with depth. As discussed above, near elevation -20 to -25 feet both the CPTU and measured N-values indicates a weaker material.

The drained friction angle for the sandy soils was calculated using the method proposed by Kulhawy, F. H. and Mayne, P. W. (1990) and is plotted on Figure 7.14 for each quadrant. The trend with depth is similar for each quadrant. The calculated friction angles are relatively high and are considerably greater than values calculated based on the SPT N-values. A relatively low friction angle value of 30 degrees was calculated from elevation -20 to -28 feet in the NW quadrant.

The secant Young's modulus of the sand soils was also estimated from the CPTU data using a method proposed by Robertson, P.K. (1990). The values are plotted by quadrant on Figure 7.15. The trend of the values with depth is similar to the trend of friction angle. Typically, the values are low to a depth of about 12 to 14 feet below ground surface and are relatively high in the upper part of Unit C to a depth of about 40 feet below ground surface. Below this depth, the values generally decrease. The median value is also plotted on each quadrant.

7.2.3 Auger Borings

As discussed in Section 4.0, ABs were drilled throughout the Project site. The primary purpose of the auger borings was to characterize the soils in Units A and B and to obtain bulk samples for laboratory testing, as explained in Section 5.0.

7.3 Laboratory Testing Results

Laboratory testing was conducted on soil samples from across the site collected for the 2006 Site Characterization Report,

7.3.1 Grain Size Analysis

Grain size analysis was performed on samples from all investigations. The grain size distribution curves are provided in Appendix B-1 and B-2.

A plot of the fines content versus elevation across the site is shown on Figure 7.16. This graph shows all previous data points in gray (both AB and CB), with the median shown as a dashed black line. The newer data points are shown in red (both AB and CB) with the composite median for all data shown as a blue line. In general, the data from the Site Characterization plots in the same range as the post site characterization data. The data from the AMEC investigation is not included on this plot.

A plot of fines content data by soil unit is shown on Figure 7.17. This plot confirms that the Unit B soils are typically finer than Units A and C. This same graph also shows the fines content data for the clay layer at depth on the northern portion of the site and confirms the percentage of fines in this layer is much higher than that of the shelly sand that makes up Unit C. The AMEC data is not included in Figure 7.17 but confirms that the fines content for the clay layer at depth is higher than that of the Unit C shelly sand.

As part of the effort to delineate differing foundation conditions around the reservoir footprint, several additional plots were developed to evaluate the potential for spatial variation of fines content at various depths. Figures 7.18 through 7.21 show the variation of fines content across the site for depth intervals of 0 to 5 feet, 5 to 10 feet, 10 to 15 feet, and 15 to 40 feet below ground surface, respectively.

The USCS classification was evaluated by depth interval to further confirm previously developed soil-type relationships to the three stratigraphic Units, A, B and C. The results of this evaluation are shown on Figure 7.22.

As part of the initial Site Characterization, grain size analyses on samples obtained from the auger borings at a depth of 0 to 3 feet, 4 to 7 feet, and 8 to 20 feet below ground surface are plotted on Figures 7.23 through 7.25, respectively.

7.3.2 Proctor Compaction Tests

A series of standard and modified Proctor compaction tests, as well as one-point and in-situ compaction tests were performed on bulk soil samples obtained from the Site Characterization auger borings from a depth of 0 to 15 feet below ground surface. Figure 7.26 plots the results of the modified proctor test results versus fines content.

7.3.3 Hydraulic Conductivity

Laboratory tests were performed to obtain an estimate of the hydraulic conductivity values of the remolded compacted soils from the Project site. Hydraulic conductivity test results for the remolded samples are plotted against elevation as shown on Figure 7.27.

A plot of the undisturbed and remolded k values versus percent fines is shown on Figures 7.28 and 7.29, respectively.

7.3.4 Triaxial Strength Test Results

Undrained triaxial tests with pore pressure measurements were performed on selected soil samples as described in Section 5.0. A series of tests were performed on soil samples from both auger borings (remolded) and rotary-wash (undisturbed). The angle of internal friction, assuming cohesion equal to zero, for samples remolded to 95% standard and modified Proctor are shown on Tables 5.8 and 5.9.

The effective angle of internal friction vs. percent fines content based on residual and maximum failure for remolded samples up to a depth of 7 feet below ground surface is plotted on Figure 7.30.

7.3.5 Corrosivity Testing, Carbonate Content, and Organic Content

Corrosivity testing was performed on shallow auger boring samples (1-4 foot depth interval) as described in Section 5.0 and summarized in Table 5.6. The results show chloride concentration in the soil sample ranging from 15 to 60 milligrams per liter (mg/L) and sulfate ranging from 5 to 855 mg/L. Sample pH ranged from 4.3 to 8.4 standard units. Additional chemical testing was done as part of the AMEC soil-cement investigation and is discussed further in Section 9.0.

Of the material from the Site Characterization test pits, the carbonate content ranges from 1.5 to 25.7%. Of the material from the auger borings, the carbonate content ranges from 0 to 37.3%. As part of the AMEC investigation, the carbonate content test was performed on two samples: 1) boring CB-472, sample depth 18.3 to 19.8 feet, and 2) boring CB-474, sample depth 45.0 to 46.5 feet. The results were 29% and 90%, respectively.

Organic content of samples collected during the Site Characterization ranges from 0.4 to 5.1% as shown on Table 5.6. Organic content of samples collected during the AMEC investigation ranges from 0 to 1% as shown on the gradation curves in Appendix B-2.

7.3.6 Atterberg Limit Testing

Testing for the plasticity index and liquid limit were preformed on 20 undisturbed samples. Results of this testing are plotted on Figure 7.31 along with data previously obtained by CDM. The plot shows nearly all of the data falls between the U and A lines. Testing for the plasticity index and liquid limit were also performed on 15 samples as part of the AMEC investigation. Of the samples tested, 3 are non-plastic, 10 fall between the U and A lines and are low plasticity, and 2 fall below the A line and are low plasticity.

8.0 TEST CELL PROGRAM DATA

8.1 Introduction

In order to provide a large scale field test of the construction and operation of the Project, a Test Cell Program was designed and constructed on a 475 acre portion of the 12,000 acre site (Figure 3.2). The Test Cell Program consists of two reservoir test cells (RTC) and two STA test cells. The test cell layout is shown on Figure 8.1. This report summarizes data obtained during the construction and one-year operations phase of the Test Cell Program for the Project. For a full report on the Test Cell Program refer to *Final Test Cell Analytical Report for Construction and Operations* dated July 2007. Photographs of the test cell construction are included in Appendix F.

For the purposes of the test cell construction, informal stratigraphic Units A and B were referred to as Soil Type 1, while informal Unit C was referred to as Soil Type 2. For a description of Units A, B and C refer to Section 6.0. Please note that the definitions of Soil Types 1 and 2 in the test cell program may be different than those used in the current Technical Specifications.

8.2 Construction Field and Laboratory Test Program

8.2.1 Earthwork

Soil Type 1 compacted fill was placed within the test cell embankments, the STA berms, the sedimentation pond perimeter dike, the access roads, and the access ramps. This material was to be placed at a minimum dry density of 95% of the Modified Proctor Compaction Test (ATSM D1557) maximum dry density and within 2% of the optimum moisture content. Families of curves for the compaction tests completed on site borrow materials are provided in Appendix F. The results of the in-place density tests are also provided in Appendix F. A summary of the average percent compaction and deviation from optimum moisture content is provided in Table 8.1.

In addition to the Soil Type 1 earth fill, compacted sand filter material was placed within the blanket drains and chimney drains of the two test cells. The filter sand was obtained from two borrow sources. SMI sand was used in Reservoir Test Cell 1 (RTC-1), and E.R. Jahna Industries, Inc. sand was used in Reservoir Test Cell 2 (RTC-2). Particle size analyses (ASTM D422) and minimum and maximum index density tests (ASTM D4253 and D4254) were completed on the two materials. The drain materials were to be placed and compacted to a relative density ranging from 55% to 70%. A total of 68 in-place density tests were completed on the filter sand material. The in-place relative density ranged from 21% to 96% with an average value of 74%. The fines content (percentage of soil passing the U.S. No. 200 mesh sieve) ranged from 0.2% to 2.9% with an average value of 1.0%. These results are provided in Appendix F.

8.2.2 Shell-Rock

The majority of the shell-rock material placed on the access roads, ramps, and crest roads at the site was obtained from Stewart Mining Industries. Small quantities of coquina rock and shell-rock from Palm Beach Aggregate were also placed on the north/south access road. Compliance tests were completed on the SMI borrow material by A.M Engineering and provided by the supplier. The results are provided in Appendix F. The material had a slightly lower carbonate content than the minimum acceptable value allowed by the FDOT Standard Specifications for Road and Bridge Construction Section 913A (i.e. 46.5% vs. 50%). However, all other properties of the shell-rock met the Project specifications, and the material was approved for use.

The Project specification was modified to allow for a minimum in-place density of 98% of the Modified Proctor Compaction Test (ASTM D1557) maximum dry density, rather than a minimum dry density of 129 pounds per cubic foot. Results of the Modified Proctor tests and sieve analysis tests completed on the shell-rock and coquina rock materials are provided in Appendix F. A total of 15 in-place density tests were completed on shell-rock material. Results of these tests are provided in Appendix F. The average degree of compaction calculated from the tests was 99.5%.

8.2.3 Soil-Cement

Soil-cement was placed on the outside (downstream) slope of the north and south walls of RTC-2. Soil-cement was placed on the outside rather than the inside face slope so that the soil-cement could be observed and tested during the one year operations period. Soil-cement on the north wall consisted entirely of flat plate soil-cement; while both flat plate and stair-stepped soil cement was placed on the south wall. A plan view of the limits of the soil cement is provided on Figure 8.2. After the contractor stockpiled sufficient quantities of Soil Type 1 and Soil Type 2 for use in the soil-cement, samples were obtained and shipped to the Ardaman's Tampa laboratory for mix design testing. A laboratory testing program was completed on representative samples of the two stockpiled materials (Table 8.2) to determine: 1) if the native soils were suitable for use in the soil-cement mix, with testing to determine carbonate content, fines content, and calcium absorption; 2) if moisture-density relationship of the soil-cement mixtures (ASTM D558) were completed on the two soil types after adding varying amounts of cement to the soil; 3) compressive strength (ASTM D1663) of lab-prepared soil-cement samples; and 3) the percent of material loss (ASTM D559) using wetting/drying tests of lab-prepared soil-cement samples. Samples for Soil Type 1 were prepared with 9%, 11%, and 13% cement by dry weight, while samples for Soil Type 2 were prepared with 7%, 9%, and 11% cement by dry weight. Results of the mix design tests are provided in Appendix F.

During field production, standard soil-cement proctor compaction tests (ASTM D588) were completed and 1/30 cubic foot standard compaction molded samples were prepared for each type of material being placed each day. Five samples were prepared at approximately 95% of the maximum dry density as determined from the compaction tests and shipped to the Ardaman West Palm Beach laboratory for curing and compressive strength testing. Compressive strength tests were typically completed at 3, 7, 28, and 56 days after preparation.

Results of the compaction and strength tests are provided in Appendix F for field production samples. Table 8.3 presents a comparison in 28-day compressive strength of soil-cement samples prepared as part of the mix design as well as the field production. Soil-cement field production compressive strength test results versus laboratory mix design results are provided in Table 8.4. Two of the materials tested, Sample No. 4 – Soil Type 2 with 7% cement and Sample No. 7 – Soil Type 1 with 11% cement, exhibited relatively low compressive strength values, although the sample with only 7% cement was not lower than anticipated. As a result, several six-inch diameter cores were obtained in the general vicinity of where the samples had been obtained. A total of four compressive strength tests were completed at each of the locations at 29 to 31 days after the materials had been placed. These results are summarized in Table 8.4. The cores in the vicinity of Sample No. 4 exhibited lower strengths than the 28 day strength of the laboratory samples (averaging 360 psi vs. 441 psi). In contrast, the cores in the vicinity of Sample Number 7 exhibited higher strengths than the 28 day strength of the laboratory samples (averaging 539 psi vs. 422 psi).

Additionally, wet-dry testing was performed on the mix design samples and the field production Soil Type 1 with 11% cement following the ASTM D559 test procedure (wetting and drying compacted soil-cement mixture), (presented in Appendix F). Loss results for the mix design samples indicate 0.7% and 0.0% for the Soil Type 2 and Soil Type 1 samples, respectively. Loss for the field production sample was 1%.

In-place density tests of the flat plate and stair-step soil cement are also provided in Appendix F. The soil cement was placed at an average dry density of 98.3% of the Standard Soil-Cement Proctor Compaction Test maximum dry density, and a moisture content of 1.3% below its optimum moisture content. However, the soil cement batch mixing plant had difficulty in applying sufficient water to the Soil Type 2 mix for two working days, June 20, 2006 and June 22, 2006. During this period, the soil-cement was placed at 91.4% to 107.0% compaction and 2.7% to 5.2% below its optimum moisture content.

8.2.4 Geotextile

Material conformance tests were completed on samples of the non-woven geotextile delivered to the site. A sample was cut from the end of selected rolls of the geotextile at the project site and shipped to the Ardaman and Associates Orlando laboratory for material conformance tests. A total of six rolls of geotextile were tested for mass/unit area (ASTM D5261), thickness (ASTM D5199), and grab strength/elongation (ASTM D4632). Results of the tests are provided in Appendix F. One permittivity test (ASTM D4491) was also completed on a geotextile sample.

During geotextile installation, 13 samples of the sewn geotextile seam were obtained and tested for both geotextile breaking load and seam breaking load. Results of the tests are provided in Appendix F. The ratio of seam strength to geotextile material strength ranged from 33 to 63%.

8.3 Site Instrumentation

8.3.1 Paperless Recorders

Flow and stage data are recorded by three paperless recorders installed at the site; one recorder for each RTC and one recorder for both STA cells. The paperless recorders store data on a flash memory card, and includes flow-metered inflows from the irrigation canal to the RTCs and STA cells, flow-metered inflows from the RTC internal drains to the seepage collection canal, flow-metered inflows from the seepage collection canal to the RTC, and stage data recorded by pressure-transducers for the Reservoir, STA cells, seepage collection canals, and the internal drain sumps. The locations of the paperless recorders are shown on Figure 8.3, and the data being collected at the RTC site is summarized in Table 8.5.

8.3.2 Piezometers

Piezometers were installed at the site at the locations shown on Figure 8.3 to record groundwater levels adjacent to the RTCs. Automatic data recorders (Level Trolls™ and Geokon units) were installed in each piezometer. The piezometers were installed in groups, or nests, that include three to four wells installed at different depths. The embankment piezometer nests (EPZ#-E) were installed in the embankment crest at each RTC and consist of four wells, including a well within the RTC embankment interior, a shallow surficial well (EPZ#-A, target interval shallow Unit A sands, depth approximately 2 to 7 feet below ground surface), a shallow intermediate well (EPZ#-B, target interval shallow Unit C sand, depth approximately 15 to 25 feet below ground surface), and a deep intermediate well (EPZ#-C, target interval Unit C sands, depth approximately 40 to 55 feet below ground surface).

Nests located outside of the reservoir embankments (at varying distances from the RTC cells) consisted of three wells, a shallow surficial well (PZ#-A, target interval shallow Unit A sands, depth approximately 2 to 7 feet below ground surface), a shallow intermediate well (PZ#-B, target interval shallow Unit C sand, depth approximately 15 to 20 feet below ground surface), and a deep intermediate well (PZ#-C, target interval Unit C sands, depth approximately 40 to 50 feet below ground surface). Piezometer installation details are provided in Table 8.6, and a schematic showing the vertical placement of the piezometers is shown in Figure 8.4.

Nests located outside of the STA embankments consisted of two wells, a shallow surficial well (PZ#-A, target interval shallow Unit A sands, depth approximately 2 to 7 feet below ground surface), and a shallow intermediate well (PZ#-B, target interval shallow Unit C sand, depth approximately 15 to 20 feet below ground surface).

8.3.3 Vibrating Wire Piezometers

Piezometers identified as "VWP" consisting of a Geokon model 4500 AL vibrating wire device were embedded directly into the subsurface beneath the embankment prior to embankment construction at the locations shown on Figures 8.5 and 8.6. Five VWPs were embedded in a shallow trench every 30 feet in a line beneath the embankment. Between each piezometer, a 1 foot wide layer of ½ inch bentonite pellets was installed in the excavated trench. The VWP cables for each transect of five were routed to a single data logger located at the downstream toe of the embankment as shown on Figures 8.5 and 8.6.

8.3.4 Settlement Gauges

One settlement gauge was installed with the vibrating wire piezometers (in the same trench) at each RTC at the locations shown on Figure 8.3. The settlement gauges consisted of Geokon vibrating wire settlement gauges.

8.4 Test Cell Operations and Monitoring Program

Following the completion of construction and the installation of all site instrumentation, the RTCs were filled, and the STA test cells were filled to allow the planned planting and seeding, thus beginning the operations phase of the Project. This Section provides a summary of the site monitoring activities performed during the start-up and the operations period of the test cells from May 2006 to June 2007.

8.4.1 Reservoir Test Cells Flow and Stages

Flow and stage data from the paperless recorders were downloaded monthly. Average monthly inflows and stages for both RTCs for May 2006 through June 2007 are included in Table 8.7 and stage vs. volume curves for the RTCs are included in Appendix F. The inflows to RTC-1 in May 2006 and RTC-2 in June 2006 represent the volumes required to fill each RTC. The average stage for RTC-1 over the operations period was 40.70 feet, while the average stage at RTC-2 over the operations period was 40.33 feet. The stage at RTC-1 was increased to 42 feet in January 2007 to evaluate the performance of the embankment and drains at a stage above what would be considered normal full storage level. The maximum stage recorded at RTC-1 for the test period was 42.94 feet in February 2007. The maximum stage recorded at RTC-2 over the test period was 40.93 in December 2006.

The data show that the average monthly inflows required to maintain the stage at the target elevations over the test period was approximately 5,321,000 gallons per month (approximately 177,400 gallons per day) for RTC-1 and 7,952,000 gallons per month (approximately 265,000 gallons per day) for RTC-2. Total inflow to RTC-1 over the test period was approximately 75,343,300 gallons, and total inflow to RTC-2 was approximately 87,417,215 gallons. The flows are approximate since there were periods of recorder malfunction during the test program.

Seepage collection canals (SCC) were constructed around the perimeter of each RTC to intercept some of the seepage water that was lost from the cells. The average stage of the seepage collection canal at RTC-1 (SCC-1) during the operations period was 19.40 feet, and the average stage at seepage collection canal at RTC-2 (SCC-2) over the operations period was 19.41 feet.

A pump was installed in each seepage canal to allow water to be pumped from the canal to the reservoir cell at each RTC. Flow meters recorded the flows that were diverted to the RTCs during the test program. The data indicates that an average of approximately 26,300 gallons per day was diverted from SCC-1 to RTC-1 during the test program, and an average of approximately 20,300 gallons per day was diverted from SCC-2 to RTC-2 during the program. The total flows from the seepage canals represent about 10% of the total inflows to RTC-1 and about 6% of the total inflows to RTC-2.

Minimal flow was recorded at the drain sump pumps at either RTC during the operations period, indicating that the phreatic surface had only reached the bottom level of the drains during the test program. Further discussion of the phreatic surface is included in Section 8.4.3.

8.4.2 STA Test Cells Flow and Stages

The STA stages were dictated by the observed plant growth in the STAs. STA-1 was initially inundated to an elevation of approximately 23.5 feet to saturate the soils for planting. STA-2 was initially inundated to an elevation of approximately 25 feet to fill the existing irrigation ditches and slightly inundate the plateaus for seeding. The water level in STA-1 was increased in August 2006 to an elevation of approximately 24.3 feet. The water level in STA-2 was increased in August 2006 to an elevation of approximately 25.5 feet. The average elevation of STA-1 over the test period was 23.9 feet, and the average stage for STA-2 was 24.6 feet (Table 8.7).

The flow data show that average monthly inflow required to maintain the pool elevation in STA-1 during the operation period was approximately 4,839,745 gallons (approximately 161,000 gallons per day). The average monthly inflow required to maintain the pool elevation at STA-2 over the test period was approximately 9,495,413 gallons (approximately 316,500 gallons per day). The flow data show that inflows to STA-2 exceeded the inflows to STA-1, or the RTCs. The water losses at STA-2 are possibly due to vertical seepage losses through the spreader ditches and existing irrigation ditches which could be hydraulically connected to the shelly sand unit (Unit C) of the surficial aquifer at STA-2. A layer of low hydraulic conductivity Unit B material was placed in the west spreader swale at STA-2 on June 21, 2006 in an attempt to reduce the seepage losses. Stage/volume plots (Appendix F) do not indicate a decrease in the inflow to STA-2 due to this layer.

8.4.3 Groundwater and Embankment Water Levels

Water levels in the site piezometers were recorded hourly and downloaded monthly. At RTC-1, transects of piezometer nests are located in a line from the embankment and extend to the north and west (Figure 8.3). At RTC-2, transects of piezometer nests are located in a line from the embankment and extend to the north and east (Figure 8.3).

The RTCs were filled and the depth maintained over the test period. RTC-1 was at normal full storage level (NFSL) of 40 feet on May 18, 2006, and RTC-2 was at NFSL on June 15, 2006. Water level data collection from the test cell piezometers began on June 1, 2006. Figures 8.7 and 8.8 show the water levels in piezometer transects at RTC-1 - North and RTC-2 - East for the first 2 to 2½ months of the operations period. Figures 8.9 and 8.10 show the hydrographs for transects RTC-1 - North and RTC-2 - East for the full operations period, and Figure 8.11 shows the rainfall hydrograph as compared to PZ-7B and PZ-24B at RTC-2, and background well PZ-383S for the full operations period. PZ-383S is located approximately 4,000 feet north of the test cell site, and is part of the site-wide background monitoring program. Additional hydrographs are included in Appendix F.

Generally, water levels in the “B” and “C” piezometers (shallow and intermediate portion of the surficial aquifer) show a strong increasing trend in water levels beginning in June and reaching peak levels in mid July 2006. In addition to filling the test cells, 8.5 inches of rainfall fell at the test cell site during this time frame. A 2 to 3 foot rise in groundwater elevation was observed at all of the site background monitoring wells in response to the increased rainfall as illustrated in Figure 8.11. A groundwater rise of approximately 3 feet was observed in the piezometers at RTC-1 during this initial operations period; however RTC-1 was full for about 13 days before data was collected. A groundwater rise of approximately 4 to over 6 feet was observed in the piezometers at RTC-2. The highest rise in water level was in piezometers located beneath the embankment, and those closest to the downstream toe (within 100 feet) as would be expected. The far-field piezometer nest located about 1,200 feet east of RTC-2 (PZ-24B and PZ-24C, Figure 8.6) showed a groundwater rise of approximately 3 feet during this initial operations period, which is equivalent to the site-wide response to rainfall.

After mid-July the water levels at the test cell site appeared to stabilize and begin to follow area rainfall patterns. The groundwater levels decline from the end of July through mid-August 2006. A slight increase in water levels was observed in late August 2006, apparently in response to increased rainfall at this time due to tropical storm Ernesto. A similar pattern in water level response was observed at RTC-2. A rise in the groundwater levels was also observed in mid-September 2006, which coincides with a rain event of about 1.6 inches. In October 2006, water levels generally decreased but showed a slight increase in late October apparently in response to a rain event. Groundwater levels in November 2006 continued to show an overall decrease consistent with decreasing rainfall from September to November 2006. As shown on the hydrographs, groundwater levels at RTC-1 decreased in response to the drawdown test at SCC-1 performed from November 27 to December 29, 2006 (drawdown test discussed in Section 8.4.4). The water levels recovered from the drawdown test in January and February 2007 although they remained at levels that were slightly lower than the pre-test levels, likely due to low rainfall in the area. Water levels generally continued to decline from March to June 2007, partially due to a decline in the stage at each of the RTCs. By June 2, 2007, water levels increased in response to an increase in rainfall.

Groundwater elevation contour maps of the surficial aquifer at the test cell site are included in Appendix F. The contour maps represent the months of June, August, October, and December 2006, and March and May 2007. The contour maps show the formation of a groundwater mound (as indicated by the hydrographs) beneath the test cell site due to seepage from the test cells. At RTC-1, the groundwater levels on the west side of the test cells were affected by the irrigation canal water levels that were used as a source of water to the test cells.

Phreatic Surface

The vibrating wire transects were utilized to generate phreatic surface cross-section plots along each RTC vibrating wire transect. The plots generated during the test cell program are included in Appendix F. The plots show that the phreatic surface was generally highest near the upstream end of the embankment, and decreases near the downstream toe. The plots also indicate that the phreatic surface levels were near the bottom or below the drain at both RTCs, as confirmed by the minimal flow from the drain sumps to the seepage collection canals over the test period. Increasing the stage of RTC-1 to 42+ feet did not significantly affect the level of the phreatic surface.

8.4.4 Seepage Canal Drawdown Test

A deviation from the normal operating condition was implemented as a test, and included lowering the level of the SCC at RTC-1 to allow observations of seepage effects on the Reservoir embankment and canals under this condition. SCC-1 was lowered from the normal operating elevation of approximately 21 feet to elevation 15 feet. The seepage canal water level was maintained at an elevation of approximately 15 feet for 33 days, and then lowered to elevation of 12 feet for the last 2 days of the test. The test began on November 27, 2006 and was run until December 29, 2006. All water pumped from the seepage canal was measured and quantified to the extent possible for the duration of the testing period.

Table 8.8 shows the pumped volumes and canal elevations for the duration of the test. As shown on the table, the average daily volume pumped from SCC-1 during the test was approximately 1,800,000 gallons. Figure 8.12 shows the daily volume pumped vs. the stage in SCC-1. The total volume pumped from SCC-1 during the drawdown test was approximately 65,646,277 gallons. The average pumping rate over the test period was approximately 1,400 gallons per minute, although the exact pumping rate could not be determined since some of the flow was not metered but estimated based on pumping time.

The visual observations during the drawdown test focused on the seepage canal and any evidence of potential piping that could compromise the integrity of the embankment. As the water level was reduced in the canal, a daily inspection of the embankment and seepage canal was performed. The daily inspection revealed the formation of erosion gullies on the banks of the seepage canal due to rainfall runoff (see photos in Appendix F). No evidence of piping of embankment material was observed during the test.

Hydrographs of water level data from the piezometer transects for RTC-1 are included in Appendix F. As shown on the hydrographs, groundwater levels at RTC-1 decreased in response to the drawdown test at SCC-1. Figure 8.13 shows the response of two piezometers on the north side of RTC-1. PZ-16B is located about 70 feet north of SCC-1, and PZ-25B is located about 400 feet north of SCC-1. As shown on the figure, the drawdown in both wells generally follows the canal drawdown with a lag time of 1 to 2 days. The groundwater elevation contours for December 2006 (Appendix F) show the response of the shallow surficial aquifer to the drawdown test.

8.4.5 Seepage Estimates

Although the pumped quantities provide an indication of the seepage losses from RTCs, a water budget model was constructed for each reservoir and STA cell to estimate the actual seepage being lost from the reservoirs during the operations period. The water budget models were developed using the data generated during the monitoring program. Seepage losses for this purpose are defined as the total water losses by both horizontal and/or vertical flow to the subsurface. Only minimal flow was being intercepted by the embankment chimney/blanket drains during the operations period.

An analytical approach was developed using daily values of reservoir stage, reservoir inflow quantity, evaporation (from the EAA STA 1-W), and rainfall data for the site.

A water budget equation was developed that included inflow and outflow components as follows:

$$\text{Rainfall} + \text{Pumped Inflows} = \text{Evaporation} + \text{Seepage} + \text{Pumped Outflows} = \frac{\text{Change in Volume}}{\text{Stage in Reservoir}}$$

Outflow included evaporation, seepage, and change in the volume of water (storage) within the cells. Evaporation data utilized in the model was obtained from STA 1-W (in DBHYDRO). Since seepage is the unknown variable, the seepage coefficient was adjusted as a calibration parameter until the actual vs. modeled reservoir or STA volume and stages were comparable. The water budgets were assessed on a daily basis for the operations period during which water was being pumped to the cells. The RTC water budget models were run utilizing data from June 2006 to April 2007. The STA cell water budget models utilized data from October 2006 to December 2006, representing a period of maximum water levels in the STA cells. Stage-area relationships were used to determine the final reservoir stage resulting from the addition of a volume of rainfall and/or pumped inflows and the subtraction of a volume of evaporation and seepage water.

The model shows that seepage losses at RTC-1 had generally stabilized as of August 2006 at an average rate of approximately 163,000 gallons per day. The maximum seepage observed during the operations period was during the drawdown test when seepage losses increased at RTC-1 to approximately 200,000 gallons per day.

At RTC-2, the calculated seepage over the operations period with a full reservoir was estimated at approximately 400,000 gallons per day during the first two months of operations, and then declined over the operations period with the average seepage at approximately 225,000 gallons per day.

The water budget model for STA-1 indicates that an average of 190,000 gallons per day was lost through seepage from the cell. During the drawdown test seepage losses increased at STA-1 to an average of approximately 240,000 gallons per day.

The operations summary indicates that more water had been supplied to STA-2 than any other test cell on site. In December, about 10 million gallons were supplied to STA-2 to maintain the water level. A water budget model was set up to evaluate seepage from STA-2. The model indicates that prior to the drawdown test the average seepage from STA-2 was approximately 500,000 gallons per day. Following initiation of the drawdown test, the seepage increased to approximately 780,000 gallons per day from STA-2 due to the proximity of the STA to the seepage canal at RTC-1.

8.5 Groundwater Quality

Groundwater samples were obtained from selected piezometers at the test cell site in July, September, and December 2006, and in March 2007. The results are summarized in Table 8.9 and the laboratory reports are included in Appendix F. Most of the detected parameters in the groundwater are below the established maximum contaminant level (MCL, per 62-550 FAC) or groundwater cleanup target level (per 62-777 FAC). Total dissolved solids (TDS) and chloride are typically above the secondary MCLs. The results are summarized below.

Field Parameters

The temperature of the groundwater samples ranged from 24.62° C to 25.66 ° C. Conductivity of the samples ranged from 1131 to 1705 umhos per centimeter (umhos/cm), and pH ranged from 6.81 to 7.56 standard units. Dissolved oxygen levels ranged from 0.24 to 0.41 mg/L.

Color, Odor Turbidity

Color in the groundwater samples typically ranged between 15 to 60 PCU. There are isolated occurrences of 100 PCU and 150 PCU. Odor typically ranged between U to 8.0 T.O.N. PZ-16C has decreased in value from 132 to 4 T.O.N. between July 2006 and December 2006. Turbidity at well PZ-16C ranges from 0.19 to 64 NTU while all others range from 0.7 to 44 NTU. The turbidity in both PZ-12C and PZ-16C decreased between July 2006 and September 2006.

Nutrients

The nitrite-nitrate concentrations ranged from below detection limits to 0.048 mg/L. There were two samples in March 2007 where the concentration was 0.11 mg/L (PZ-21B) and 0.13 mg/L (PZ-24C). The ammonia concentration in the groundwater samples ranged from 0.21 to 1.0 mg/L, and TKN ranged from 0.25 to 1.5 mg/L.

The phosphorus concentration ranged from 0.043 to 0.81 mg/L. An increase in concentration was observed at PZ-5C from 0.079 mg/L in September 2006 to 0.77 mg/L in December 2006. Dissolved phosphorus ranged from 0.025 to 0.62 mg/L, and soluble reactive phosphorus ranged from 0.013 to 0.54 mg/L.

Metals

Arsenic

The arsenic concentration ranged from below detection limits to 0.0079 mg/L. The maximum contamination level (MCL) for arsenic of 0.010 mg/L was not exceeded in the groundwater samples.

Barium

The barium has ranged from 0.0067 to 0.096 mg/L. These levels are well below the MCL of 2 mg/L, but still above the MDL of 0.00014 mg/L.

Beryllium

Beryllium was not detected during the test program.

Cadmium

Cadmium was not detected during the test program.

Chromium

The chromium level has ranged from below detection limits to 0.0086 mg/L. The last reported detection of chromium was in December 2006 in PZ-12C, PZ-16C, and PZ-26C. The levels that were reported in those wells were below the MCL of 0.1 mg/L.

Copper

The copper concentrations ranged from below detection limits to 0.0041 mg/L. All of the most recent data show that the copper content is below detectable levels.

Cyanide

Only one detection of cyanide occurred at PZ-26B in December 2006. The reported level was 0.009 mg/L, which is below the MCL of 0.2 mg/L.

Calcium

Calcium concentrations ranged from 16 to 310 mg/L.

Lead

Lead was not detected during the test program.

Mercury

Only one detection of mercury occurred at PZ-24C in July 2006. The reported level was 0.000072 mg/L, which is below the MCL of 0.002 mg/L.

Nickel

Nickel concentrations have ranged from below detection limits to 0.024 mg/L. Since December 2006, nickel has not been above detectable levels in the groundwater samples.

Silver

Silver was not detected during the test program.

Iron

Iron concentration ranged from below detection limits to 4.3 mg/L. Eight of the 15 wells have had an iron content that meets the MCL of 0.3 mg/L.

Sulfate

Sulfate concentrations ranged from 25 to 270 mg/L. All of the most recent data is below the MCL of 250 mg/L.

Zinc

The level of zinc ranged from below detection limits to 0.0093 mg/L. All of the wells meet the MCL of 5.0 mg/L.

Total Dissolved Solids

Total dissolved solids concentrations have ranged from 420 to 2000 mg/L. Most wells exceeded the MCL of 500 mg/L.

Chloride

Chloride concentrations ranged from 42 to 570 mg/L. PZ-16C had concentrations of 530 mg/L and higher. The MCL is 250 mg/L. PZ-16C, PZ-12C and PZ-26C have exceeded the MCL of 250 mg/L.

8.6 Overwash Test

An overwash test program was performed at the test cell site in February 2007 to evaluate the potential impact of waves overtopping the Reservoir embankment. The focus of the test was to evaluate the effects of wave overtopping on the downstream slope of the embankment, and the effectiveness of dense groundcover (sod) as slope protection. The test was designed and implemented by the SFWMD Acceler8 program staff. A full report on the overwash test is included in Appendix F.

9.0 SOIL-CEMENT INVESTIGATION DATA

Tests for the soil-cement armoring system were conducted as part of the investigations for this Project. Following is a summary of the investigations and the data collected.

9.1 Site Characterization Study

As part of the initial Site Characterization, test pit samples were selected for soil-cement testing. These test pit samples were obtained primarily in the reservoir area and along the intake canal. Compressive strength, density, and percent compaction tests were run on material from the test pit locations, as well as pH, carbonate content, and corrosivity. The cement content was varied on the tests from 5%, 7%, 9%, and 11%. Results of the testing are provided in Appendix G and are summarized in Table 9.1.

9.2 Soil Cement Test Cell Program

Soil-cement testing was also done as part of the Test Cell Program. The testing and results are discussed in detail in Section 8.2.3 of this report. The data collected is provided in the Soil-Cement Laboratory and Field Test Results in Appendix F.

9.3 AMEC 2013 Study

Another source of data for the soil-cement testing came from the AMEC investigation conducted in 2012. AMEC issued a report to the USACE Jacksonville District titled *Final Report of Geotechnical Exploration*, Volume II on January 18, 2013. The investigation involved test pit soil sampling, test pit groundwater sampling, well-water sampling and tap water sampling. Laboratory testing included: geotechnical testing of test pit samples, chemical analyses of the water samples, chemical analyses of soil samples, water source verification testing for soil-cement, and soil-cement mix design testing. Geotechnical testing of test pit samples is discussed in Section 5.0. The remaining laboratory testing is discussed below.

9.3.1 Chemical Analyses of Water Samples

As discussed in the AMEC report, chemical analyses were performed on Water Source Verification samples collected from test pits TP-475, TP-478, TP-491, and TP-498, the potable well-water source at the on-site Area Office, and a tap water source from the Martin County Sheriff's Office located in Indiantown, Florida. Test Pit 475-D was selected as a duplicate water source resulting in seven total samples. The following Water Analysis Parameters were performed on the well-water and groundwater samples to Environmental Protection Agency (EPA) standards:

- 7 EPA SW-8469040B – pH
- 7 EPA 413.2 – oils & grease
- 7 EPA 305.2 – acidity
- 7 EPA 200.7 – sodium
- 7 EPA 310.1 – alkalinity
- 7 EPA 415.1 – total organic matter
- 7 EPA – 300 – sulfate
- 7 EPA 200.7 – iron
- 7 EPA 200.7 – potassium
- 7 EPA 300 – chlorides
- 7 EPA 300 – nitrates

- 7 EPA 200.7 – selenium
- 7 EPA 200.7 – zinc
- 7 EPA 200.7 – lead
- 7 EPA 8081 – pp DDE
- 7 EPA 8081 – chlordane
- 7 EPA 200.7 – copper
- 7 EPA 200.7 – pp DDT
- 7 EPA 8081 – heptachlor
- 7 ASTM C1603 – Water Density

The laboratory reports are provided in Appendix G. A summary of the results is provided in Table 9.2.

9.3.2 Chemical Analyses of Soil Samples

The following parameters were analyzed on composite “Unit C” material collected from the test pits. Test Pits 475-D and TP-498-D, were selected for duplicate sampling (one at each test pit) using EPA, Soil Science Society of America (SSSA), and the International Humic Substances Society (IHSS) standards.

- 25 EPA SW-846 9045C – pH
- 25 EPA 9060 A – total organic carbon
- 25 EPA SW-846 6010C – calcium
- 25 EPA SW-846 6010C – sodium
- 25 EPA SW-846 6010C – potassium
- 25 EPA SW-846 6010C – magnesium
- 25 SSSA – sulfate
- 25 EPA SW-846 6010C – iron
- 25 EPA 325.2 – chlorides
- 25 SSSA – nitrates
- 25 EPA 160.3 – percent moisture
- 25 IHSS Method – humic substance
- 25 EPA SW-846 6010C – lead
- 25 EPA SW-846 6010C – copper
- 25 EPA SW-846 6010C – zinc
- 25 EPA SW-846 8081 – chlordane
- 25 EPA SW-846 8081 – selenium
- 25 EPA SW-846 8081 – pp DDT
- 25 EPA SW-846 8081 – pp DDE
- 25 EPA SW-846 8081 – heptachlor

The laboratory reports are provided in Appendix G. A summary of the results is provided in Table 9.3.

9.3.3 Water Source Verification Testing

To evaluate water source impacts on strength testing, Water Source Verification testing consisted of strength testing and results comparison for soil-cement samples produced using various water sources. Testing was performed using 3 water sources: potable water from the Area Office water-well, groundwater from 4 test pits (TP-475, TP-478, TP-491, and TP-498), and tap water. Water samples were mixed with “Unit C” borrow soil collected from the same 4 test pits where ground water samples were taken. A total of 72 soil-cement test specimens were prepared using cement content with 8%, 10%, and 12% of the dry weight of soil aggregate. The specimens were prepared at or near 95 percent of the standard proctor maximum dry density. soil-cement time of set and unconfined compressive strength testing were performed on the prepared specimens.

The test results are provided in Table 9.4. The Compaction Test Reports are presented in Appendix G.

9.3.4 Soil-Cement Mix Design Testing

Based on the results of the Water Source Verification testing, the Site Well Water was selected as the mixing water for the Soil Cement Design Phase. In addition, due to the relatively low compressive strength values achieved by the 8% cement content samples, the scope of the Soil Cement Design Testing was changed to include 16 test pits plus two duplicate test samples at two cement contents (10% and 12%), resulting in the same number of test samples for each test type. The selected test pit samples were:

TP-476	TP-479	TP-480
TP-481	TP-482	TP-483
TP-484	TP-484D*	TP-485
TP-486	TP-488	TP-489
TP-489D*	TP-490	TP-492
TP-494	TP-495	TP-497

* Duplicate

For the soil cement design phase, three specimens of each pit sample (plus duplicates) were prepared at each of the two cement contents. The specimens were prepared at or near 95 percent of the Standard Proctor (ASTM D 558) maximum dry density. Unconfined compressive strength testing – three samples per specimen (ASTM D 1633) and wetting and drying testing – one test, two specimens were performed on the prepared specimen.

The results of these tests are provided in Table 9.5. The Compaction Test Reports are presented in Appendix G.

9.4 AMEC 2014 Study

In 2013 and 2014 AMEC completed an additional evaluation of potential soil aggregate borrow sources for soil cement production on behalf of the USACE. The results are summarized in the report titled “DRAFT Report of Geotechnical Exploration and Laboratory Testing, Phase V, Test Pits, Water Sampling, and Laboratory Testing, C-44 Reservoir and Stormwater Treatment Area” (AMEC 2014). This report is provided in Appendix G.

Field explorations completed by AMEC consisted of 12 test pits excavated within the designated soil cement borrow area. In general, the test pits were excavated to a maximum depth of approximately 18 feet. Soil samples were obtained from three depth intervals. Samples were collected at approximate depths of 6, 10, and 16 feet below existing grade. A total of 58 soil samples (includes each depth interval, composite pit sample, as well as washed/unwashed composite samples) were to be prepared and tested for geotechnical index properties and compressive strength soil-cement mix design.

Cement contents of 10% and 12% of dry weight soil aggregate were mixed with the site well water and were to be used for the stratum composite samples at depths of approximately 6, 10, and 16 feet below existing grade. Cement contents of 10%, 12% and 14% were to be used for the pit composite samples at a depth range of approximately 5 to 18 feet below existing grade. Cement contents of 14%, 16% and 18% were to be used for the washed/unwashed pit composite samples at a depth range of approximately 5 to 11 feet below existing grade utilizing both public water supply and well water, as specified.

In the case of the washed composite samples, the samples were to be washed with a public water source from AMEC's Jacksonville laboratory over a #230 sieve, to remove all particle sizes smaller than the #230 sieve from the testing material.

Total of 918 soil cement samples were prepared and tested for unconfined compressive strength at 7 days and 28 days from the date of preparation. The samples were tested in accordance with ASTM D1633, Test Method A. All specimens were to be prepared to a target density of 95% of the maximum dry density as determined by ASTM D 558.

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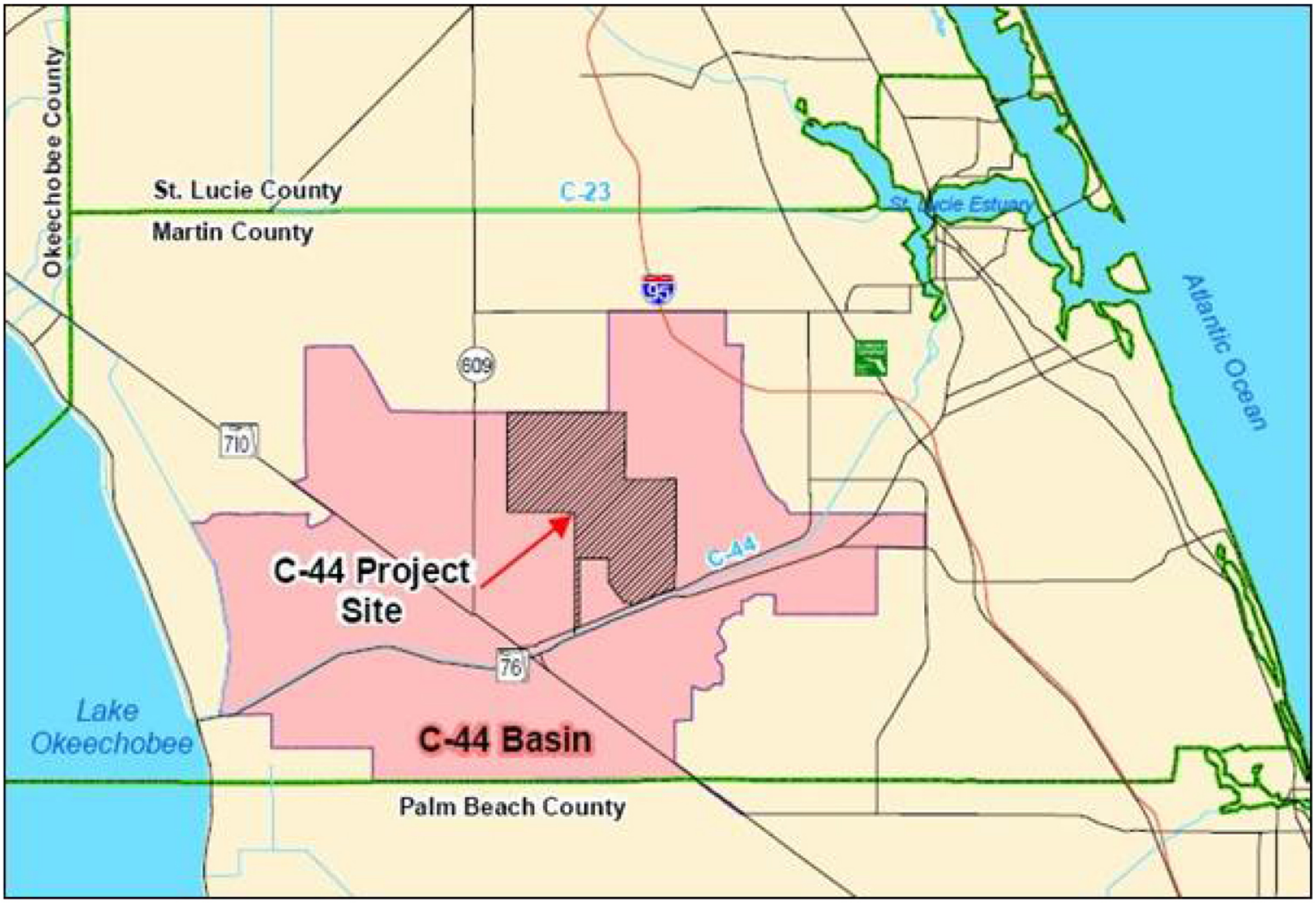
FIGURES



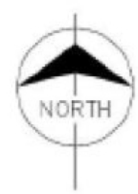


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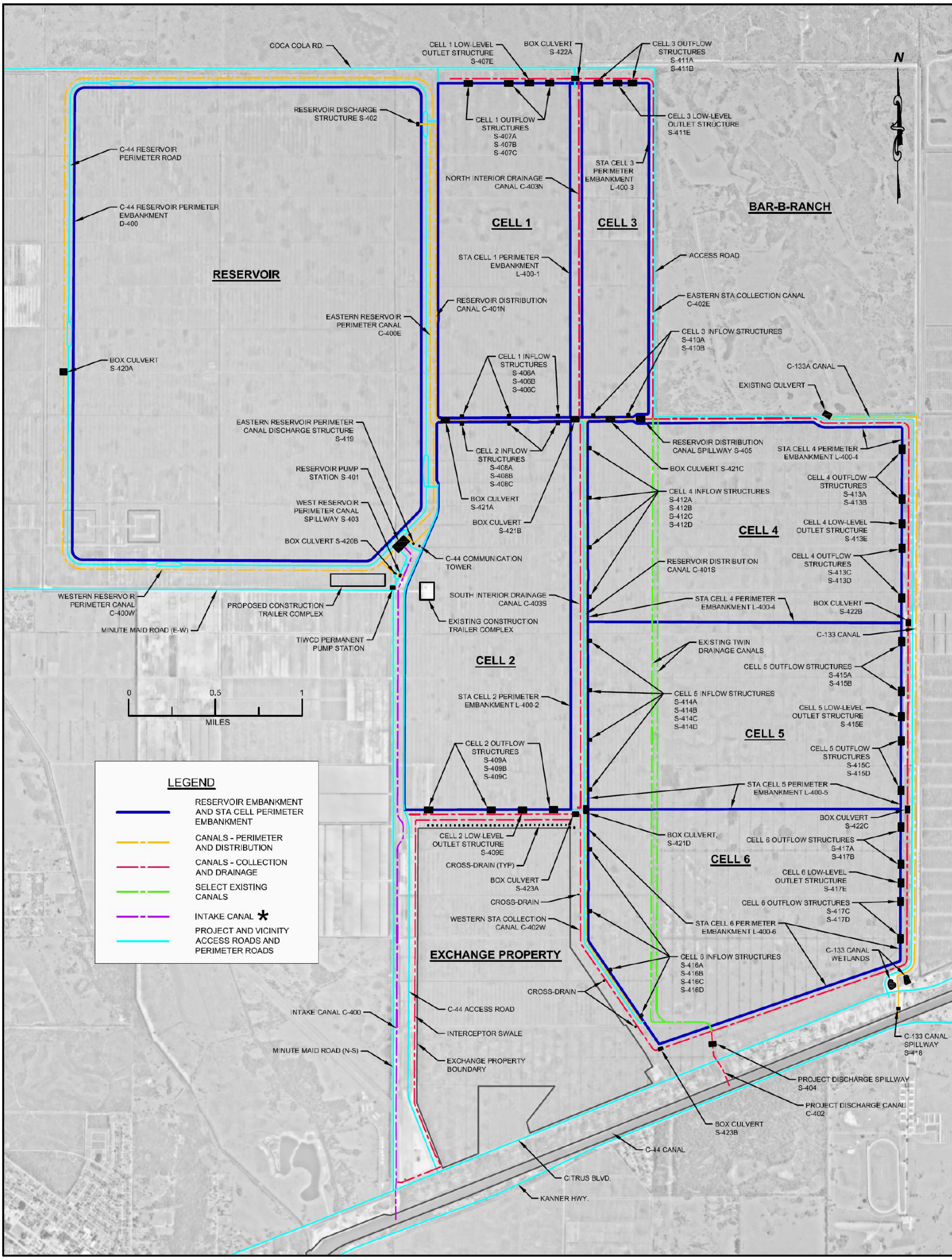
Figure 1.1
Project Vicinity Map
Geotechnical Data Report

HDR
C-44 Reservoir/STA Project
December 23, 2014



NOTE:

1) LISTING OF STRUCTURES IS FROM NORTH TO SOUTH OR WEST TO EAST.

* EROSION PROTECTION SYSTEM FOR INTAKE CANAL TO BE SEPARATE CONSTRUCTION CONTRACT AFTER CONTRACT 1 WARRANTY PERIOD.

Note: This figure prints full size at 11"x17"

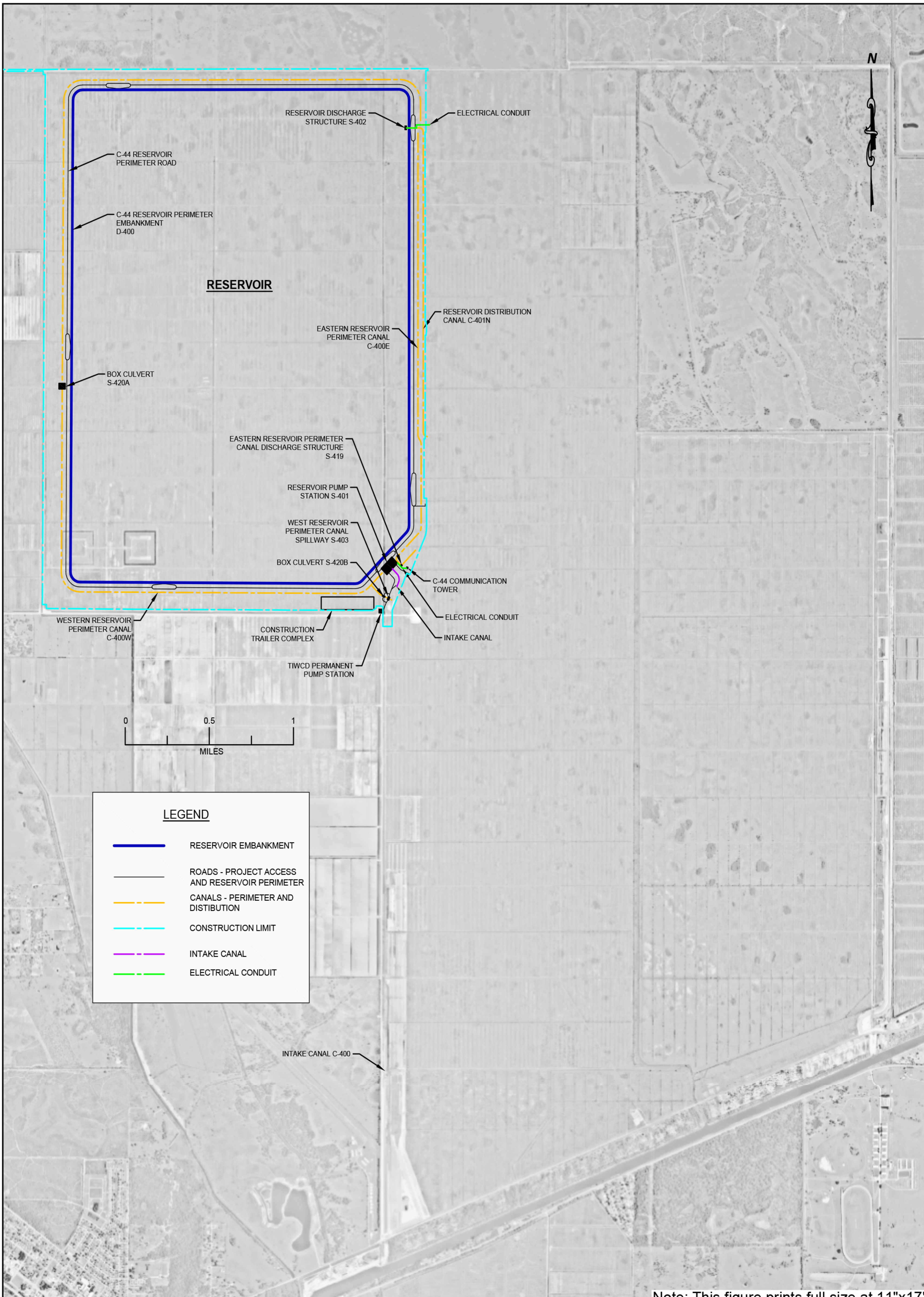
US Army Corps of Engineers ®

Figure 1.2
C-44 Project and Vicinity Features Map
Geotechnical Data Report

HDR

C-44 Reservoir/STA Project

December 23, 2014



Department of the Army
Jacksonville District,
Corps of Engineers
Jacksonville, Florida

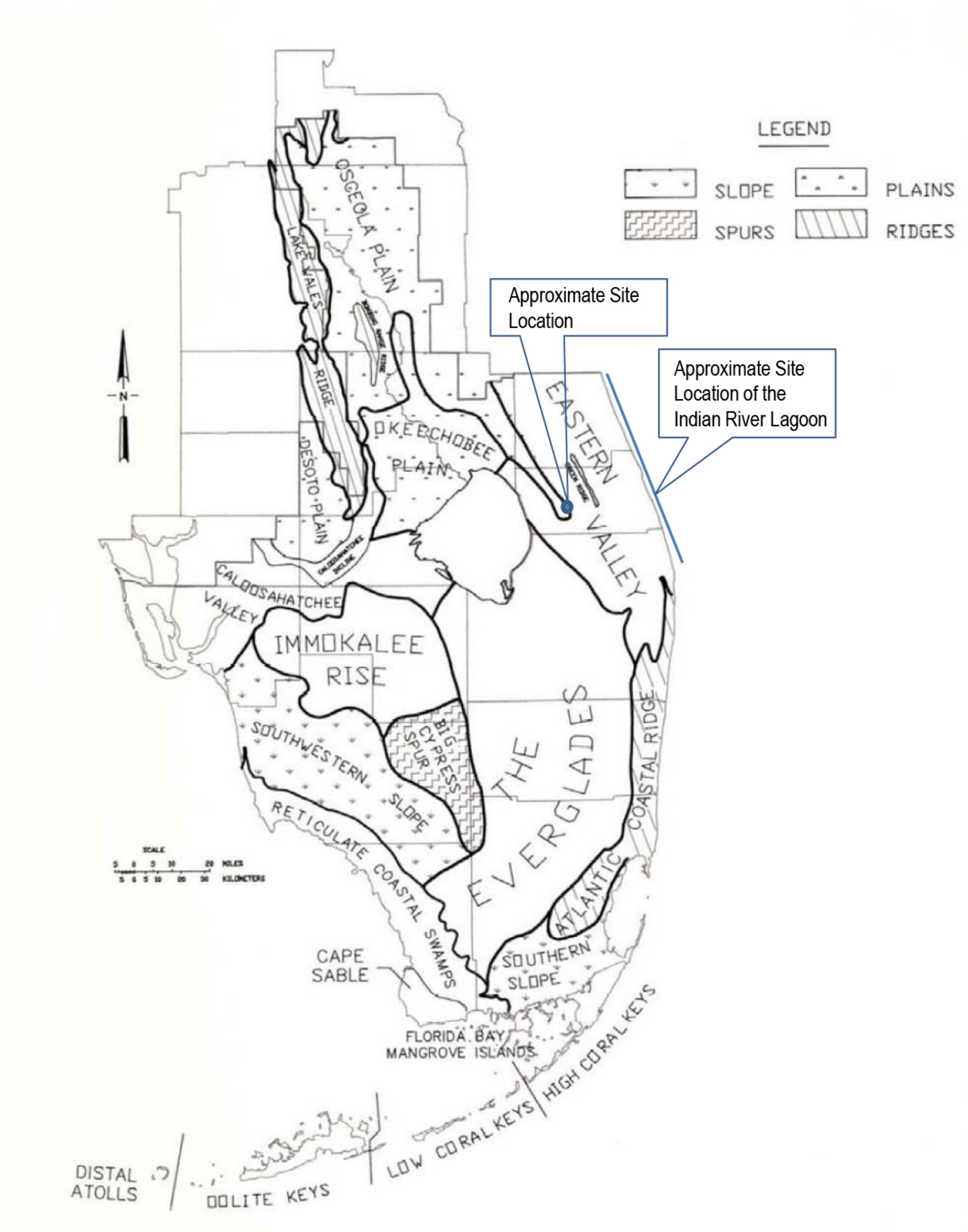
HDR Engineering, Inc.
1400 Centrepark Blvd.
Suite 720
West Palm Beach, FL 33401

Contract 2 Project Features

C-44 Reservoir/STA Project

DATE
December 23, 201

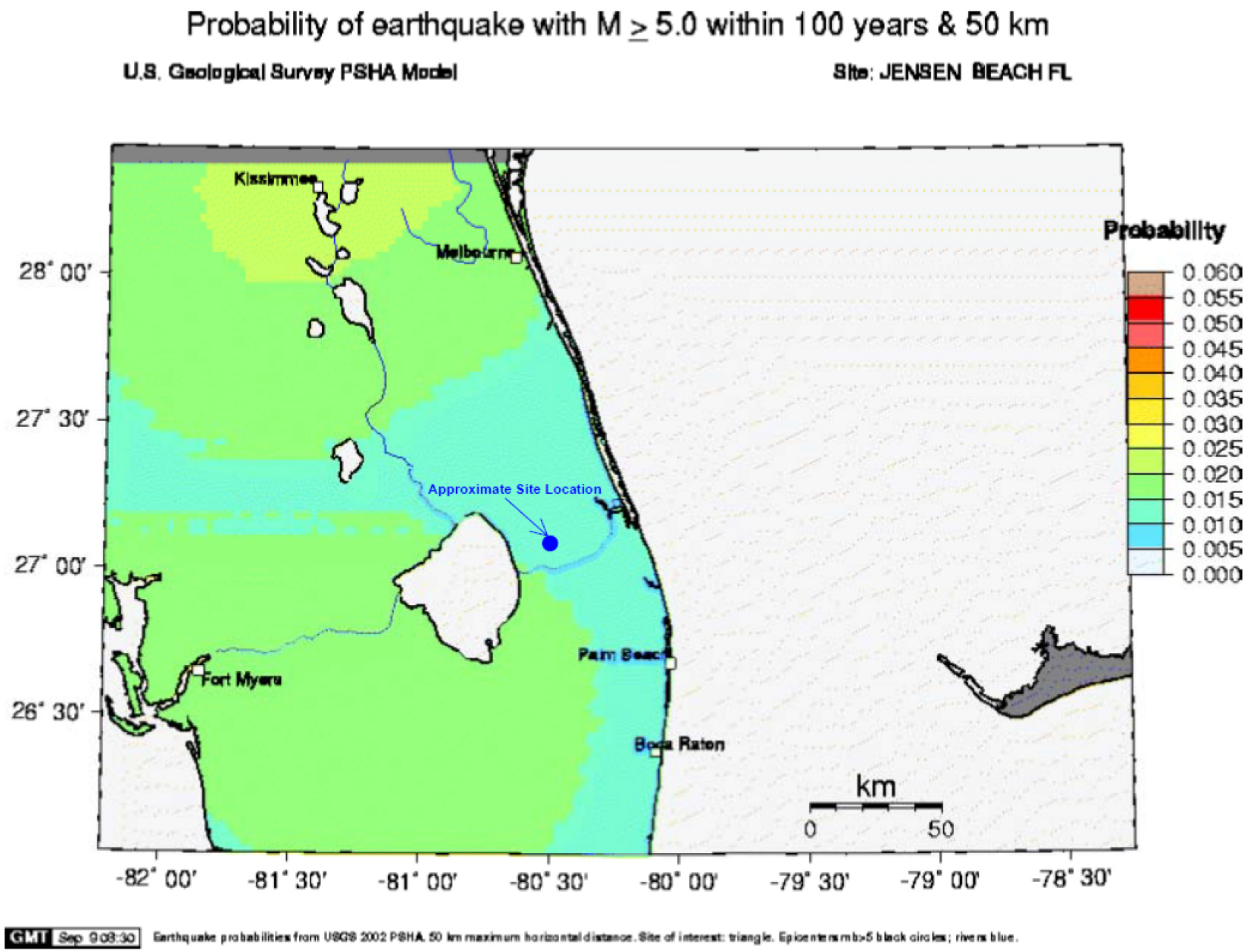
FIGURE 1.3



Reference: Maddox, 1992; after White, 1970

Source: Site Characterization Report, 2006, Figure 5.1

US Army Corps of Engineers ®	**Figure 2.1** **Geomorphic Features of the South Florida Water Management District** Geotechnical Data Report	HDR **C-44 Reservoir/STA Project** December 23, 2014



Reference: U.S. Geologic Survey
Source: Site Characterization Report, 2006, Figure 5.25

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Figure 2.2
Earthquake Probability: Magnitude 5.0 Within 100 Years
Geotechnical Data Report

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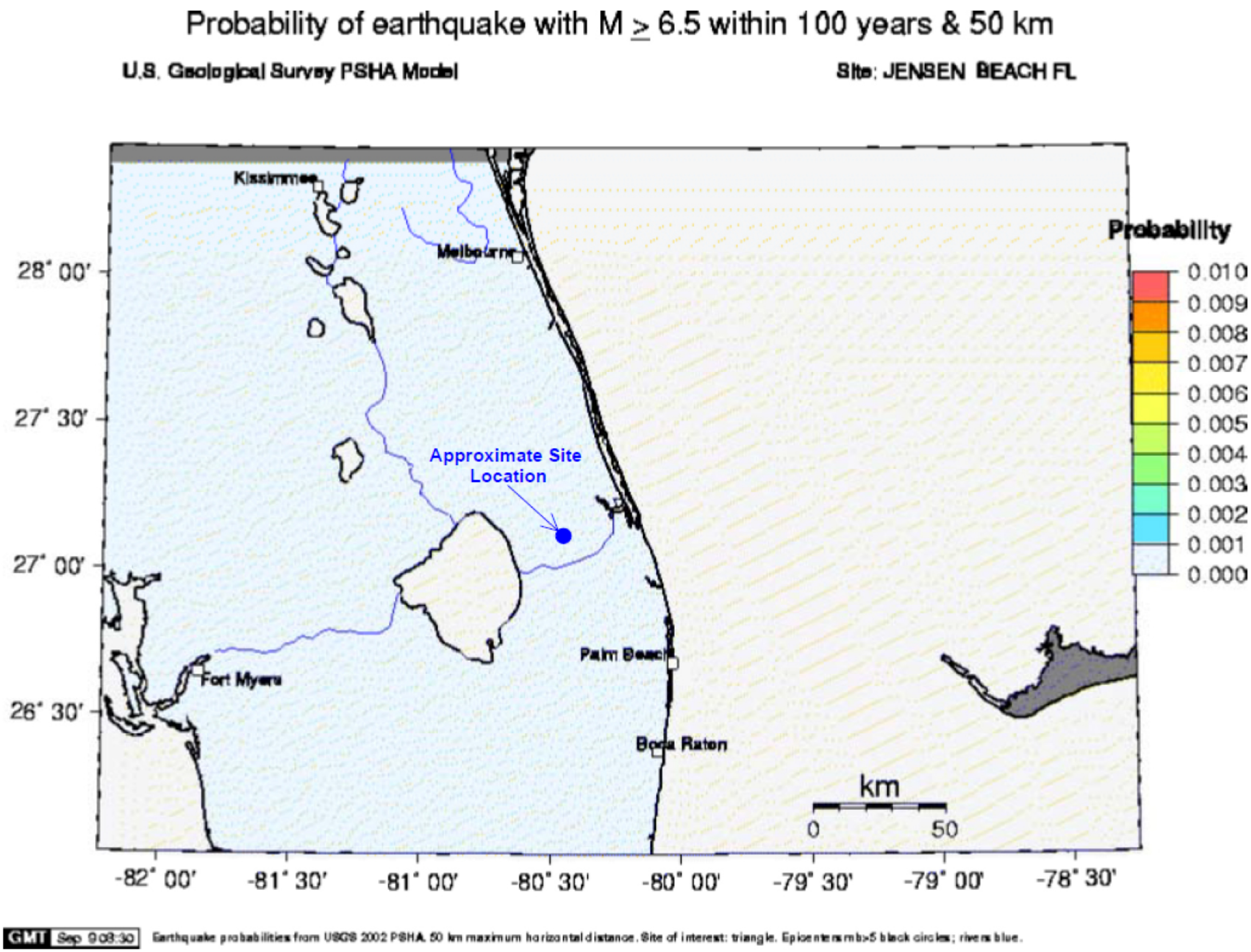
December 23, 2014



Reference: U.S. Geologic Survey
Source: Site Characterization Report, 2006, Figure 5.6

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Figure 2.3
Earthquake Probability: Magnitude 6.5 Within 100 Years
Geotechnical Data Report

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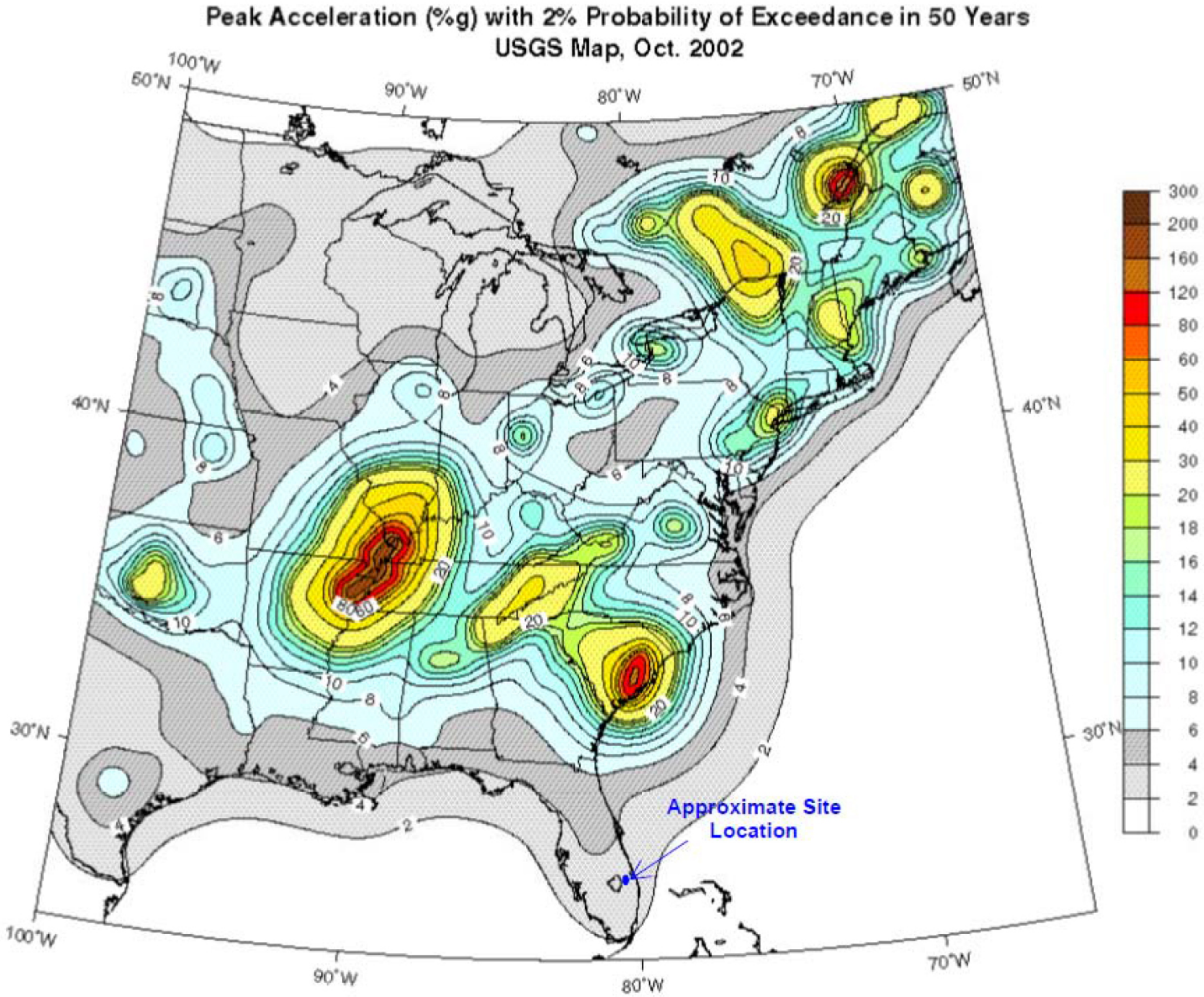
December 23, 2014



Reference: U.S. Geologic Survey
Source: Site Characterization Report, 2006, Figure 5.27

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Figure 2.4
USGS Map of Peak Acceleration
Geotechnical Data Report

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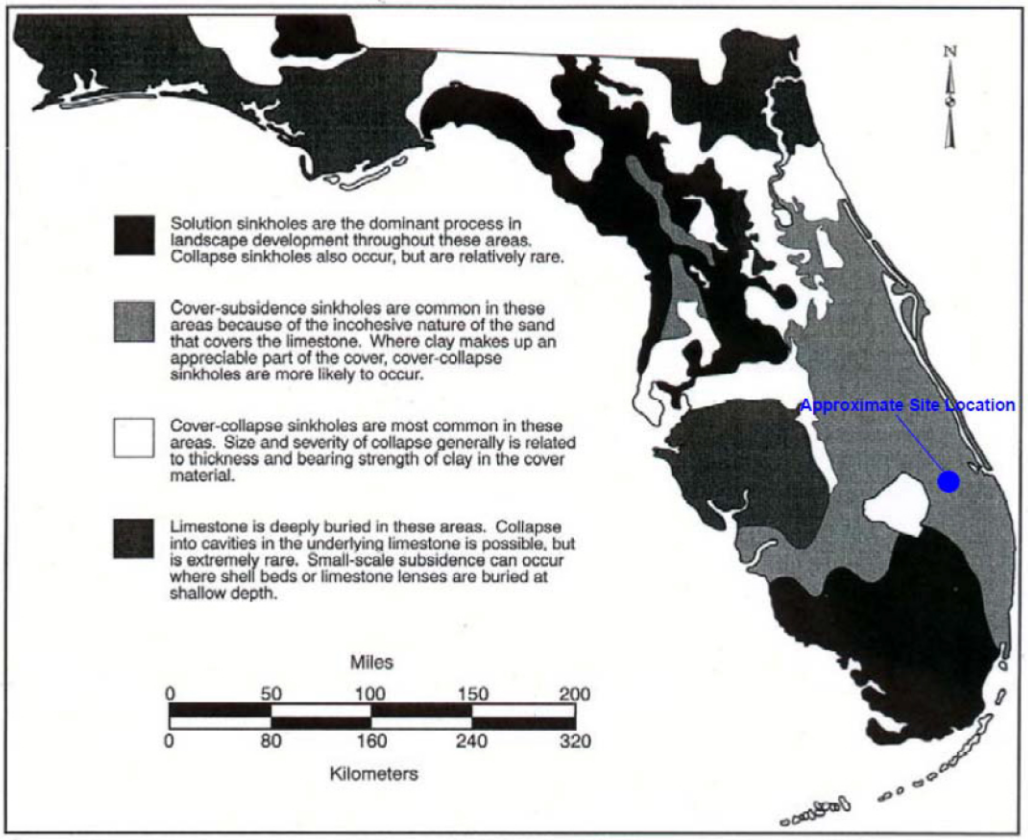
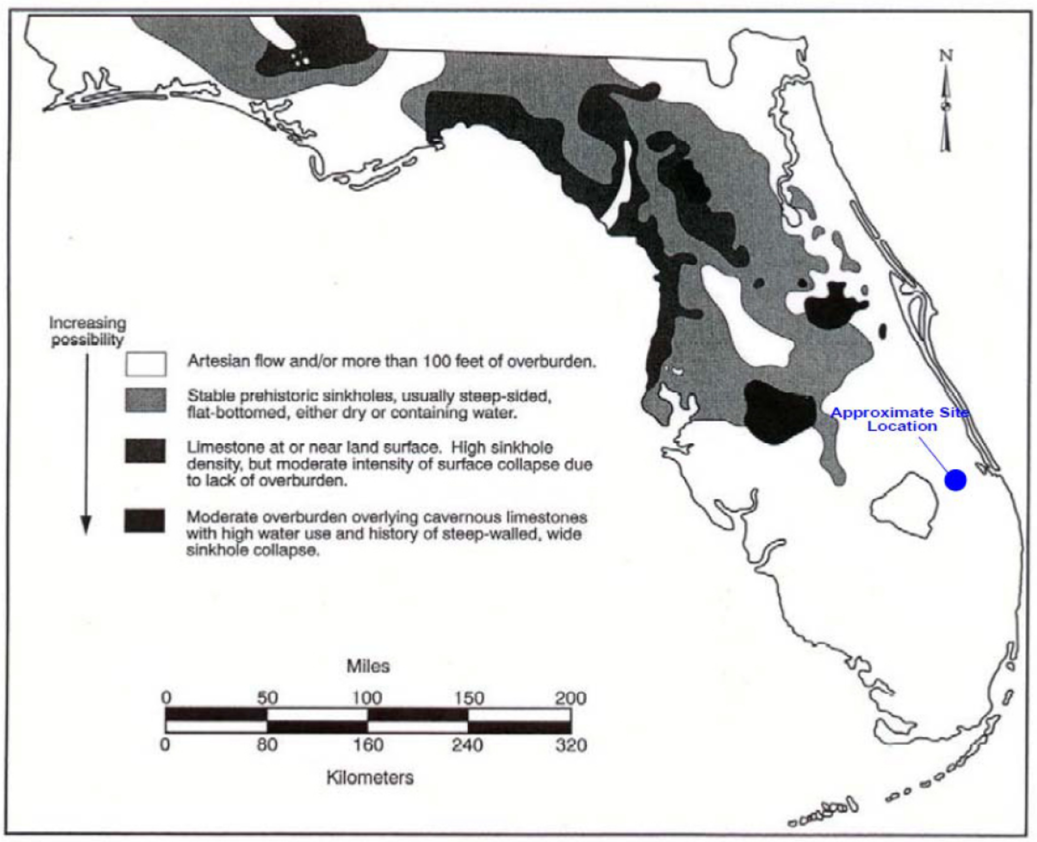
C-44 Reservoir/STA Project
December 23, 2014



Predicted Sinkhole Types
(Sinclair and Stewart, 1985)



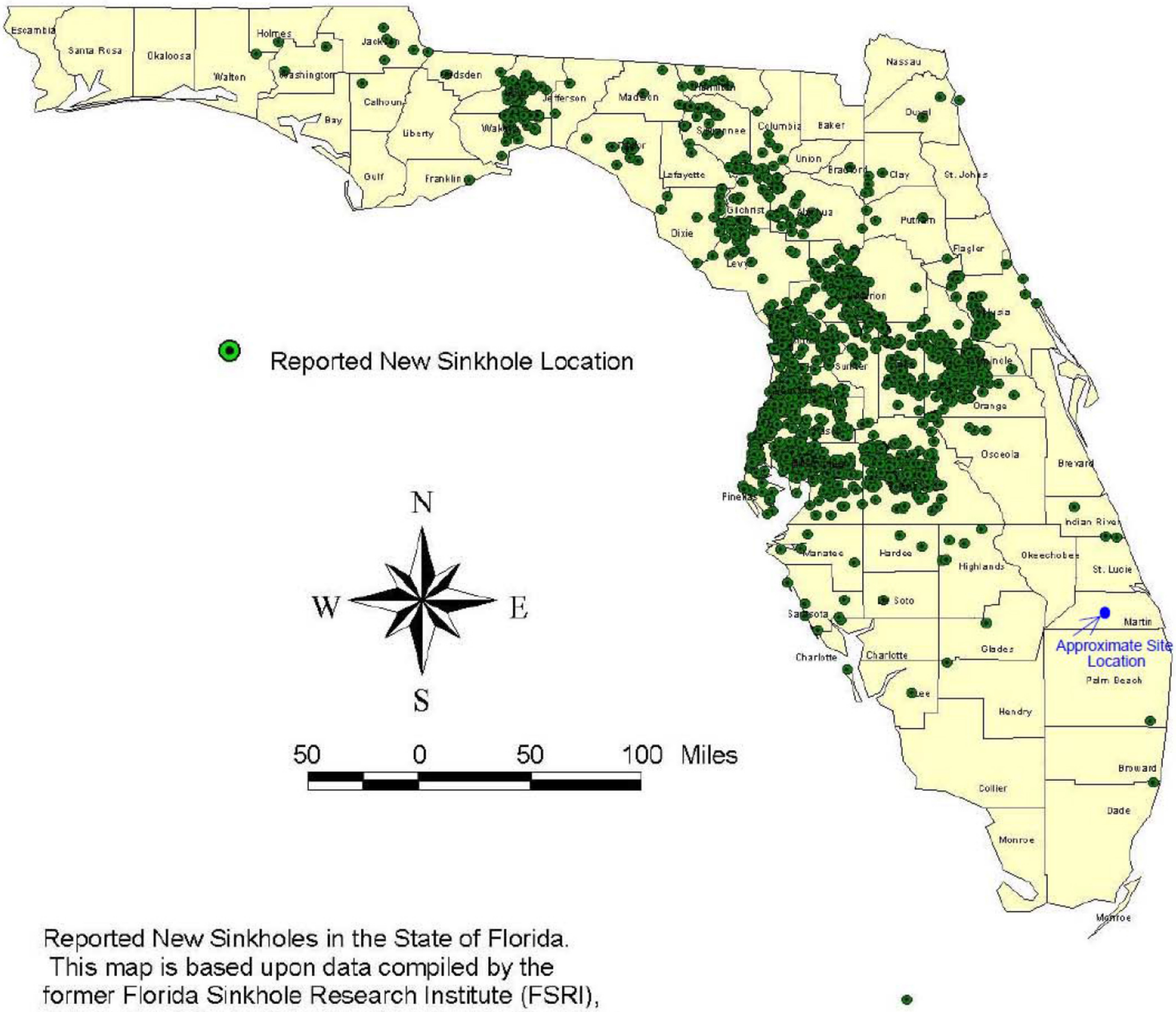
Sinkhole Probability Map
of Florida
(Sinclair and Stewart, 1985)

Reference: Upchurch and Randazzo, 1997

Source: Site Characterization Report, 2006, Figure 5.28

US Army Corps of Engineers ®	**Figure 2.5** **Sinkhole Types and Probabilities in Florida** Geotechnical Data Report	HDR **C-44 Reservoir/STA Project** December 23, 2014

Locations of Reported New Sinkholes in the State of Florida



Reported New Sinkholes in the State of Florida. This map is based upon data compiled by the former Florida Sinkhole Research Institute (FSRI), University of Central Florida, Orlando, Florida. The data contains reports of 2,805 new sinkholes that developed between approximately 1960 and 1995. Subsurface Evaluations, Inc. has collected data and compiled reports of new sinkholes through September 2004 for the St. John's River Water Management District. Subsurface Evaluations, Inc. accepts no responsibiliyt for any inaccuracies. In no event shall Subsurface Inc., be liable for any damages whatsoever arising out of the use or inability to use this information.

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www.SubsurfaceEvaluations.com

Reference: Subsurface Evaluations, Inc., 2004

Source: Site Characterization Report, 2006, Figure 5.29

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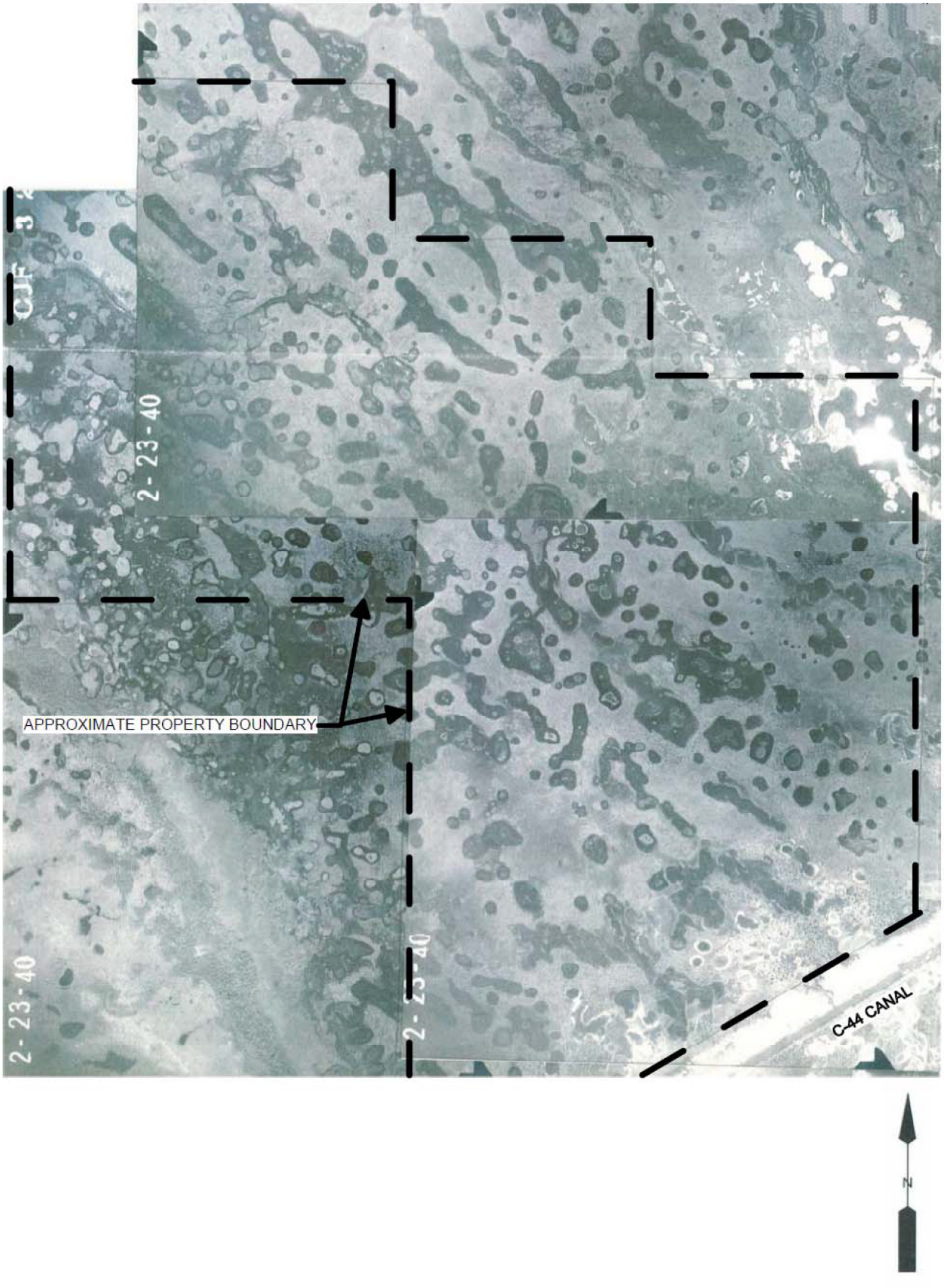
Figure 2.6
Reported New Sinkholes in Florida
Geotechnical Data Report

C-44 Reservoir/STA Project
December 23, 2014



Notes: Approximate Property Boundary has changed since the production of this figure.
Reference: U.S. Army Corps of Engineers, 1940 Aerial
Source: Site Characterization Report, 2006, Figure 2.2

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Figure 2.7
1940 Aerial Photograph
Geotechnical Data Report

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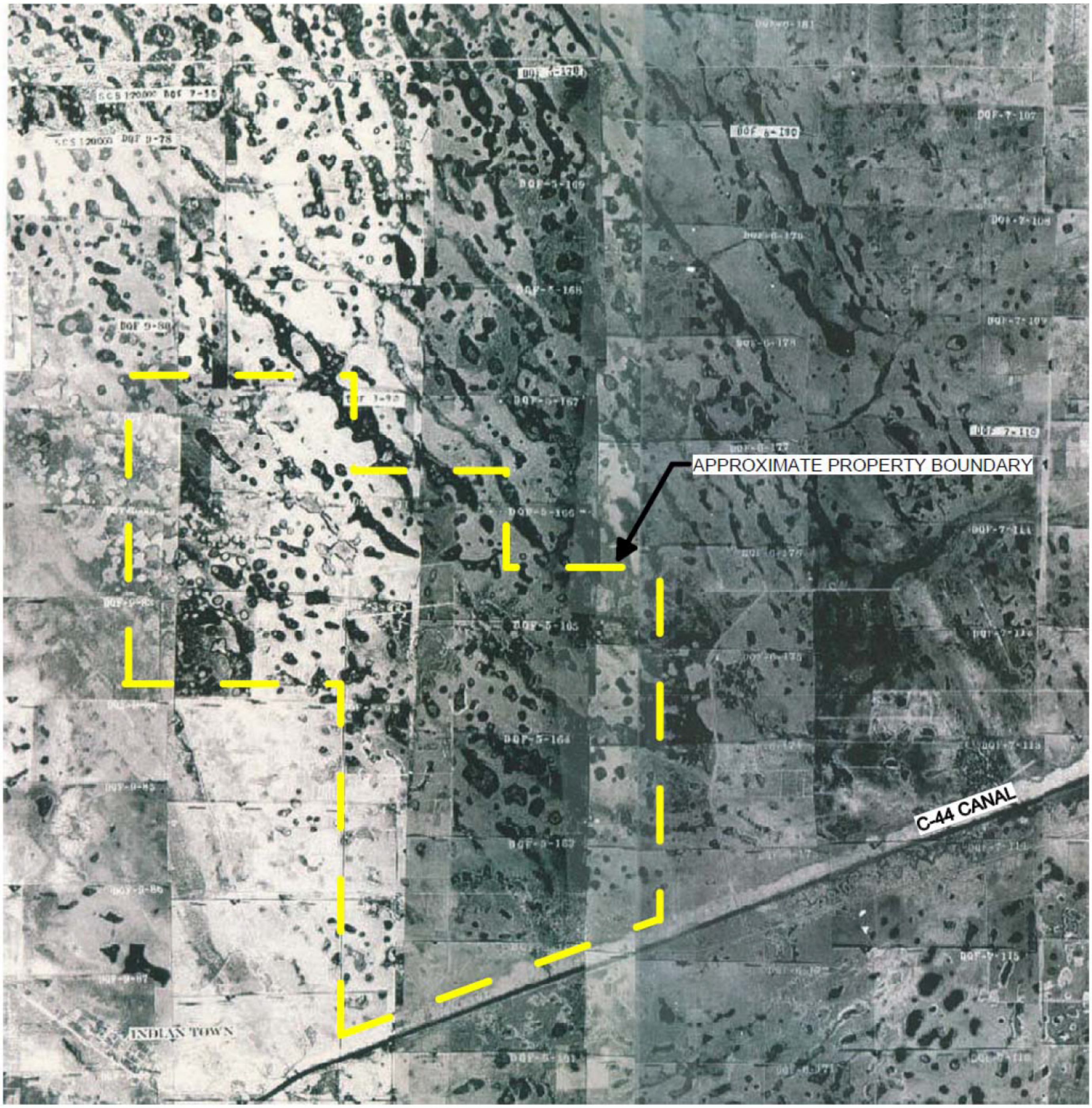
C-44 Reservoir/STA Project
December 23, 2014



Reference: U.S. Department of Agriculture
Source: Site Characterization Report, 2006, Figure 2.3

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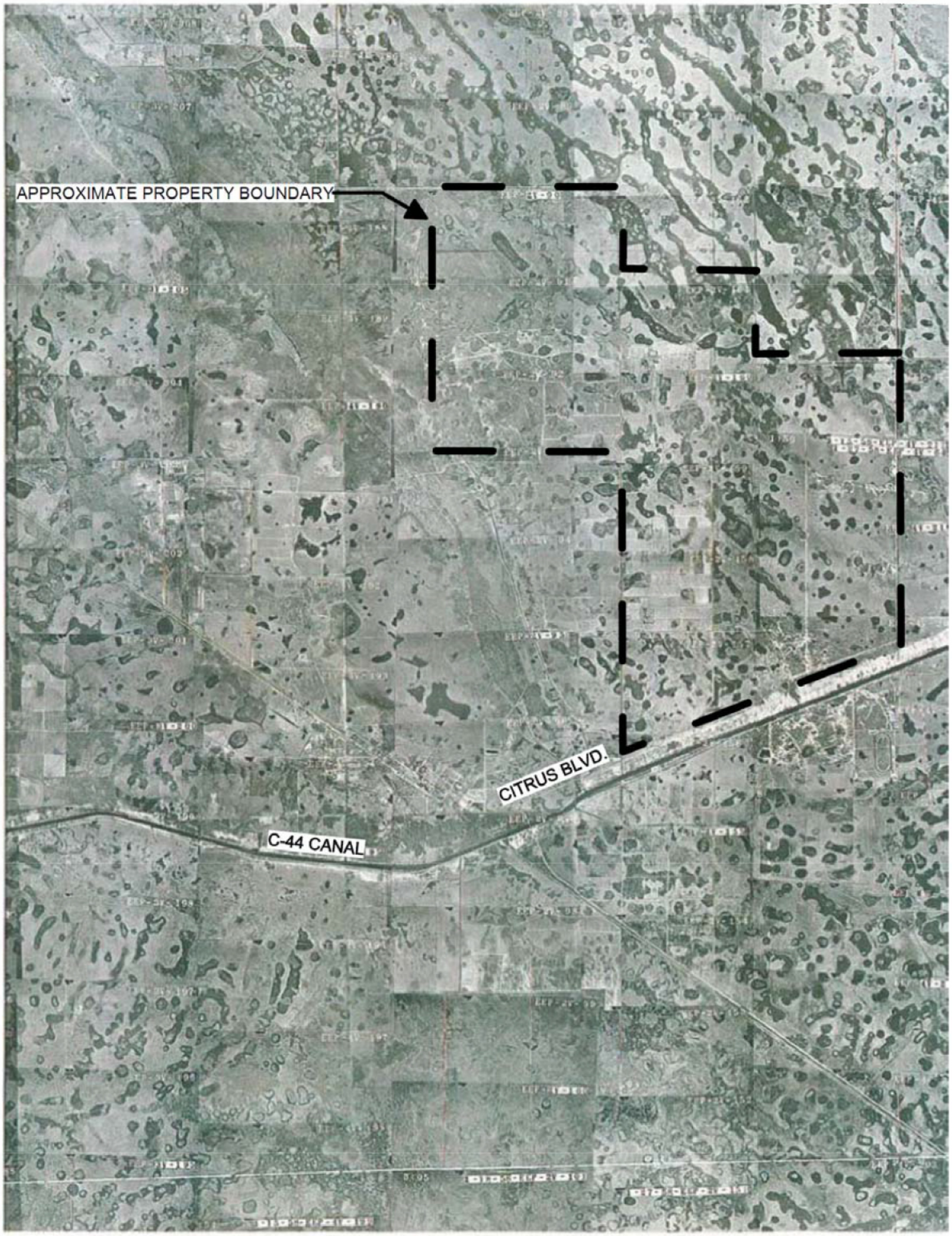
Figure 2.8
1952 Aerial Photograph
Geotechnical Data Report

C-44 Reservoir/STA Project
December 23, 2014

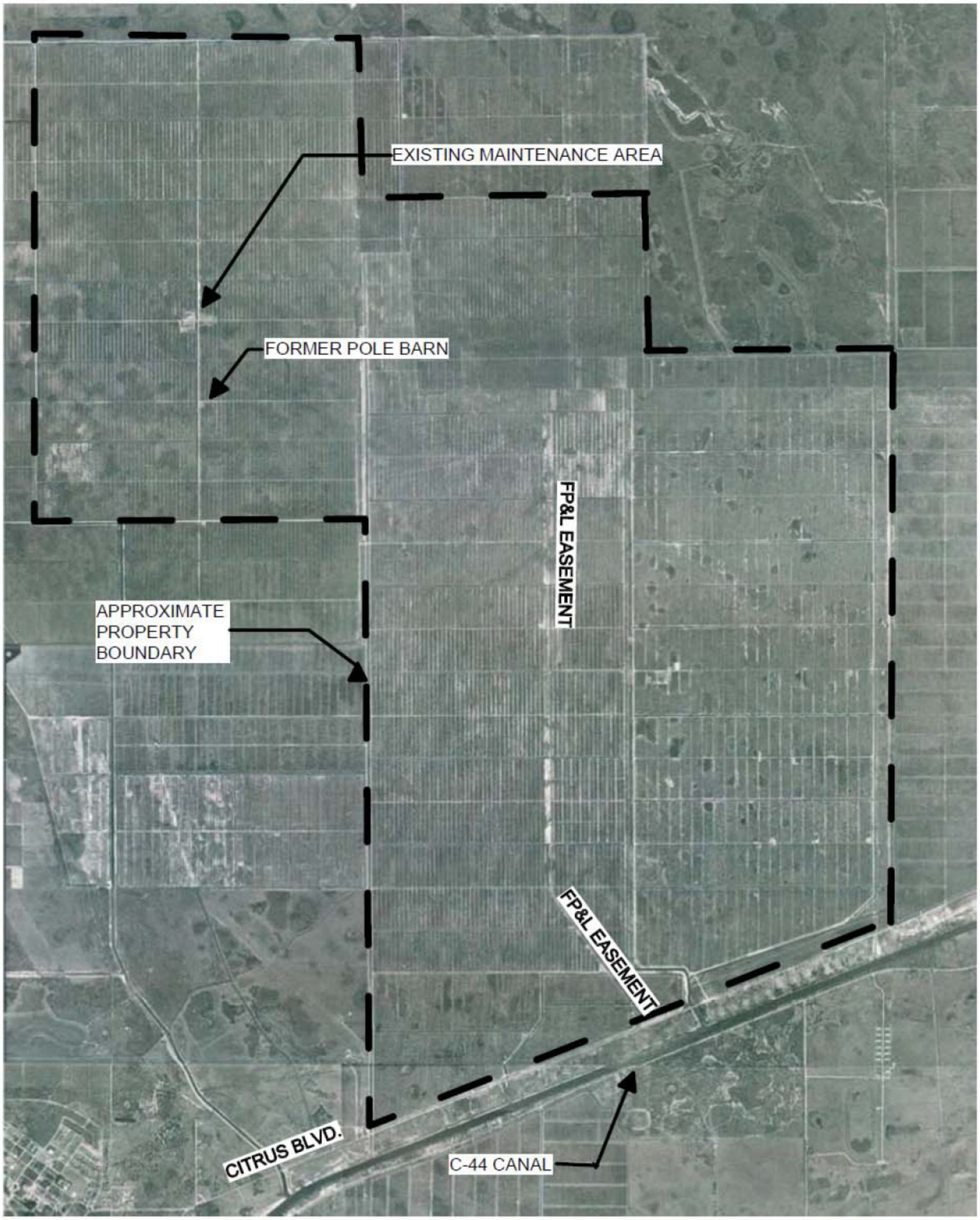


Reference: U.S. Department of Agriculture
Source: Site Characterization Report, 2006, Figure 2.4

US Army Corps of Engineers

Figure 2.9
1958 Aerial Photograph
Geotechnical Data Report

HDR
C-44 Reservoir/STA Project
December 23, 2014



Reference: Aerial photograph obtained from the State
University System of Florida PALMM Project, 1970 Aerial
Source: Site Characterization Report, 2006, Figure 2.5

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Figure 2.10
1970 Aerial Photograph
Geotechnical Data Report

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C-44 Reservoir/STA Project
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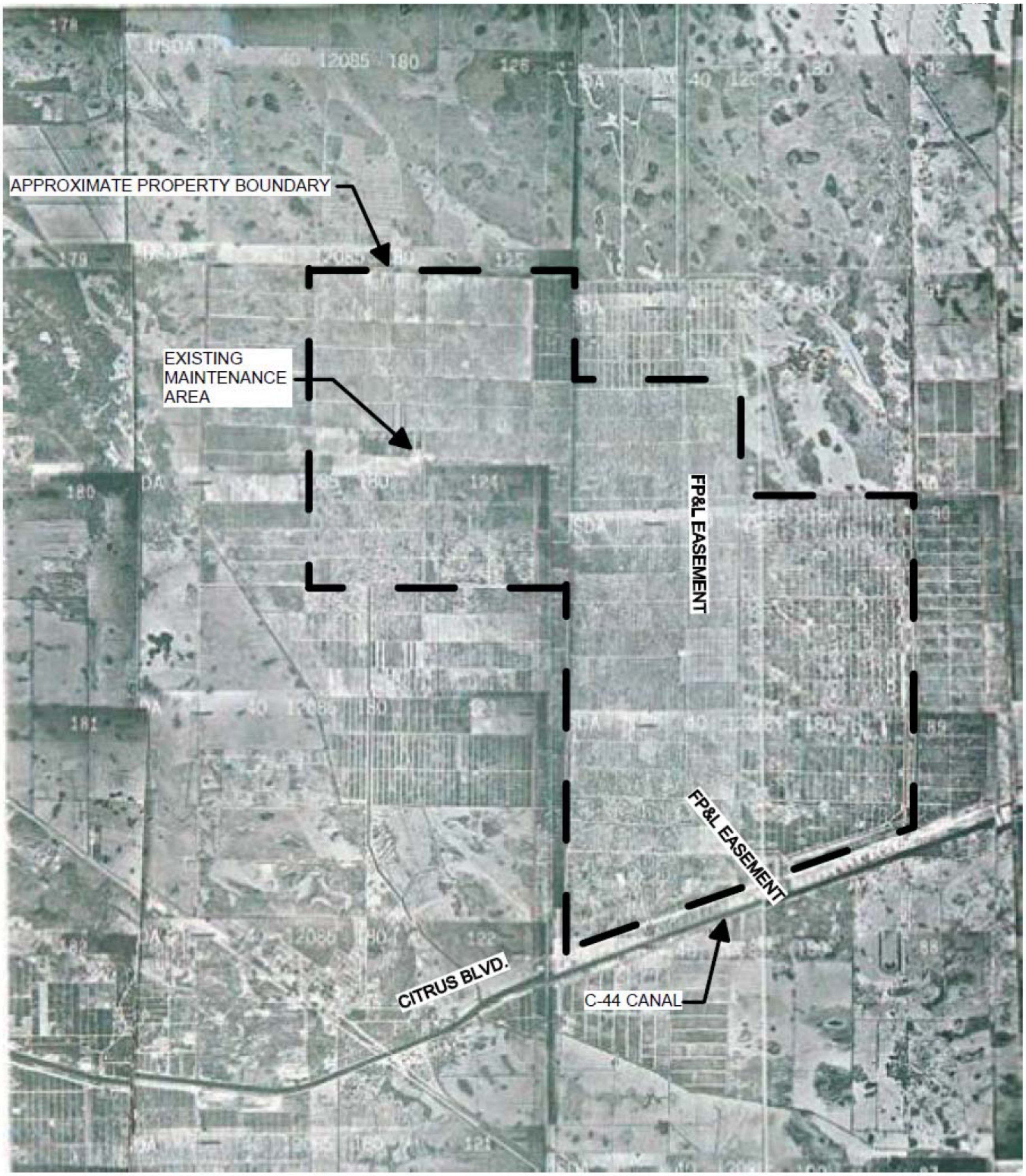
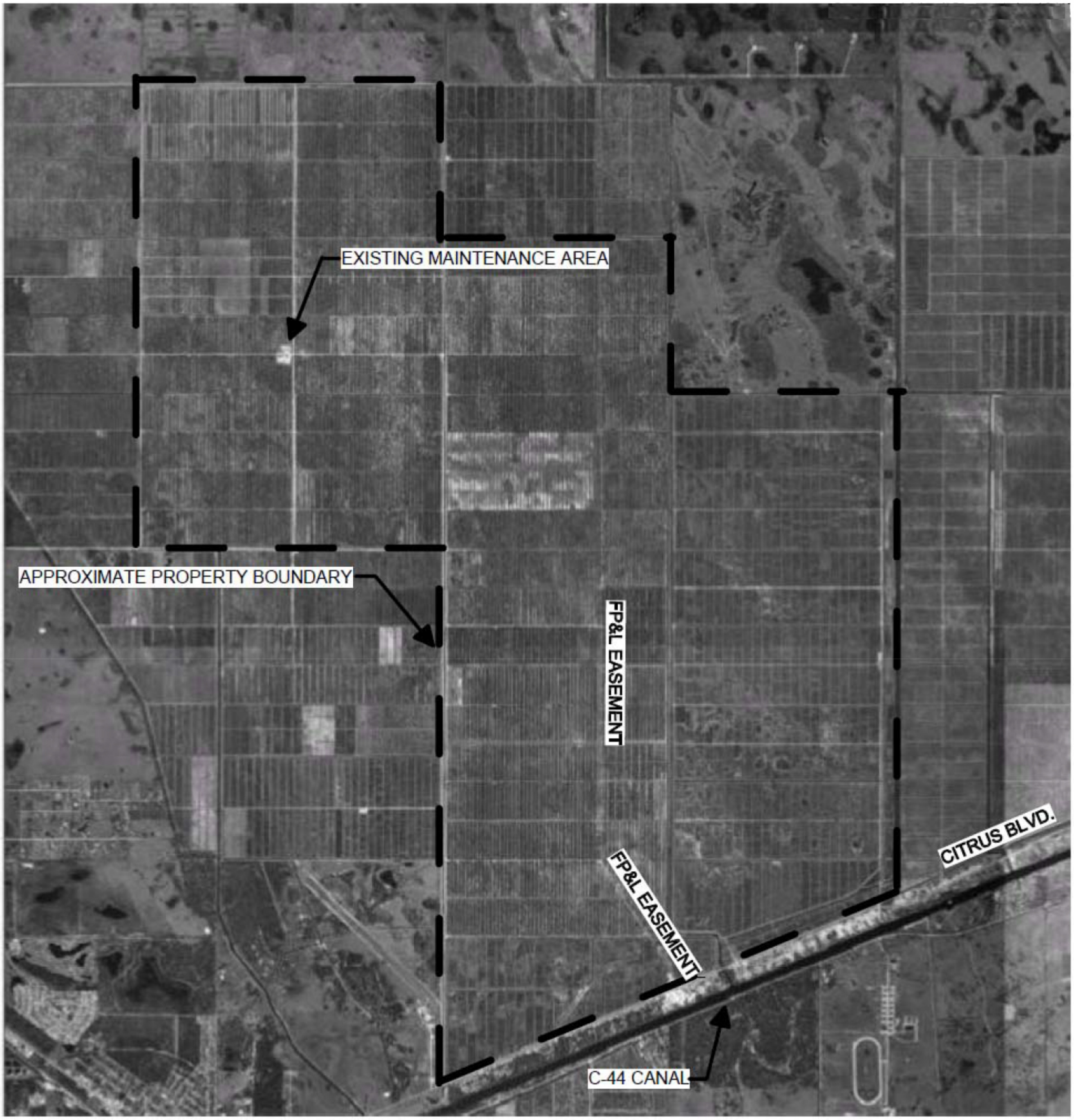


Reference: Aerial photograph obtained from the State University
of Florida PALMM Project, 1981
Source: Site Characterization Report, 2006, Figure 2.6

US Army Corps of Engineers ®	**Figure 2.11** **1981 Aerial Photograph** Geotechnical Data Report	HDR **C-44 Reservoir/STA Project** December 23, 2014



Reference: Aerial Photograph obtained from the
State University System of Florida PALMM Project, 1999 Aerial
Source: Site Characterization Report, 2006, Figure 2.7

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Figure 2.12
1999 Aerial Photograph
Geotechnical Data Report

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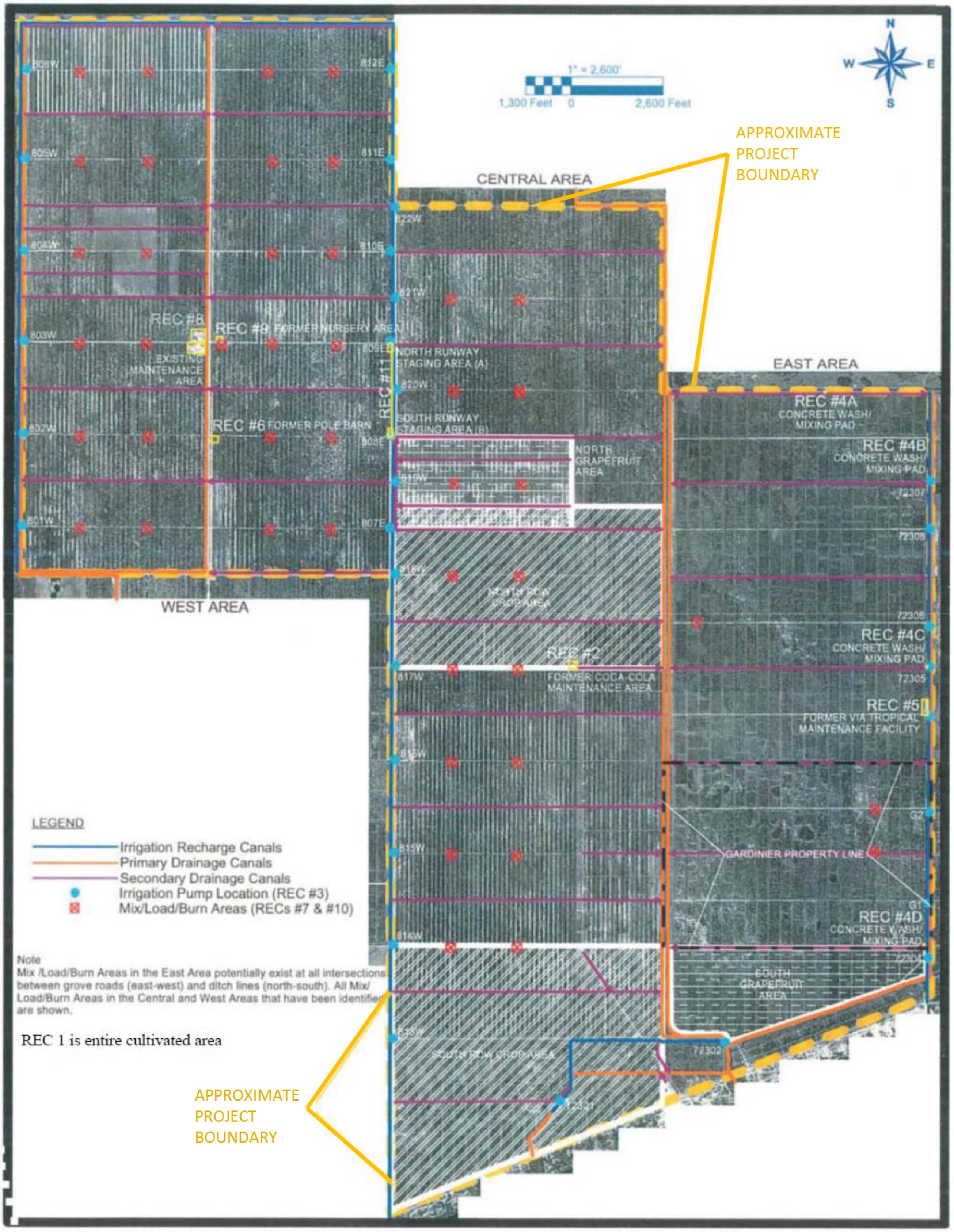
C-44 Reservoir/STA Project
December 23, 2014



Reference: CDM Phase I/II ESA, December 2004
Source: Site Characterization Report, 2006, Figure 2.10

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Figure 2.13
Recognized Environmental Conditions (REC) Locations
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Legend:
A - Auger Borings
B - Core Borings
APT - Aquifer Performance Tests
W - Monitor Well

Reference: CDM, Preliminary Geotechnical Design Report, 2004
Source: Site Characterization Report, 2006, Figure 3.1

Note: This figure prints full size at 11"x17".

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Figure 3.1
Previous Geotechnical Explorations
Geotechnical Data Report

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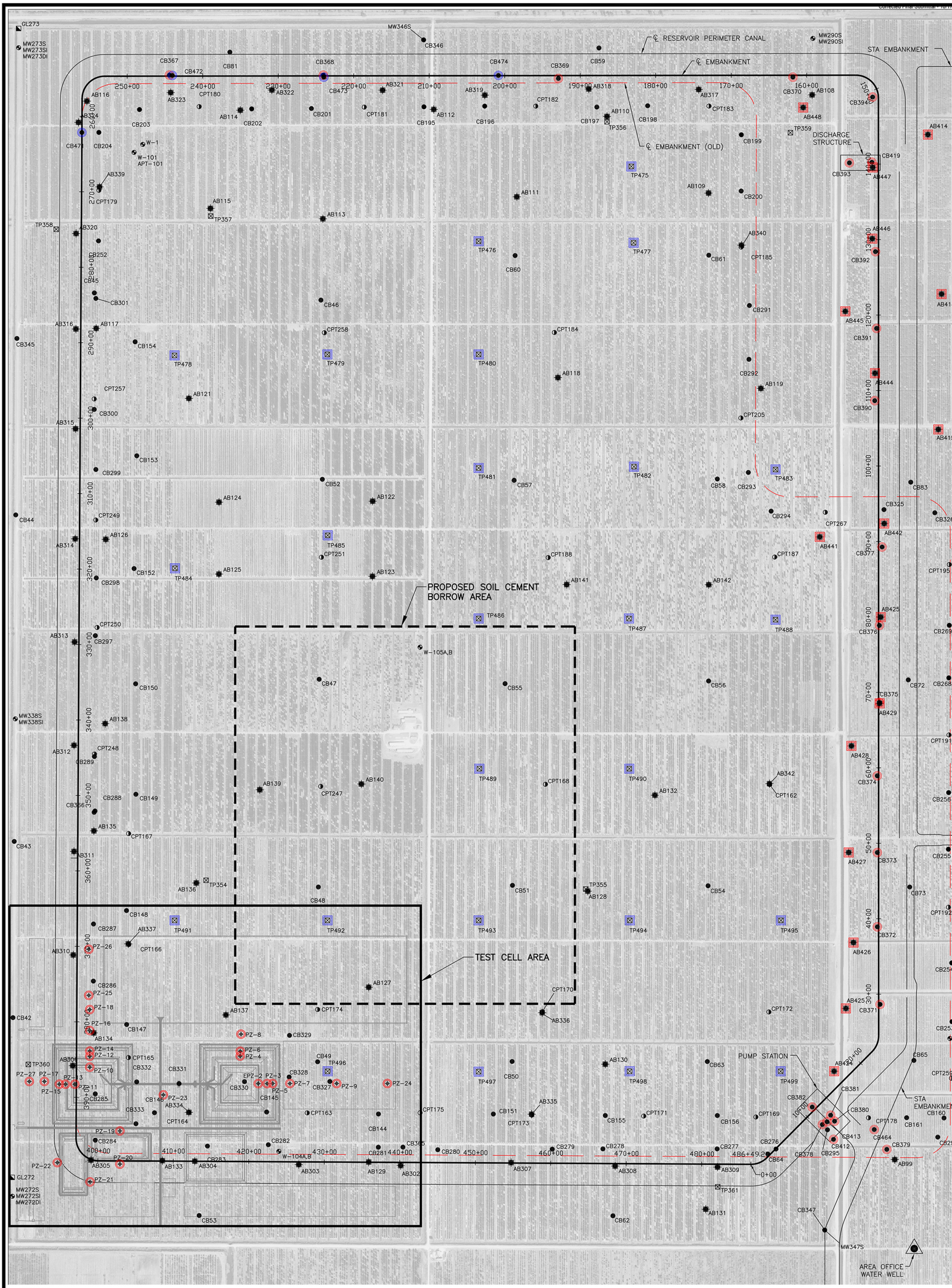

LEGEND

- ROTARY WASH BORINGS (CB)
- CONE PENETROMETER TEST (CPT)
- AUGER BORINGS (AB)
- GEOLOGIC BORINGS (GL)
- MONITORING WELL(S) (MW)
- TEST PIT (TP)
- ROTARY WASH BORINGS (POST SITE CHARACTERIZATION)
- AUGER BORINGS (POST SITE CHARACTERIZATION)
- PIEZOMETERS (PZ) (TEST CELL PROGRAM)
- ROTARY WASH BORINGS (AMEC INVESTIGATION)
- AUGER BORINGS (AMEC INVESTIGATION)

600 300 0 600 1200

NORTH

Note: This figure prints full size at 22"x34"

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Figure 3.2
Reservoir Vicinity Explorations
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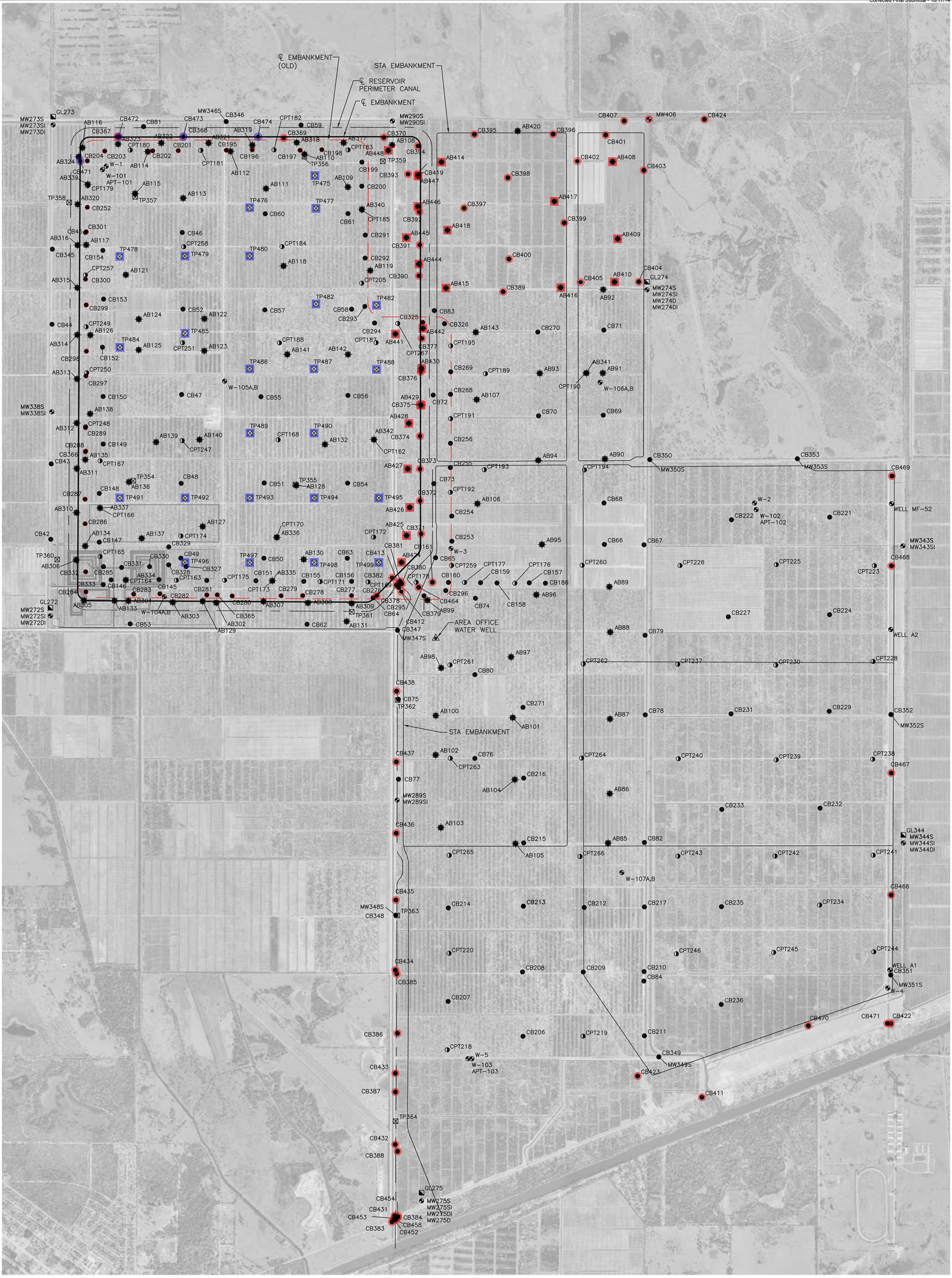
December 23, 2014



LEGEND

- ROTARY WASH BORINGS (CB)
- CONE PENETROMETER TEST (CPT)
- AUGER BORINGS (AB)
- GEOLOGIC BORINGS (GL)
- MONITORING WELL(S) (MW & W)
- TEST PIT (TP)
- ROTARY WASH BORINGS (POST SITE CHARACTERIZATION)
- AUGER BORINGS (POST SITE CHARACTERIZATION)
- PIEZOMETERS (PZ) (TEST CELL PROGRAM)
- ROTARY WASH BORINGS (AMEC INVESTIGATION)
- AUGER BORINGS (AMEC INVESTIGATION)

1400 700 0 1400 2800

NORTH

Note: This figure prints full size at 22"x34"

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Figure 3.3
Project Site Explorations
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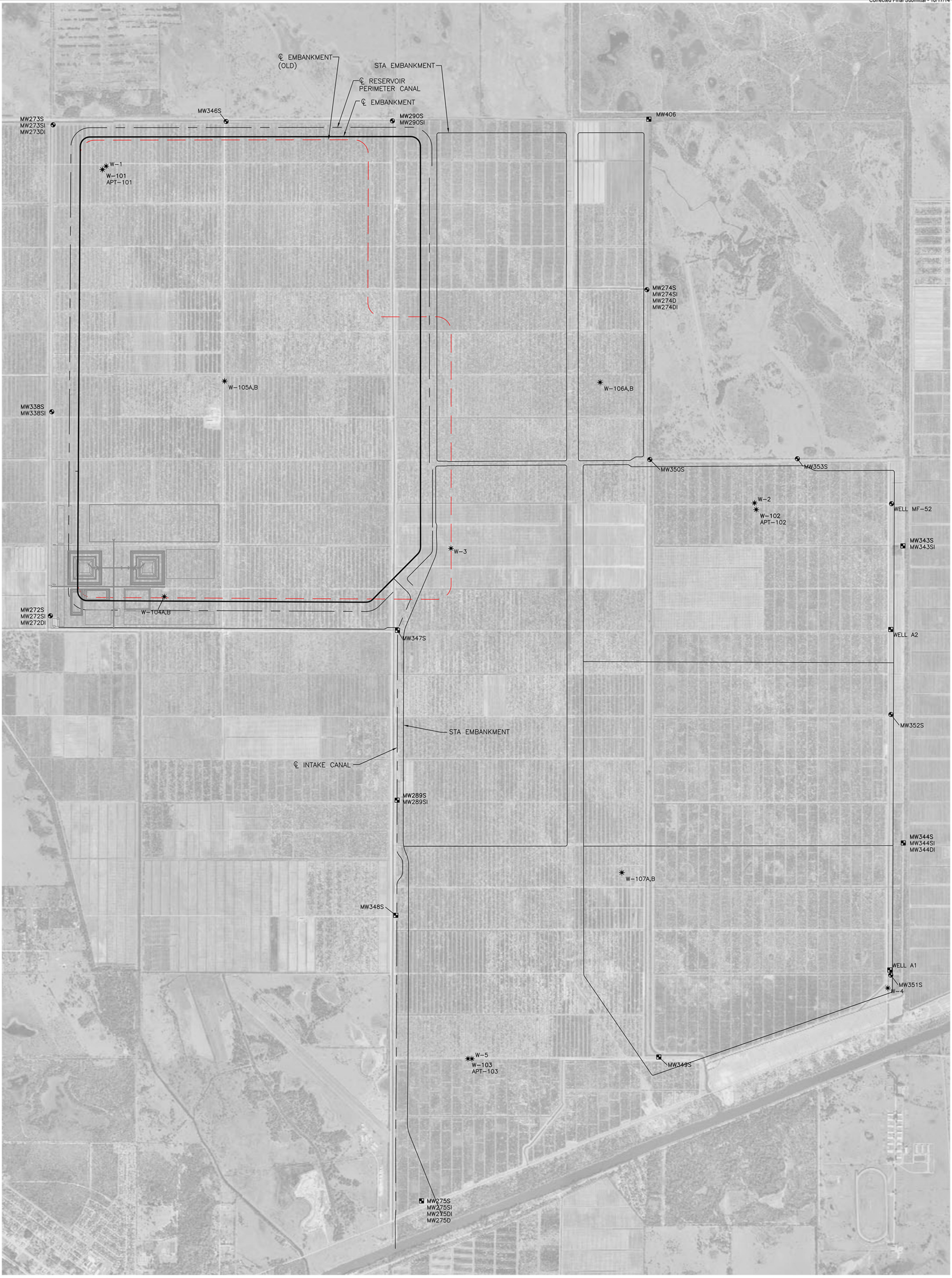
December 23, 2014

Corrected Final Submittal - 10/17/14



LEGEND

- MONITORING WELL(S) (DATA COLLECTION ONGOING)
- MONITORING WELL(S) (PLUGGED AND ABANDONED OR DESTROYED)
- MONITORING WELL(S) (USED FOR AQUIFER TESTING BY ARDAMAN & ASSOC. 2003 OR CDM 2004)

1400 700 0 1400 2800

NORTH

Note: This figure prints full size at 22"x34"

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Figure 3.4
Monitoring Well Locations
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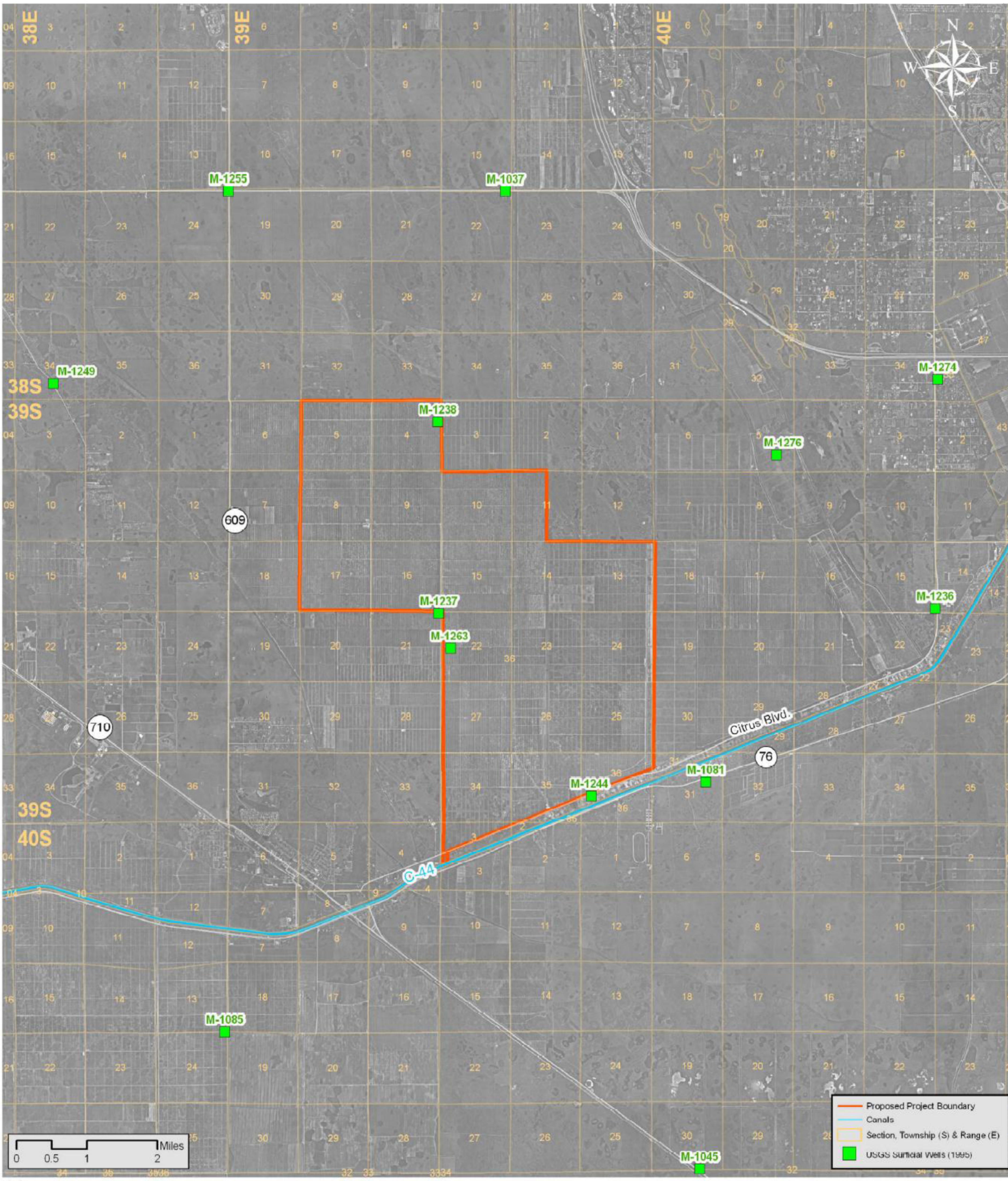

Note: This figure prints full size at 11"x17".

Reference: USGS
Source: Site Characterization Report, 2006, Figure 3.7

Note: This figure prints full size at 11"x17".

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Figure 4.1
USGS Surficial Aquifer Monitoring Wells in the Project Area
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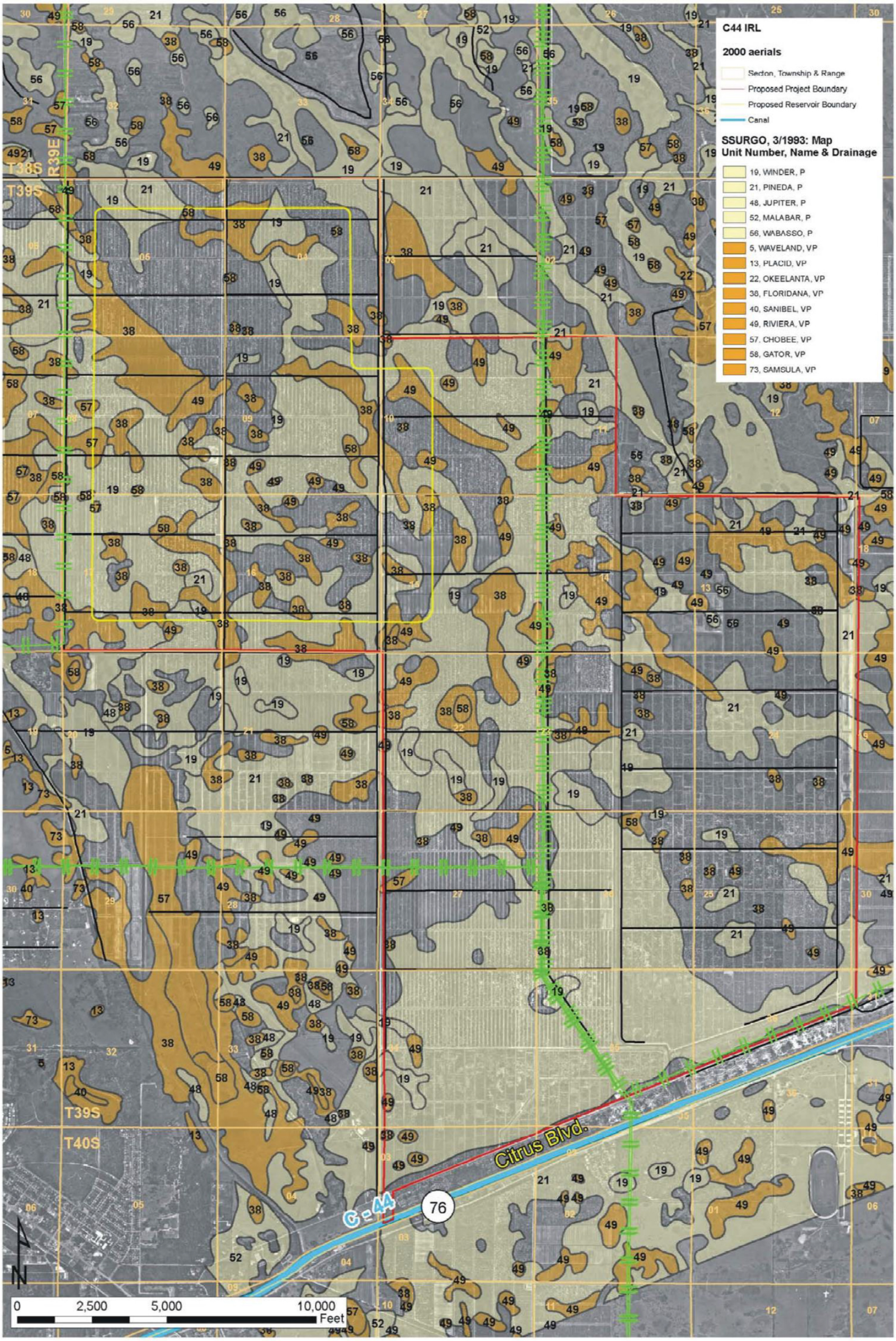

Reference: USDA SCS, 1981
Source: Site Characterization Report, 2006, Figure 5.2

Note: This figure prints full size at 11"x17".

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Figure 6.1
Soils Map of Project Area
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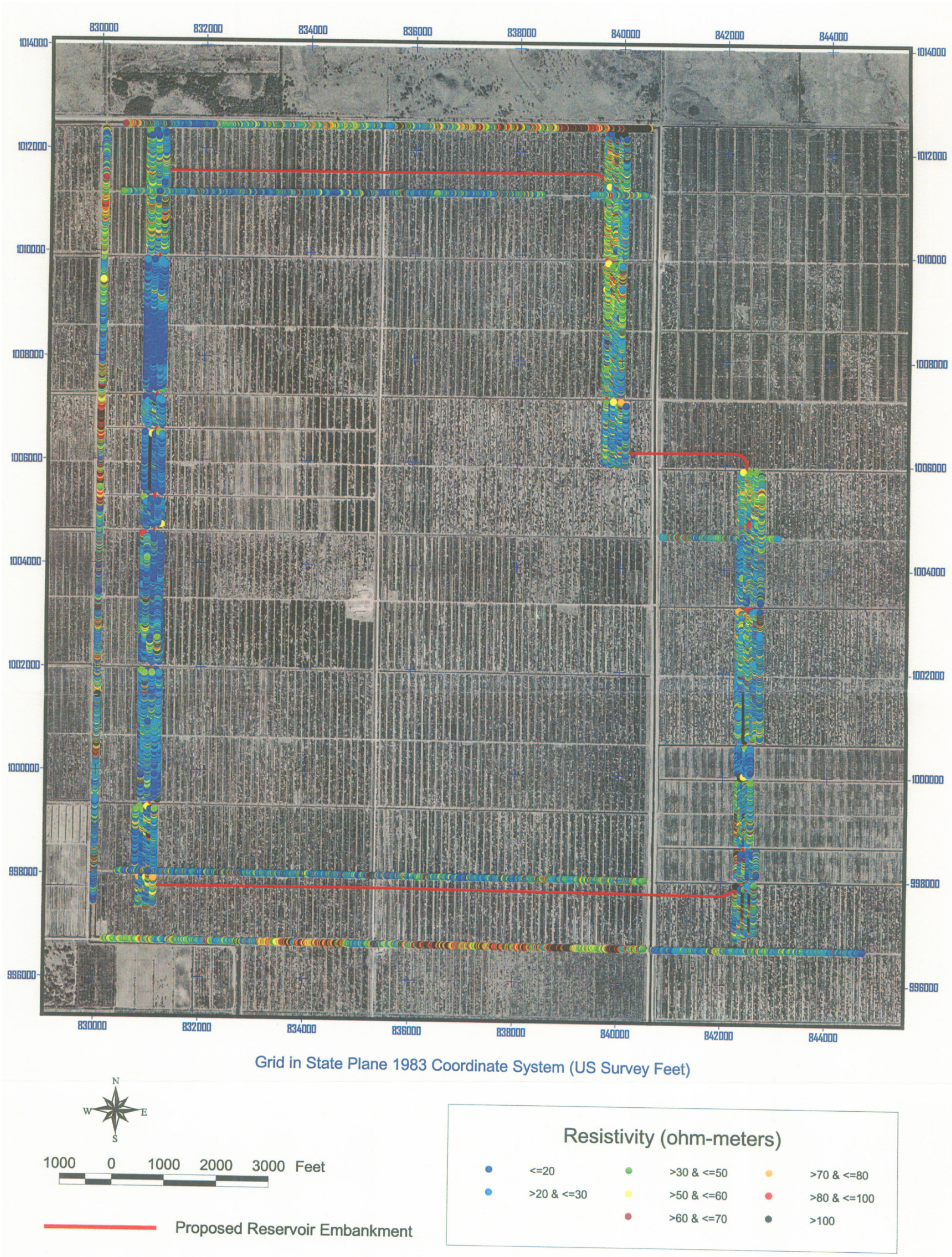

Source: Site Characterization Report, 2006, Figure 2

Note: This figure prints full size at 11"x17".

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Figure 6.2
Resistivity Map of Soil at Depth 1.4 feet
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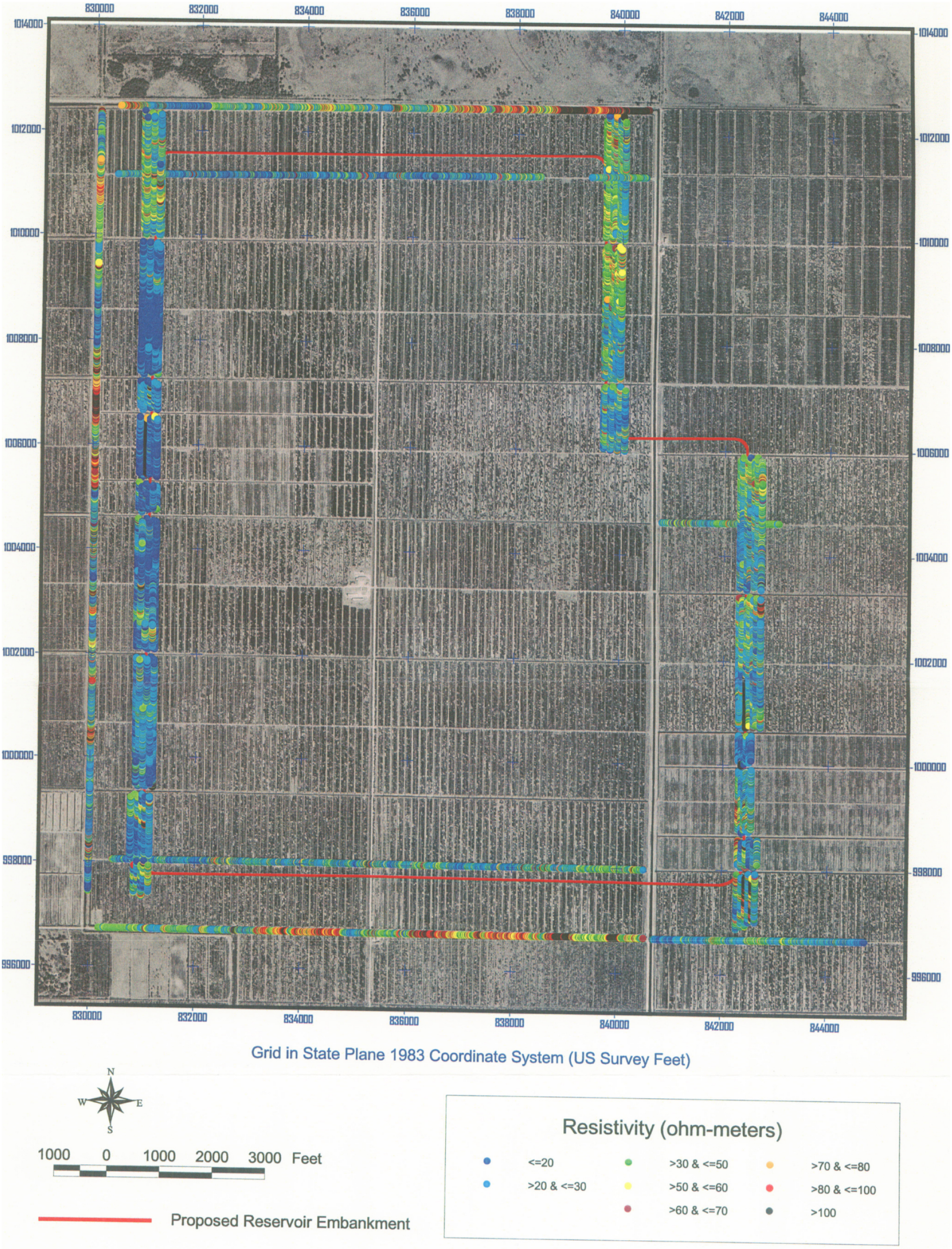

Source: Site Characterization Report, 2006, Figure 3

Note: This figure prints full size at 11"x17".

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Figure 6.3
Resistivity Map of Soil at Depth 4.4 feet
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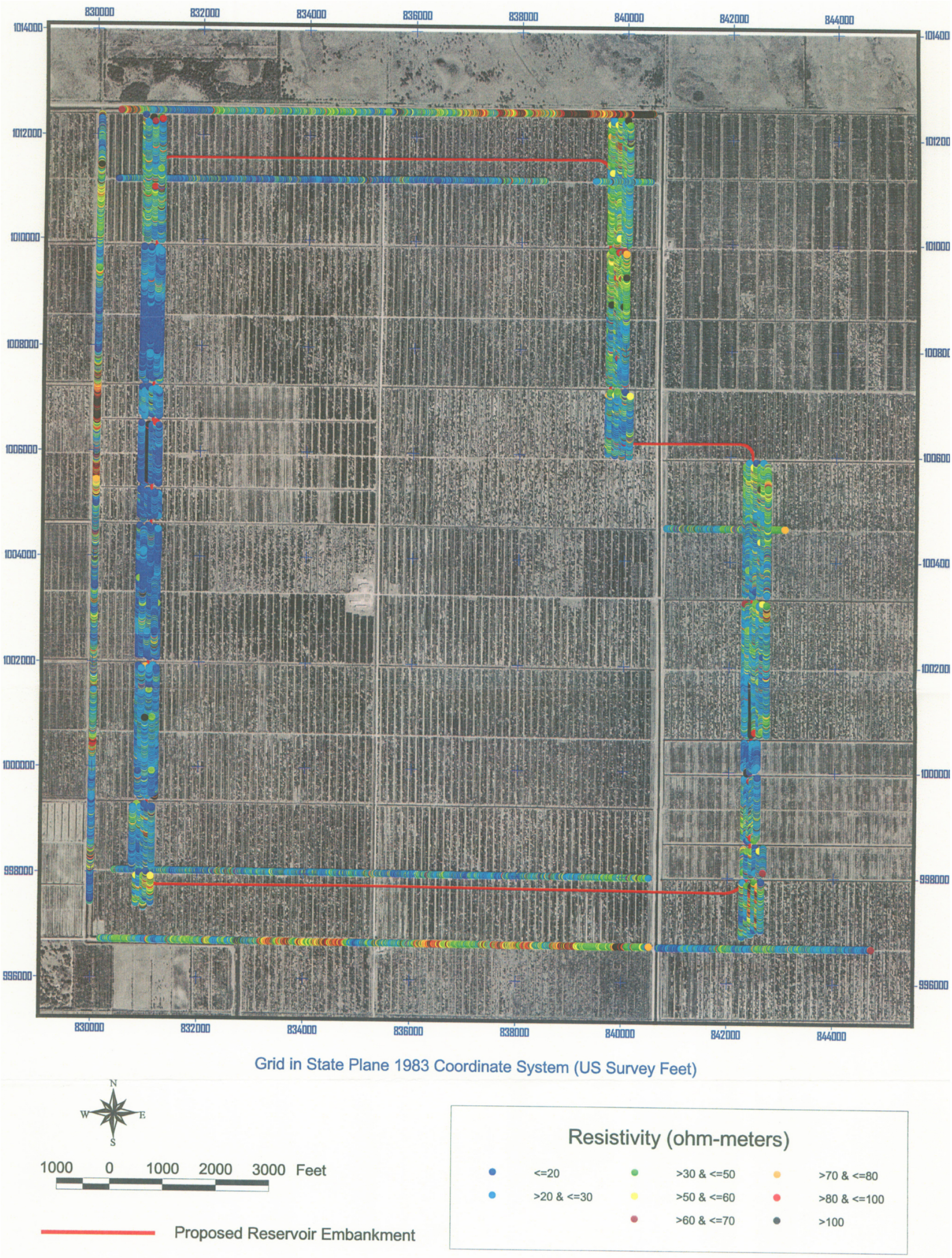
December 23, 2014



Source: Site Characterization Report, 2006, Figure 4

Note: This figure prints full size at 11"x17".

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Figure 6.4
Resistivity Map of Soil at Depth 7.6 feet
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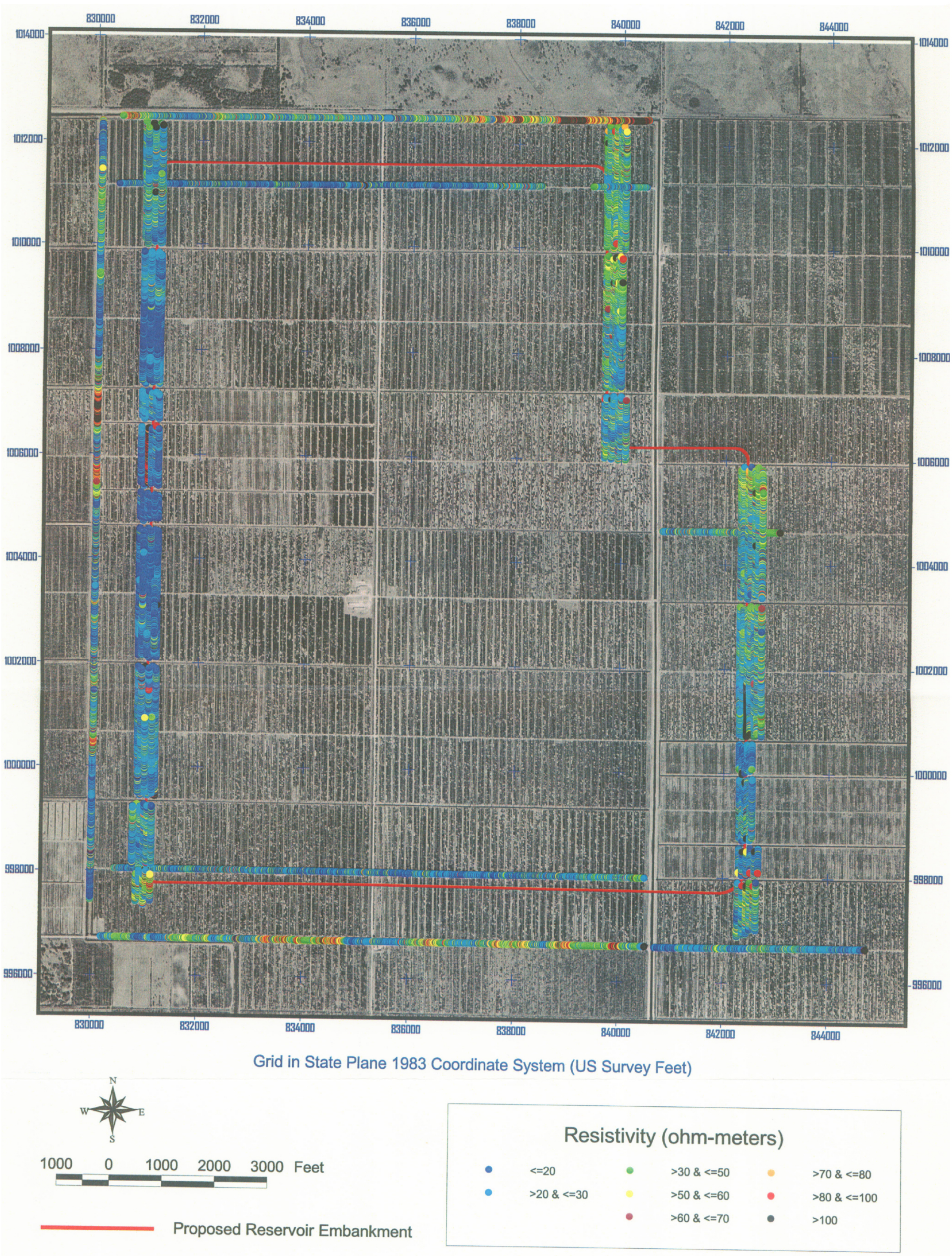

Source: Site Characterization Report, 2006, Figure 5

Note: This figure prints full size at 11"x17".

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Figure 6.5
Resistivity Map of Soil at Depth 10.2 feet
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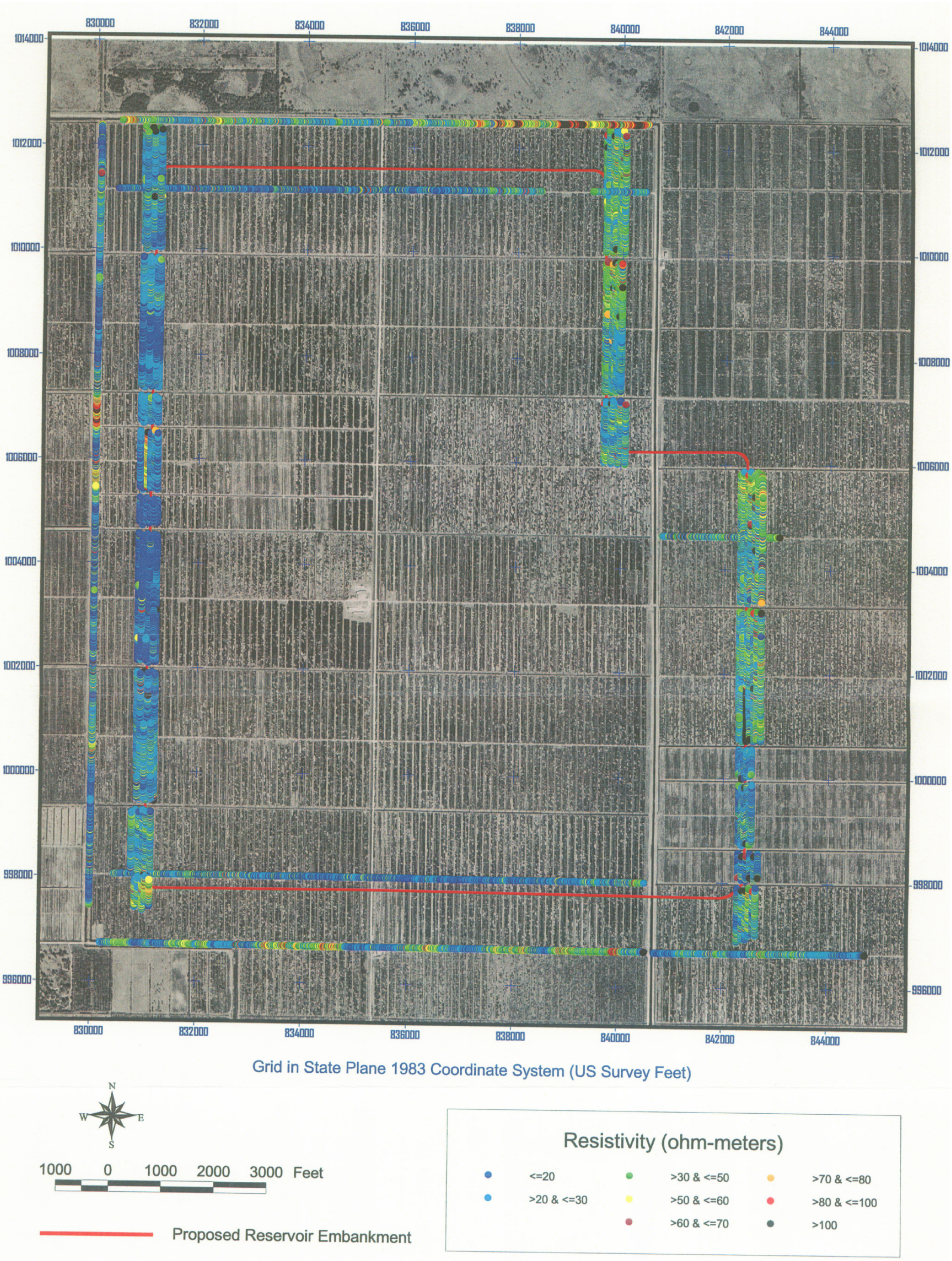

Source: Site Characterization Report, 2006, Figure 6

Note: This figure prints full size at 11"x17".

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Figure 6.6
Resistivity Map of Soil at Depth 13.4 feet
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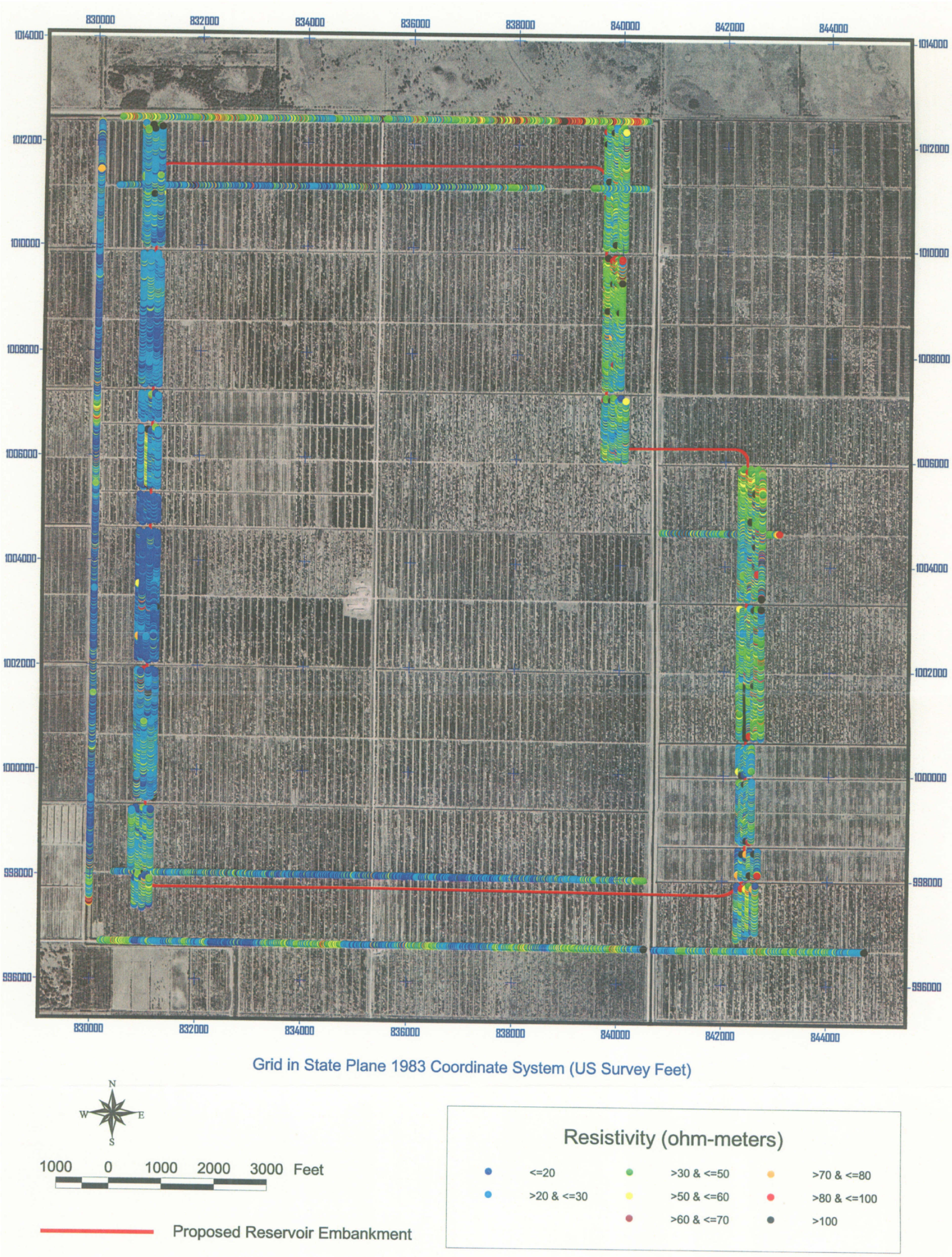

Source: Site Characterization Report, 2006, Figure 7

Note: This figure prints full size at 11"x17".

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Figure 6.7
Resistivity Map of Soil at Depth 17.3 feet
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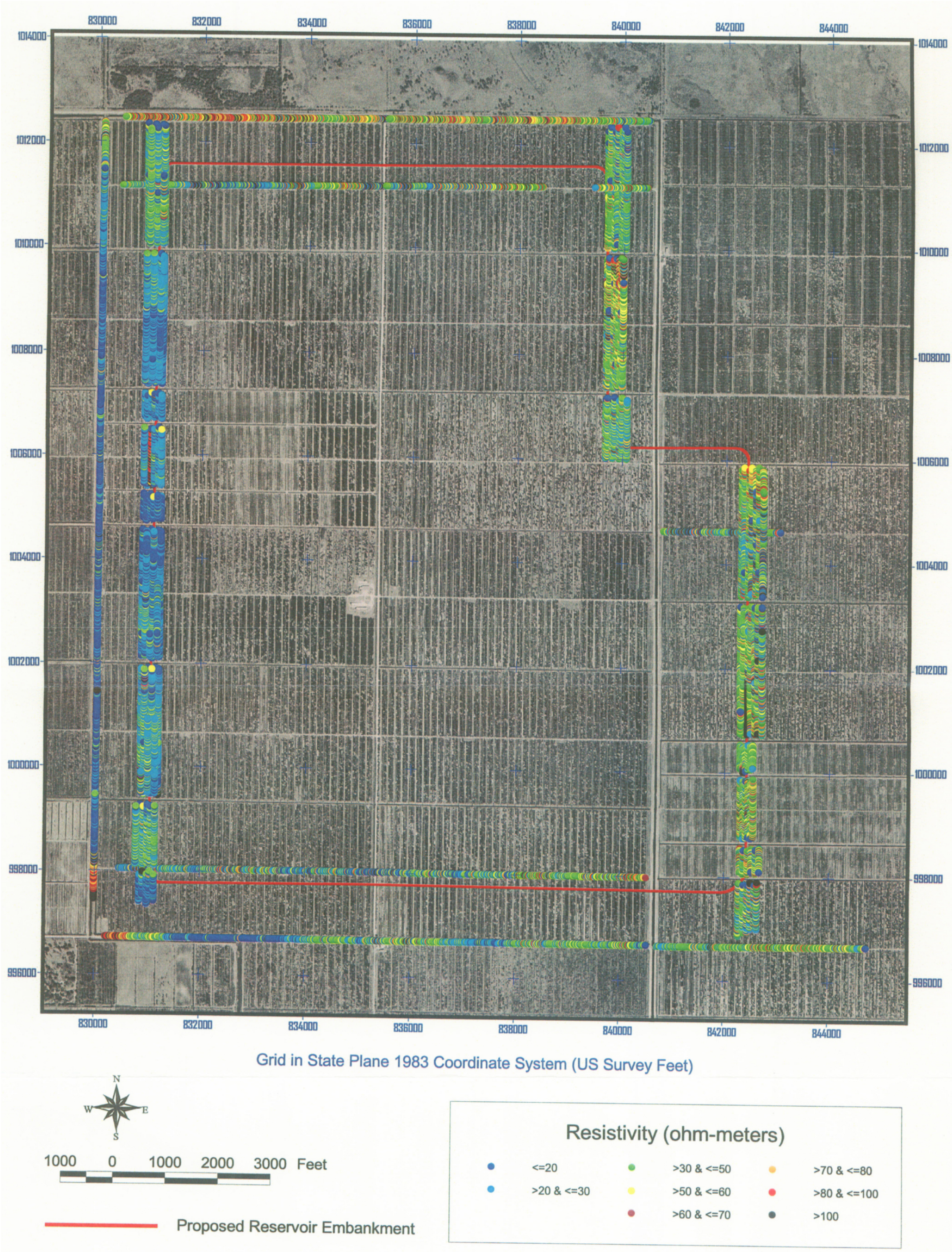

Source: Site Characterization Report, 2006, Figure 8

Note: This figure prints full size at 11"x17".

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Figure 6.8
Resistivity Map of Soil at Depth 22.0 feet
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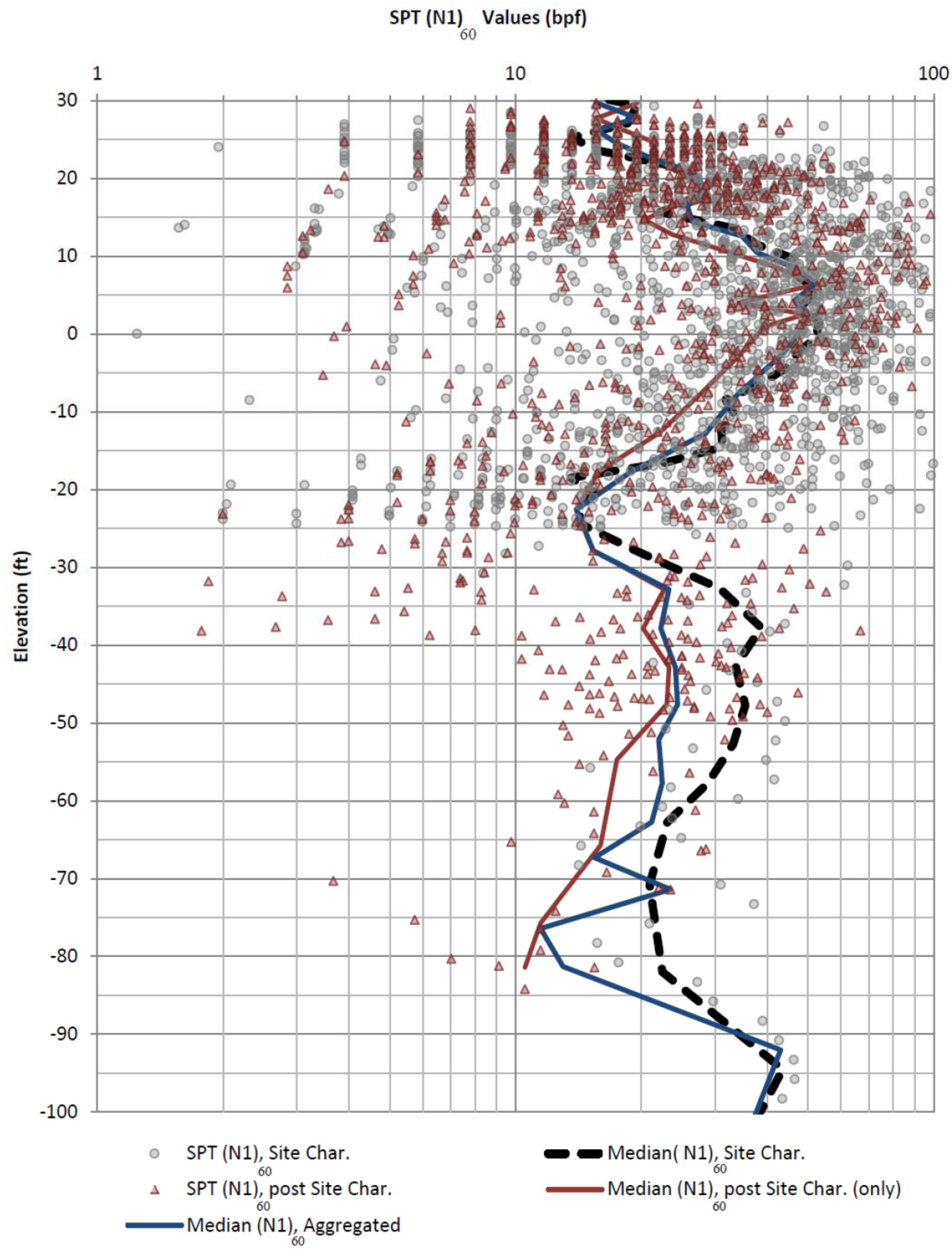

Note: site characterization phase data is approximately 66% of total, post-site characterization data is approximately 34% of the total

Source: Site Characterization Report, 2006, Figure 2.11

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Figure 7.1
SPT $(N1)_{60}$ vs. Elevation
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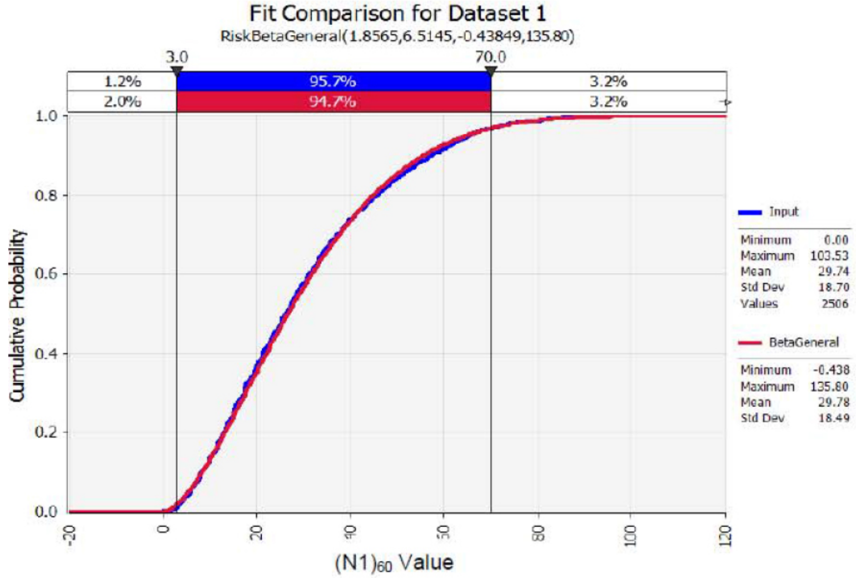
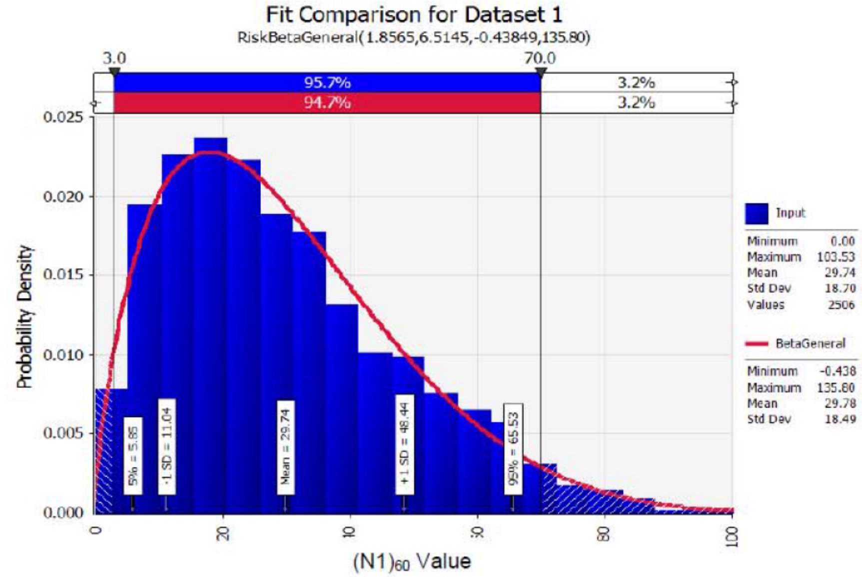
December 23, 2014





Statistical distribution of $(N1)_{60}$ values across the reservoir site based on 150 borings. Total number of data points in the analysis is 2,689. Data points with an uncorrected SPT N value of greater than 60 (approximately 7% of total) are excluded from the statistical analysis

Source: Site Characterization Report, 2006, Figure 2.12

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Figure 7.2

Statistical Evaluation of $(N1)_{60}$ Data

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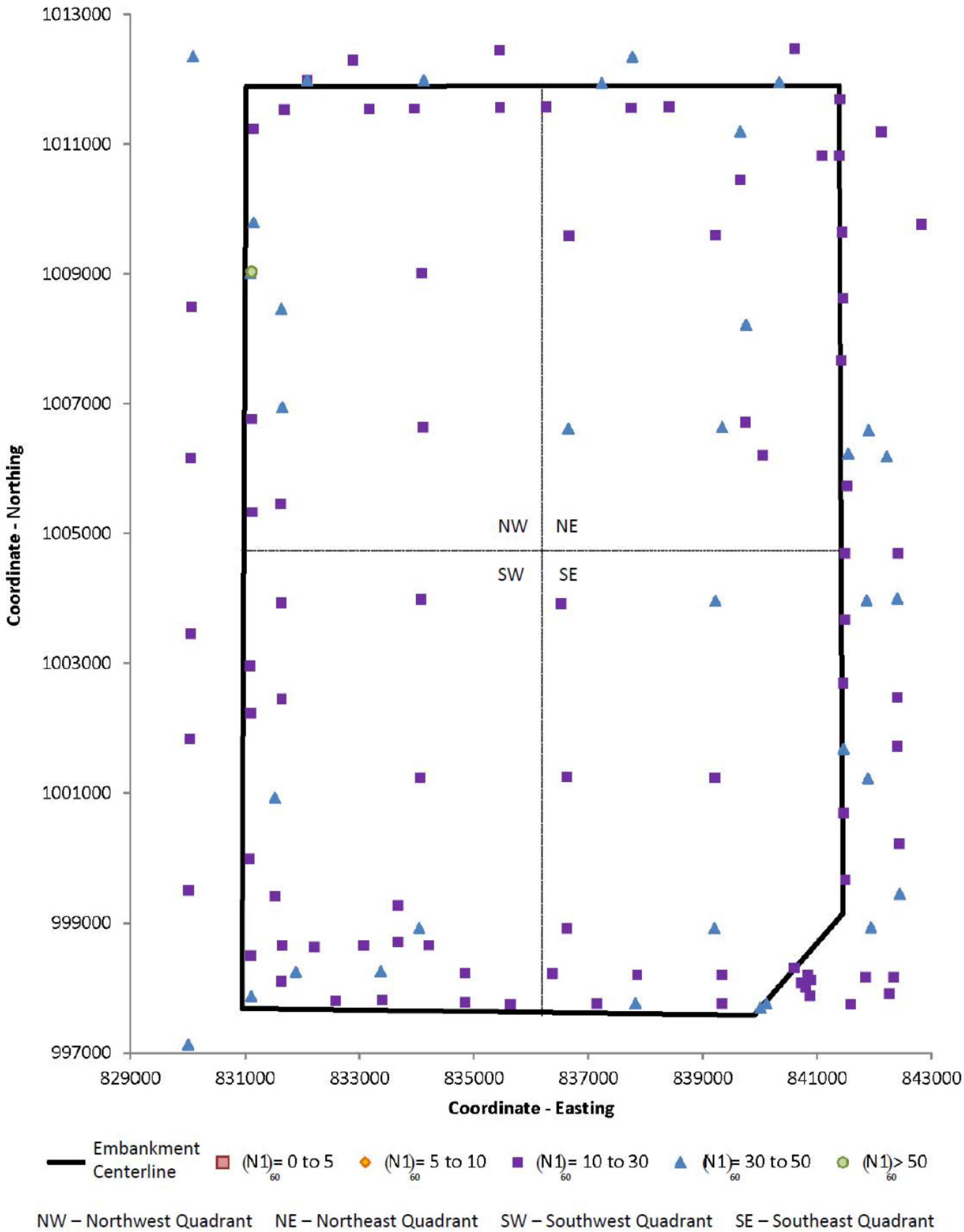
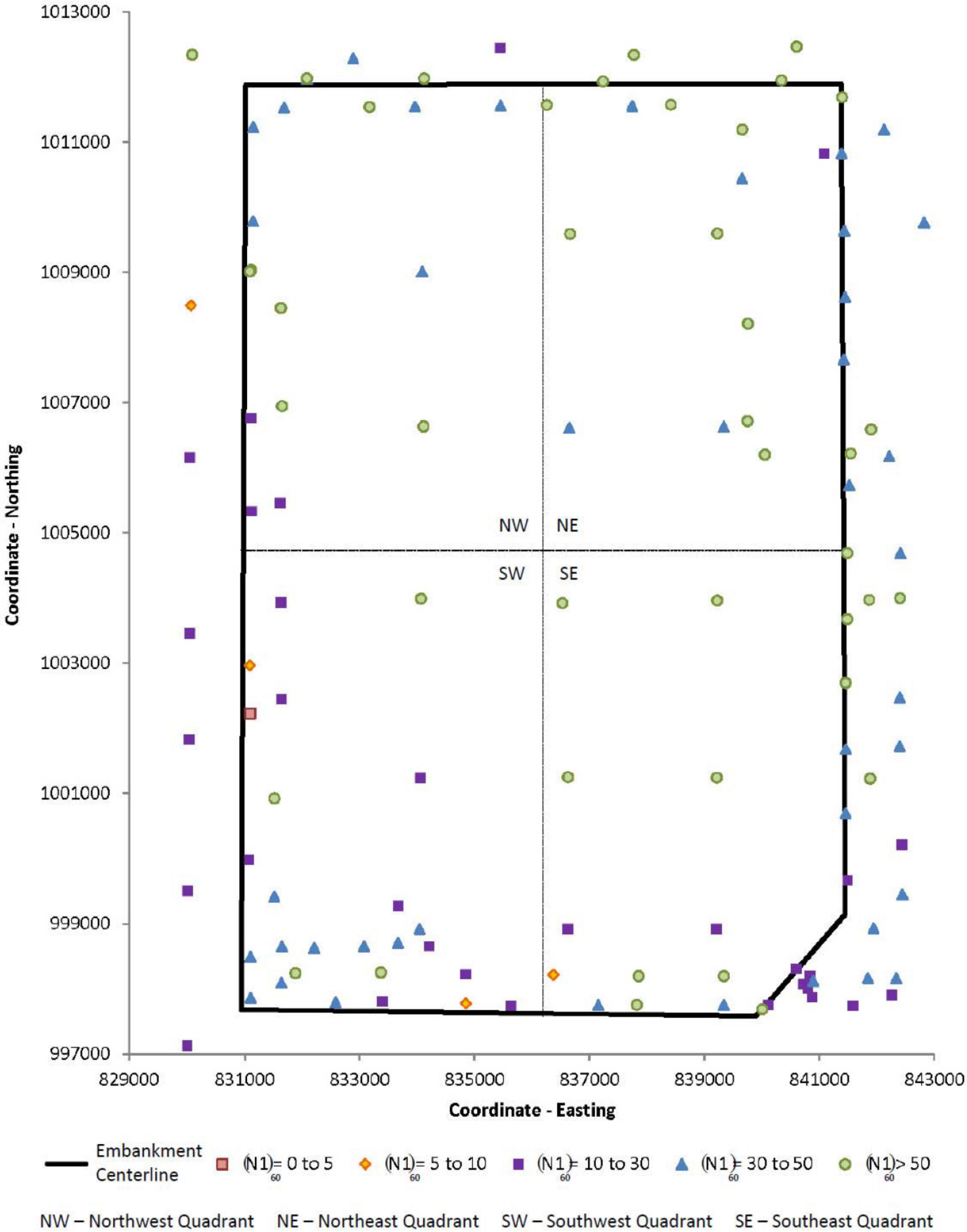


Source: Site Characterization Report, 2006, Figure 2.13

US Army Corps of Engineers	**Figure 7.3** **Average SPT $(N1)_{60}$: 0 to 10ft Deep** Geotechnical Data Report	HDR **C-44 Reservoir/STA Project** December 23, 2014



Source: Site Characterization Report, 2006, Figure 2.14

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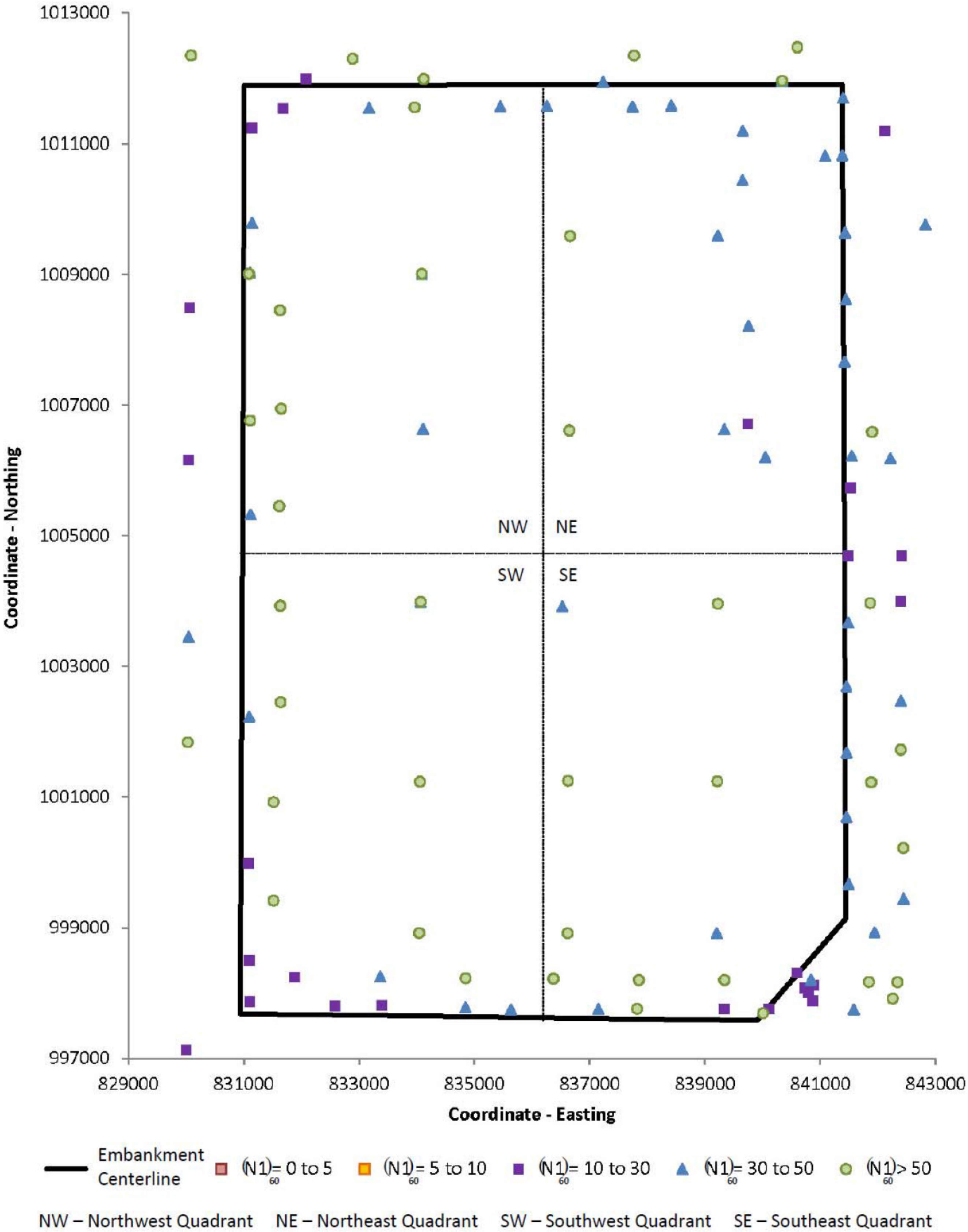
Figure 7.4
Average SPT $(N1)_{60}$: 10 to 20ft Deep
Geotechnical Data Report

HDR
C-44 Reservoir/STA Project
December 23, 2014



Source: Site Characterization Report, 2006, Figure 2.15

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Figure 7.5
Average SPT $(N1)_{60}$: 20 to 40ft Deep
Geotechnical Data Report

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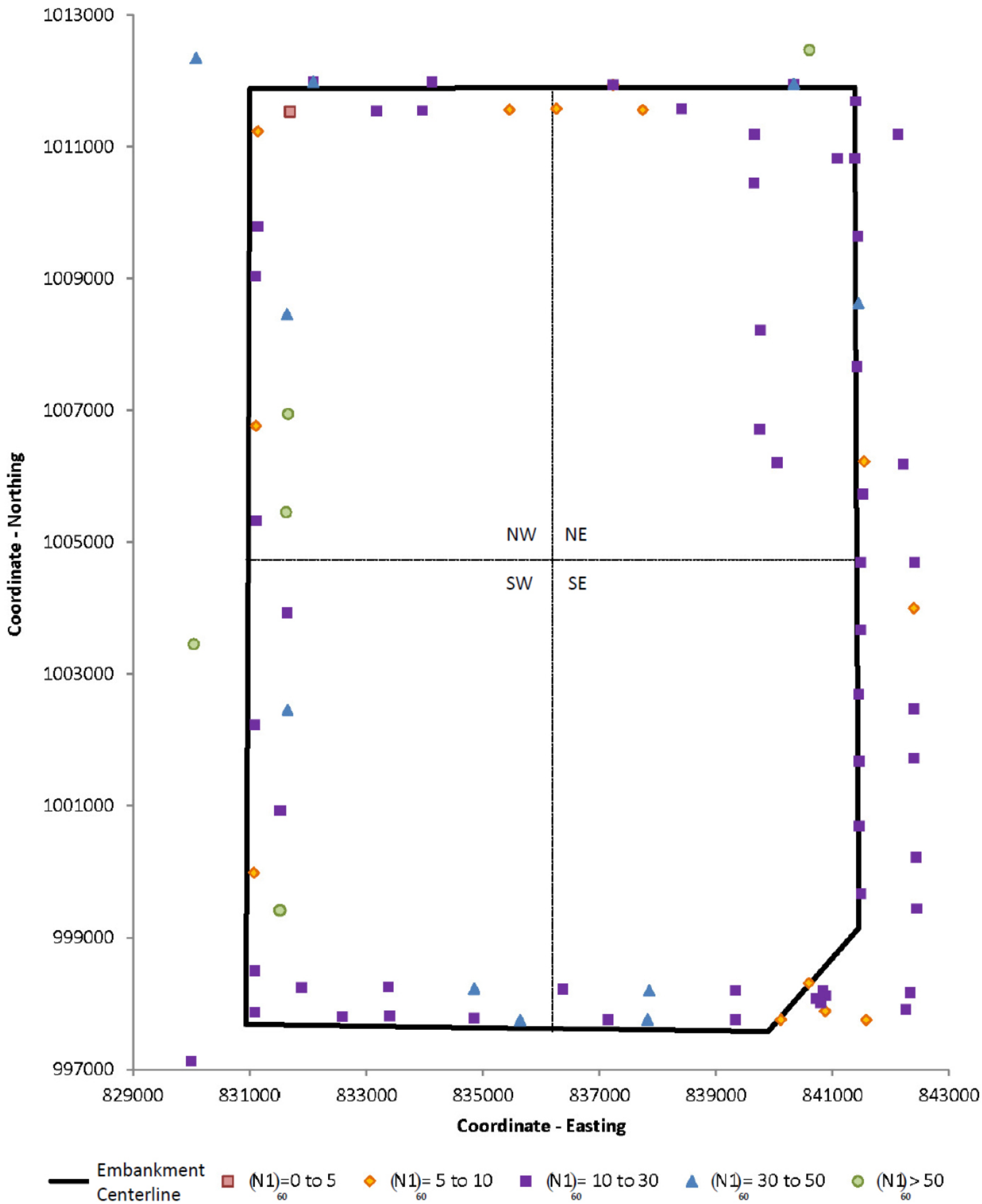

NW – Northwest Quadrant   NE – Northeast Quadrant   SW – Southwest Quadrant   SE – Southeast Quadrant

Source: Site Characterization Report, 2006, Figure 2.16

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Figure 7.6
Average SPT $(N1)_{60}$: > 40ft Deep
Geotechnical Data Report

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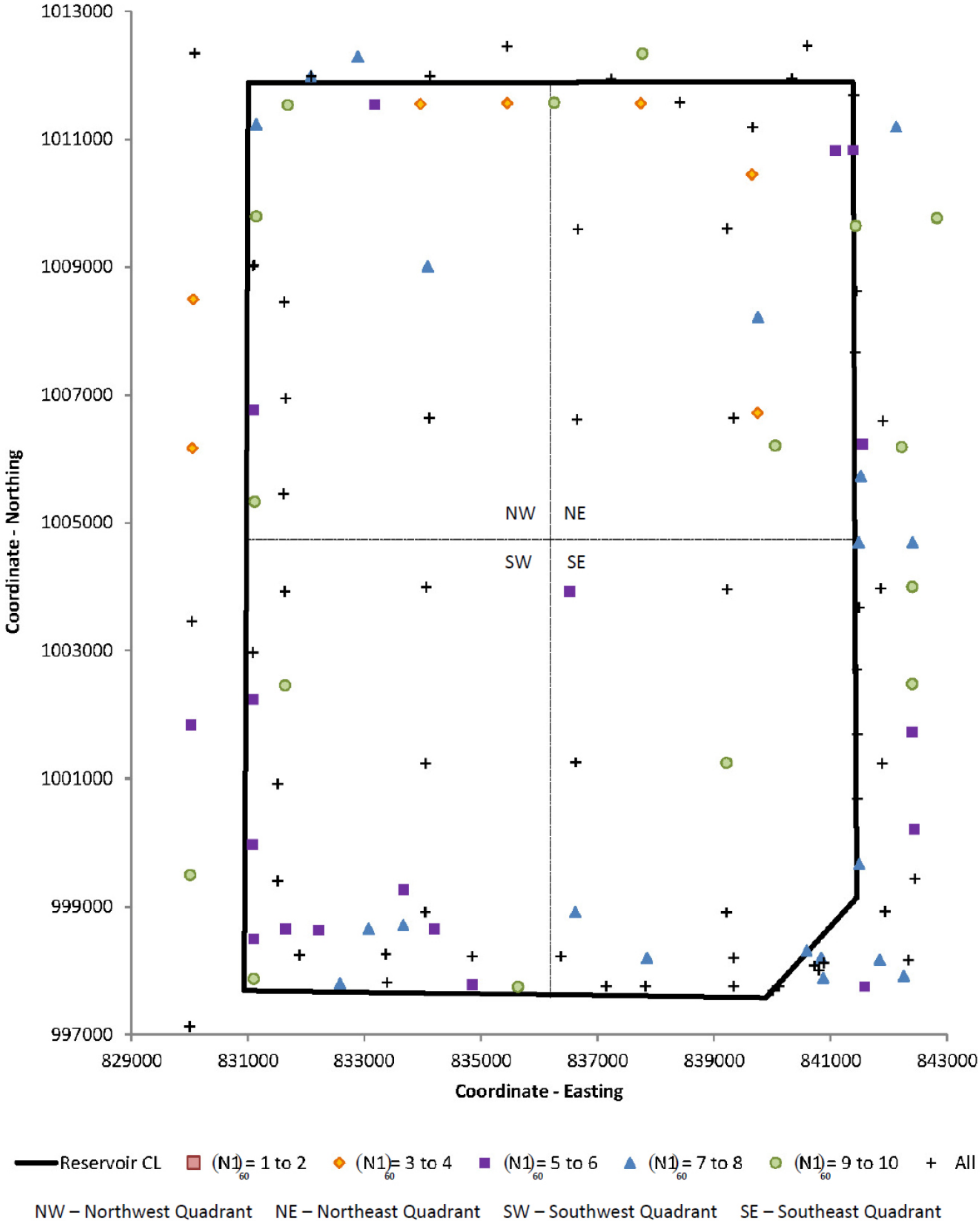

Source: Site Characterization Report, 2006, Figure 2.17

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Figure 7.7

Occurrence of SPT $(N1)_{60} \leq 10$: 0 to 10ft Deep

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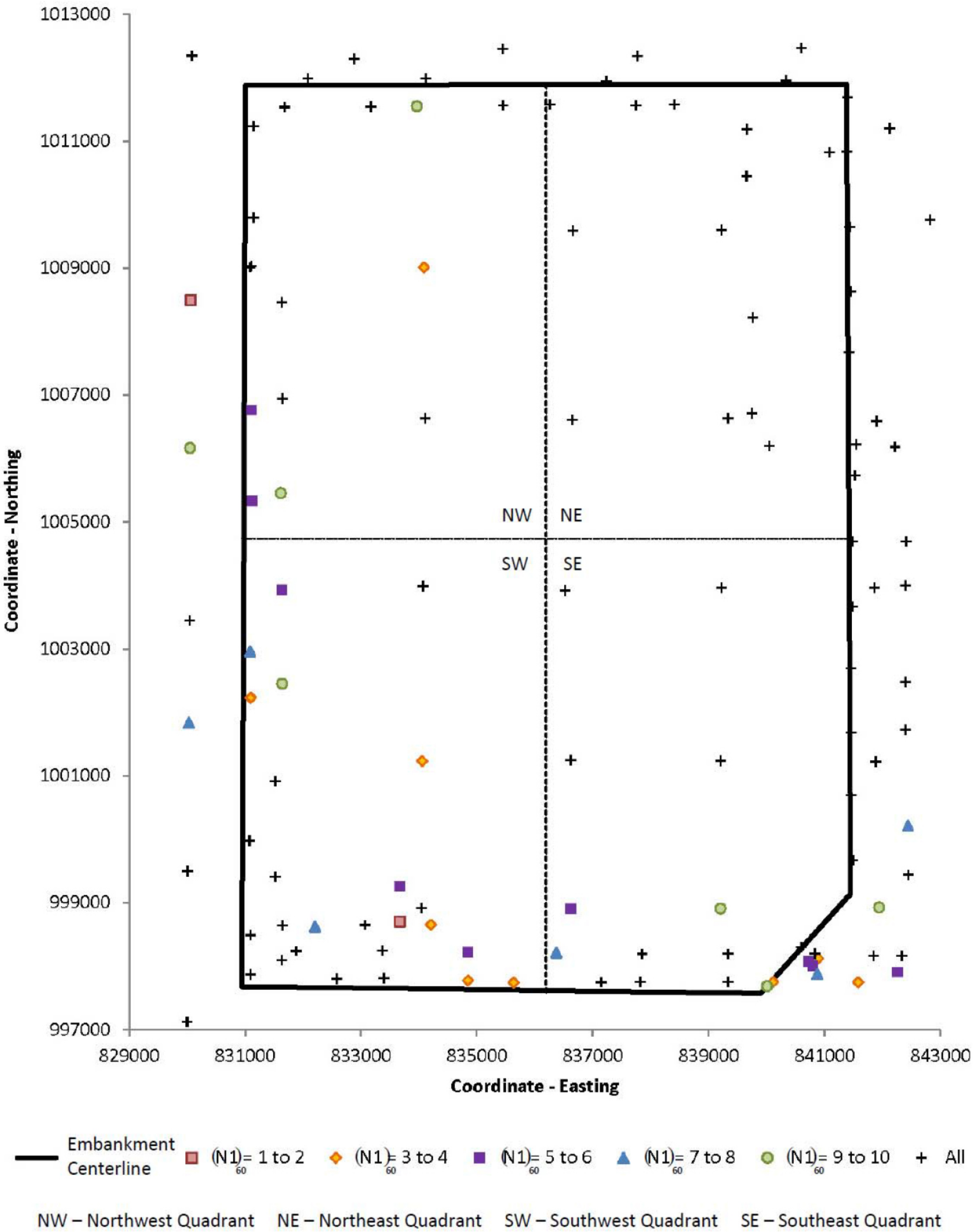

Source: Site Characterization Report, 2006, Figure 2.18

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Figure 7.8
Occurrence of SPT $(N1)_{60} \leq 10$: 10 to 20ft Deep
Geotechnical Data Report

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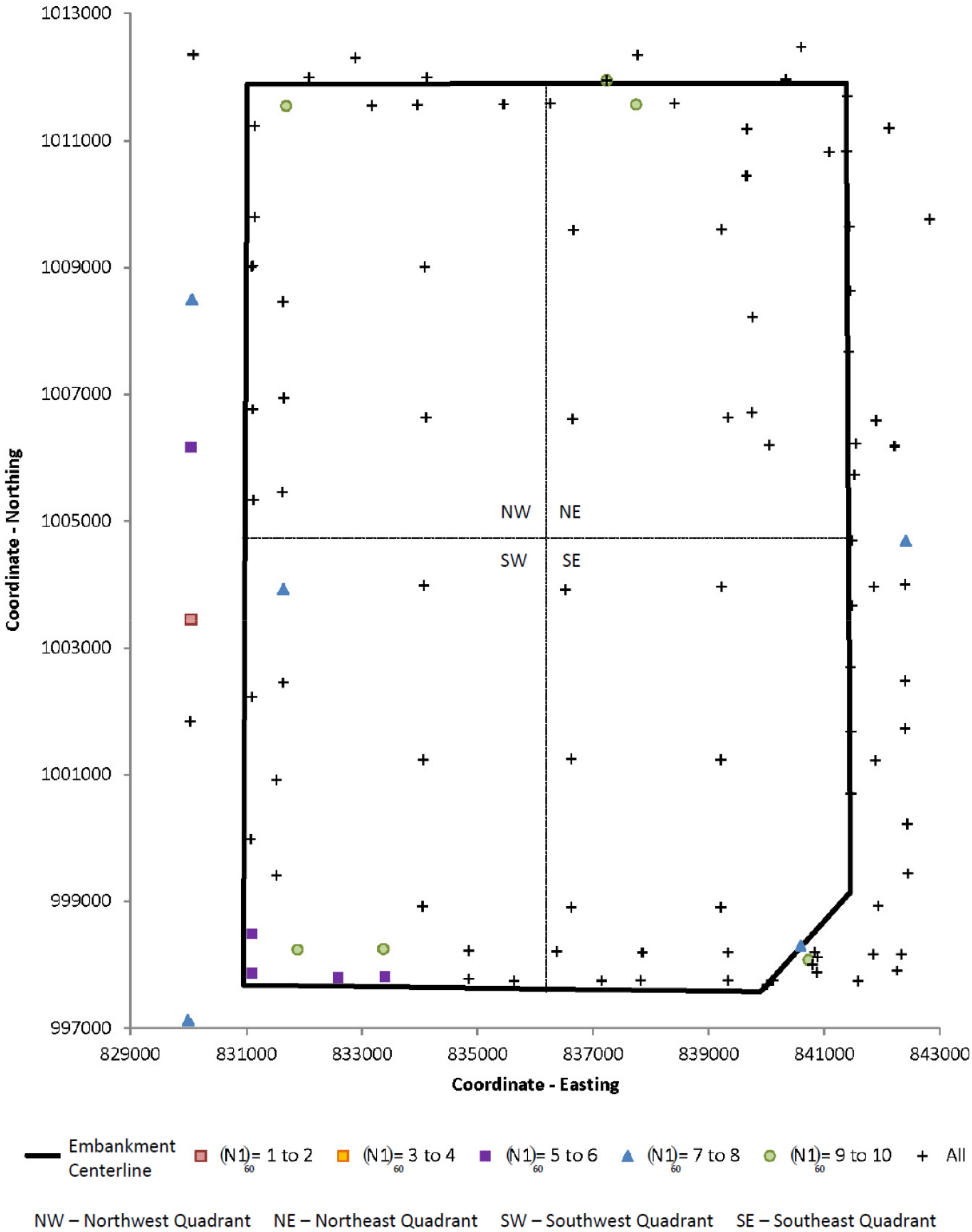

Source: Site Characterization Report, 2006, Figure 2.19

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Figure 7.9

Occurrence of SPT $(N1)_{60} \leq 10$: 20 to 40ft Deep

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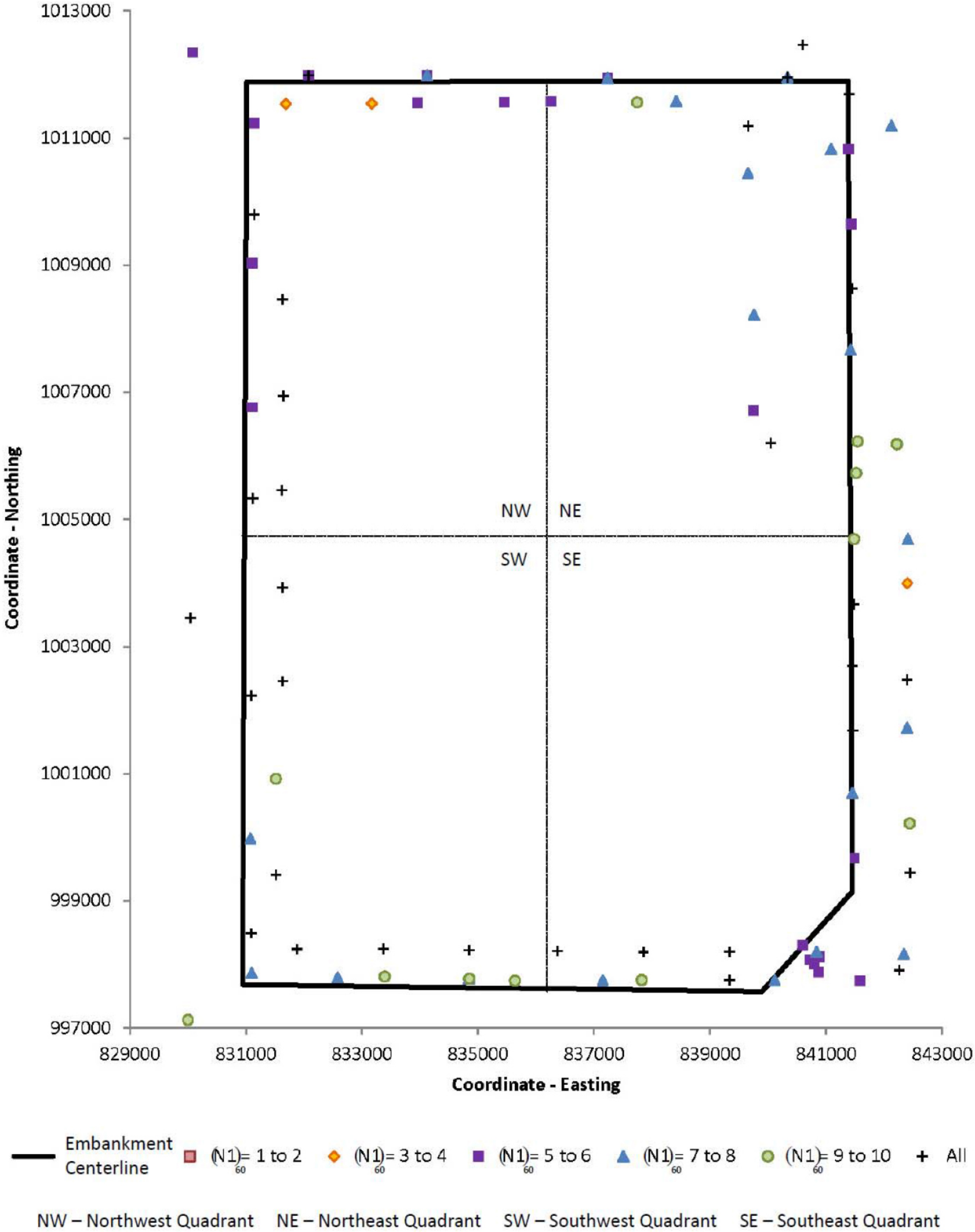

Source: Site Characterization Report, 2006, Figure 2.20

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Figure 7.10
Occurrence of SPT $(N1)_{60} \leq 10$: > 40ft Deep
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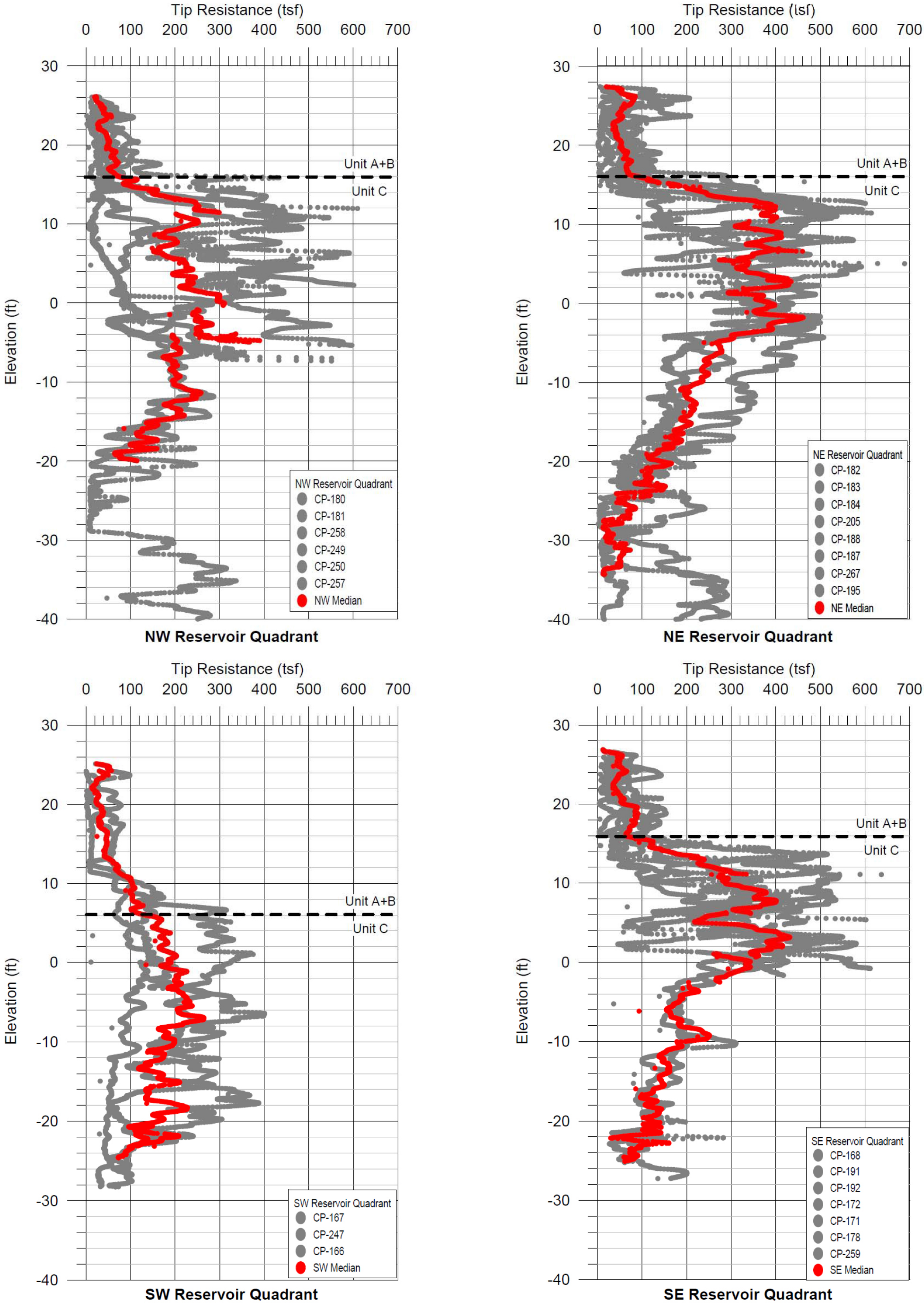
C-44 Reservoir/STA Project
December 23, 2014



Source: Site Characterization Report, 2006, Figure 6.9

Note: This figure prints full size at 11"x17".

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Figure 7.11

Reservoir Area CPT Tip Resistance vs Elevation

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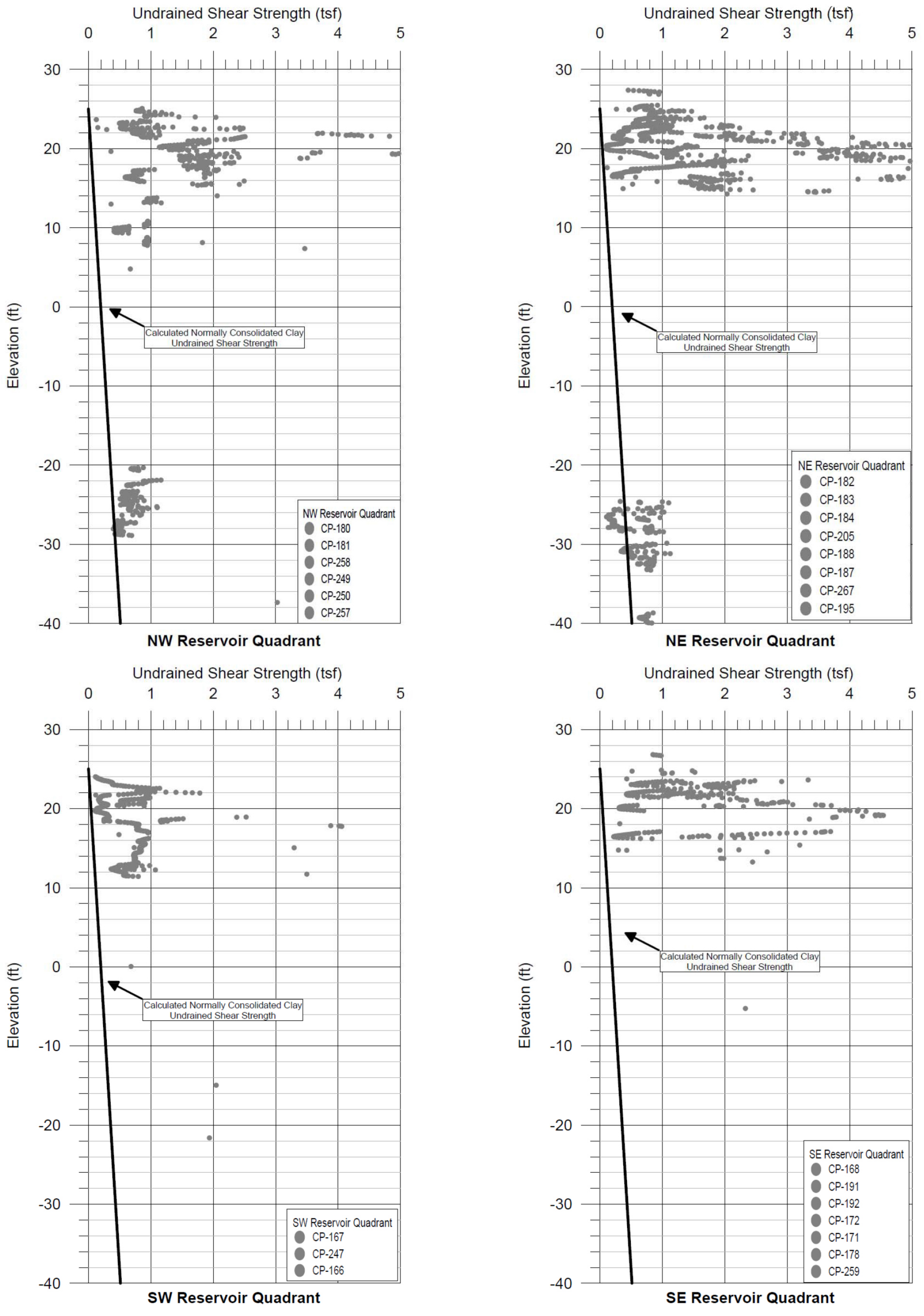

Source: Site Characterization Report, 2006, Figure 6.10

Note: This figure prints full size at 11"x17".

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Figure 7.12
Reservoir Area Undrained Shear Strength Estimated from CPT Tip Resistance vs. Elevation
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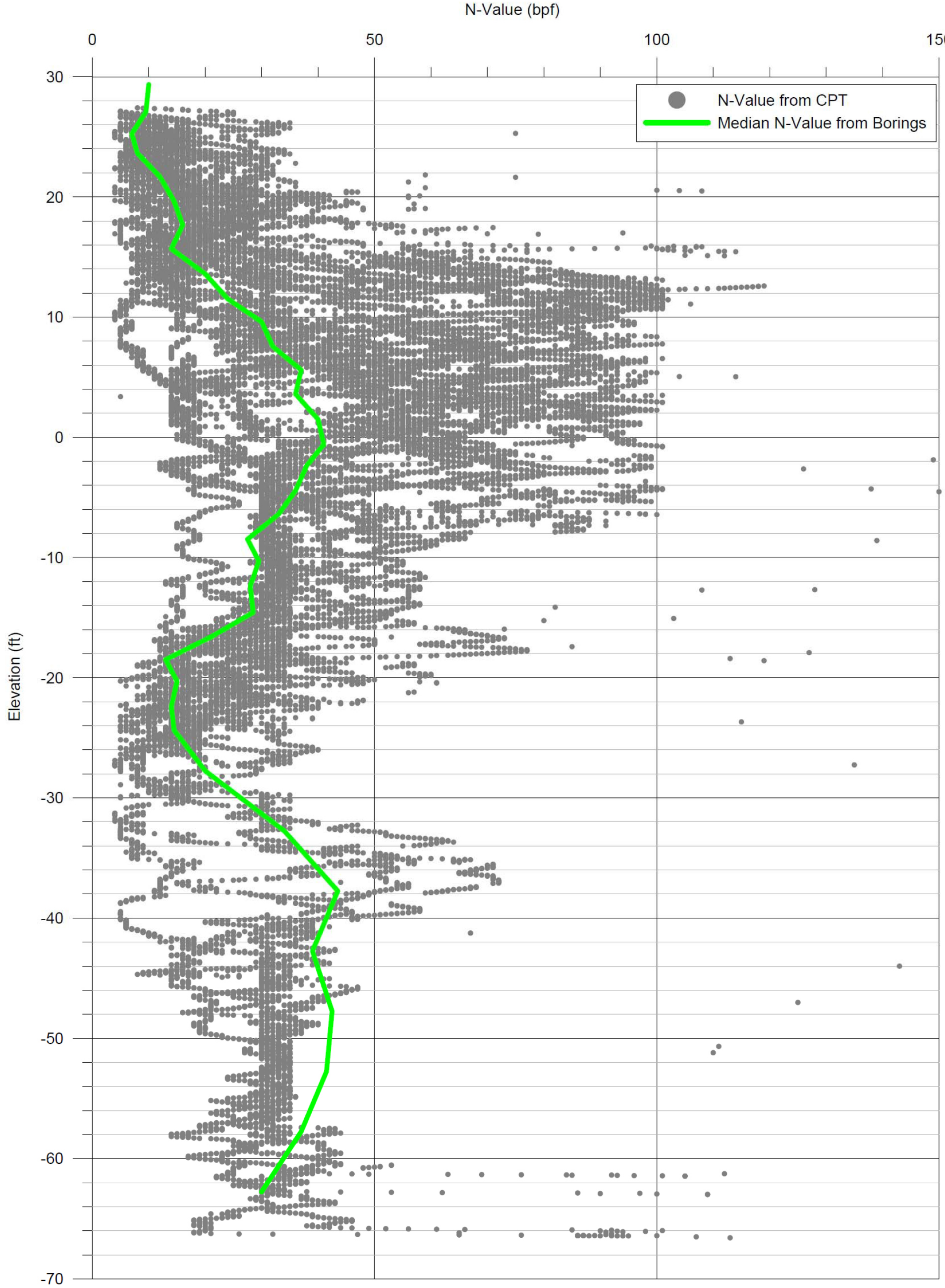

Source: Site Characterization Report, 2006, Figure 6.11

Note: This figure prints full size at 11"x17".

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Figure 7.13
Reservoir Area CPT Estimated N-Value vs. Elevation
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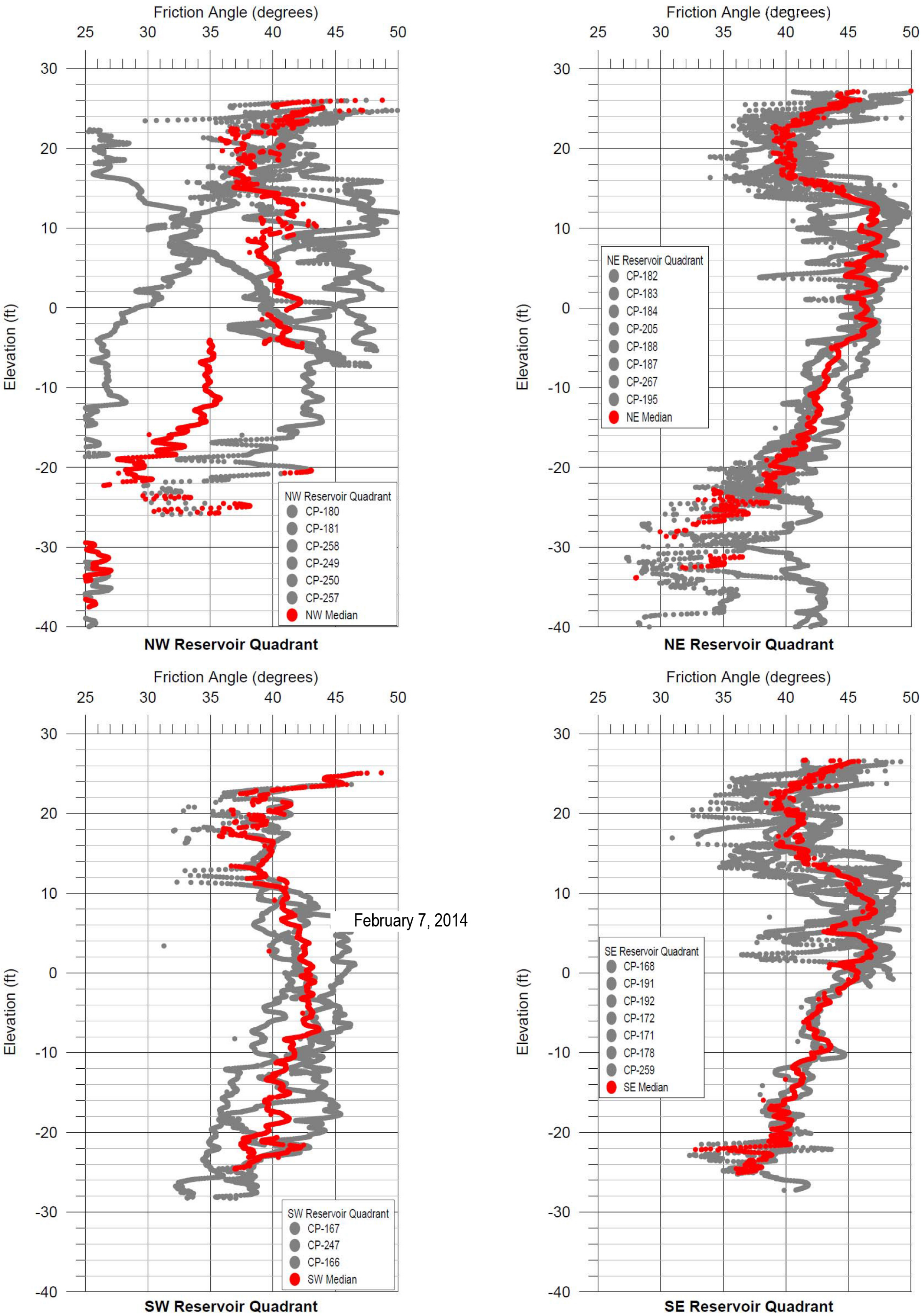
December 23, 2014



Source: Site Characterization Report, 2006, Figure 6.12

Note: This figure prints full size at 11"x17".

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Figure 7.14
Reservoir Area Friction Angle Estimated from CPT Tip Resistance vs. Elevation
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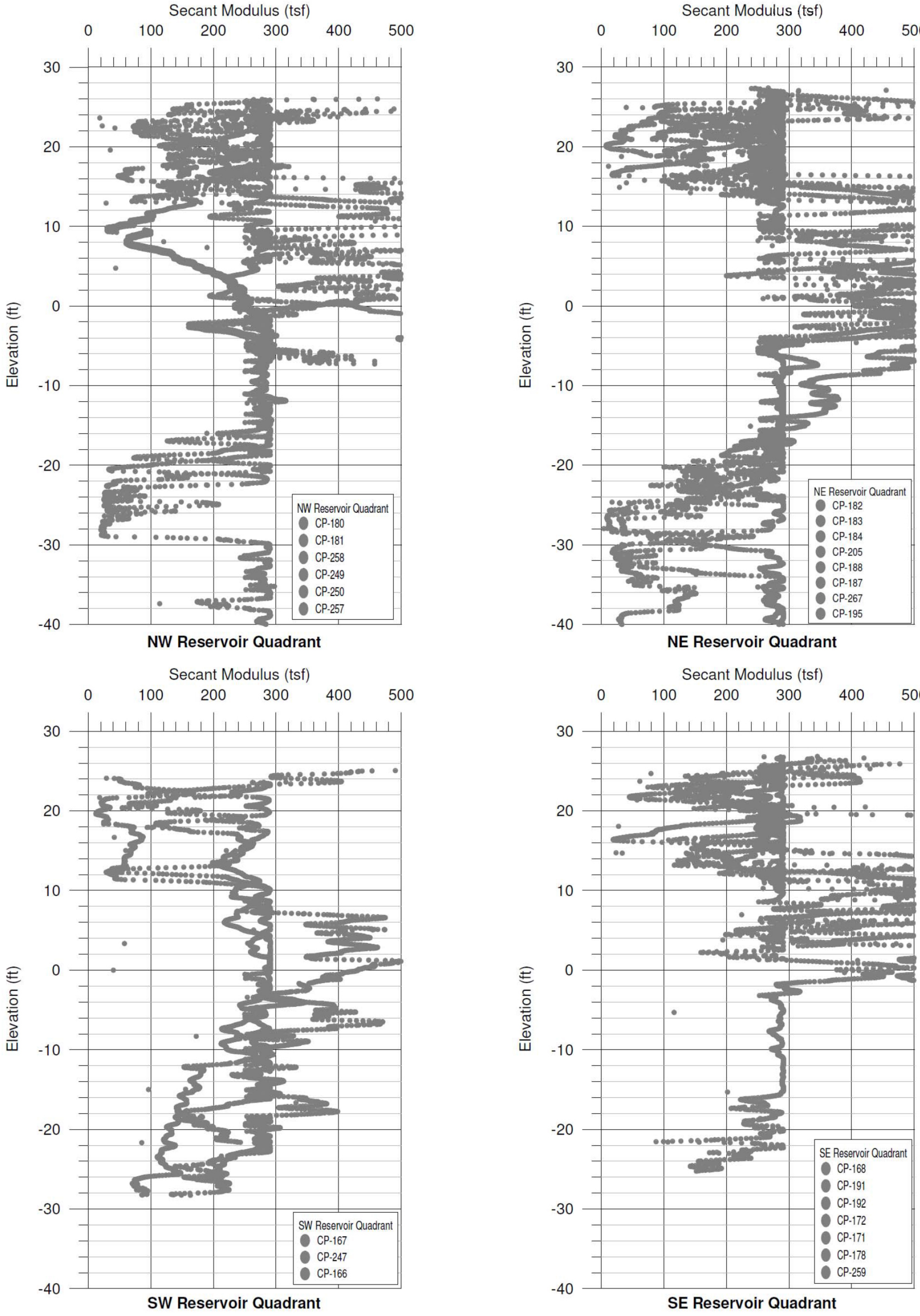

Source: Site Characterization Report, 2006, Figure 6.13

Note: This figure prints full size at 11"x17".

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Figure 7.15
Reservoir Area Secant Young's Modulus Estimated from CPT Tip Resistance vs. Elevation
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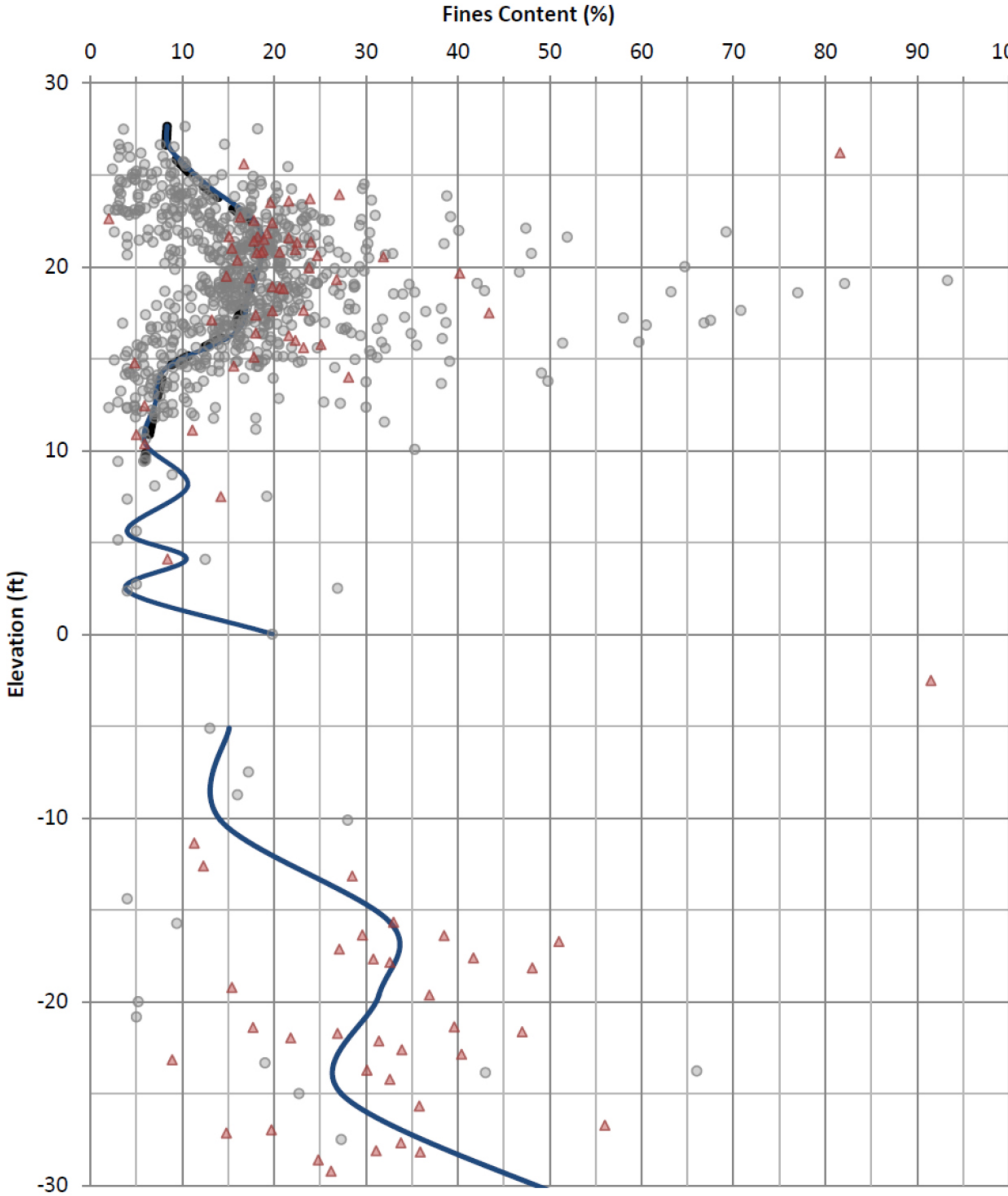


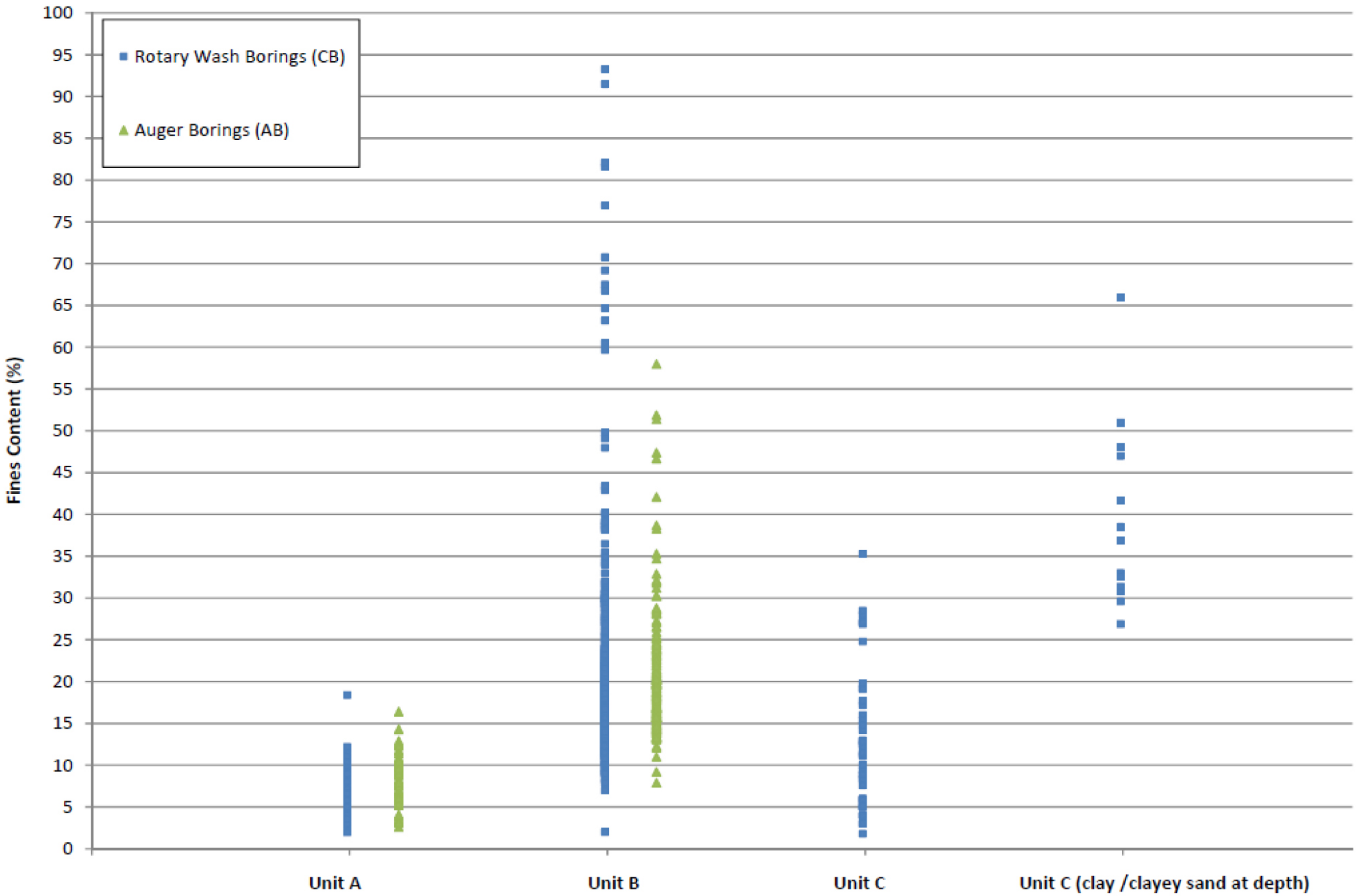
Note: site characterization phase data is approximately 88% of total data set. The post-site characterization data is approximately 12% of the total.

Source: Site Characterization Report, 2006, Figure 2.4

US Army Corps of Engineers

Figure 7.16
Fines Content vs. Elevation
Geotechnical Data Report

C-44 Reservoir/STA Project
December 23, 2014



Source: Site Characterization Report, 2006, Figure 2.4

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Figure 7.17
Fines Content by Soil Unit
Geotechnical Data Report

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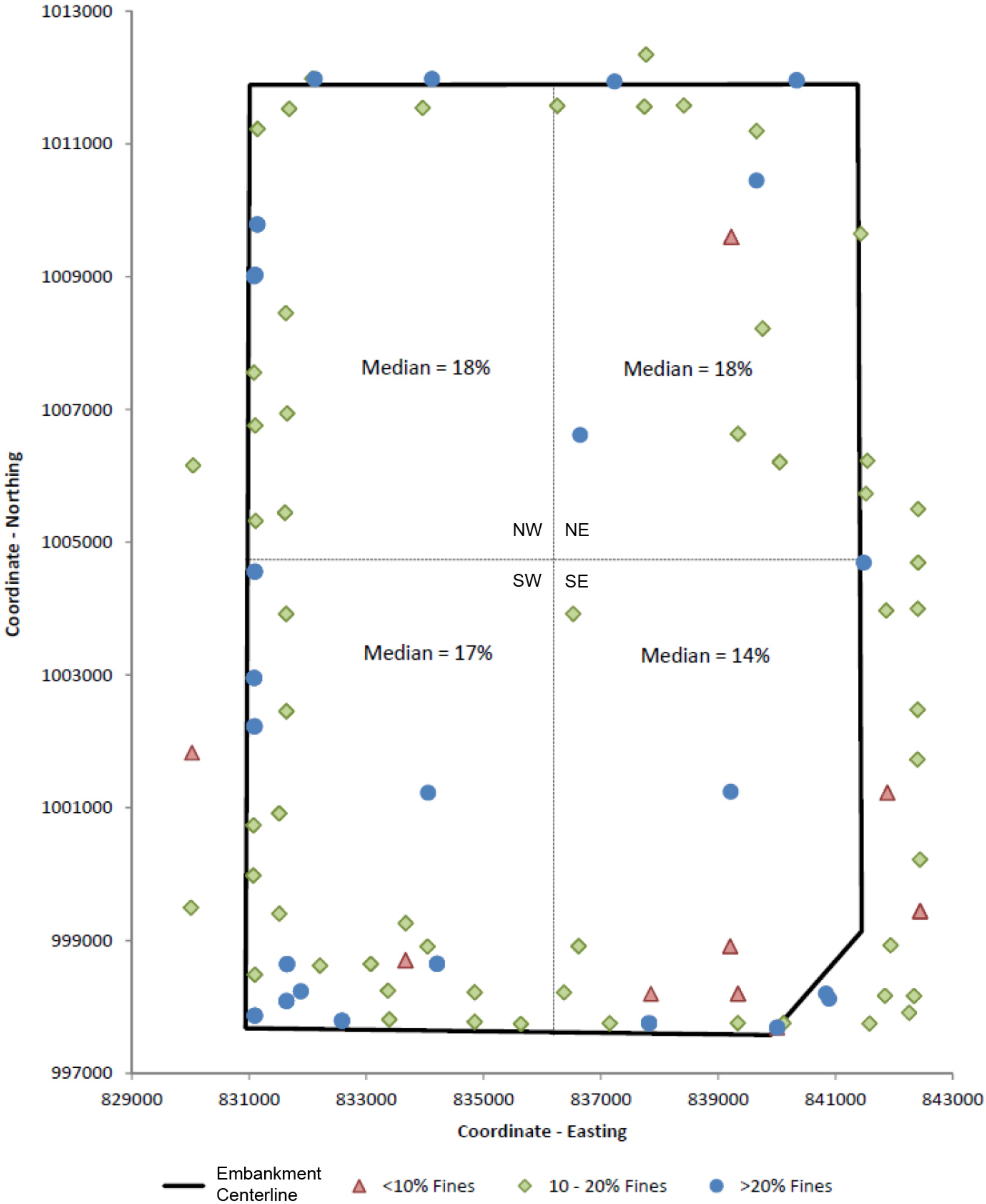

Source: Site Characterization Report, 2006, Figure 2.6

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Figure 7.18
Fines by Quadrant: 0 to 5ft Deep
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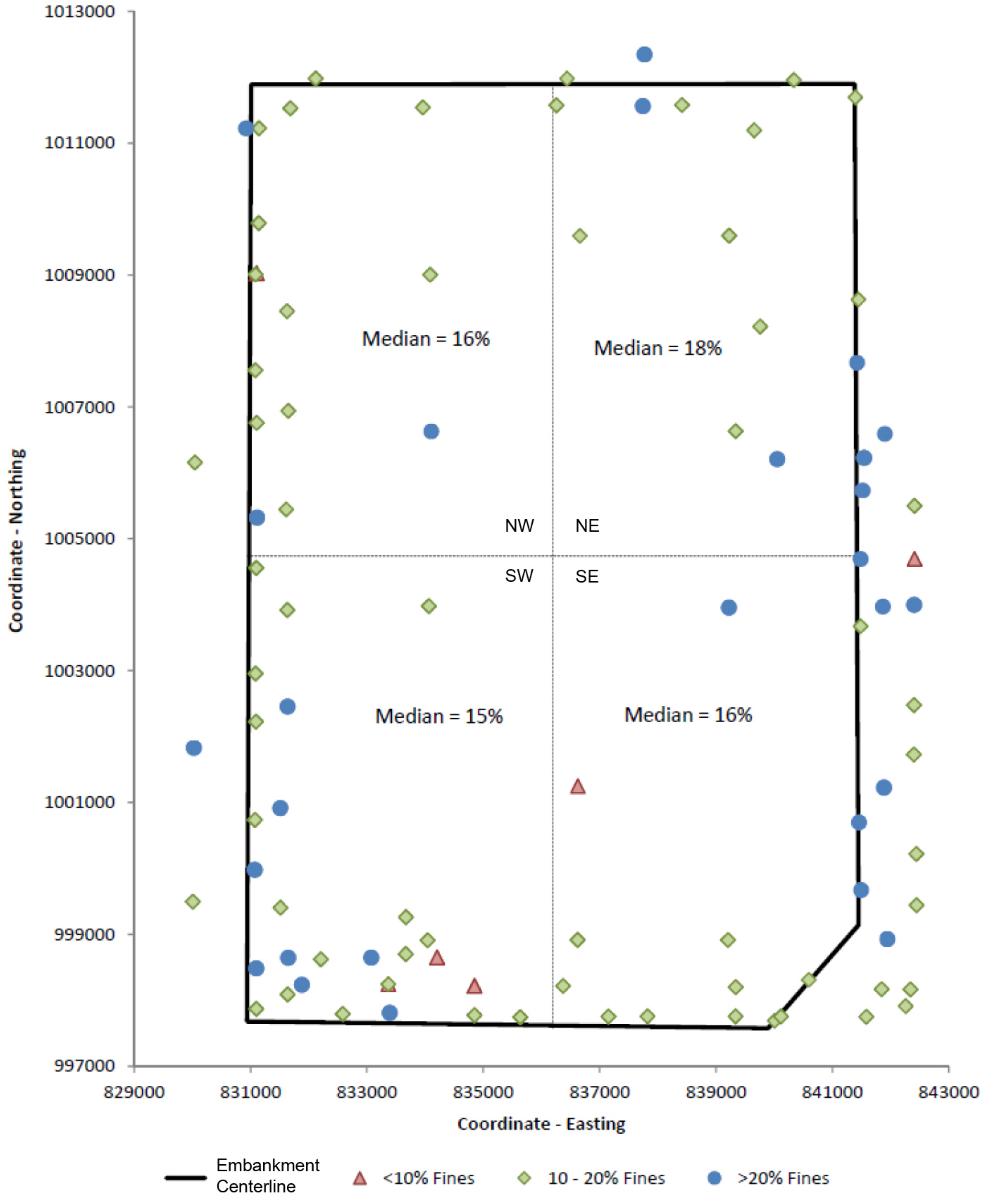

Source: Site Characterization Report, 2006, Figure 2.7

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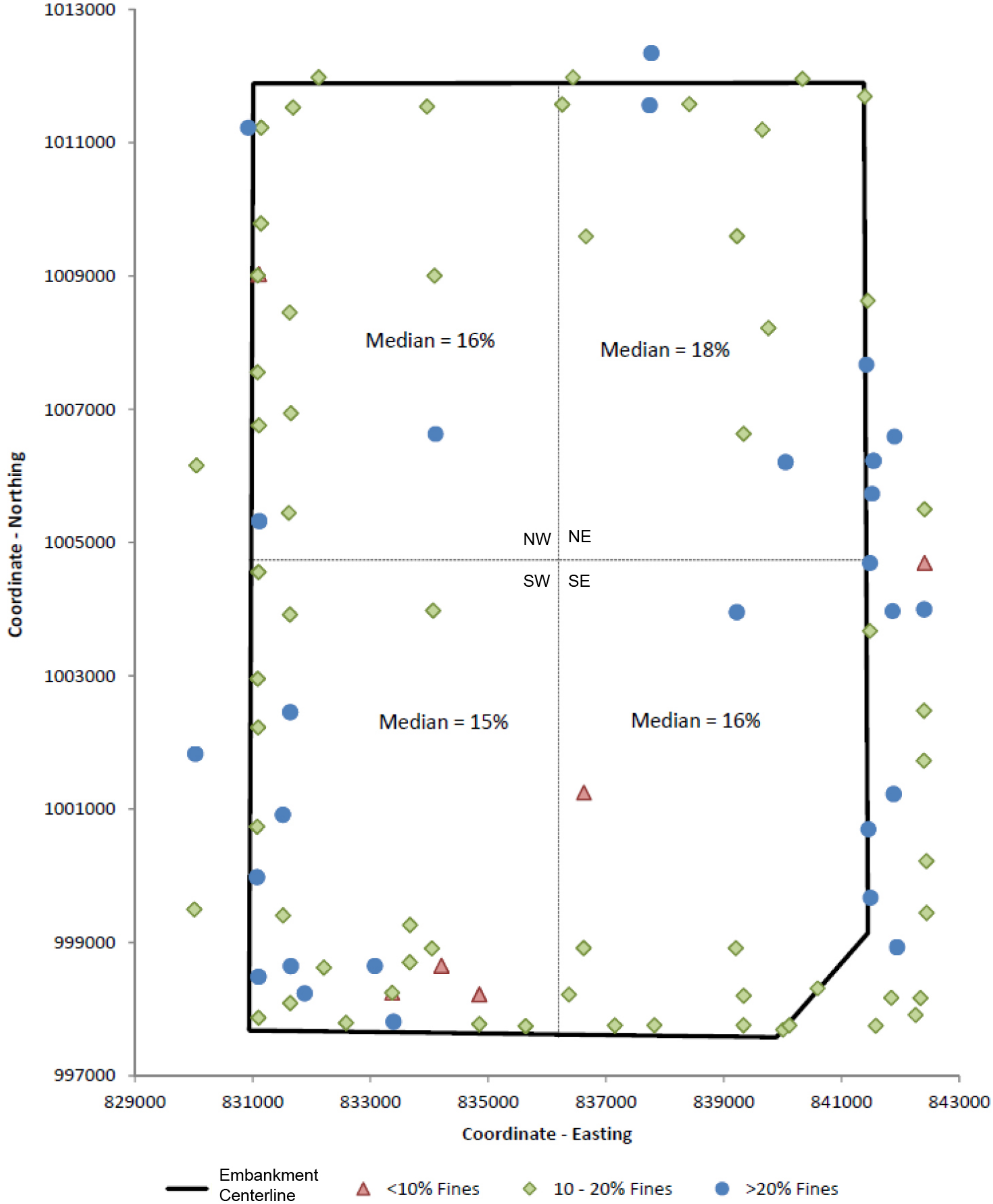
Figure 7.19
Fines by Quadrant: 5 to 10ft Deep
Geotechnical Data Report

C-44 Reservoir/STA Project
December 23, 2014



Source: Site Characterization Report, 2006, Figure 2.8

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Figure 7.20
Fines by Quadrant: 10 to 15ft Deep
Geotechnical Data Report

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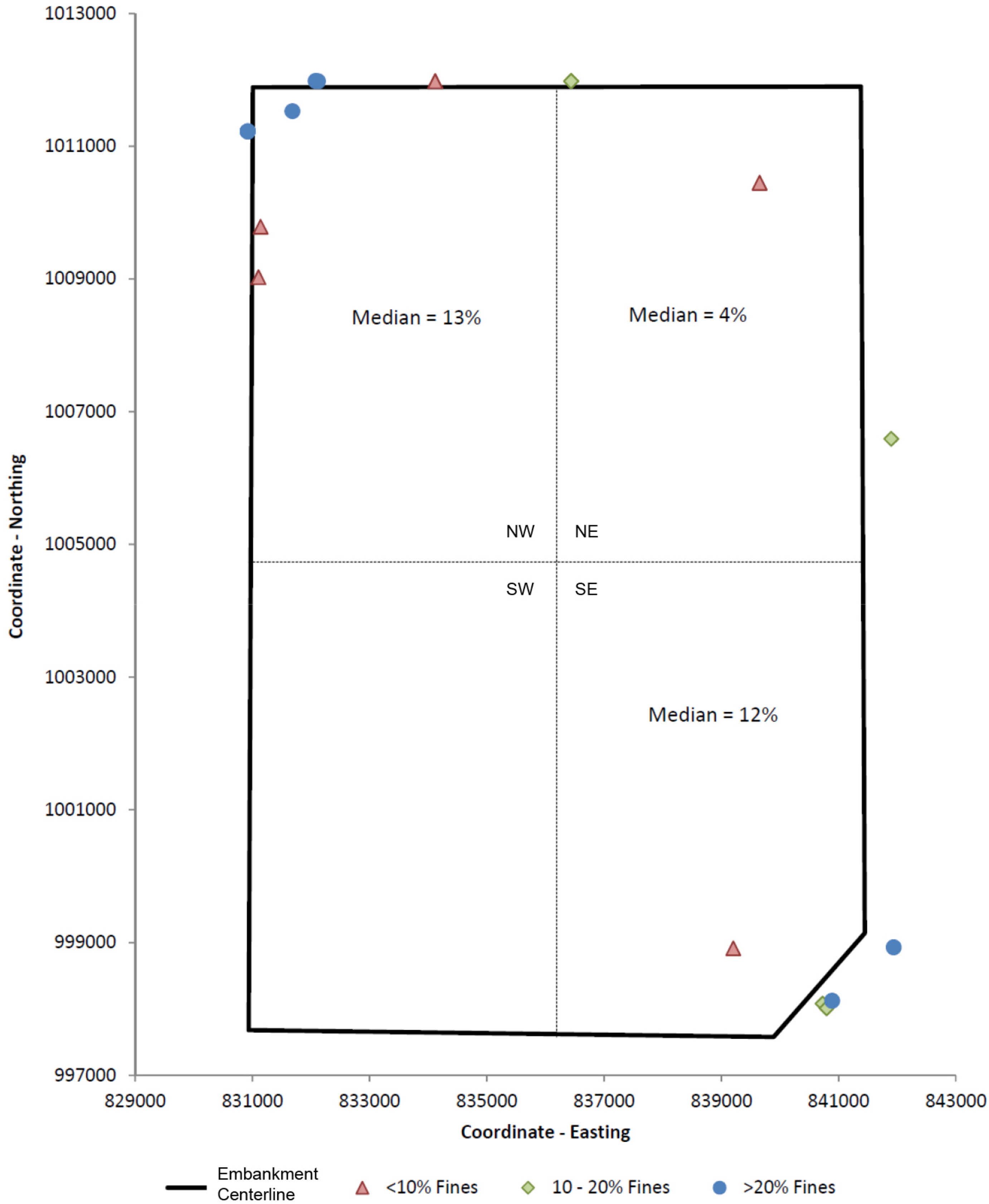
C-44 Reservoir/STA Project
December 23, 2014



Source: Site Characterization Report, 2006, Figure 2.9

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Figure 7.21
Fines by Quadrant: 15 to 40ft Deep
Geotechnical Data Report

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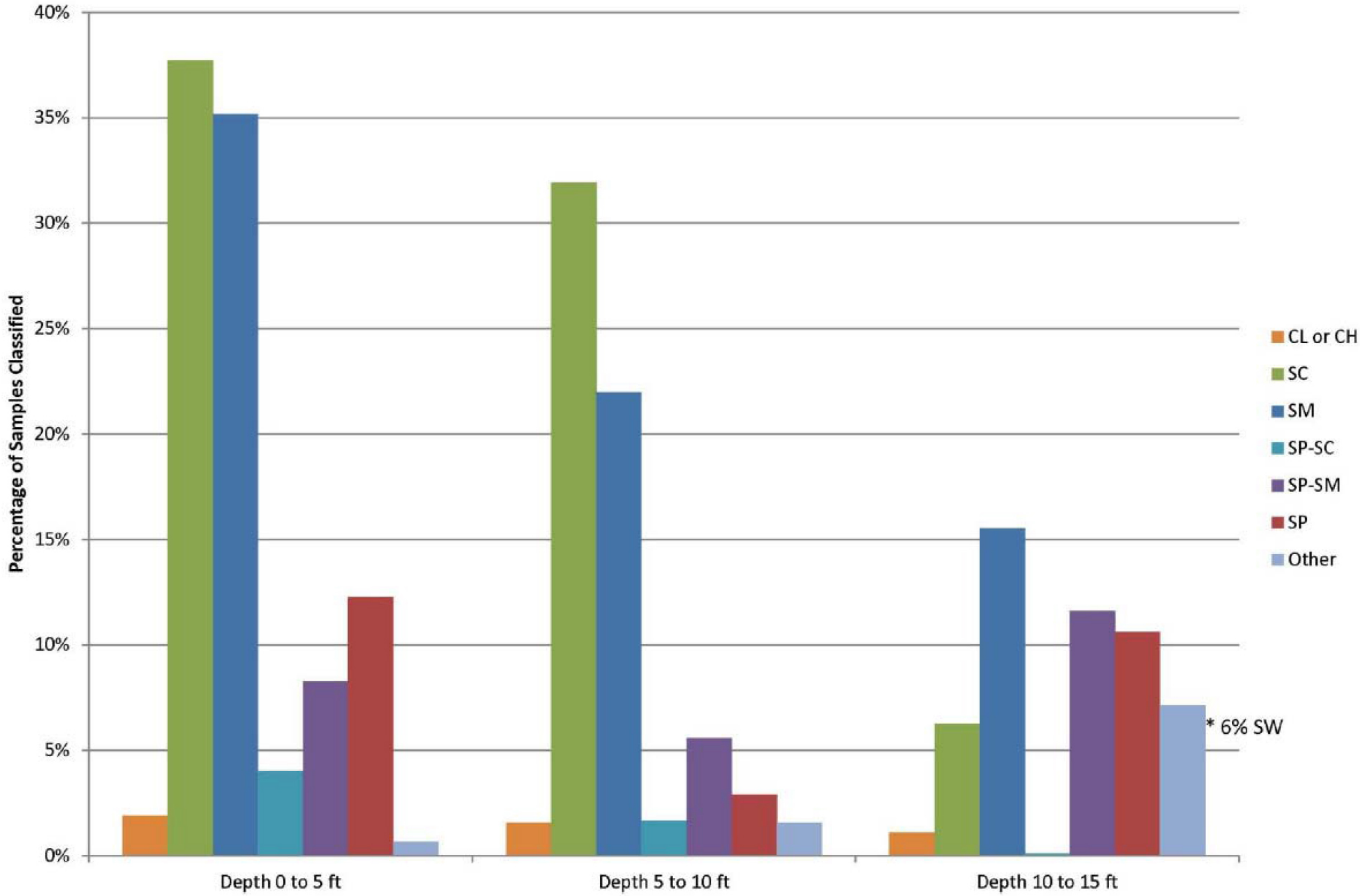

Source: Site Characterization Report, 2006, Figure 2.10

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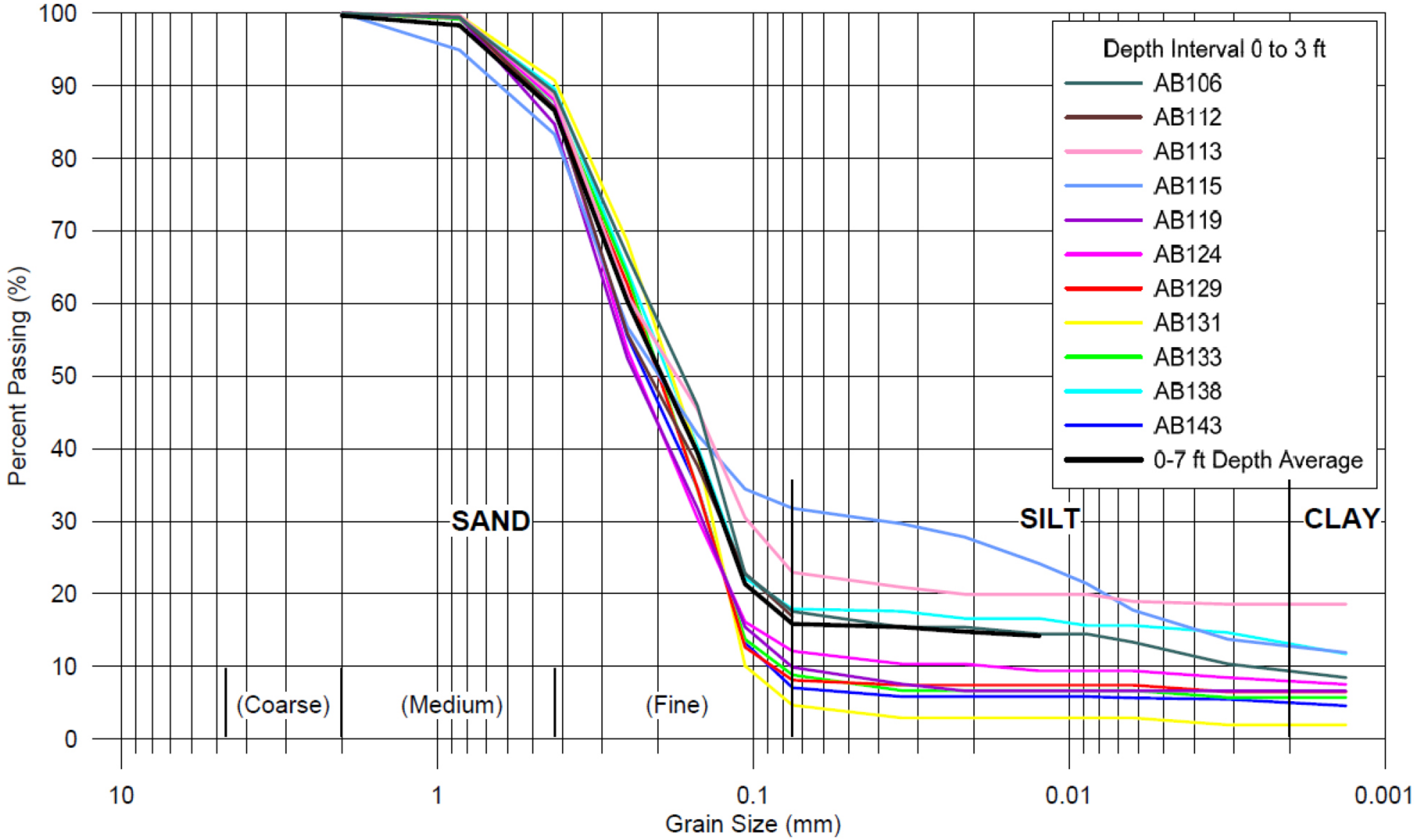
Figure 7.22
USCS Classifications by Depth Interval
Geotechnical Data Report



Reference: Ardaman & Associates Geotechnical Site Investigation and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.14

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Figure 7.23
Laboratory Grain Size Analysis Test Results – Auger Borings, Depths 0 to 3ft
Geotechnical Data Report

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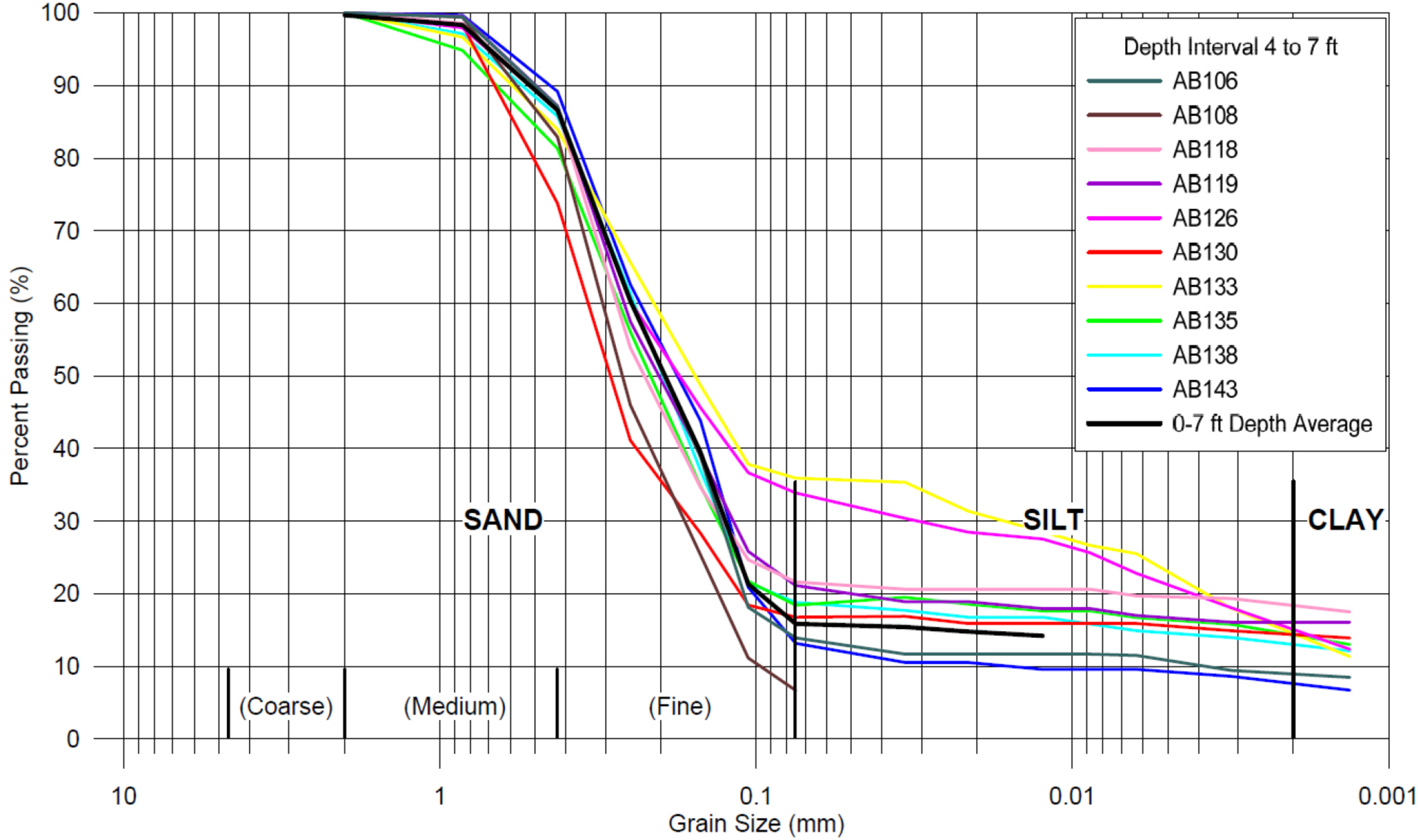
December 23, 2014



Reference: Ardaman & Associates Geotechnical Site Investigation and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.15

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Figure 7.24
Laboratory Grain Size Analysis Test Results – Auger Borings, Depths 4 to 7ft
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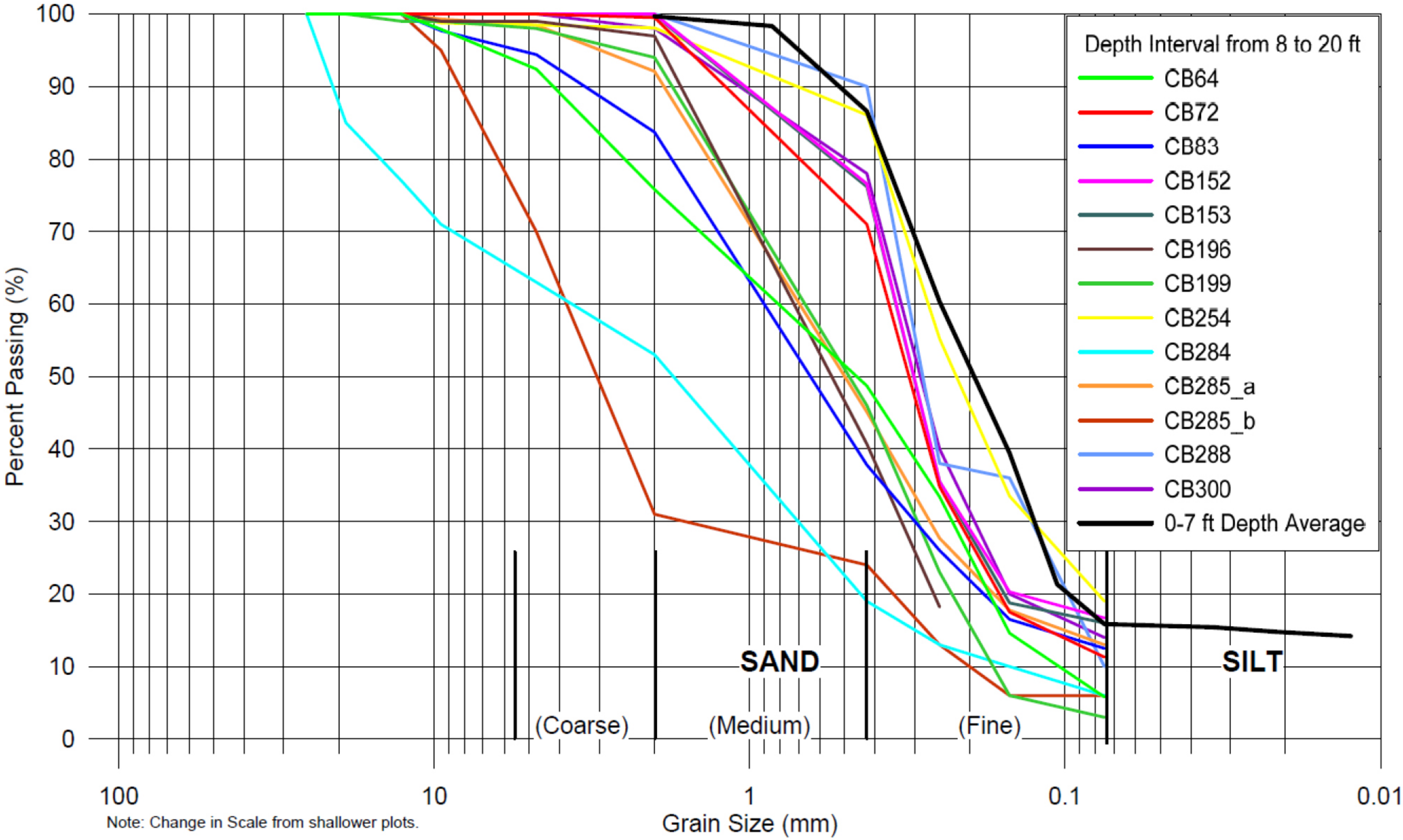
December 23, 2014



Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.16

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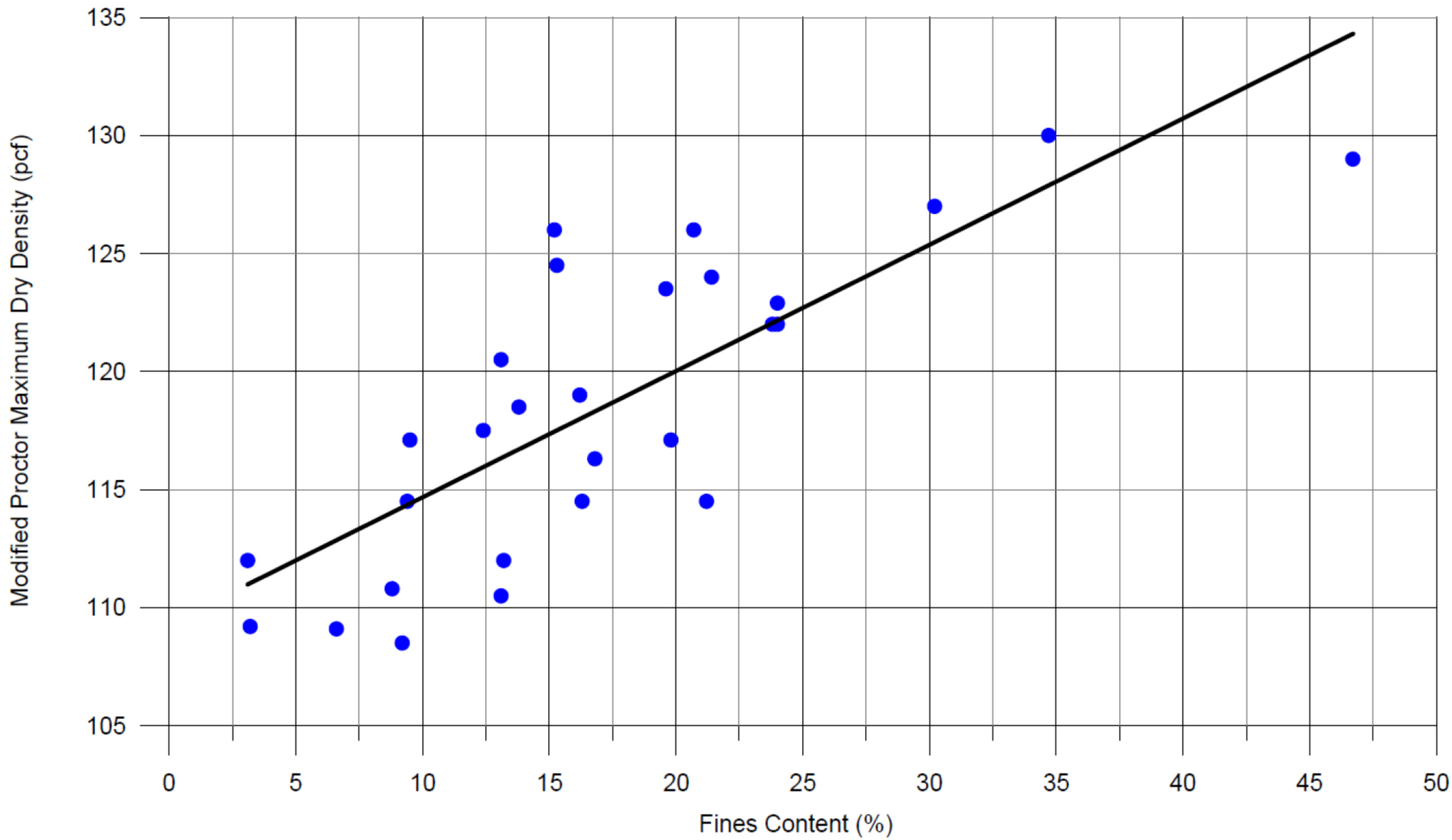
Figure 7.25
Laboratory Grain Size Analysis Test Results – Auger Borings, Depths 8 to 20ft
Geotechnical Data Report

HDR
C-44 Reservoir/STA Project
December 23, 2014



Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.18

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Figure 7.26
Modified Proctor Maximum Dry Density vs. Percent Fines
Geotechnical Data Report

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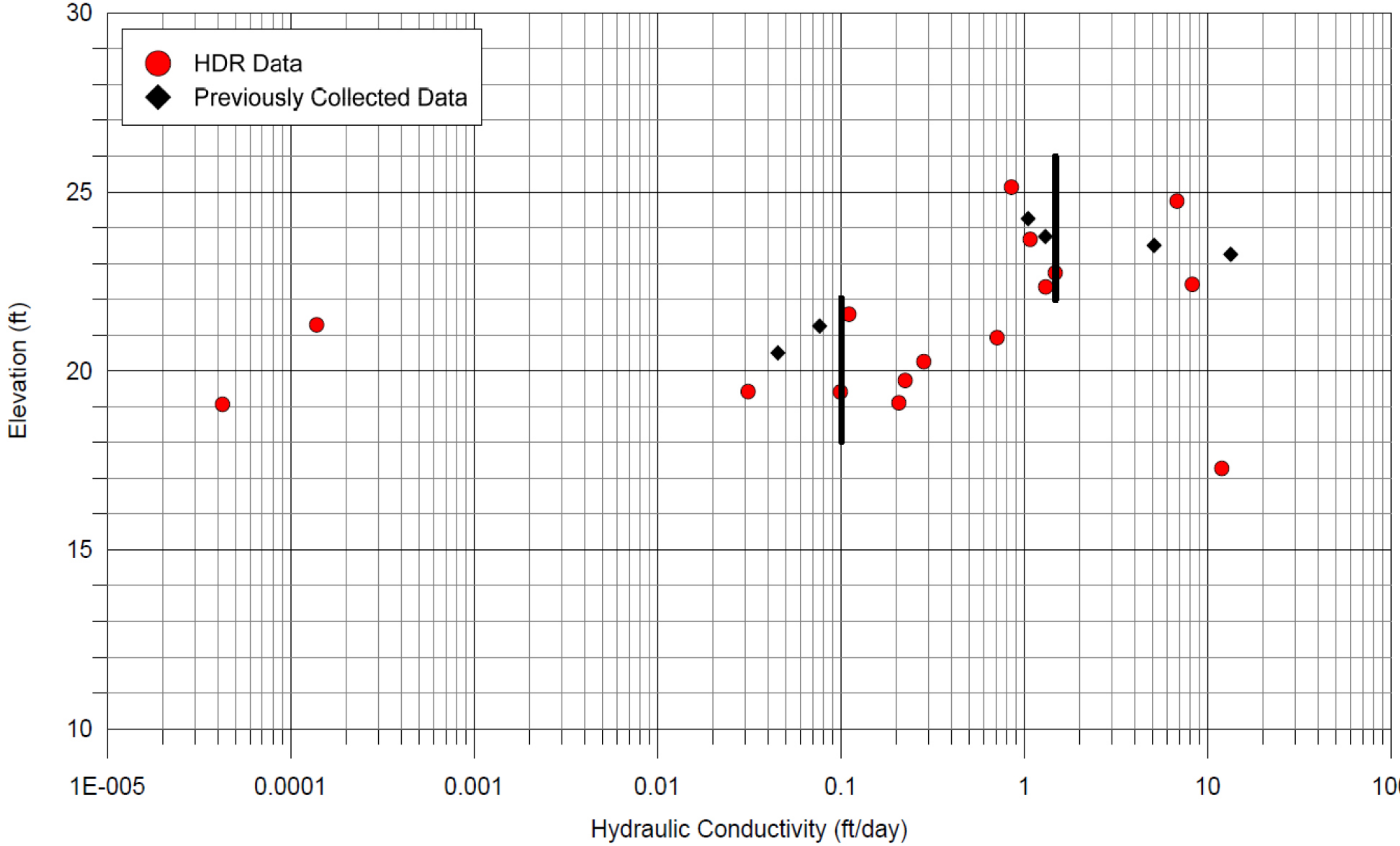
December 23, 2014



Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.19

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Figure 7.27
Remolded Laboratory Hydraulic Conductivity vs. Elevation
Geotechnical Data Report

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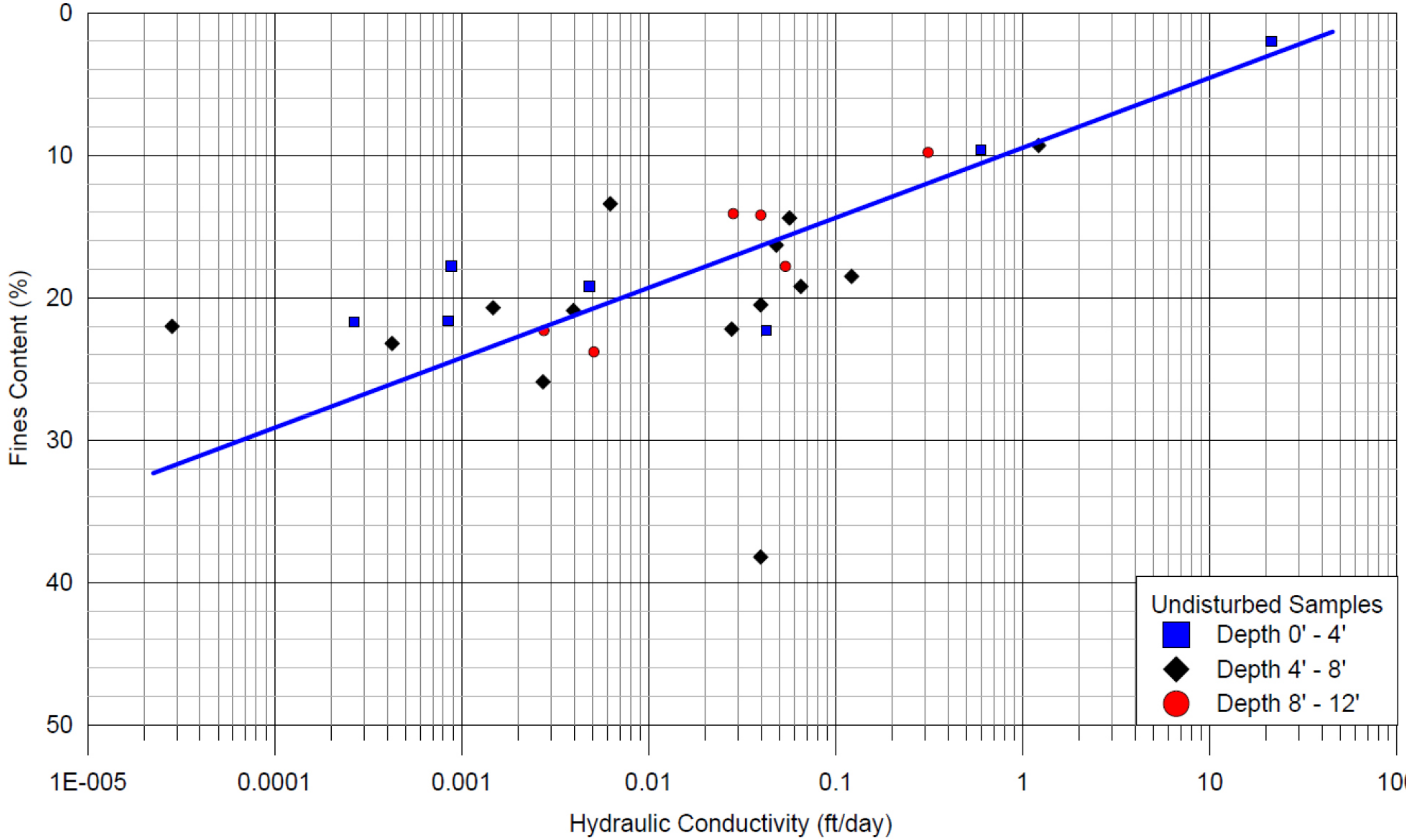

Reference: Ardaman & Associates Geotechnical Site Investigation and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.20

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Figure 7.28
Undisturbed Laboratory Hydraulic Conductivity vs. Percent Fines Content Test Results
Geotechnical Data Report

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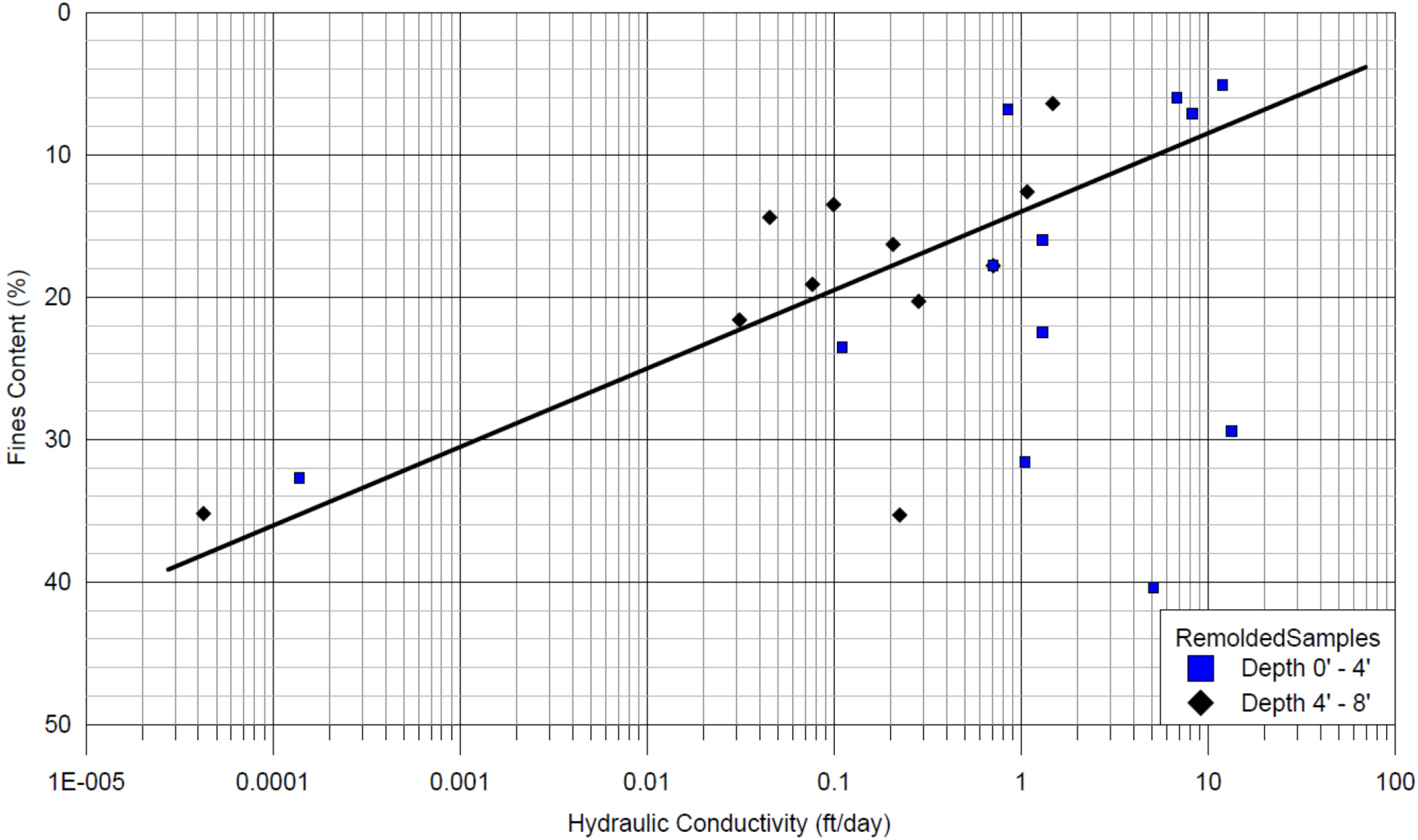

Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.21

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Figure 7.29
Remolded Laboratory Hydraulic Conductivity vs. Percent Fines Content Test Results
Geotechnical Data Report

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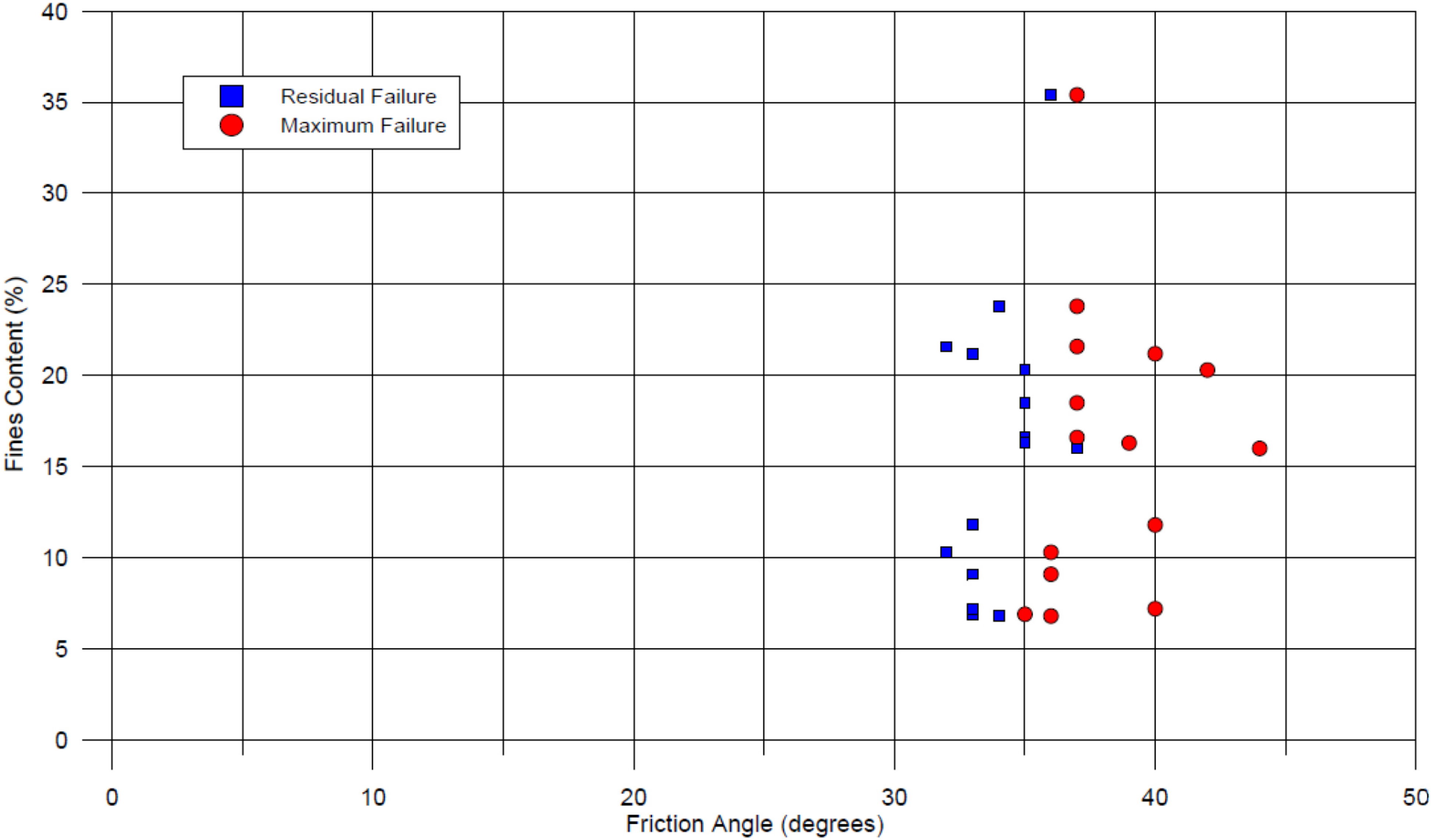

Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.22

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Figure 7.30
Fines Content vs. Friction Angle for Remolded Samples, 0 to 7ft Depth
Geotechnical Data Report

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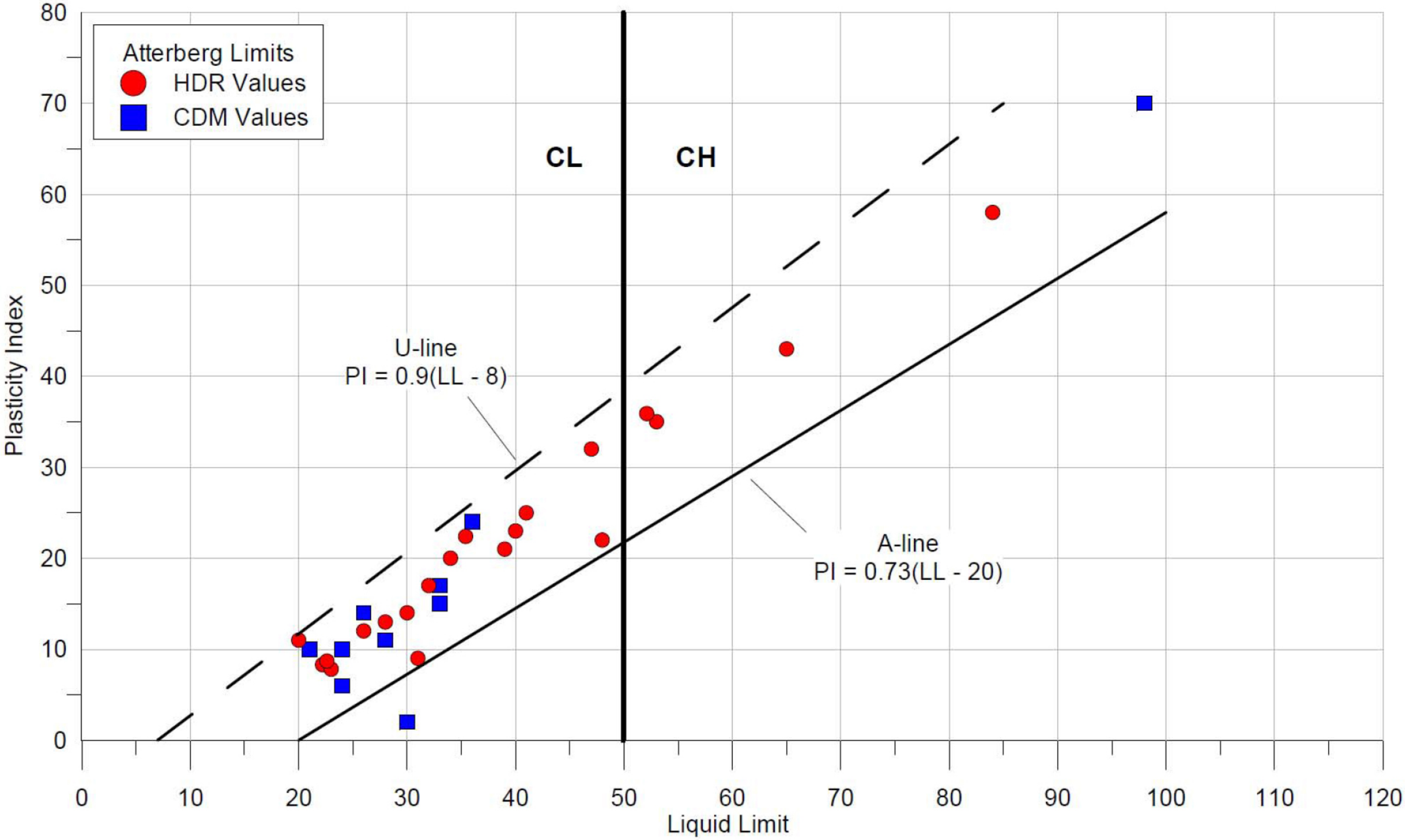

Reference: Ardaman & Associates Geotechnical Site Investigation
and Laboratory Testing Report, dated September 2005
Source: Site Characterization Report, 2006, Figure 6.25

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Figure 7.31

Atterberg Limits, Liquid Limit vs. Plasticity Index

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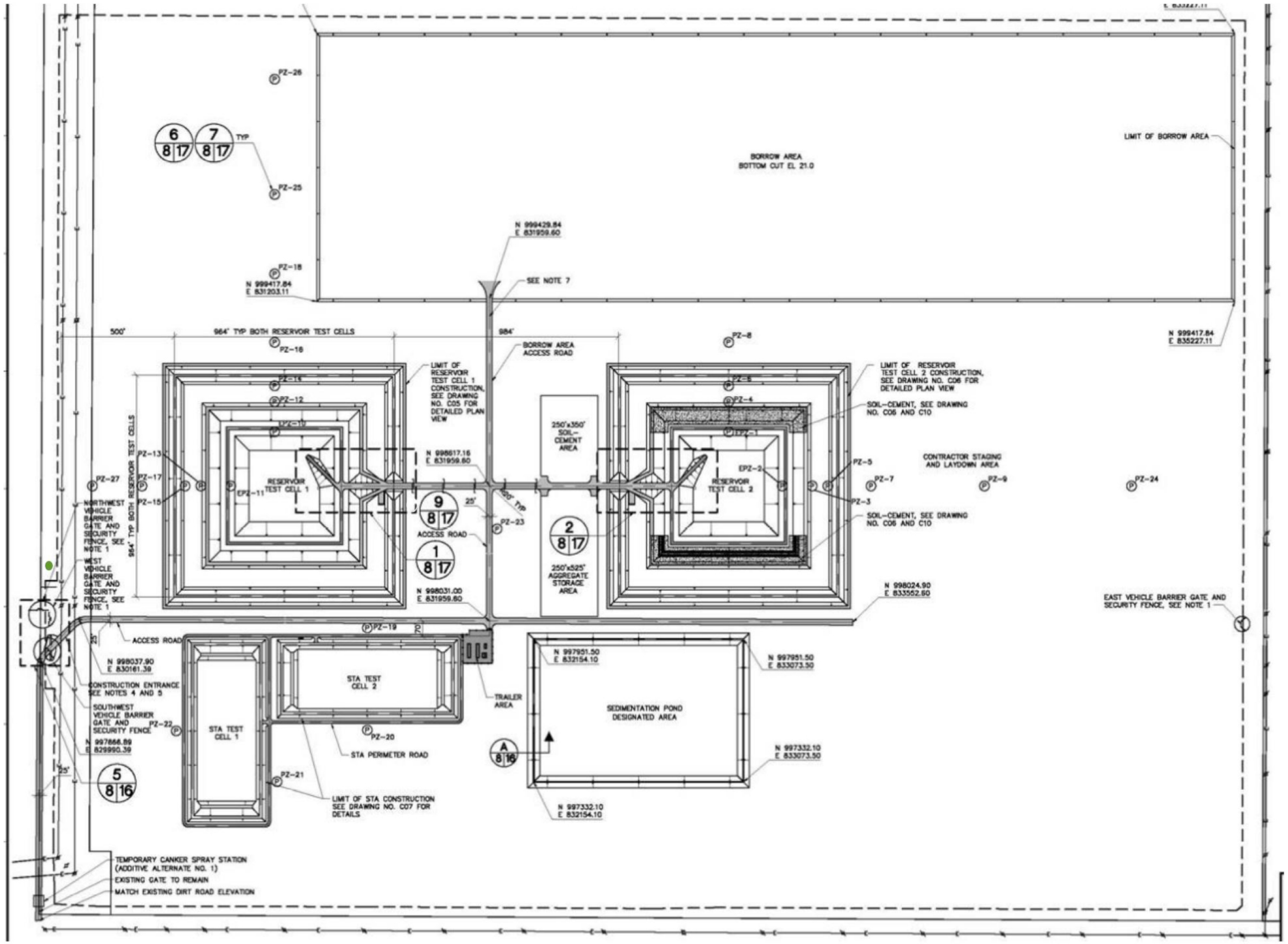

Source: Site Characterization Report, 2006, Figure 3.1

Note: This figure prints full size at 11"x17"

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Figure 8.1
Test Cell Layout
Geotechnical Data Report

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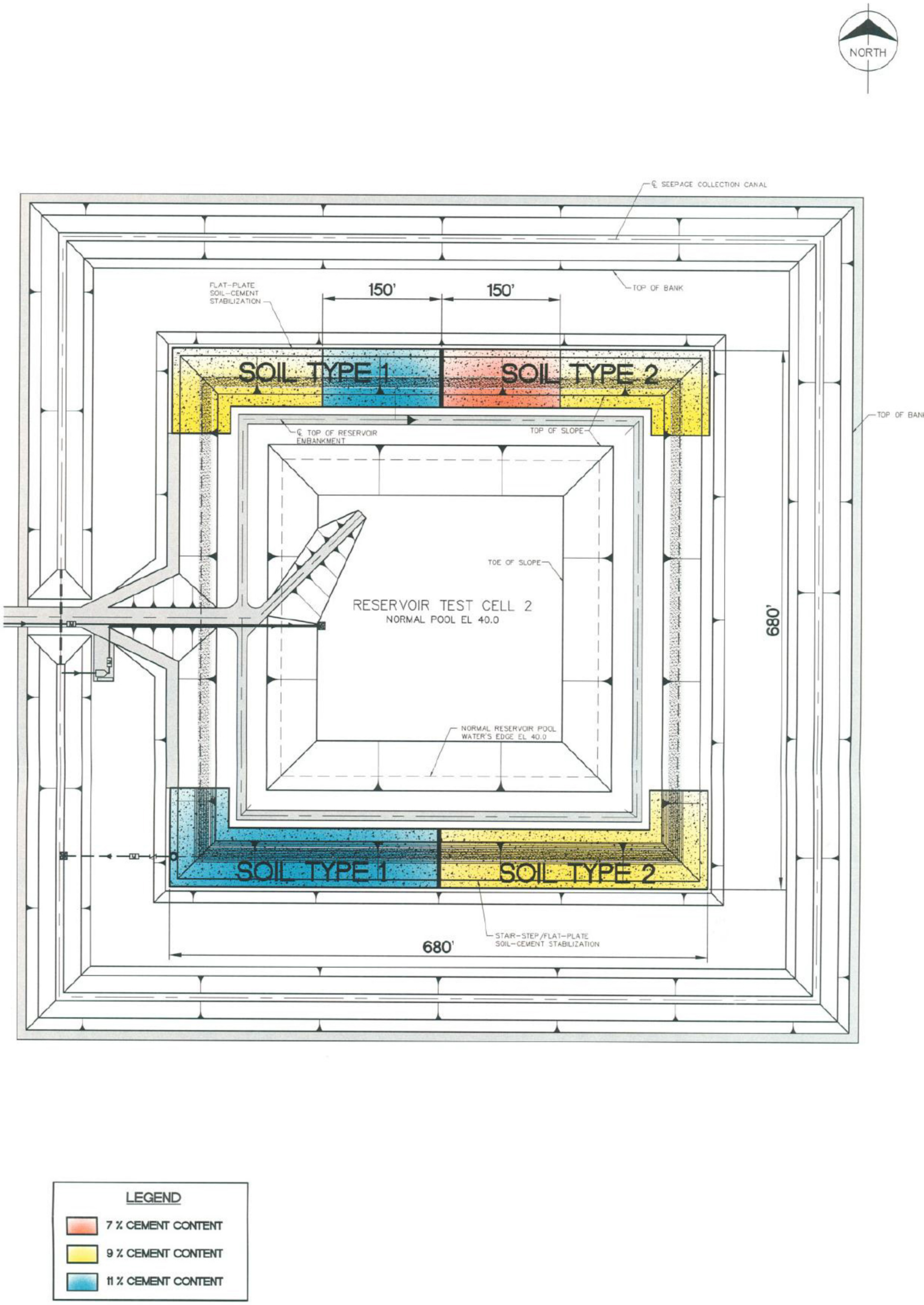

Source: Site Characterization Report, 2006, Figure 3.2

Note: This figure prints full size at 11"x17".

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Figure 8.2
Soil Cement Placement Details
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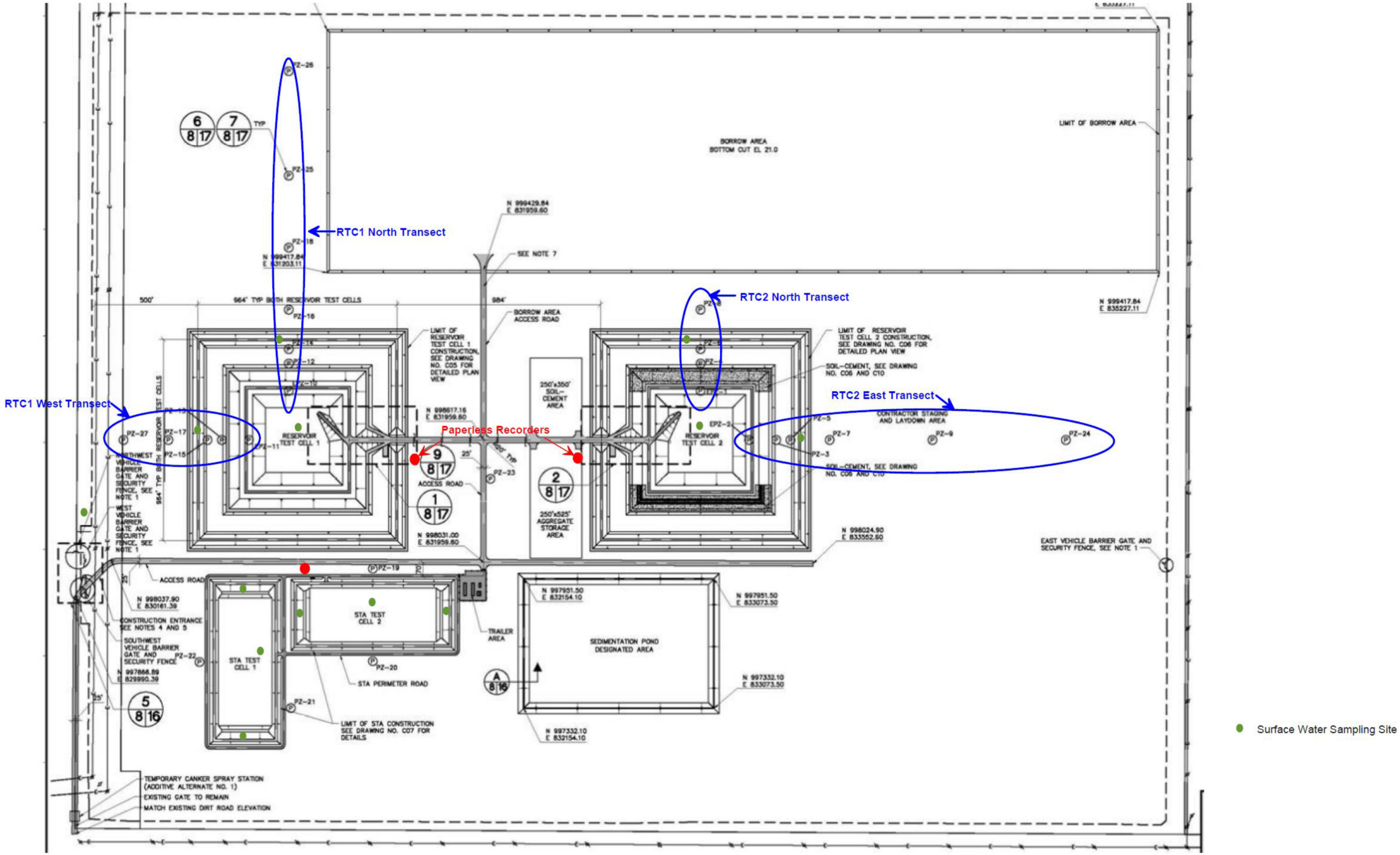

Source: Site Characterization Report, 2006, Figure 4.1

Note: This figure prints full size at 11"x17"

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Figure 8.3
Site Monitoring Points
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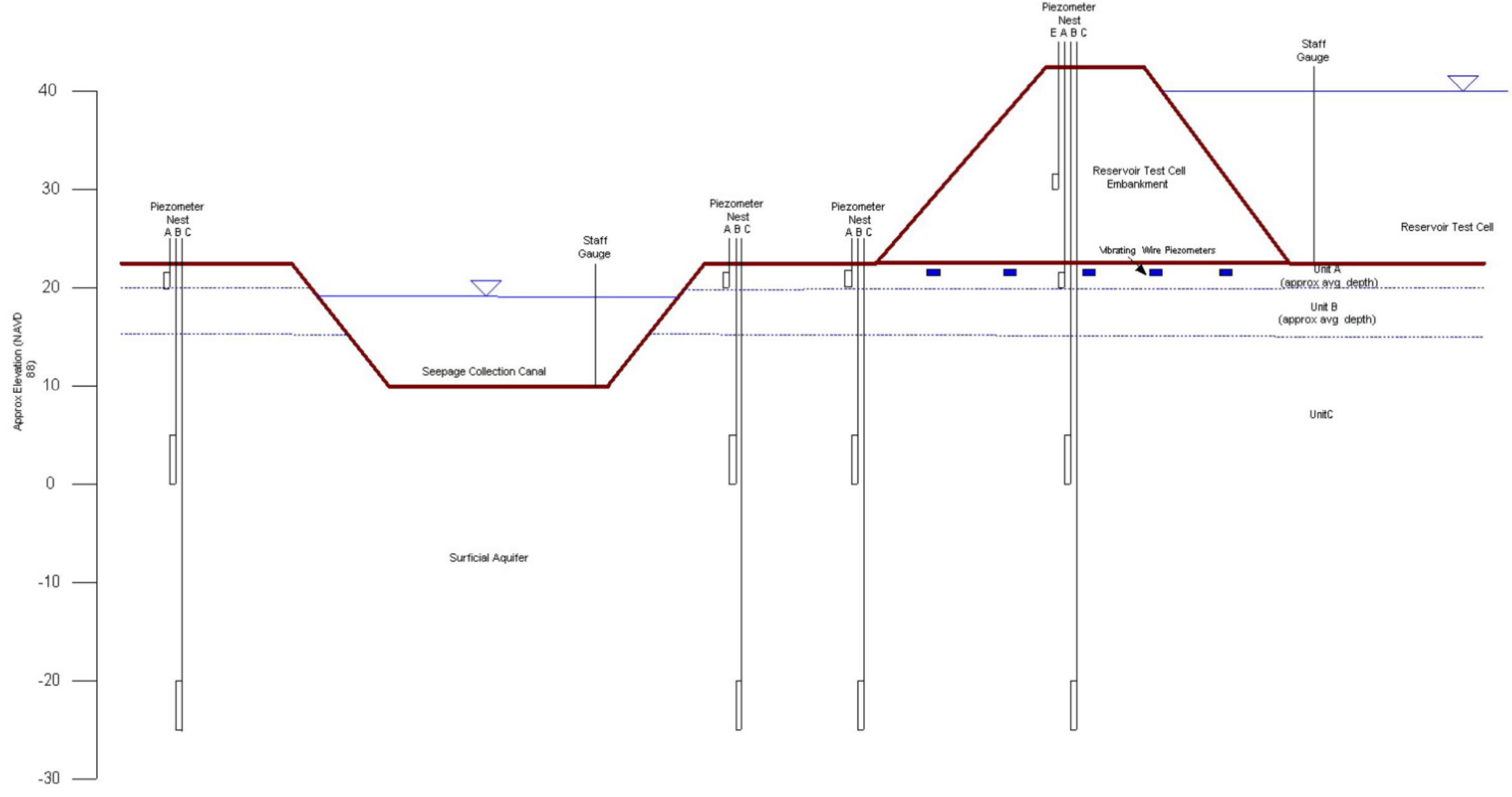

Source: Site Characterization Report, 2006, Figure 4.2

Note: This figure prints full size at 11"x17"

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Figure 8.4
Piezometer Configuration at Reservoir Test Cells
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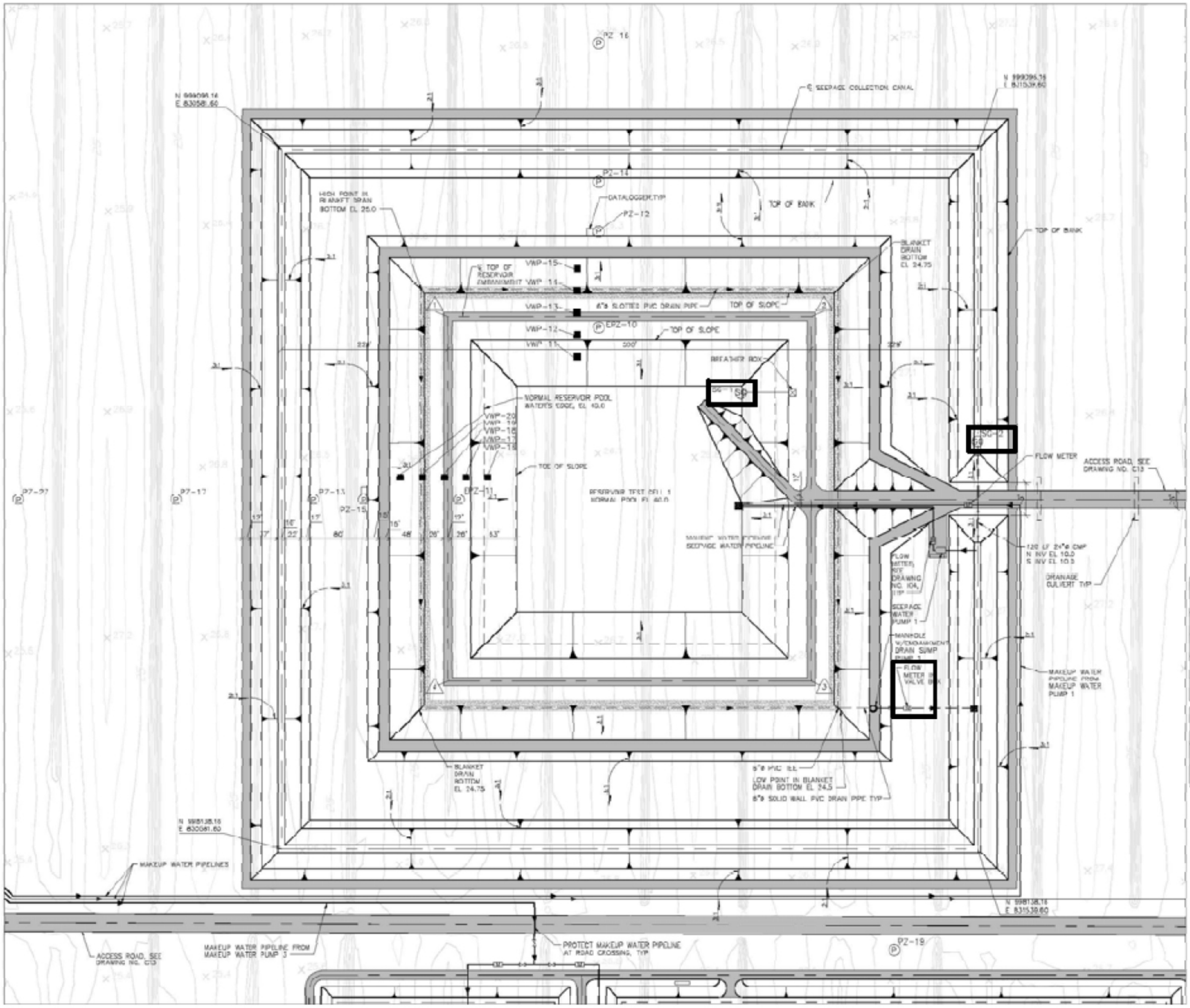

RESERVOIR TEST CELL 1 EMBANKMENT CENTERLINE			
ID	NORTHING	EASTING	LOCATION
1	998867.16	830810.60	NW COR
2	[illegible]	[illegible]	NE COR
3	998367.16	831310.60	SE COR
4	998367.16	830810.60	SW COR

RESERVOIR TEST CELL 1 STAFF GAUGE LOCATIONS			
ID	NORTHING	EASTING	LOCATION
SG-1	998782.16	831213.60	RESERVOIR
SG-2	[illegible]	[illegible]	SEEPAGE COLLECTION

Source: Site Characterization Report, 2006, Figure 4.3

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Figure 8.5
Test Cell 1 Layout
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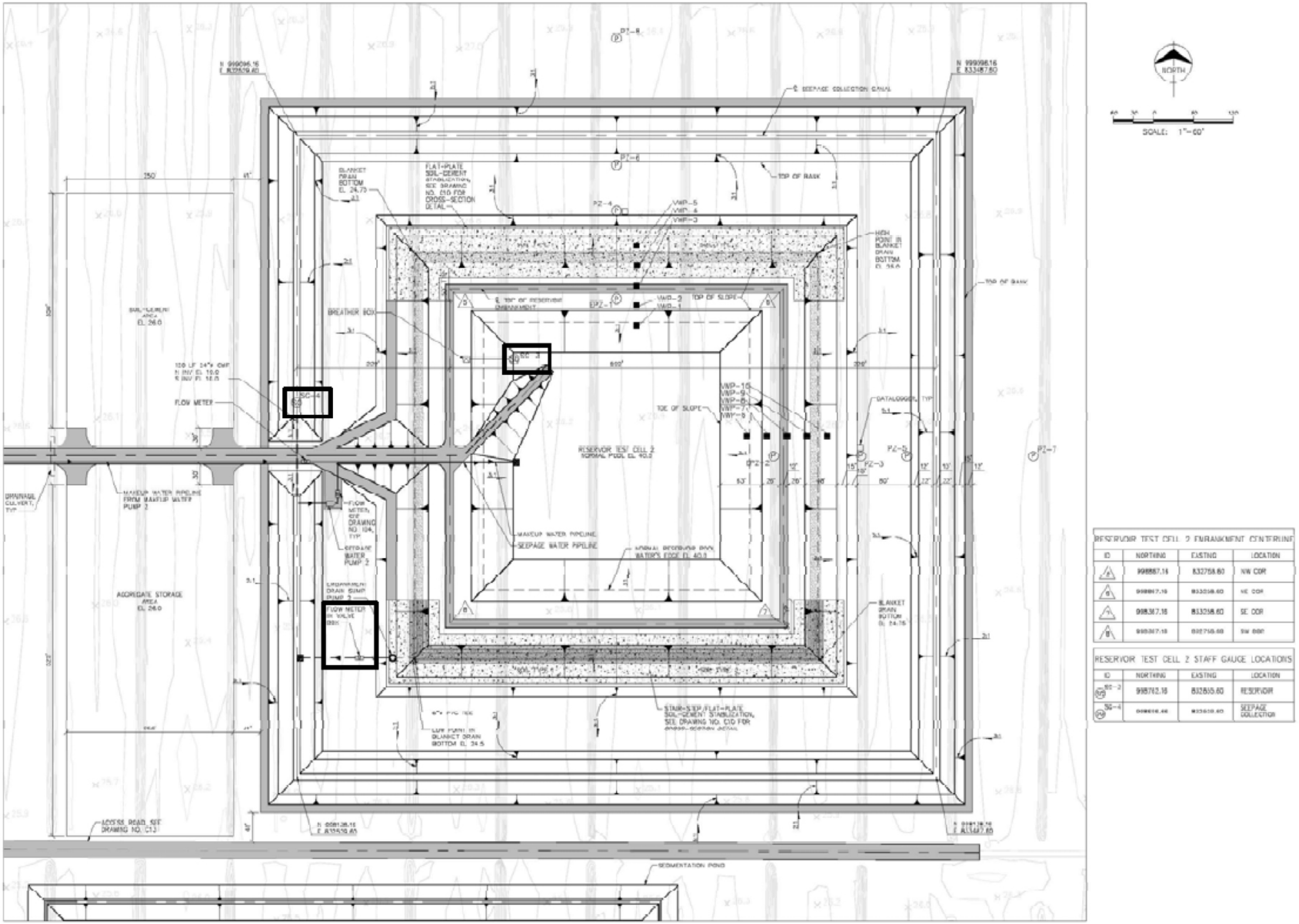

Source: Site Characterization Report, 2006, Figure 4.4

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Figure 8.6

Test Cell 2 Layout

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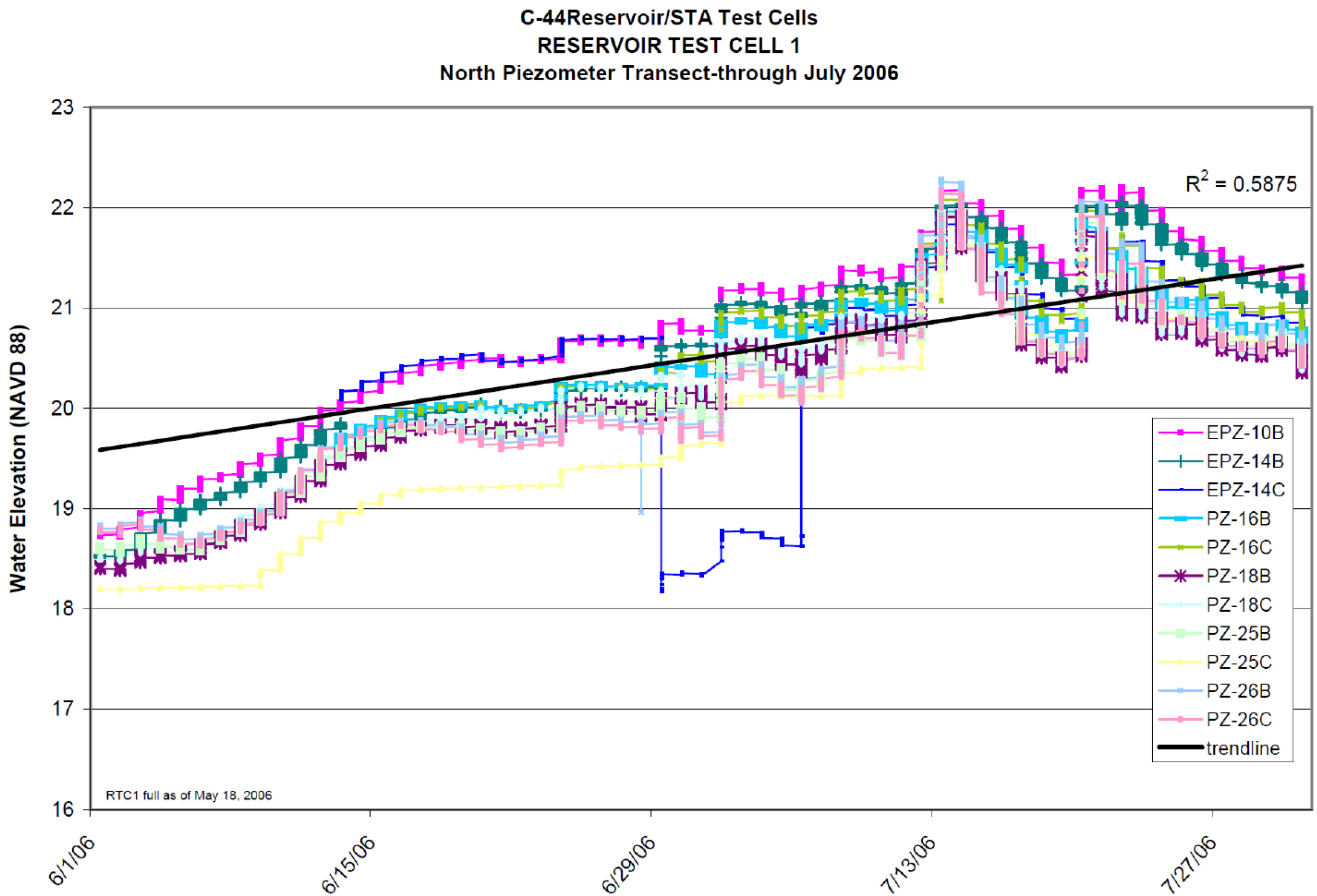

Source: Site Characterization Report, 2006, Figure 2.4

Note: This figure prints full size at 11"x17"

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Figure 8.7
Surficial Aquifer Water Levels
After Approximately Two Months of Test Cell Operation – RTC1
Geotechnical Data Report

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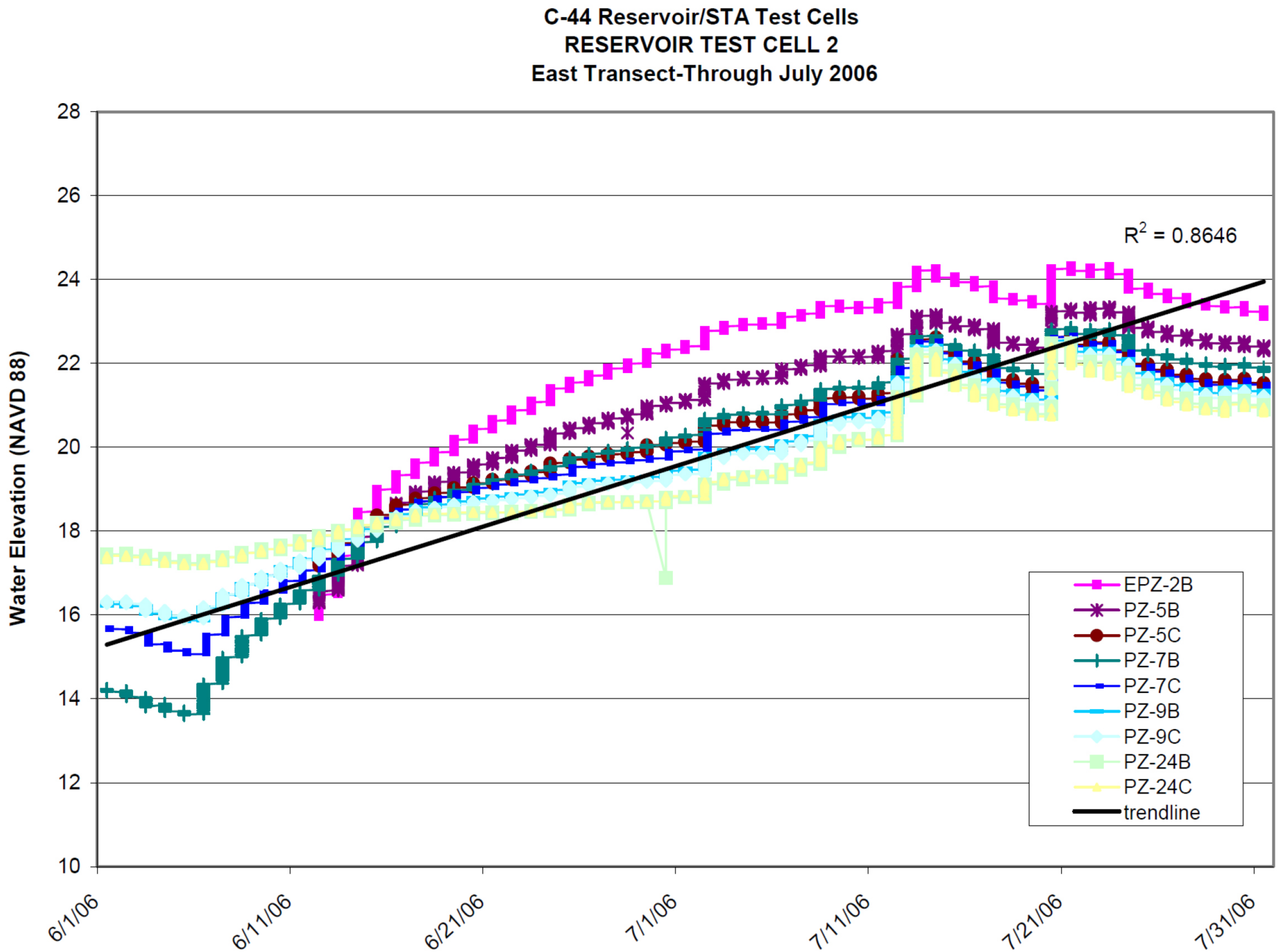
December 23, 2014



Source: Site Characterization Report, 2006, Figure 4.6

Note: This figure prints full size at 11"x17"

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Figure 8.8
Shallow Piezometer Water Levels
After Approximately Two Months of Test Cell Operation – RTC2
Geotechnical Data Report

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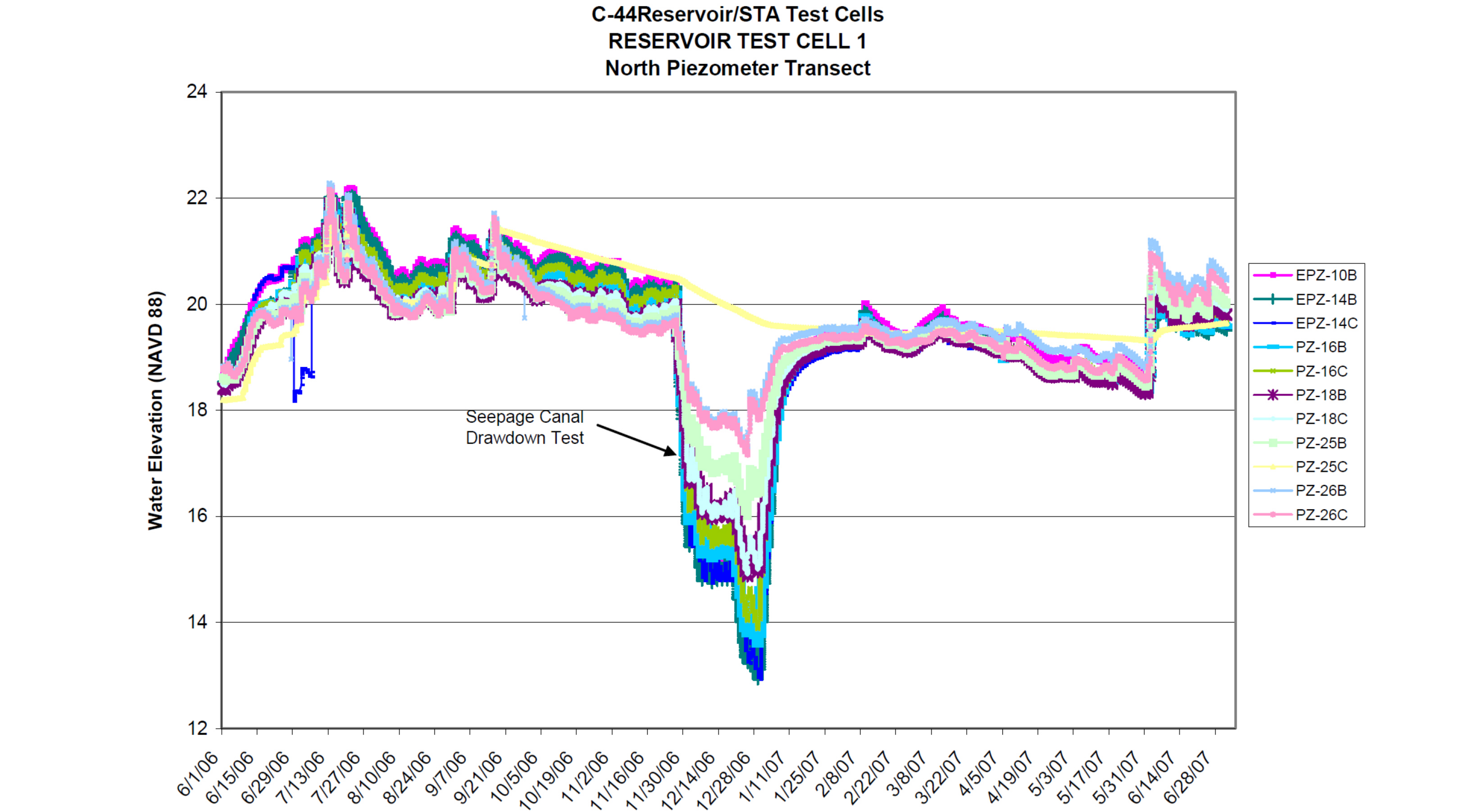
December 23, 2014



Source: Site Characterization Report, 2006, Figure 4.7

Note: This figure prints full size at 11"x17"

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Figure 8.9

Surficial Aquifer Water Levels – RTC1 North Transect

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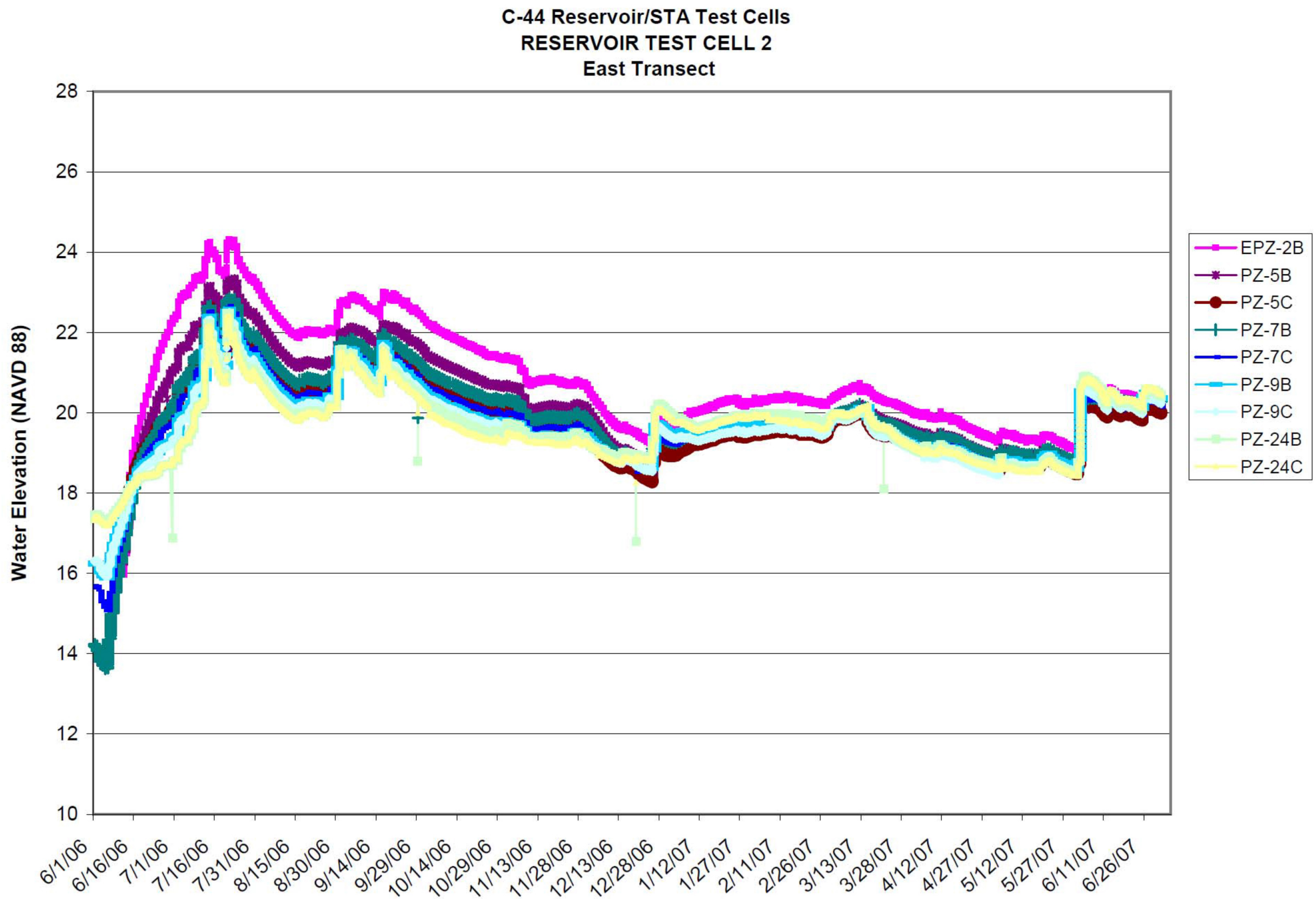

Source: Site Characterization Report, 2006, Figure 4.8

Note: This figure prints full size at 11"x17"

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Figure 8.10
Surficial Aquifer Water Levels – RTC1 East Transect
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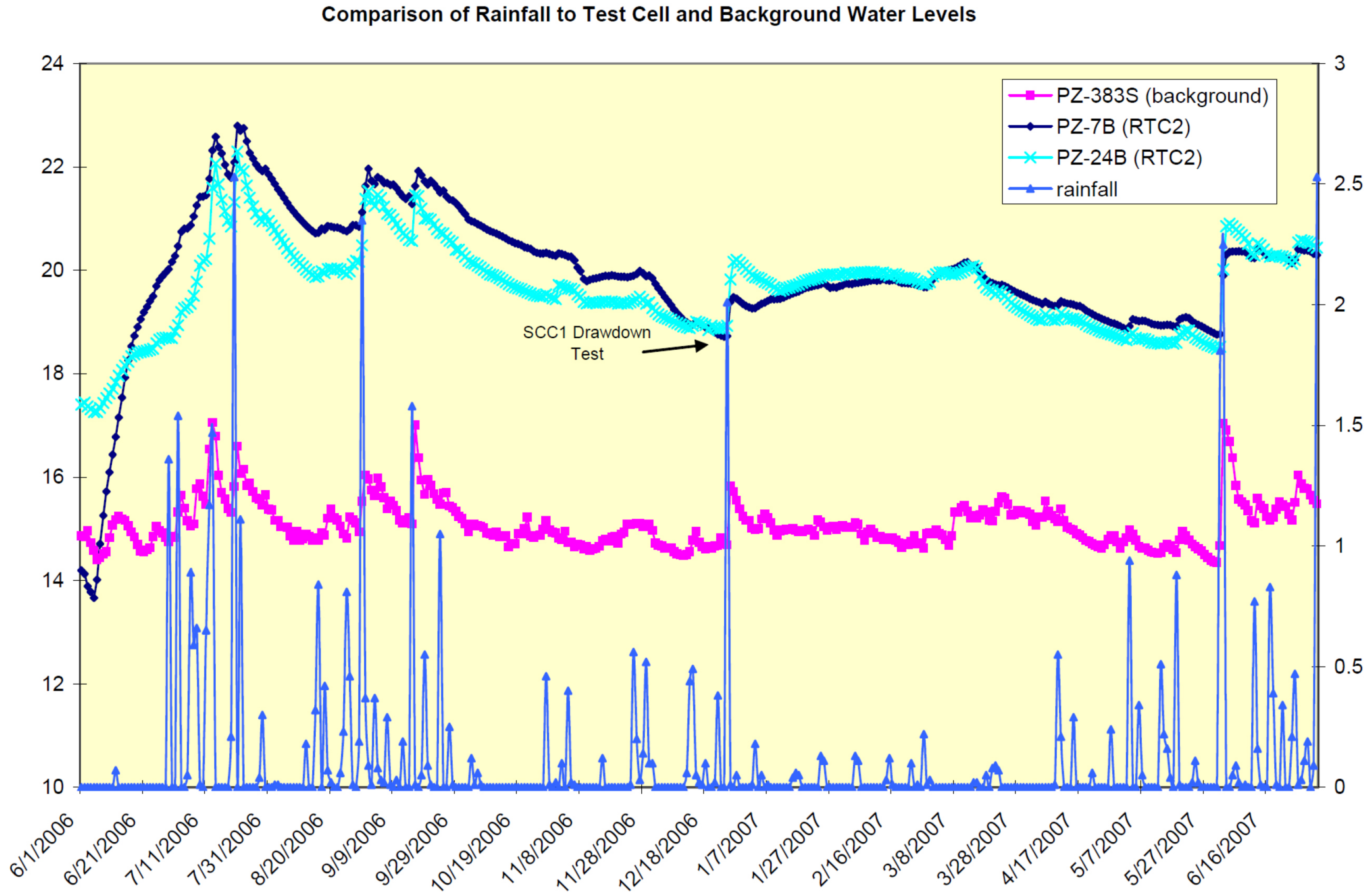
December 23, 2014



Source: Site Characterization Report, 2006, Figure 4.9

Note: This figure prints full size at 11"x17"

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Figure 8.11
Comparison of Rainfall to Test Cell and Background Water Levels
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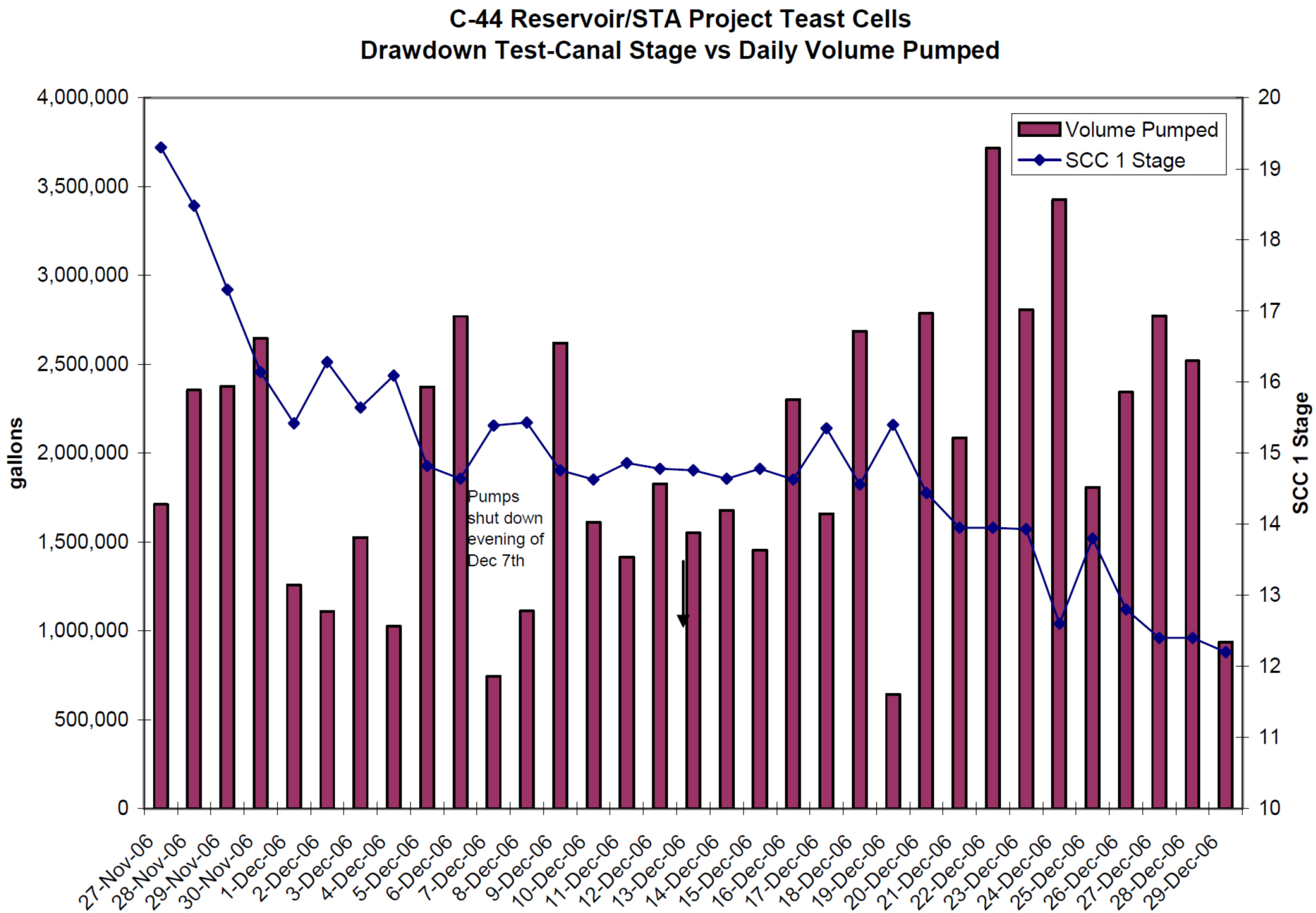

Source: Site Characterization Report, 2006, Figure 4.10

Note: This figure prints full size at 11"x17"

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Figure 8.12

Seepage Canal SCC1 Drawdown vs. Daily Pumped Volume

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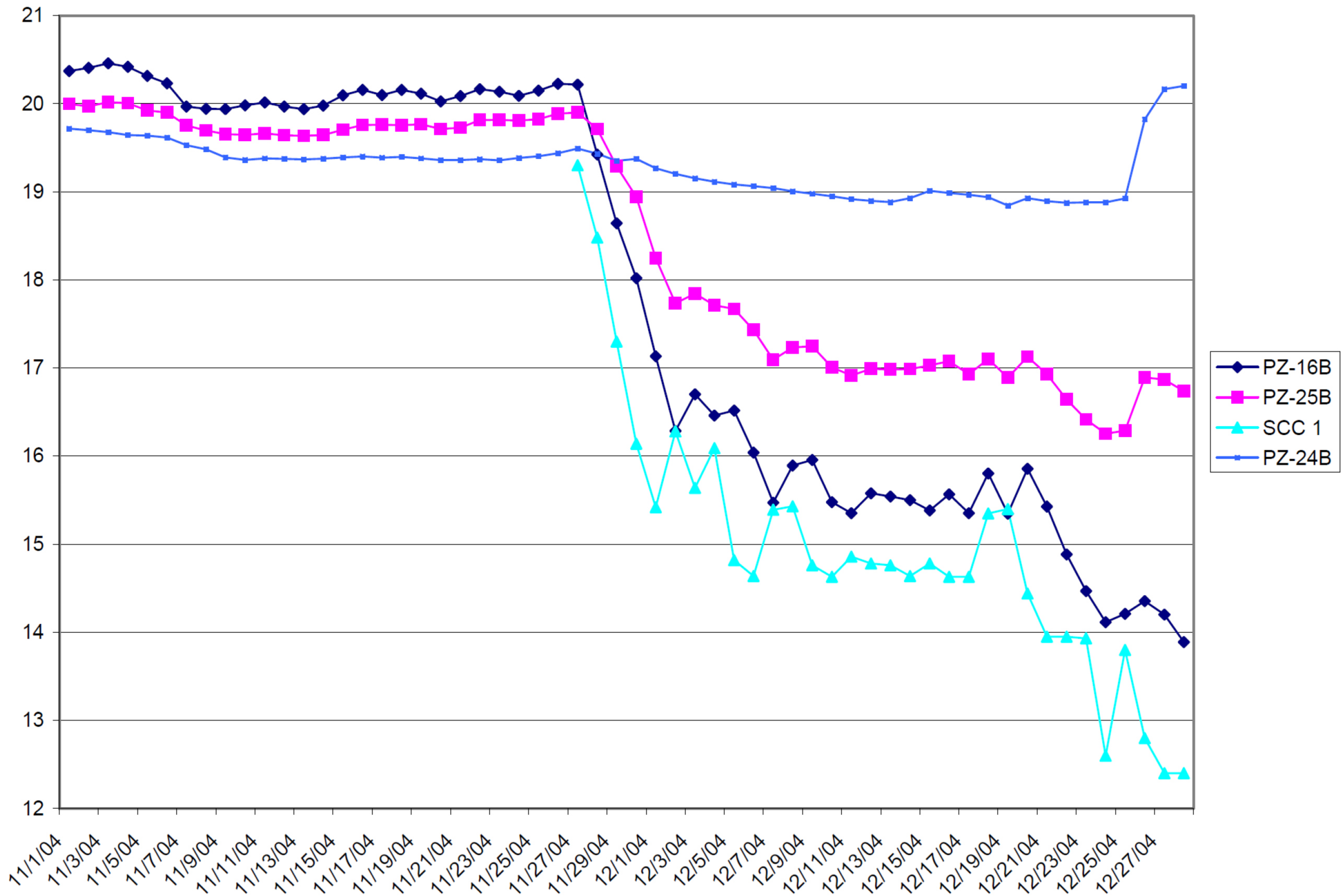

Source: Site Characterization Report, 2006, Figure 4.11

Note: This figure prints full size at 11"x17"

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Figure 8.13

Seepage Canal SCC1 And Piezometer Water Levels During Drawdown Test

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TABLES

Table 2.1
Summary of Contaminants Detected in REC Areas
Geotechnical Data Report

Contaminant	Significance	TEC	PEC	REC Affected	Exceeds TEC	Remedial Action	Remediation Suggested
Copper (Cu)	Strongly attaches to organic matter and minerals in soils. Travels easily in surface waters. Copper rich soils limit the number of plants surviving. Copper can disrupt activity of microorganisms and earthworms in soil.	32 mg/kg	150 mg/kg 85 mg/kg *	1 2 3 4 5 6 7 8 9 10 11 Canals & Ditches	Y Y N Y Y Y Y Y Y Y Y Y	Recommended Recommended Not Recommended Recommended Recommended Recommended Recommended Recommended Not Recommended Recommended Necessary Recommended	Soil Inversion Technology OR Use contaminated soil in berm construction
Arsenic	Inorganic arsenic can cause genetic alterations in the fish of the surface waters. Birds die from eating contaminated fish. Human exposure to inorganic arsenic can cause various health effects from stomach and intestine irritation to damage of DNA.	9.8 mg/kg	33 mg/kg	1 5 7 8 10 11	N N N N N N	Not Recommended Not Recommended Not Recommended Not Recommended Not Recommended Not Recommended	Soil Inversion Technology OR Use contaminated soil in berm construction
Zinc	Fish accumulating zinc in their bodies it is able to bio magnify up the food chain. Water-soluble zinc can contaminate groundwater. Zinc rich soils have limited plant survival and negatively effect microorganisms and earthworms in the soil.	120 mg/kg	460 mg/kg	2 4 5 8 11	Y Y Y Y Y	Combined w/ Cu Remediation Recommended Recommended Recommended Recommended	Soil Inversion Technology OR Use contaminated soil in berm construction
Barium	Water-soluble barium may cause breathing difficulties, increased blood pressures, heart rhythm changes, stomach irritation, swelling of brain and liver, or kidney and heart damage.	20 mg/kg	60 mg/kg	7 8 10 Canals & Ditches	Y Y Y Y	Not Recommended Not Recommended Not Recommended Not Recommended	Soil Inversion Technology OR Use contaminated soil in berm construction
Cadmium	Causes various human health concerns and negative effects on earthworms at low concentrations.	1 mg/kg	5 mg/kg	8	Y	Recommended	Soil Inversion Technology OR Use contaminated soil in berm construction
Lead	Lead poisoning of water and soil organisms, effecting the health of the entire system. Negative human impact.	36 mg/kg	130 mg/kg	8	Y	Recommended	
Silver	Numerous human health damages possible.	1 mg/kg	2.2 mg/kg	1	N	Not Recommended	
Acenaphthene Napthalene 1-methylnapthalene o-Xylene 1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene m&p Xylenes TRPH	liver nasal nasal neurological none specified none specified neurological multiple endpoints - mixed contaminants	GWLC=2100 mg/kg GWLC=1700 mg/kg GWLC=2200 mg/kg GWLC=200 mg/kg GWLC=300 mg/kg GWLC=300 mg/kg GWLC=200 mg/kg GWLC=340 mg/kg	FWLC=700 mg/kg FWLC=2,200 mg/kg FWLC=10,000 mg/kg FWLC=3900 mg/kg FWLC=7200 mg/kg FWLC=6700 mg/kg FWLC=3900 mg/kg FWLC=340 mg/kg	8 (R8-S1, R8-S6, R8-S12, R8-S18, R8-S19, R8-S22)	GWLC or FWLC exceeded	Recommended	Soil Removal

Note: This table prints full size at 11"x17".

Table 2.1 (continued)
Summary of Contaminants Detected in REC Areas
Geotechnical Data Report

Contaminant	Significance	TEC	PEC	REC Affected	Exceeds TEC	Remedial Action	Remediation Suggested
Acenaphthene (in GW) Anthracene (in GW) Naphthalene (in GW) 1-Methylnaphthalene (in GW) 1,2,4 Trimethylbenzene (in GW) m&p Xylenes (in GW)	liver none specified nasal nasal none specified neurological	GWC=20 ug/L GWC=2100 ug/L GWC=14 ug/L GWC=28 ug/L GWC=10 ug/L GWC=20 ug/L	SWC=3 ug/L SWC=0.3 ug/L SWC=26 ug/L SWC=95 ug/L SWC=220 ug/L SWC=370 ug/L	8	GWC exceeded GWC exceeded GWC exceeded GWC exceeded GWC exceeded GWC exceeded	Recommended at R8-MW1 & R8-MW8	Excavate to GW level for atmospheric exposure
Anthracene Fluoranthene Chrysene Fluorene Phenanthrene Pyrene	none specified blood-kidney-liver carcinogen blood-kidney-liver kidney liver	GWLC=2500 mg/kg GWLC=1200 mg/kg GWLC=77 mg/kg GWLC=160 mg/kg GWLC=250 mg/kg GWLC=880 mg/kg	FWLC=0.4 FWLC=1.3 mg/kg NS FWLC=17 mg/kg NS FWLC=1.3 mg/kg	3 (PS 808, PS 816, PS 818, PS 822 & Gardinier PS-1)	FWLC exceeded	Recommended	Soil Removal
Chlordane	carcinogen - liver	3.2 µg/kg	18 µg/kg	5	Y	Recommended	Excavation and Off-site disposal
Anthracene (in GW)	none specified	GWC=2100 ug/L	SWC=0.3 ug/L	3 (PS 806)	GWC exceeded	No Recommendation stated	No recommendation stated
TRPH	multiple endpoints - mixed contaminants	GWLC 340 mg/kg TEC not established	FWLC 340 mg/kg	5 (R5-S14) 7 10	GWLC exceeded GWLC exceeded GWLC exceeded	No recommendation stated Recommended Recommended	No recommendation stated Excavation and Off-site disposal
Naphthalene	nasal	180 ug/kg FWLC 2200 µg/kg	560 ug/kg GWLC 1200 µg/kg	2 (R2-S1 & R2-S8)	Y	No recommendation stated	No recommendation stated
Endosulfan II	cardiovascular - kidney	FWLC 5 µg/kg	GWLC 3800 µg/kg	4	GWLC exceeded	Recommended at R4-S2	Excavation and Off-site disposal
4,4-DDE	carcinogen	3.2 µg/kg (sum DDE)	31 µg/kg (sum DDE)	4 8	Y Y	Recommended at REC4D Recommended	Excavation and Off-site disposal

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 2.2
Impacted Soil Area Coordinates
Geotechnical Data Report

SOIL IMPACT AREA†	POINT	NORTHING (FT)	EASTING (FT)	EXCAVATION DEPTH (IN)
C1*	1	1011217	836331	18
	2	1011217	836375	
	3	1011180	836375	
	4	1011180	836331	
C2	5	1012584	836666	12
	6	1012584	837992	
	7	1010959	837992	
	8	1010959	836666	
C3*	9	1011143	831636	12
	10	1011143	831827	
	11	1011074	831827	
	12	1011074	831636	
C4*	13	1011154	833527	18
	14	1011154	833732	
	15	1011073	833732	
	16	1011073	833527	
C5*	17	1010959	831359	12
	18	1010958	832686	
	19	1009333	832686	
	20	1009333	831359	
C6	21	1010958	834013	12
	22	1010958	835339	
	23	1009333	835339	
	24	1009333	834012	
C7	25	1010958	839319	12
	26	1010957	840646	
	27	1009332	840645	
	28	1009332	839319	
C8*	29	1008696	830865	12
	30	1008696	830928	
	31	1008600	830928	
	32	1008600	830865	
C9	33	1008583	831627	24
	34	1008583	831840	
	35	1008503	831840	
	36	1008503	831627	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C10	37	1008661	832901	12
	38	1008661	832981	
	39	1008599	832981	
	40	1008599	832901	
C11	41	1008700	834498	18
	42	1008700	834551	
	43	1008603	834551	
	44	1008603	834498	
C12	45	1008649	835047	12
	46	1008649	835101	
	47	1008603	835101	
	48	1008603	835047	
C13	49	1005938	837018	18
	50	1005937	837238	
	51	1005871	837229	
	52	1005876	837017	
C14	53	1009334	837992	12
	54	1009334	839319	
	55	1007708	839319	
	56	1007708	837992	
C15*	57	1007708	834012	12
	58	1007708	835339	
	59	1006083	835339	
	60	1006083	834013	
C16	61	1007275	840645	12
	62	1007275	842575	
	63	1006166	842575	
	64	1006166	840645	
C17	65	1006083	830032	12
	66	1006083	831359	
	67	1004457	831359	
	68	1004457	834012	
	69	1002831	834012	
	70	1002830	832686	
	71	1001205	832686	
	72	1001206	831359	
	73	1002830	831359	
	74	1002831	830032	
C18	75	1005942	831610	12
	76	1005942	831823	
	77	1005862	831823	
	78	1005862	831610	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C19*	79	1006007	835818	18
	80	1006007	835905	
	81	1005944	835905	
	82	1005944	835818	
C20*	83	1006022	838257	24
	84	1006022	838343	
	85	1005949	838343	
	86	1005949	838257	
C21	87	1005934	838783	12
	88	1005934	838996	
	89	1005854	838996	
	90	1005854	838783	
C22	91	1003394	834271	12
	92	1003394	834348	
	93	1003314	834348	
	94	1003314	834271	
C23*	95	1003297	837008	24
	96	1003297	837220	
	97	1003217	837220	
	98	1003217	837008	
C24	99	1003289	838782	24
	100	1003289	839235	
	101	1003125	839235	
	102	1003125	838782	
C25	103	1002830	834012	12
	104	1002830	835339	
	105	1001205	835339	
	106	1001205	834013	
C26	107	997991	836980	24
	108	997991	837193	
	109	997911	837193	
	110	997911	836980	
C27	111	997954	837193	12
	112	997954	838750	
	113	997899	838750	
	114	997899	838877	
	115	996713	838877	
	116	996713	837108	
	117	997911	837108	
	118	997911	837193	
C28	119	997979	838750	12
	120	997979	838963	
	121	997899	838963	
	122	997899	838750	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C29	123	1005056	840646	12
	124	1005056	842575	
	125	1003947	842575	
	126	1003947	840646	
C30	127	1004612	843311	24
	128	1004612	843375	
	129	1004569	843375	
	130	1004569	843311	
C31*	131	1004612	844240	24
	132	1004612	844472	
	133	1004542	844472	
	134	1004542	844240	
C32	135	1004622	845729	12
	136	1004622	845864	
	137	1004566	845864	
	138	1004566	845729	
C33	139	1006166	846434	12
	140	1006166	848364	
	141	1005056	848364	
	142	1005056	846434	
C34*	143	1004697	847480	24
	144	1004697	847563	
	145	1004641	847563	
	146	1004641	847480	
C35	147	1004699	848018	12
	148	1004699	848094	
	149	1004645	848094	
	150	1004645	848018	
C36	151	1001953	844216	12
	152	1001953	844429	
	153	1001873	844429	
	154	1001873	844216	
C37	155	1002032	845195	12
	156	1002032	845275	
	157	1001970	845275	
	158	1001970	845195	
C38	159	1001962	846368	12
	160	1001962	846493	
	161	1001910	846493	
	162	1001910	846368	
C39	163	1002092	847885	18
	164	1002092	848016	
	165	1001989	848016	
	166	1001989	847885	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C40	167	999290	842330	24
	168	999290	842543	
	169	999210	842543	
	170	999210	842330	
C41	171	1000617	844505	12
	172	1000617	846435	
	173	999507	846435	
	174	999507	844505	
C42	175	996657	844215	18
	176	996657	844452	
	177	996597	844452	
	178	996597	844215	
C43*	179	996740	846665	24
	180	996740	846731	
	181	996680	846731	
	182	996680	846665	
C44	183	996733	847731	18
	184	996733	847858	
	185	996682	847858	
	186	996682	847731	
C45*	187	994005	842331	18
	188	994005	842544	
	189	993925	842544	
	190	993925	842331	
C46*	191	994007	844225	24
	192	994007	844432	
	193	993932	844432	
	194	993932	844225	
C47*	195	994011	845178	18
	196	994011	845261	
	197	993930	845261	
	198	993930	845178	
C48	199	994712	846792	18
	200	994712	846885	
	201	994630	846885	
	202	994630	846792	
C49*	203	994707	847327	12
	204	994707	847416	
	205	994629	847416	
	206	994629	847327	
C50	207	991351	842329	18
	208	991351	842542	
	209	991271	842542	
	210	991271	842329	

* This impacted soil area cannot be remediated with Remedial Method Type E.

† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C51	211	992387	843221	12
	212	992387	844507	
	213	990741	844507	
	214	990741	843221	
C52*	215	991445	847455	24
	216	991445	847525	
	217	991375	847525	
	218	991375	847455	
C53	219	984939	846589	12
	220	984939	848367	
	221	985269	848367	
	222	985270	852967	
	223	986684	852967	
	224	986684	856034	
	225	985270	856034	
	226	983244	850061	
	227	984284	850059	
	228	984284	848365	
	229	983807	848365	
	230	983807	847364	
C54*	231	1009905	841540	18
	232	1009905	843320	
	233	1007275	843320	
	234	1007275	841540	
	235	1008330	841540	
	236	1008330	840645	
	237	1008855	840645	
	238	1008855	841540	
C55	239	1009380	843765	18
	240	1009380	844210	
	241	1009905	844210	
	242	1009905	845100	
	243	1007275	845100	
	244	1007275	844210	
	245	1008855	844210	
	246	1008855	843765	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C56*	247	1011480	844655	18
	248	1011480	845545	
	249	1012005	845545	
	250	1012005	845100	
	251	1012530	845100	
	252	1012530	845990	
	253	1008855	845990	
	254	1008855	845545	
	255	1010430	845545	
	256	1010430	845100	
	257	1010955	845100	
	258	1010955	844655	
C59*	259	1002857	840316	24
	260	1002857	840492	
	261	1002697	840492	
	262	1002697	840366	
	263	1002445	840366	
	264	1002445	840416	
	265	1002395	840416	
	266	1002395	840316	
	267	1002445	840316	
	268	1002445	840266	
	269	1002642	840266	
	270	1002642	840216	
	271	1002757	840216	
	272	1002757	840266	
	273	1002807	840266	
	274	1002807	840316	
C60	275	993916	845991	12
	276	993916	846211	
	277	993586	846211	
	278	993586	845991	
C61	279	1003585	834790	12
	280	1003585	835215	
	281	1003410	835215	
	282	1003410	834910	
	283	1003495	834910	
	284	1003495	834790	
C62	285	1003325	834682	12
	286	1003325	834762	
	287	1003225	834762	
	288	1003225	834682	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C63	289	1012551	841985	12
	290	1012558	846131	
	291	1012537	846131	
	292	1012526	841985	
C64	293	1007276	840607	12
	294	1007276	840639	
	295	1006577	840645	
	296	1006166	840645	
	297	1006166	840649	
	298	1005056	840659	
	299	1005056	840646	
	300	1003947	840646	
	301	1003947	840669	
	302	1001945	840687	
	303	1001944	840654	
C65	304	1004664	848519	12
	305	1004664	848529	
	306	998010	848513	
	307	998006	848471	
C66*	308	1012509	847792	24
	309	1012509	847828	
	310	1012497	847828	
	311	1012497	847792	
C67*	312	1012475	847801	24
	313	1012475	847825	
	314	1012457	847825	
	315	1012457	847801	
C68*	316	1011182	839772	24
	317	1011178	839838	
	318	1011135	839842	
	319	1011139	839769	
C69*	320	1003320	830819	24
	321	1003317	830957	
	322	1003223	830949	
	323	1003233	830809	
C70	324	1000624	838744	18
	325	1000623	838971	
	326	1000564	838965	
	327	1000568	838742	
C71	328	990741	843221	18
	329	990741	844507	
	330	989422	844507	
	331	989420	843221	

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

C72	332	990741	844507	12
	333	990741	848365	
	334	989094	848365	
	335	989093	845999	
	336	989425	845999	
	337	989422	844507	
C73*	338	1004601	841412	24
	339	1004601	841495	
	340	1004550	841495	
	341	1004550	841412	
C74	342	1008590	835844	18
	343	1008588	835918	
	344	1008554	835916	
	345	1008553	835842	
C75	346	996652	842257	18
	347	996657	842513	
	348	996598	842509	
	349	996621	842242	
C76	350	996674	845866	24
	351	996673	845927	
	352	996611	845933	
	353	996616	845865	
SPMI-1	342	1007334	841402	12
SPMI-2	343	1007327	843150	12
SPMI-3	344	1007333	845248	12
SPMI-4	345	1009938	843138	12
SPMI-5	346	1002969	835136	12

Notes:
1. The term "structural fill" here means that it can be used for construction of the embankment provided it meets all of the requirements for embankment fill in the specifications.

* This impacted soil area cannot be remediated with Remedial Method Type E.
† MLB (Mix/Load/Burn) area coordinates not included. MLB areas are shown on Figure 1 and Figure 2 for information purposes only.

Table 3.1
Summary of Site Explorations
Geotechnical Data Report

	Site Characterization	**Post-Site Characterization**	AMEC 2012	Total
Cone Penetrometer (CPT)	65	0	0	**65**
Rotary Wash (CB)	149	70	4	**223**
Auger Boring (AB)	89	22	0	**111**
Monitoring Well (MW)	18	1	0	**19**
Test Pits (TP)	11	0	25	**36**

Table 4.1
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
AB 085	847,285	990,086	27.13	10	Site Characterization
AB 086	847,338	991,618	23.58	10	Site Characterization
AB 087	847,345	993,935	24.11	10	Site Characterization
AB 088	847,351	996,626	26.05	10	Site Characterization
AB 089	847,326	998,032	26.54	10	Site Characterization
AB 090	847,188	1,001,995	26.81	10	Site Characterization
AB 091	847,123	1,004,658	27.63	10	Site Characterization
AB 092	847,135	1,007,246	26.96	10	Site Characterization
AB 093	845,168	1,004,648	28.70	10	Site Characterization
AB 094	845,121	1,001,951	27.56	10	Site Characterization
AB 095	845,236	999,343	27.24	10	Site Characterization
AB 096	845,062	997,785	25.70	10	Site Characterization
AB 097	844,279	995,856	24.89	10	Site Characterization
AB 098	842,110	995,516	24.78	10	Site Characterization
AB 099	841,685	997,616	26.29	10	Site Characterization
AB 100	841,946	994,038	24.41	10	Site Characterization
AB 101	844,329	993,976	26.92	10	Site Characterization
AB 102	841,941	992,817	24.51	10	Site Characterization
AB 103	842,101	990,565	24.60	10	Site Characterization
AB 104	844,395	992,055	25.17	10	Site Characterization
AB 105	844,414	990,068	25.99	10	Site Characterization
AB 106	843,236	1,000,608	24.91	10	Site Characterization
AB 107	843,215	1,003,834	24.00	10	Site Characterization
AB 108	840,591	1,011,726	28.24	10	Site Characterization
AB 109	839,218	1,010,424	27.04	10	Site Characterization
AB 110	837,872	1,011,440	25.52	10	Site Characterization
AB 111	836,680	1,010,376	24.10	10	Site Characterization
AB 112	835,580	1,011,533	24.84	10	Site Characterization
AB 113	834,110	1,010,076	24.08	10	Site Characterization
AB 114	833,016	1,011,514	24.61	10	Site Characterization
AB 115	832,622	1,010,213	23.78	10	Site Characterization
AB 116	830,987	1,011,633	24.90	10	Site Characterization
AB 117	831,109	1,008,623	24.23	10	Site Characterization
AB 118	837,225	1,007,979	24.92	10	Site Characterization
AB 119	839,912	1,007,836	26.68	10	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
AB 121	832,336	1,007,695	20.39	10	Site Characterization
AB 122	834,769	1,006,331	24.13	10	Site Characterization
AB 123	834,767	1,005,334	24.40	10	Site Characterization
AB 124	832,734	1,006,317	23.63	10	Site Characterization
AB 125	832,730	1,005,365	23.39	10	Site Characterization
AB 126	831,233	1,005,827	24.56	10	Site Characterization
AB 127	834,720	999,892	24.52	10	Site Characterization
AB 128	837,620	1,001,173	24.24	10	Site Characterization
AB 129	834,716	997,577	24.91	10	Site Characterization
AB 130	837,851	998,880	24.61	10	Site Characterization
AB 131	839,180	996,958	19.77	10	Site Characterization
AB 132	838,509	1,002,445	23.06	10	Site Characterization
AB 133	831,982	997,593	25.23	10	Site Characterization
AB 134	831,076	999,288	22.86	10	Site Characterization
AB 135	831,078	1,001,962	25.75	10	Site Characterization
AB 136	832,435	1,001,272	23.88	10	Site Characterization
AB 137	832,828	999,524	24.57	10	Site Characterization
AB 138	831,225	1,003,384	23.42	10	Site Characterization
AB 139	833,273	1,002,508	25.09	10	Site Characterization
AB 140	834,620	1,002,584	23.87	10	Site Characterization
AB 141	837,340	1,005,236	25.47	10	Site Characterization
AB 142	839,222	1,005,234	25.57	10	Site Characterization
AB 143	843,185	1,005,921	29.17	10	Site Characterization
AB 302	835,139	997,532	23.26	15	Site Characterization
AB 303	833,794	997,547	24.62	15	Site Characterization
AB 304	832,415	997,590	23.80	15	Site Characterization
AB 305	831,045	997,610	23.14	15	Site Characterization
AB 306	830,801	998,855	23.21	15	Site Characterization
AB 307	836,604	997,576	24.32	15	Site Characterization
AB 308	837,981	997,531	23.28	15	Site Characterization
AB 309	839,337	997,517	23.80	15	Site Characterization
AB 310	830,810	1,000,321	23.70	15	Site Characterization
AB 311	830,813	1,001,691	24.42	15	Site Characterization
AB 312	830,813	1,003,097	23.24	15	Site Characterization
AB 313	830,824	1,004,465	23.95	15	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
AB 314	830,830	1,005,833	24.02	15	Site Characterization
AB 315	830,835	1,007,292	27.07	15	Site Characterization
AB 316	830,838	1,008,616	25.42	15	Site Characterization
AB 317	839,089	1,011,797	25.48	15	Site Characterization
AB 318	837,633	1,011,804	25.80	15	Site Characterization
AB 319	836,256	1,011,721	25.70	15	Site Characterization
AB 320	830,841	1,009,880	27.00	15	Site Characterization
AB 321	834,901	1,011,779	25.48	15	Site Characterization
AB 322	833,436	1,011,783	24.21	15	Site Characterization
AB 323	832,092	1,011,748	23.12	15	Site Characterization
AB 324	830,874	1,011,352	25.29	15	Site Characterization
AB 334	832,337	998,235	24.37	8	Site Characterization
AB 335	836,876	998,218	24.48	8	Site Characterization
AB 336	837,016	999,562	25.23	8	Site Characterization
AB 337	831,535	1,000,466	22.32	8	Site Characterization
AB 339	831,152	1,010,498	24.34	8	Site Characterization
AB 340	839,656	1,009,735	26.52	8	Site Characterization
AB 341	846,618	1,004,657	28.15	8	Site Characterization
AB 342	840,026	1,002,598	24.50	8	Site Characterization
AB 408	847,427	1,011,210	26.76	15.0	Post Site Characterization
AB 409	847,584	1,008,819	26.25	15.0	Post Site Characterization
AB 410	847,487	1,007,479	26.91	15.0	Post Site Characterization
AB 414	842,124	1,011,199	27.31	15.0	Post Site Characterization
AB 415	842,262	1,007,292	27.75	15.0	Post Site Characterization
AB 416	845,818	1,007,307	25.62	15.0	Post Site Characterization
AB 417	845,619	1,009,980	25.57	15.0	Post Site Characterization
AB 418	842,305	1,009,086	23.94	15.0	Post Site Characterization
AB 424	840,882	998,787	26.0	5.0	Post Site Characterization
AB 425	841,038	999,619	26.0	5.0	Post Site Characterization
AB 426	841,138	1,000,492	26.0	5.0	Post Site Characterization
AB 427	841,075	1,001,686	26.0	5.0	Post Site Characterization
AB 428	841,111	1,003,098	26.0	3.0	Post Site Characterization
AB 429	841,484	1,003,662	26.0	5.0	Post Site Characterization
AB 430	841,500	1,004,805	26.0	5.0	Post Site Characterization
AB 441	840,692	1,005,868	26.0	5	Post Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.		Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
AB	442	841,545	1,006,045	26.0	5.0	Post Site Characterization
AB	444	841,423	1,008,037	26.0	5.0	Post Site Characterization
AB	445	841,030	1,008,857	26.0	5.0	Post Site Characterization
AB	446	841,387	1,009,820	26.0	5.0	Post Site Characterization
AB	447	841,393	1,010,764	26.0	5.0	Post Site Characterization
AB	448	840,472	1,011,558	26.0	5.0	Post Site Characterization
CB	042	830,006	999,497	27.68	30	Site Characterization
CB	043	830,023	1,001,832	26.92	30	Site Characterization
CB	044	830,043	1,006,159	26.46	30	Site Characterization
CB	045	831,084	1,009,010	25.27	30	Site Characterization
CB	046	834,085	1,009,006	23.75	30	Site Characterization
CB	047	834,062	1,003,981	24.22	30	Site Characterization
CB	048	834,051	1,001,228	24.03	30	Site Characterization
CB	049	834,041	998,912	24.18	30	Site Characterization
CB	050	836,617	998,916	23.66	30	Site Characterization
CB	051	836,622	1,001,250	23.35	30	Site Characterization
CB	052	834,104	1,006,631	24.80	30	Site Characterization
CB	053	832,472	996,875	24.91	30	Site Characterization
CB	054	839,212	1,001,244	24.11	30	Site Characterization
CB	055	836,524	1,003,923	23.46	30	Site Characterization
CB	056	839,219	1,003,958	24.74	30	Site Characterization
CB	057	836,644	1,006,618	25.23	30	Site Characterization
CB	058	839,335	1,006,635	25.68	30	Site Characterization
CB	059	837,767	1,012,347	25.71	30	Site Characterization
CB	060	836,657	1,009,596	25.42	30	Site Characterization
CB	061	839,222	1,009,601	27.41	30	Site Characterization
CB	062	837,952	996,871	21.65	30	Site Characterization
CB	063	839,202	998,915	25.18	30	Site Characterization
CB	064	840,004	997,690	24.79	30	Site Characterization
CB	065	841,939	998,930	26.58	30	Site Characterization
CB	066	847,172	999,344	26.22	30	Site Characterization
CB	067	848,401	999,334	26.96	30	Site Characterization
CB	068	847,160	1,000,628	27.37	30	Site Characterization
CB	069	847,135	1,003,351	28.01	30	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 070	845,131	1,003,331	28.05	30	Site Characterization
CB 071	847,155	1,005,990	27.16	30	Site Characterization
CB 072	841,864	1,003,973	26.18	30	Site Characterization
CB 073	841,883	1,001,228	26.64	30	Site Characterization
CB 074	843,173	997,676	24.78	30	Site Characterization
CB 075	840,786	994,544	24.75	30	Site Characterization
CB 076	843,156	992,710	25.63	30	Site Characterization
CB 077	840,787	992,067	26.05	30	Site Characterization
CB 078	848,439	994,060	28.82	30	Site Characterization
CB 079	848,434	996,526	27.38	30	Site Characterization
CB 080	843,157	995,308	25.54	30	Site Characterization
CB 081	832,879	1,012,292	23.97	30	Site Characterization
CB 082	848,412	990,104	27.97	30	Site Characterization
CB 083	841,897	1,006,593	27.84	30	Site Characterization
CB 084	848,395	985,809	27.85	30	Site Characterization
CB 144	834,847	998,220	24.91	50	Site Characterization
CB 145	833,366	998,246	25.62	50	Site Characterization
CB 146	831,880	998,237	24.64	50	Site Characterization
CB 147	831,512	999,406	24.79	50	Site Characterization
CB 148	831,510	1,000,916	24.43	50	Site Characterization
CB 149	831,634	1,002,457	23.87	50	Site Characterization
CB 150	831,631	1,003,921	23.32	50	Site Characterization
CB 151	836,369	998,219	25.42	50	Site Characterization
CB 152	831,610	1,005,448	25.19	50	Site Characterization
CB 153	831,646	1,006,942	23.83	50	Site Characterization
CB 154	831,624	1,008,453	24.21	50	Site Characterization
CB 155	837,851	998,200	24.36	50	Site Characterization
CB 156	839,335	998,201	23.66	50	Site Characterization
CB 157	844,842	998,154	24.40	50	Site Characterization
CB 158	843,842	998,150	24.51	50	Site Characterization
CB 159	843,332	998,157	25.89	50	Site Characterization
CB 160	842,337	998,167	26.99	50	Site Characterization
CB 161	841,843	998,171	26.11	50	Site Characterization
CB 186	845,344	998,142	24.54	50	Site Characterization
CB 195	835,449	1,011,566	25.41	50	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 196	836,254	1,011,576	25.15	50	Site Characterization
CB 197	837,739	1,011,565	25.94	50	Site Characterization
CB 198	838,412	1,011,581	25.74	50	Site Characterization
CB 199	839,653	1,011,197	26.17	50	Site Characterization
CB 200	839,651	1,010,452	26.62	50	Site Characterization
CB 201	833,959	1,011,545	25.25	50	Site Characterization
CB 202	833,168	1,011,540	24.70	50	Site Characterization
CB 203	831,682	1,011,531	24.15	50	Site Characterization
CB 204	831,144	1,011,228	25.78	50	Site Characterization
CB 206	844,648	984,095	24.35	30	Site Characterization
CB 207	842,328	985,177	22.92	30	Site Characterization
CB 208	844,632	986,091	23.55	30	Site Characterization
CB 209	846,516	986,089	23.81	30	Site Characterization
CB 210	848,402	986,100	27.24	30	Site Characterization
CB 211	848,413	984,110	28.03	30	Site Characterization
CB 212	846,546	988,090	25.11	30	Site Characterization
CB 213	844,661	988,131	22.81	30	Site Characterization
CB 214	842,335	988,076	24.63	30	Site Characterization
CB 215	844,670	990,090	25.55	30	Site Characterization
CB 216	844,670	992,099	22.59	30	Site Characterization
CB 217	848,413	988,106	28.30	30	Site Characterization
CB 221	854,157	1,000,190	26.45	30	Site Characterization
CB 222	851,111	1,000,109	26.62	30	Site Characterization
CB 224	854,153	997,167	27.34	30	Site Characterization
CB 227	851,014	997,101	26.85	30	Site Characterization
CB 229	854,142	994,170	27.09	30	Site Characterization
CB 231	851,099	994,092	29.09	30	Site Characterization
CB 232	853,858	991,170	27.89	30	Site Characterization
CB 233	850,811	991,130	26.86	30	Site Characterization
CB 234	853,847	988,165	26.45	30	Site Characterization
CB 235	850,801	988,113	26.99	30	Site Characterization
CB 236	850,794	985,084	26.57	30	Site Characterization
CB 252	831,139	1,009,790	24.87	50	Site Characterization
CB 253	842,443	999,444	26.34	50	Site Characterization
CB 254	842,439	1,000,222	26.98	50	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 255	842,395	1,001,729	24.71	50	Site Characterization
CB 256	842,399	1,002,480	24.60	50	Site Characterization
CB 268	842,401	1,004,000	25.90	50	Site Characterization
CB 269	842,408	1,004,696	25.00	50	Site Characterization
CB 270	845,108	1,005,929	27.26	30	Site Characterization
CB 271	844,649	994,292	24.48	30	Site Characterization
CB 276	840,112	997,756	25.18	50	Site Characterization
CB 277	839,332	997,758	23.90	50	Site Characterization
CB 278	837,819	997,758	23.59	50	Site Characterization
CB 279	837,149	997,754	23.96	50	Site Characterization
CB 280	835,633	997,746	24.11	50	Site Characterization
CB 281	834,846	997,776	24.72	50	Site Characterization
CB 282	833,390	997,812	25.27	50	Site Characterization
CB 283	832,582	997,795	25.02	50	Site Characterization
CB 284	831,096	997,871	23.74	50	Site Characterization
CB 285	831,096	998,487	23.96	50	Site Characterization
CB 286	831,071	999,981	23.84	50	Site Characterization
CB 287	831,073	1,000,738	24.12	50	Site Characterization
CB 288	831,090	1,002,228	23.81	50	Site Characterization
CB 289	831,085	1,002,957	23.53	50	Site Characterization
CB 291	839,760	1,008,935	26.22	50	Site Characterization
CB 292	839,755	1,008,221	25.94	50	Site Characterization
CB 293	839,746	1,006,722	24.06	50	Site Characterization
CB 294	840,048	1,006,209	26.07	50	Site Characterization
CB 295	841,580	997,751	24.10	50	Site Characterization
CB 296	842,254	997,914	25.50	50	Site Characterization
CB 297	831,097	1,004,559	23.54	50	Site Characterization
CB 298	831,110	1,005,324	25.70	50	Site Characterization
CB 299	831,104	1,006,761	23.88	50	Site Characterization
CB 300	831,083	1,007,557	24.11	50	Site Characterization
CB 301	831,104	1,009,028	24.40	50	Site Characterization
CB 325	841,542	1,006,229	27.51	50	Site Characterization
CB 326	842,216	1,006,187	28.50	50	Site Characterization
CB 327	834,203	998,651	24.27	50	Site Characterization
CB 328	833,666	998,703	26.06	20	Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 329	833,669	999,262	25.87	20	Site Characterization
CB 330	833,073	998,649	25.60	20	Site Characterization
CB 331	832,206	998,623	24.63	20	Site Characterization
CB 332	831,645	998,646	24.10	20	Site Characterization
CB 333	831,635	998,091	24.27	20	Site Characterization
CB 345	830,058	1,008,498	27.17	20	Site Characterization
CB 346	835,445	1,012,454	29.41	20	Site Characterization
CB 347	840,758	996,682	27.41	20	Site Characterization
CB 348	840,704	987,847	27.00	20	Site Characterization
CB 349	848,859	983,455	27.17	20	Site Characterization
CB 350	848,581	1,001,974	29.96	20	Site Characterization
CB 351	856,049	985,994	28.00	20	Site Characterization
CB 352	856,055	994,072	27.17	20	Site Characterization
CB 353	853,156	1,002,000	25.20	20	Site Characterization
CB 365	835,171	997,781	23.71	50	Site Characterization
CB 366	831,081	1,002,218	24.22	50	Site Characterization
CB 367	832,078	1,011,988	21.88	75.0	Post Site Characterization
CB 367 B	832,078	1,011,988	21.88	75.5	Post Site Characterization
CB 368	834,117	1,011,987	24.79	75.0	Post Site Characterization
CB 368 B	834,117	1,011,987	24.79	75.5	Post Site Characterization
CB 369	837,230	1,011,943	25.84	75.0	Post Site Characterization
CB 369 B	837,230	1,011,943	25.84	75.5	Post Site Characterization
CB 370	840,336	1,011,960	25.41	75.0	Post Site Characterization
CB 370 B	840,336	1,011,960	25.41	75.5	Post Site Characterization
CB 371	841,491	999,673	26.55	75.0	Post Site Characterization
CB 372	841,454	1,000,700	25.77	50.0	Post Site Characterization
CB 373	841,454	1,001,685	25.63	75.0	Post Site Characterization
CB 374	841,453	1,002,702	25.87	50.0	Post Site Characterization
CB 375	841,481	1,003,675	26.78	75.0	Post Site Characterization
CB 376	841,482	1,004,695	26.45	50.0	Post Site Characterization
CB 377	841,517	1,005,734	26.64	75.0	Post Site Characterization
CB 378	840,726	998,081	27.15	75.0	Post Site Characterization
CB 379	840,794	998,011	25.90	75.0	Post Site Characterization
CB 380	840,888	998,125	25.36	75.0	Post Site Characterization
CB 381	840,836	998,204	25.66	75.0	Post Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 382	840,591	998,312	27.12	75.0	Post Site Characterization
CB 383	840,584	978,341	29.62	75.0	Post Site Characterization
CB 384	840,771	978,486	28.22	110.0	Post Site Characterization
CB 385	840,733	986,033	26.93	50.0	Post Site Characterization
CB 386	840,757	984,189	24.94	50.0	Post Site Characterization
CB 387	840,693	982,369	27.22	50.0	Post Site Characterization
CB 388	840,761	980,529	24.46	50.0	Post Site Characterization
CB 389	844,032	1,007,180	27.52	30.0	Post Site Characterization
CB 390	841,420	1,007,673	29.72	75.0	Post Site Characterization
CB 391	841,444	1,008,631	30.53	50.0	Post Site Characterization
CB 392	841,429	1,009,648	26.71	75.0	Post Site Characterization
CB 393	841,084	1,010,825	27.09	110.0	Post Site Characterization
CB 394	841,392	1,011,697	27.42	50.0	Post Site Characterization
CB 395	843,142	1,012,056	29.02	30.0	Post Site Characterization
CB 396	845,584	1,012,064	28.62	30.0	Post Site Characterization
CB 397	842,822	1,009,770	28.26	30.0	Post Site Characterization
CB 398	844,180	1,010,714	29.50	30.0	Post Site Characterization
CB 399	845,928	1,009,315	27.59	30.0	Post Site Characterization
CB 400	844,216	1,008,194	26.81	30.0	Post Site Characterization
CB 401	847,213	1,012,034	27.61	30.0	Post Site Characterization
CB 402	846,332	1,011,225	27.21	30.0	Post Site Characterization
CB 403	848,393	1,010,944	26.61	30.0	Post Site Characterization
CB 404	848,237	1,007,486	26.00	30.0	Post Site Characterization
CB 405	846,438	1,007,474	27.31	30.0	Post Site Characterization
CB 407	847,785	1,012,475	27.50	30.0	Post Site Characterization
CB 411	850,193	982,206	28.87	75.0	Post Site Characterization
CB 412	840,874	997,884	24.71	50.0	Post Site Characterization
CB 413	840,789	998,117	25.08	110.0	Post Site Characterization
CB 419	841,382	1,010,833	24.77	75.0	Post Site Characterization
CB 422	856,053	984,489	26.00	75	Post Site Characterization
CB 423	848,204	982,865	25.20	75.0	Post Site Characterization
CB 424	850,273	1,012,523	24.33	110.0	Post Site Characterization
CB 431	840,669	978,537	26.00	30	Post Site Characterization
CB 432	840,687	980,742	26.00	30	Post Site Characterization
CB 433	840,691	982,949	26.00	30	Post Site Characterization

Table 4.1 (continued)
Summary of Boring Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CB 434	840,692	986,152	26.00	30	Post Site Characterization
CB 435	840,709	988,321	26.00	30	Post Site Characterization
CB 436	840,716	990,391	26.00	30	Post Site Characterization
CB 437	840,721	992,603	26.00	30	Post Site Characterization
CB 438	840,728	994,795	26.00	30	Post Site Characterization
CB 452	840,647	978,417	29.66	80	Post Site Characterization
CB 453	840,657	978,451	29.21	50	Post Site Characterization
CB 454	840,774	978,514	27.49	50	Post Site Characterization
CB 458	840,710	978,402	30.07	80	Post Site Characterization
CB 464	841,413	998,014	26.00	100	Post Site Characterization
CB 466	856,061	988,475	26.00	30	Post Site Characterization
CB 467	856,066	992,257	26.00	30	Post Site Characterization
CB 468	856,072	998,679	26.00	30	Post Site Characterization
CB 469	856,086	1,001,464	26.00	30	Post Site Characterization
CB 470	853,493	984,421	26.00	30	Post Site Characterization
CB 471	855,942	984,493	26.00	16	Post Site Characterization
CB 471*	830,919	1,011,227	27.40	70.5	AMEC Investigation
CB 472	832,118	1,011,983	24.70	70.75	AMEC Investigation
CB 473	834,117	1,011,983	24.80	70.5	AMEC Investigation
CB 474	836,436	1,011,983	25.80	70.5	AMEC Investigation

Table 4.2
Summary of CPT Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CPT 162	840,028	1,002,587	24.57	51	Site Characterization
CPT 163	833,905	998,225	24.45	53	Site Characterization
CPT 164	832,336	998,230	24.50	53	Site Characterization
CPT 165	831,535	998,958	25.02	53	Site Characterization
CPT 166	831,539	1,000,465	23.72	52	Site Characterization
CPT 167	831,538	1,001,926	25.15	52	Site Characterization
CPT 168	837,058	1,002,590	23.84	40	Site Characterization
CPT 170	837,017	999,575	25.23	6	Site Characterization
CPT 171	838,360	998,195	25.03	27	Site Characterization
CPT 172	840,018	999,573	25.42	20	Site Characterization
CPT 173	836,876	998,206	24.60	53	Site Characterization
CPT 174	834,040	999,593	22.73	53	Site Characterization
CPT 175	835,397	998,227	24.45	51	Site Characterization
CPT 176	844,395	998,142	24.09	15	Site Characterization
CPT 177	842,836	998,165	25.75	26	Site Characterization
CPT 178	841,337	998,169	26.90	26	Site Characterization
CPT 179	831,145	1,010,453	23.57	78	Site Characterization
CPT 180	832,472	1,011,561	24.89	88	Site Characterization
CPT 181	834,660	1,011,555	26.06	23	Site Characterization
CPT 182	836,931	1,011,576	23.92	86	Site Characterization
CPT 183	839,225	1,011,578	26.17	14	Site Characterization
CPT 184	837,176	1,008,577	27.43	94	Site Characterization
CPT 185	839,652	1,009,708	26.65	135	Site Characterization
CPT 187	840,095	1,005,601	27.16	52	Site Characterization
CPT 188	837,095	1,005,594	26.17	21	Site Characterization
CPT 189	843,484	1,004,638	27.83	52	Site Characterization
CPT 190	846,584	1,004,650	28.00	15	Site Characterization
CPT 191	842,403	1,003,243	26.61	52	Site Characterization
CPT 192	842,396	1,000,960	25.95	25	Site Characterization
CPT 193	843,448	1,001,661	26.83	15	Site Characterization
CPT 194	846,556	1,001,654	25.52	51	Site Characterization
CPT 195	842,407	1,005,501	27.45	11	Site Characterization
CPT 205	839,647	1,007,443	24.80	91	Site Characterization
CPT 218	842,301	983,677	25.49	45	Site Characterization
CPT 219	846,512	984,101	24.25	46	Site Characterization

Table 4.2 (continued)
Summary of CPT Logs
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
CPT 220	842,357	986,667	23.91	52	Site Characterization
CPT 223	855,543	998,687	26.61	52	Site Characterization
CPT 225	852,502	998,717	26.76	24	Site Characterization
CPT 226	849,516	998,690	25.62	52	Site Characterization
CPT 228	855,503	995,715	27.62	29	Site Characterization
CPT 230	852,488	995,603	27.09	52	Site Characterization
CPT 237	849,448	995,630	26.33	53	Site Characterization
CPT 238	855,490	992,687	26.14	9	Site Characterization
CPT 239	852,481	992,698	27.67	52	Site Characterization
CPT 240	849,466	992,701	25.00	52	Site Characterization
CPT 241	855,507	989,709	24.02	52	Site Characterization
CPT 242	852,463	989,684	27.71	52	Site Characterization
CPT 243	849,452	989,681	26.93	53	Site Characterization
CPT 244	855,525	986,714	27.67	29	Site Characterization
CPT 245	852,421	986,696	24.24	52	Site Characterization
CPT 246	849,403	986,653	25.25	52	Site Characterization
CPT 247	834,081	1,002,552	24.21	52	Site Characterization
CPT 248	831,083	1,002,981	23.59	28	Site Characterization
CPT 250	831,119	1,004,657	24.94	32	Site Characterization
CPT 257	831,077	1,007,687	24.57	32	Site Characterization
CPT 258	834,128	1,008,566	26.14	52	Site Characterization
CPT 259	842,435	998,694	26.70	17	Site Characterization
CPT 260	846,482	998,697	27.00	16	Site Characterization
CPT 261	842,384	995,609	24.97	16	Site Characterization
CPT 262	846,518	995,641	24.67	21	Site Characterization
CPT 263	842,393	992,718	26.15	21	Site Characterization
CPT 264	846,466	992,722	26.10	52	Site Characterization
CPT 265	842,364	989,708	24.91	52	Site Characterization
CPT 266	846,417	989,670	24.70	53	Site Characterization
CPT 267	840,765	1,006,194	27.00	15	Site Characterization

Table 4.3
Summary of Test Pits
Geotechnical Data Report

Exploration I.D.	Easting (NAD83)	Northing (NAD83)	Elevation (ft-NAVD88)	Depth (ft)	Phase
TP 354	832,563	1,001,317	24.62*	10	Site Characterization
TP 355	837,592	1,001,201	24.09*	10	Site Characterization
TP 356	837,874	1,011,368	26.38*	10	Site Characterization
TP 357	832,625	1,010,119	24.23*	10	Site Characterization
TP 358	830,579	1,009,944	25.56*	10	Site Characterization
TP 359	840,303	1,011,223	25.76*	10	Site Characterization
TP 360	830,208	998,877	25.39*	10	Site Characterization
TP 361	839,340	997,254	23.64*	10	Site Characterization
TP 362	840,764	994,521	24.67*	10	Site Characterization
TP 363	840,747	987,841	25.48*	10	Site Characterization
TP 364	840,699	981,465	26.98*	10	Site Characterization
TP 475	838,196	1,010,777	24.90	13	AMEC Investigation
TP 476	836,174	1,009,786	26.10	16	AMEC Investigation
TP 477	838,226	1,009,765	25.80	16	AMEC Investigation
TP 478	832,146	1,008,273	23.60	16	AMEC Investigation
TP 479	834,170	1,008,286	27.90	16	AMEC Investigation
TP 480	836,174	1,008,286	28.00	21	AMEC Investigation
TP 481	836,174	1,006,781	26.50	22	AMEC Investigation
TP 482	838,231	1,006,799	25.60	17	AMEC Investigation
TP 483	840,106	1,006,761	27.40	20	AMEC Investigation
TP 484	832,152	1,005,452	25.40	24	AMEC Investigation
TP 485	834,175	1,005,889	24.50	18	AMEC Investigation
TP 486	836,174	1,004,786	25.90	15	AMEC Investigation
TP 487	838,165	1,004,786	26.50	16	AMEC Investigation
TP 488	840,106	1,004,770	25.30	16	AMEC Investigation
TP 489	836,184	1,002,796	25.60	25	AMEC Investigation
TP 490	838,169	1,002,796	26.50	17	AMEC Investigation
TP 491	832,147	1,000,786	23.70	20	AMEC Investigation
TP 492	834,172	1,000,786	24.70	23	AMEC Investigation
TP 493	836,174	1,000,786	25.80	12	AMEC Investigation
TP 494	838,176	1,000,786	26.80	16	AMEC Investigation
TP 495	840,178	1,000,786	26.60	20	AMEC Investigation
TP 496	834,174	998,786	24.50	24	AMEC Investigation
TP 497	836,174	998,781	25.80	24	AMEC Investigation
TP 498	838,174	998,786	26.80	20	AMEC Investigation
TP 499	840,174	998,786	26.30	18	AMEC Investigation

*Note: Elevation not surveyed; interpolated from topographic contours.

Table 4.4
Summary of Monitoring Wells
Geotechnical Data Report

Exploration I.D.		Easting (NAD83)	Northing (NAD83)	Ground Surface Elevation (ft-NAVD88)	Screen Interval (BGS) From	Screen Interval (BGS) To	Phase
MW 272	S	829,996	997,130	26.95	13	23	Site Characterization
	SI				48	58	
	DI				92.5	102.5	
MW 273	S	830,080	1,012,350	27.75	13	23	Site Characterization
	SI				38	48	
	DI				84	94	
MW 274	S	848,492	1,007,240	28.27	21	31	Site Characterization
	SI				41	51	
	DI				90	100	
	D				144	154	
MW 275	S	841,503	978,994	27.53	15	25	Site Characterization
	SI				50	60	
	DI				75	85	
	DI				133	143	
MW 289	S	840,746	991,416	27.06	17.5	27.5	Site Characterization
	SI				40	50	
MW 290	S	840,601	1,012,473	31.84	20	30	Site Characterization
	SI				40	50	
MW 338	S	830,039	1,003,455	27.55	20	25	Site Characterization
	SI				40	50	
MW 343	S	856,428	999,298	28.88	20	25	Site Characterization
	SI				45	50	
MW 344	S	856,440	990,090	24.42	15	25	Site Characterization
	SI				45	55	
	DI				90	100	
MW 346	S	835,445	1,012,454	29.41	10	20	Site Characterization
MW 347	S	840,758	996,682	27.41	14	24	Site Characterization
MW 348	S	840,704	987,847	27.00	10	20	Site Characterization
MW 349	S	848,859	983,455	27.17	9.5	19.5	Site Characterization
MW 350	S	848,581	1,001,974	29.96	9.4	19.4	Site Characterization
MW 351	S	856,049	985,994	28.00	7	17	Site Characterization
MW 352	S	856,055	994,072	27.17	9.2	19.2	Site Characterization
MW 353	S	853,156	1,002,000	25.20	9	19	Site Characterization
MW 406		848,551	1,012,523	26.00	NA	NA	Post Site Characterization
MF 52		856,075	1,000,605	31.60 (x on flange)	400	1320	2001

Table 4.5
Monitoring Well Nomenclature and Status
Geotechnical Data Report

Informal Well ID	Well Nomenclature in SFWMD Database DBHydro		General Location	Status of Well Condition and Data Collection (Reference)
	Station ID in DBHydro	Well DB Key		
SURFICIAL AQUIFER MONITOR WELLS				
MW272DI	C44B8D3	88240	Reservoir	Data collection ongoing
MW272S	C44B8D1	88241	Reservoir	Data collection ongoing
MW272SI	C44B8D2	88242	Reservoir	Data collection ongoing
MW273DI	C44B8A3	88249	Reservoir	Data collection ongoing
MW273S	C44B8A1	88250	Reservoir	Data collection ongoing
MW273SI	C44B8A2	88251	Reservoir	Data collection ongoing
MW274D	C44B2A4	88252	STA	Data collection ongoing
MW274DI	C44B2A3	88253	STA	Data collection ongoing
MW274S	C44B2A1	88255	STA	Data collection ongoing
MW274SI	C44B2A2	88254	STA	Data collection ongoing
MW275D	C44B5A4	88256	STA, inflow canal	Plugged and abandoned 2012
MW275DI	C44B5A3	88257	STA, inflow canal	Plugged and abandoned 2012
MW275S	C44B5A1	88258	STA, inflow canal	Plugged and abandoned 2012
MW275SI	C44B5A2	88259	STA, inflow canal	Plugged and abandoned 2012
MW289S	C44B6B1	88260	STA, inflow canal	Plugged and abandoned 2012
MW289SI	C44B6B2	88261	STA, inflow canal	Plugged and abandoned 2012
MW290S	C44B1B1	88262	Reservoir	Data collection ongoing
MW290SI	C44B1B2	88263	Reservoir	Data collection ongoing
MW338S	C44B8C1	88264	Reservoir	Data collection ongoing
MW338SI	C44B8C2	88265	Reservoir	Data collection ongoing
MW343S	C44B4A1	88266	STA, outflow canal	Plugged and abandoned 2012
MW343SI	C44B4A2	88267	STA, outflow canal	Plugged and abandoned 2012
MW344DI	C44B4C3	88268	STA, outflow canal	Plugged and abandoned 2012
MW344S	C44B4C1	88269	STA, outflow canal	Plugged and abandoned 2012
MW344SI	C44B4C2	88270	STA, outflow canal	Plugged and abandoned 2012
MW345S	C44B8B1	88271	Reservoir	Destroyed 2012
MW346S	C44B1A1	88272	Reservoir	Data collection ongoing
MW347S	C44B6A1	88273	STA, inflow canal	Plugged and abandoned 2012
MW348S	C44B6C1	88274	STA, inflow canal	Plugged and abandoned 2012
MW349S	C44B5B1	88275	STA	Destroyed 2012
MW350S	C44B3A1	88276	STA	Data collection ongoing
MW351S	C44B4D1	88277	STA, outflow canal	Data collection ongoing
MW352S	C44B4B1	88278	STA, outflow canal	Data collection ongoing
MW353S	C44B3C1	88279	STA	Data collection ongoing
W-101	NONE	NONE	APT, Reservoir area	Well near APT-101; CDM, 2004
W-104A	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-104B	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-105A	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-105B	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-102	NONE	NONE	APT at STA	Well near APT-102; CDM, 2004
W-103	NONE	NONE	APT at STA	Well near APT-103; CDM, 2004
W-106A	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-106B	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-107A	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
W-107B	NONE	NONE	Slug Test, Reservoir area	CDM, 2004
MW406S	NONE	NONE	STA, Background	None
MW406SI	NONE	NONE	STA, Background	None
W-1	NONE	NONE	Slug tests at well cluster, Reservoir area	Ardaman & Associates, 2003
W-2	NONE	NONE	Slug tests at well cluster, STA	Ardaman & Associates, 2003
W-3	NONE	NONE	Slug tests at well cluster, STA	Ardaman & Associates, 2003
W-4	NONE	NONE	Slug tests at well cluster, STA	Ardaman & Associates, 2003
W-5	NONE	NONE	Slug tests at well cluster, STA	Ardaman & Associates, 2003
FLORIDAN AQUIFER WELLS				
MF-52	MF-52	W3952	NE berm STA	Data collection ongoing

Notes: DBHydro is the groundwater and surface water database maintained by SFWMD. Database accessed at http://www.sfwmd.gov/portal/page/portal/xweb%20environmental%20monitoring/dbhydro%20application. Access groundwater level and quality data from each well by searching for the DB key. Well locations are identified on Figs. 3.1, 3.2, 3.3, and 3.4 of this GDR using "Informal Well ID". Aquifer performance test (APT) results also are available on DBHydro under "C44 basin". Screened intervals for monitor wells with "MW-XXX" nomenclature are found on Table 4.4 of this GDR. Wells with "W-X" nomenclature are found on Table 4.8. Screened intervals for monitor wells with" W-10X" nomenclature are found on Tables 4.9 and 4.10 of this GDR.

Source: USACE

Table 4.6
Pore Pressure Decay from CPTU Soundings
Geotechnical Data Report

CPTU ID (CP)	Depth (ft)	Elevation (ft-NAVD88)	K_h				Soil Unit
			Based on Robertson		Based on Baligh and Levadoux		
			(cm/sec)	(ft/d)	(cm/sec)	(ft/d)	
CP05-IR44-CP-226	15.5	10.12	8.00E-06	0.023	1.60E-03	4.528	C
CP05-IR44-CP-228	9.0	18.62	2.00E-05	0.057	7.10E-03	20.126	A+B
CP05-IR44-CP-240	25.5	-0.50	2.00E-05	0.057	3.00E-03	8.504	C
CP05-IR44-CP-258	22.1	4.04	2.20E-05	0.062	2.60E-03	7.370	C
CP05-IR44-CP-259	15.6	11.10	6.00E-06	0.017	1.20E-03	3.402	C
CP05-IR44-CP-267	12.0	15.00	6.00E-07	0.002	1.50E-04	0.425	C
CP05-IR44-CP-194	11.8	13.72	6.00E-06	0.017	1.60E-03	4.535	C
CP05-IR44-CP-162	15.4	9.17	2.00E-05	0.057	4.81E-03	13.635	C
CP05-IR44-CP-164	15.6	8.90	6.00E-06	0.017	2.49E-04	0.706	C
CP05-IR44-CP-165	19.0	6.02	1.00E-05	0.028	1.35E-03	3.827	C
CP05-IR44-CP-168	18.6	5.24	1.00E-05	0.028	1.55E-03	4.394	C
CP05-IR44-CP-172	15.1	10.32	2.00E-06	0.006	4.67E-04	1.324	C
CP05-IR44-CP-174	22.1	0.63	3.50E-05	0.099	5.30E-03	15.024	C
CP05-IR44-CP-177	18.7	7.05	1.00E-04	0.283	2.00E-02	56.693	C
CP05-IR44-CP-178	22.4	4.50	5.00E-05	0.142	6.80E-03	19.276	C
CP05-IR44-CP-181	12.4	13.66	6.00E-06	0.017	1.70E-03	4.819	C

Source: Ardaman and Associates, 2005

Table 4.7
Falling Head Permeability Field Test Results
Geotechnical Data Report

Depth (ft)	Test Boring	Stratum	Falling Head Permeability kavg (ft/day)	kh (ft/day)	kv (ft/day)
5.00	W-104	SC	0.066	0.208	0.021
7.17	W-105	SC	0.077	0.243	0.024
6.33	W-106	SC	0.033	0.104	0.04
6.33	W-107	SC	0.066	0.208	0.021

Source: Ardaman and Associates, 2003

Table 4.8
Field Permeability Test Results
Geotechnical Data Report

Well Cluster	Screened Depth (ft)	Permeability (cm/s) Constant Head	Falling Head	Falling Head	Average
W-1	2.8 - 7.8	na	na	na	**na**
	20 - 25	3.86E-03	3.67E-03	4.00E-03	**3.84E-03**
	48 - 53	na	2.15E-04	2.18E-04	**2.17E-04**
W-2	4.5 -9.5	na	7.97E-05	7.35E-05	**7.66E-05**
	24 - 29	4.40E-03	3.46E-03	na	**3.93E-03**
	60 - 65	1.32E-03	1.25E-03	1.35E-03	**1.31E-03**
W-3	7 - 12	na	7.20E-05	7.03E-05	**7.12E-05**
	25 - 30	5.56E-03	5.55E-03	6.06E-03	**5.72E-03**
	50 - 55	1.78E-03	2.08E-03	1.93E-03	**1.93E-03**
	75 - 80	2.18E-03	1.57E-03	1.26E-03	**1.67E-03**
W-4	4.6 - 9.6	1.50E-03	1.37E-03	1.49E-03	**1.45E-03**
	25 - 30	7.35E-03	4.58E-03	na	**5.97E-03**
	65 - 70	3.44E-03	3.30E-03	na	**3.37E-03**
W-5	4.85 - 9.85	na	8.67E-05	na	**8.67E-05**
	24.7 - 29.7	2.66E-03	2.05E-03	na	**2.36E-03**
	64.8 - 69.8	4.88E-03	8.09E-03	na	**6.49E-03**

Source: Ardaman and Associates, 2003

Table 4.9
Field Slug Test Results
Geotechnical Data Report

Test Depth (ft)	Test Boring Number	Stratum	Slug-In k(ft/day)	Slug-Out k(ft/day)
22.83-27.83	W-104A	silty fine sand & shell	12.4	11.8
59-64	W-104B	fine sand & shell	128.4	120.4
24-29	W-105A	fine sand & shell	38.5	47
59-64	W-105B	unknown	67.4	60.6
30-35	W-106A	fine sand & shell	31.7	31.7
75-80	W-106B	silty fine sand & shell	< 0.5	< 0.5
24-29	W-107A	fine sand & shell	224.6	214.1
64-69	W-107B	fine sand & shell	79.3	62

Source: Ardaman and Associates, 2003

Table 4.10
Aquifer Performance Test Results
Geotechnical Data Report

Test Boring Number	Discharge (gpm)	Testing Depth (ft)	Distance to Monitoring Well (ft)	Approximate Saturated Thickness (ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity	
						kh (ft/day)	kv (ft/day)
W-101	100	37.5-137.5	60.4	125	19,100	20.0	0.35
W-102	23	35-135	63.4	125	26,000	28.0	1
W-103	14	35-135	49.7	125	ND	ND	ND

Source: CDM, 2004

Table 4.11
Slug Test Results - Site Wells
Geotechnical Data Report

Well Number	Screen Interval Depth	Screen Interval Elevation	Screened Interval Soil Classifications	K_h, Falling Head ft/day	K_h, Rising Head ft/day
MW-272 S	13 - 23	13.95 – 3.95	SP-SM, SW	26.76	20.60
MW-272 SI*	48 - 58	-21.05 – -31.05	SP, SW	-	-
MW-273 S	13 - 23	14.75 – 4.75	SW, SP	6.90	16.60
MW-273 SI	38 - 48	-10.25 – -20.25	SP, SM	5.51	1.78
MW-274 S	20 - 30	8.27 – -1.73	SC, SM	2.87	1.76
MW-274SI*	40 - 50	-11.73 – -21.73	SW	-	-
MW-275 S	14 - 24	-22.47 – 3.53	SP, SP-SM	6.25	8.67
MW-289 S*	15 - 25	13.06 – 2.06	SP, SW, SM	-	-
MW-289 SI	39 - 49	-11.94	SW, SP-SM, SP	14.80	8.71
MW-290 S*	20 - 30	11.84 – -21.94	SW, SP-SM	-	-
MW-290 SI	39 - 49	-7.16 – 1.84	SP, SP-SM	21.50	20.90
MW-338 S	20 - 25	7.55 – 2.55	SP-SM, SP	5.21	9.52
MW-338 SI	38 - 48	-10.45 – -20.45	SP-SM, SW	30.10	30.24
MW-343 S	20 - 25	8.88 – 3.88	SM, SP-SM	6.88	12.89
MW-343 SI*	45 - 50	-16.12 – -21.12	SW, SP, SM	-	-
MW-344 S*	15 - 25	9.42 – -0.58	SW	-	-
MW-344 SI	45 - 55	-20.58 – -30.58	SP, SP-SM	14.55	14.02

*Note: Elevation not surveyed; interpolated from topographic contours.

Source: Ardaman and Associates, 2005

Table 5.1
Specific Gravity Test Results
Geotechnical Data Report

Auger Boring ID AB)	Depth Interval From (ft)	Depth Interval To (ft)	Elevation Interval From (ft)	Elevation Interval To (ft)	Specific Gravity (@ Test Temp)	Specific Gravity (@ 20 Deg)
CP05-IR44-AB-106	1	3	23.91	21.91	2.635	2.634
CP05-IR44-AB-106	4	7	20.91	17.91	2.785	2.784
CP05-IR44-AB-108	4	7	24.24	21.24	2.739	2.738
CP05-IR44-AB-112	1	3	23.84	21.84	2.783	2.782
CP05-IR44-AB-113	1	3	23.08	21.08	2.742	2.741
CP05-IR44-AB-115	1	3	22.78	20.78	2.802	2.801
CP05-IR44-AB-118	4	7	20.92	17.92	2.701	2.699
CP05-IR44-AB-119	1	3	25.68	23.68	2.687	2.685
CP05-IR44-AB-119	4	7	22.68	19.68	2.670	2.668
CP05-IR44-AB-124	1	3	22.63	20.63	2.619	2.617
CP05-IR44-AB-129	1	3	23.91	21.91	2.696	2.694
CP05-IR44-AB-130	4	7	20.61	17.61	2.644	2.643
CP05-IR44-AB-131	1	3	18.77	16.77	2.722	2.721
CP05-IR44-AB-133	1	3	24.23	22.23	2.678	2.676
CP05-IR44-AB-135	4	7	21.75	18.75	2.700	2.698
CP05-IR44-AB-138	1	3	22.42	20.42	2.682	2.681
CP05-IR44-AB-138	4	7	19.42	16.42	2.660	2.658
CP05-IR44-AB-143	4	7	25.17	22.17	2.649	2.648
CP05-IR44-AB-126	4	7	20.56	17.56	2.691	2.690
CP05-IR44-AB-133	4	7	21.23	18.23	2.676	2.675
CP05-IR44-AB-143	1	3	28.17	26.17	2.667	2.666

Source: Site Characterization Report, 2006

Table 5.2
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-99	0	1	26.29	25.29	Very Light Brown Sand	14.2%	107.7	2.0%	--	--	--	--	7.9%	111.9	96.3%	6.3%
CP05-IR44- AB-99	0	3	26.29	23.29	Light Brown Sand	16.9%	109.2	9.9%	--	--	--	--	7.9%	111.9	97.5%	9.0%
CP05-IR44- AB-106	0	1	24.91	23.91	Dark Gray Sand with Light Brown Clayey Sand & Organics	17.8%	97.4	18.4%	--	--	--	--	14.0%	110.5	88.1%	3.8%
CP05-IR44- AB-106	0	3	24.91	21.91	Dark Gray Sand with Light Brown Clayey Sand & Organics	23.2%	86.2	17.5%	--	--	--	--	14.0%	110.5	78.0%	9.2%
CP05-IR44- AB-106	1	3	23.91	21.91	Dark Gray Sand with Light Brown Clayey Sand & Organics	--	--	--	--	--	--	--	14.0	110.5	--	--
CP05-IR44- AB-106	4	7	20.91	17.91	Gray Clayey Sand	--	--	--	--	--	--	--	11.0	119.5	--	--
CP05-IR44- AB-107	0	1	24.00	23.00	Light Gray Sand	14.7%	104.1	2.9%	--	--	--	--	10.7%	117.1	88.9%	4.0%
CP05-IR44- AB-107	0	3	24.00	21.00	Light Brown to Light Gray Sand	16.0%	106.5	3.0%	--	--	--	--	10.7%	117.1	90.9%	5.3%
CP05-IR44- AB-108	0	1	28.24	27.24	Brown to Dark Brown Sand with Clayey Sand	11.0%	109.1	12.2%	10.1%	118.5	11.0%	118.9	--	--	91.8%	0.0%
CP05-IR44- AB-108	0	3	28.24	25.24	Light Brown Sand with Clayey Sand	13.2%	110.6	17.6%	10.1%	118.5	11.0%	118.9	--	--	93.1%	2.2%
CP05-IR44- AB-108	4	7	24.24	21.24	Brown Clayey Sand	--	--	--	--	--	--	--	10.0	114.5	--	--
CP05-IR44- AB-109	0	1	27.04	26.04	Light Brown Sand with Clayey Sand	9.9%	97.6	5.2%	8.8%	115.5	10.5%	116.2	--	--	84.0%	-0.6%
CP05-IR44- AB-109	0	3	27.04	24.04	Light Brown Sand with Clayey Sand	9.7%	101.7	5.2%	7.9%	120.1	10.0%	122.1	--	--	83.3%	-0.3%
CP05-IR44- AB-110	0	1	25.52	24.52	Dark Brown Sand with some Clayey Sand	15.2%	103.2	6.1%	9.6%	120.9	10.3%	121.2	--	--	85.2%	4.9%
CP05-IR44- AB-110	0	3	25.52	22.52	Light Brown Sand with Clayey Sand	32.5%	92.8	14.6%	9.6%	120.9	10.3%	121.2	--	--	76.6%	22.2%
CP05-IR44- AB-112	0	1	24.84	23.84	Brown Sand with Clayey Sand	15.7%	103.3	13.8%	--	--	--	--	9.5%	122.7	84.2%	6.2%

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.2 (Continued)
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-112	0	3	24.84	21.84	Light Brown Sand with Clayey Sand	12.7%	109.9	6.8%	--	--	--	--	9.5%	122.7	89.6%	3.2%
CP05-IR44- AB-112	1	3	23.84	21.84	Brown Clayey Sand	--	--	--	--	--	--	--	10.0	114.5	--	--
CP05-IR44- AB-113	1	3	23.08	21.08	Brown Clayey Sand	--	--	--	--	--	--	--	10.0	122.0	--	--
CP05-IR44- AB-115	0	1	23.78	22.78	Mixed Brown to Orange Sand with Clayey Sand	14.2%	99.9	19.8%	--	--	--	--	9.2%	127.3	78.5%	5.0%
CP05-IR44- AB-115	0	3	23.78	20.78	Mixed Brown to Orange Sand with Clayey Sand	13.3%	104.4	18.4%	--	--	--	--	9.2%	127.3	82.0%	4.1%
CP05-IR44- AB-115	1	3	22.78	20.78	Tan Sandy Clay	--	--	--	--	--	--	--	9.5	127.0	--	--
CP05-IR44- AB-117	0	1	24.23	23.23	Dark Brown Sand with Clayey Sand	15.7%	100.1	14.3%	--	--	--	--	10.8%	123.8	80.9%	4.9%
CP05-IR44- AB-117	0	3	24.23	21.23	Dark Brown Sand with Clayey Sand	16.7%	102.9	14.5%	--	--	--	--	10.8%	123.8	83.1%	5.9%
CP05-IR44- AB-118	4	7	20.92	17.92	Gray Clayey Sand	--	--	--	--	--	--	--	10.5	124.0	--	--
CP05-IR44- AB-119	0	1	26.68	25.68	Dark Brown Sand with Clayey Sand	29.3%	86.6	13.0%	--	--	--	--	10.3%	117.5	73.7%	19.0%
CP05-IR44- AB-119	0	3	26.68	23.68	Dark Brown Clayey Sand	33.2%	87.2	18.9%	--	--	--	--	10.3%	117.5	74.2%	22.9%
CP05-IR44- AB-119	1	3	25.68	23.68	Gray Clayey Sand	--	--	--	--	--	--	--	10.0	117.5	--	--
CP05-IR44- AB-119	4	7	22.68	19.68	Brown and Gray Clayey Sand	--	--	--	--	--	--	--	10.5	122.0	--	--
CP05-IR44- AB-124	1	3	22.63	20.63	Brown Clayey Sand	--	--	--	--	--	--	--	11.0	118.5	--	--
CP05-IR44- AB-126	4	7	20.56	17.56	Brown Clayey Sand	--	--	--	--	--	--	--	8.5	130.5	--	--
CP05-IR44- AB-129	1	3	23.91	21.91	Brown Sandy Clay	--	--	--	--	--	--	--	10.5	112.0	--	--

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.2 (Continued)
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-130	4	7	20.61	17.61	Brown Sandy Clay	--	--	--	--	--	--	--	9.5	126.0	--	--
CP05-IR44- AB-131	0	1	19.77	18.77	Light Brown to Brown Sand	12.9%	104.9	4.7%	--	--	--	--	10.0%	108.5	96.6%	2.9%
CP05-IR44- AB-131	0	3	19.77	16.77	Light Brown Sand	18.8%	106.5	2.7%	--	--	--	--	10.0%	108.5	98.2%	8.8%
CP05-IR44- AB-131	1	3	18.77	16.77	Brown and Gray Sandy Clay	--	--	--	--	--	--	--	10.0	108.5	--	--
CP05-IR44- AB-133	1	3	24.23	22.23	Gray Clayey Sand	--	--	--	--	--	--	--	10.5	114.5	--	--
CP05-IR44- AB-133	4	7	21.23	18.23	Gray Sandy Clay	--	--	--	--	--	--	--	8.5	129.0	--	--
CP05-IR44- AB-134	0	1	22.86	21.86	Brown Clayey Sand	12.8%	106.5	26.5%	9.9%	122.6	9.9%	122.6	--	--	86.9%	2.9%
CP05-IR44- AB-134	0	3	22.86	19.86	Brown Clayey Sand	10.6%	113.7	24.4%	9.9%	122.6	9.9%	122.6	--	--	92.8%	0.7%
CP05-IR44- AB-135	4	7	21.75	18.75	Brown Clayey Sand	--	--	--	--	--	--	--	9.5	126.0	--	--
CP05-IR44- AB-138	0	1	23.42	22.42	Brown Sand with Clayey Sand	18.0%	109.7	13.5%	--	--	--	--	9.5%	123.2	89.1%	8.5%
CP05-IR44- AB-138	0	3	23.42	20.42	Brown Sand with Cemented Sand	17.6%	110.4	12.0%	--	--	--	--	9.5%	123.2	89.6%	8.1%
CP05-IR44- AB-138	1	3	22.42	20.42	Gray Clayey Sand	--	--	--	--	--	--	--	10.0	123.5	--	--
CP05-IR44- AB-138	4	7	19.42	16.42	Gray Clayey Sand	--	--	--	--	--	--	--	9.0	124.5	--	--
CP05-IR44- AB-143	0	1	29.17	28.17	Light Gray Sand	8.4%	88.8	3.0%	--	--	--	--	10.0%	111.8	79.4%	-1.6%
CP05-IR44- AB-143	0	3	29.17	26.17	Light Gray Silty Sand	8.1%	92.9	18.4%	--	--	--	--	10.0%	111.8	83.1%	-1.9%
CP05-IR44- AB-143	1	3	28.17	26.17	Brown and Gray Fine Sand	--	--	--	--	--	--	--	9.5	112.0	--	--

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.2 (Continued)
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-143	4	7	25.17	22.17	Brown and Gray Clayey Sand	--	--	--	--	--	--	--	8.5	120.5	--	--
CP05-IR44- AB-303	0	1	24.62	23.62	Bark Brown Sand with Clayey Sand	15.8%	94.7	8.0%	10.2%	118.7	10.9%	119.1	--	--	79.5%	4.9%
CP05-IR44- AB-303	0	3	24.62	21.62	Bark Brown Sand with Clayey Sand	14.5%	100.7	7.0%	10.2%	118.7	10.9%	119.1	--	--	84.6%	3.6%
CP05-IR44- AB-304	0	1	23.80	22.80	Dark Brown Sand with Clayey Sand	17.0%	93.3	8.7%	9.6%	115.2	11.7%	116.5	--	--	80.1%	5.3%
CP05-IR44- AB-304	0	3	23.80	20.80	Dark Brown Sand with Clayey Sand	16.6%	98.5	8.9%	9.9%	118.2	11.1%	118.8	--	--	82.9%	5.5%
CP05-IR44- AB-305	0	1	23.14	22.14	Dark Brown Sand with Clayey Sand	12.1%	98.8	18.3%	--	--	--	--	14.3%	111.5	88.6%	-2.2%
CP05-IR44- AB-305	0	3	23.14	20.14	Dark Brown Sand with Clayey Sand	12.9%	103.1	18.9%	--	--	--	--	14.3%	111.5	92.4%	-1.4%
CP05-IR44- AB-306	0	1	23.21	22.21	Dark Brown Sand with Clayey Sand	15.5%	96.9	8.8%	10.7%	121.4	10.2%	121.4	--	--	79.8%	5.3%
CP05-IR44- AB-306	0	3	23.21	20.21	Dark Brown Sand with Clayey Sand	17.8%	99.7	10.9%	10.7%	121.4	10.2%	121.4	--	--	82.2%	7.6%
CP05-IR44- AB-307	0	1	24.32	23.32	Light Brown Sand with Clayey Sand	17.4%	99.2	16.5%	10.0%	124.1	9.5%	124.1	--	--	79.9%	7.9%
CP05-IR44- AB-307	0	3	24.32	21.32	Mixed Brown to Orange Sand with Clayey Sand	14.5%	106.6	27.2%	9.2%	123.9	9.6%	123.9	--	--	86.0%	4.9%
CP05-IR44- AB-308	0	1	23.28	22.28	Mixed Brown Sand with Clayey Sand	13.9%	111.7	17.4%	9.8%	110.1	10.2%	110.3	--	--	101.3%	3.7%
CP05-IR44- AB-308	0	3	23.28	20.28	Light Brown to Orange Clayey Sand	15.3%	114.9	20.1%	9.8%	110.1	10.2%	110.3	--	--	104.2%	5.1%
CP05-IR44- AB-309	0	1	23.80	22.80	Very Light Brown Sand	15.6%	105.3	2.0%	10.6%	123.7	10.2%	123.8	--	--	85.1%	5.4%
CP05-IR44- AB-309	0	3	23.80	20.80	Very Light Brown Sand	18.6%	109.5	2.4%	10.6%	123.7	10.2%	123.8	--	--	88.4%	8.4%
CP05-IR44- AB-310	0	1	23.70	22.70	Light Brown Sand	11.6%	108.4	2.7%	9.2%	121.4	10.1%	121.9	--	--	89.0%	1.5%

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.2 (Continued)
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-310	0	3	23.70	20.70	Very Light Brown Clayey Sand	19.2%	108.0	11.8%	--	--	--	--	10.2%	122.9	87.9%	9.0%
CP05-IR44- AB-311	0	1	24.42	23.42	Mixed Light Brown Sand	7.9%	109.1	6.4%	9.2%	120.3	10.4%	120.8	--	--	90.3%	-2.5%
CP05-IR44- AB-311	0	3	24.42	21.42	Light Brown to Yellow Clayey Fine Sand	17.6%	111.4	25.7%	--	--	--	--	6.9%	135.8	82.0%	10.7%
CP05-IR44- AB-312	0	1	23.24	22.24	Brown Sand with Clayey Sand	12.0%	107.9	8.6%	--	--	--	--	11.1%	120.9	89.2%	0.9%
CP05-IR44- AB-312	0	3	23.24	20.24	Gray Brown Sand with Clayey Sand and Rocks	15.9%	105.7	17.6%	--	--	--	--	11.1%	120.9	87.4%	4.8%
CP05-IR44- AB-313	0	1	23.95	22.95	Light Brown Sand	8.4%	108.2	5.2%	9.0%	116.9	10.4%	117.2	--	--	92.3%	-2.0%
CP05-IR44- AB-313	0	3	23.95	20.95	Very Light Brown Clayey Sand	19.5%	110.6	14.0%	--	--	--	--	7.4%	129.9	85.1%	12.1%
CP05-IR44- AB-314	0	1	24.02	23.02	Light Brown Sand	12.8%	108.1	6.5%	9.0%	115.9	10.5%	116.4	--	--	92.9%	2.3%
CP05-IR44- AB-314	0	3	24.02	21.02	Light Brown to White Clayey Sand	15.8%	109.5	32.4%	--	--	--	--	8.4%	129.2	84.7%	7.4%
CP05-IR44- AB-316	0	1	25.42	24.42	Dark Brown Clayey Sand	11.0%	113.3	36.2%	9.8%	124.3	9.9%	124.4	--	--	91.0%	1.1%
CP05-IR44- AB-316	0	3	25.42	22.42	Dark Brown Clayey Sand	11.4%	116.5	36.4%	9.8%	124.3	9.9%	124.4	--	--	93.7%	1.5%
CP05-IR44- AB-317	0	1	25.48	24.48	Light Brown Sand	13.0%	105.6	2.9%	--	--	--	--	11.5%	114.5	92.3%	1.5%
CP05-IR44- AB-317	0	3	25.48	22.48	Light Brown Sand	12.7%	109.8	3.2%	--	--	--	--	11.5%	114.5	95.9%	1.2%
CP05-IR44- AB-319	0	1	25.70	24.70	Brown Sand with some Silt	9.5%	110.3	10.7%	8.9%	121.2	10.1%	121.9	--	--	90.5%	-0.6%
CP05-IR44- AB-319	0	3	25.70	22.70	Light Brown to Orange Clayey Sand	17.3%	110.3	17.4%	9.3%	123.2	9.7%	123.3	--	--	89.4%	7.6%
CP05-IR44- AB-320	0	1	27.00	26.00	Dark Brown Sand with Clayey Sand & Silt	9.5%	105.8	14.6%	10.3%	124.0	10.0%	124.1	--	--	85.2%	-0.5%

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.2 (Continued)
Lab and In-Situ Density Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	In-Situ Density Test			One-Pt. Proctor				Modified Proctor		In-Situ Percent Compaction	Difference Between In-Situ and Optimum Moisture Content
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)	Moisture Content (%)	Dry Density (PCF)	Estimated Opt. Moisture Content (%)	Estimated Max. Dry Density (PCF)	Opt. Moisture Content (%)	Max. Dry Density (PCF)		
CP05-IR44- AB-320	0	3	27.00	24.00	Light Brown Sand with Clayey Sand	8.6%	110.4	12.7%	10.3%	124.0	10.0%	124.1	--	--	89.0%	-1.4%
CP05-IR44- AB-321	0	1	25.48	24.48	Light Brown Sand	13.2%	109.3	3.1%	11.4%	120.6	10.5%	120.6	--	--	90.6%	2.7%
CP05-IR44- AB-321	0	3	25.48	22.48	Light Brown Sand	12.9%	113.2	4.1%	11.4%	120.6	10.5%	120.6	--	--	93.9%	2.4%
CP05-IR44- AB-322	0	1	24.21	23.21	Mixed Brown to Orange Sand with Clayey Sand	11.6%	115.1	12.8%	9.8%	126.8	9.3%	127.3	--	--	90.4%	2.3%
CP05-IR44- AB-322	0	3	24.21	21.21	Mixed Brown to Orange Sand with Clayey Sand	11.8%	118.7	13.3%	9.8%	126.8	9.3%	127.3	--	--	93.2%	2.5%
CP05-IR44- AB-337	0	1	22.32	21.32	Dark Brown Sand with Clayey Sand	17.6%	103.3	9.9%	--	--	--	--	12.8%	116.6	88.6%	4.8%
CP05-IR44- AB-337	0	3	22.32	19.32	Brown Sand with Clayey Sand	15.0%	110.3	10.6%	27.7%	78.5	-	-	--	--	-	-
CP05-IR44- AB-339	0	1	24.34	23.34	Dark Brown Sand with Clayey Sand	26.8%	82.2	7.6%	9.0%	118.6	10.8%	119.5	--	--	68.7%	16.0%
CP05-IR44- AB-339	0	3	24.34	21.34	Dark Brown Sand with Clayey Sand	28.6%	84.3	8.6%	12.3%	115.7	12.0%	115.8	--	--	72.8%	16.6%
CP05-IR44- AB-340	0	1	26.52	25.52	Light Gray Sand	12.7%	94.6	3.1%	9.0%	110.6	10.3%	111.2	--	--	85.1%	2.4%
CP05-IR44- AB-340	0	3	26.52	23.52	Dark Brown Sand with Silt	21.0%	91.6	11.4%	9.4%	111.9	13.7%	113.5	--	--	80.7%	7.3%

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.3
Standard Proctor Test Results – Remolded Samples from Auger Borings
Geotechnical Data Report

Test No.	Depth Interval		Elevation Interval		Soil Description	Standard Proctor		
	From (ft)	To (ft)	From (ft)	To (ft)		Moisture Content (%)	Dry Density (PCF)	Fines (%)
CP05-IR44- AB-90	1	4	25.81	22.81	SP-SM	11.2	117.1	9.5
CP05-IR44- AB-90	4	7	22.81	19.81	SC	11.2	117.1	19.8
CP05-IR44- AB-91	1	4	26.63	23.63	SP-SM	11.8	110.8	8.8
CP05-IR44- AB-91	4	7	23.63	20.63	SC	12.0	116.3	16.8
CP05-IR44- AB-94	1	4	26.56	23.56	SP-SM	11.6	109.1	6.6
CP05-IR44- AB-95	1	4	26.24	23.24	SP-SM	11.6	109.2	3.2
CP05-IR44- AB-96	4	7	21.70	18.70	SC	11.0	122.9	24.0

Source: Site Characterization Report, 2006

Table 5.4
Hydraulic Conductivity Test Results – Remolded Samples
Geotechnical Data Report

Auger Boring ID	Depth Interval		Elevation Interval		Hydraulic Conductivity		Type of Test	Optimum Moisture Content (%)	Dry Density (%)	% Fines	USCS Classification	Sample Description
	from (ft)	to (ft)	from (ft)	to (ft)	(cm/s)	(ft/d)						
CP05-IR44- AB-91 *	1	4	26.63	23.63	3.00E-04	0.8504	C	11.8	106	6.8	SP-SM	Dark Brown SAND with some Silt
CP05-IR44- A-95 *	1	4	26.24	23.24	2.40E-03	6.8031	F	11.6	103.6	6	SP-SM	Dark Brown SAND with some Silt
CP05-IR44- AB-106	4	7	20.91	17.91	3.50E-05	0.0992	C	11	112.9	13.5	SC	Dark Brown Clayey SAND
CP05-IR44-AB108	4	7	24.24	21.24	5.20E-04	1.474	F	10	107.9	6.4	SP-SM	Brown SAND with some Silt
CP05-IR44- AB-115	1	4	22.78	19.78	4.90E-08	0.0001	C	9.5	121.5	32.7	SC	Yellowish Brown Clayey SAND
CP05-IR44- AB-118	4	7	20.92	17.92	1.10E-05	0.0312	C	10.5	118.2	21.6	SC	Yellowish Brown Clayey SAND
CP05-IR44- AB-126	4	7	20.56	17.56	1.50E-08	0	C	8.5	124.6	35.2	SC	Brown Clayey SAND
CP05-IR44- AB-129	1	4	23.91	20.91	2.90E-03	8.2205	F	10.5	106.1	7.1	SP-SM	Dark Brown SAND with some Silt
CP05-IR44- AB-130	4	7	20.61	17.61	7.30E-05	0.2069	C	9.5	119.2	16.3	SC	Brown Clayey SAND
CP05-IR44- AB-131	1	4	18.77	15.77	4.20E-03	11.9055	F	10	102.6	5.1	SP	Brown SAND with little Silt
CP05-IR44- AB-133	4	7	21.23	18.23	7.90E-05	0.2239	C	8.5	122.7	35.3	SC	Brown Clayey SAND with some Shells
CP05-IR44- AB-135	4	7	21.75	18.75	1.00E-04	0.2835	C	9.5	119	20.3	SC	Brown Clayey SAND with some Shells

Source: Site Characterization Report, 2006

Table 5.4 (Continued)
Hydraulic Conductivity Test Results – Remolded Samples
Geotechnical Data Report

Auger Boring ID	Depth Interval		Elevation Interval		Hydraulic Conductivity		Type of Test	Optimum Moisture Content (%)	Dry Density (%)	% Fines	USCS Classification	Sample Description
	from (ft)	to (ft)	from (ft)	to (ft)	(cm/s)	(ft/d)						
CP05-IR44- AB-138	1	4	22.42	19.42	2.50E-04	0.7087	C	10	116.9	17.8	SC	Brown Clayey SAND
CP05-IR44- AB-138	4	7	19.42	16.42	2.50E-04	0.7087	C	9	116.9	17.8	SC	Brown Clayey SAND
CP05-IR44- AB-143	4	7	25.17	22.17	3.80E-04	1.0772	C	8.5	114.4	12.6	SM	Dark Brown Silty SAND
CP05-IR44- AB-112	1	4	23.84	20.84	4.60E-04	1.3039	C	10	108.7	16	SC	Light Brown Clayey SAND
CP05-IR44- AB-113	1	4	23.08	20.08	3.90E-05	0.1106	C	10	115.9	23.5	SC	Brown Clayey SAND

Source: Site Characterization Report, 2006

Notes: C = Constant Head Test
F = Falling Head Test

Table 5.5
Hydraulic Conductivity Test Results – Undisturbed Samples
Geotechnical Data Report

Core Boring ID	Depth Interval		Elevation Interval		Hydraulic Conductivity		Type of Test	% Fines	L.L.	P.I.	USCS Classification	Dry Density (pcf)	Sample Description
	From (ft)	To (ft)	To (ft)	From (ft)	(cm/s)	(ft/d)							
CP05-IR44- CB-46	5	7	18.75	16.75	2.30E-05	0.0652	C	19.2	-	-	SC	110.2	Grayish Brown Clayey SAND
CP05-IR44- CB-47	5	7	19.22	17.22	1.40E-05	0.0397	C	20.5	26	12	SC	120.1	Grayish Brown Clayey SAND with Shell
CP05-IR44- CB-48	1	3	23.03	21.03	1.50E-05	0.0425	C	22.3	-	-	SC	114.1	Grayish Brown Clayey SAND with Shell
CP05-IR44- CB-49	8	11	16.18	13.18	1.90E-05	0.0539	C	17.8	-	-	SC	111.5	Gray Clayey SAND
CP05-IR44- CB-51	6	8	17.35	15.35	4.30E-04	1.2189	C	9.3	-	-	SP-SM	105.7	Gray SAND with some Silt and Shell
CP05-IR44- CB-52	5	7	19.80	17.80	1.40E-06	0.004	C	20.9	-	-	SC	110.7	Grayish Brown Clayey SAND
CP05-IR44- CB-54	4	6	20.11	18.11	2.00E-05	0.0567	C	14.4	-	-	SC	111.7	Gray Clayey SAND
CP05-IR44- CB-55	3	5	20.46	18.46	2.20E-06	0.0062	C	13.4	-	-	SC	94	Dark Brown Clayey SAND
CP05-IR44- CB-56	6	8	18.74	16.74	1.40E-05	0.0397	C	38.2	-	-	SC	120.2	Greenish Gray Clayey SAND
CP05-IR44- CB-57	2	4	23.23	21.23	3.00E-07	0.0009	C	21.6	-	-	SC	112.3	Orangish Gray Clayey SAND
CP05-IR44- CB-58	2	4	23.68	21.68	1.70E-06	0.0048	C	19.2	-	-	SC	115.3	Grayish Brown Clayey SAND
CP05-IR44- CB-60	6	8	19.42	17.42	5.20E-07	0.0015	C	20.7	28	13	SC	116.3	Grayish Brown Clayey SAND
CP05-IR44- CB-61	8	10	19.41	17.41	1.00E-05	0.0283	C	14.1	NP	NP	SC	112.4	Grayish Brown Clayey SAND
CP05-IR44- CB-63	4	6	21.18	19.18	9.80E-06	0.0278	C	22.2	NP	NP	SC	120.3	Yellowish Brown Clayey SAND
CP05-IR44- CB-65	10	12	16.58	14.58	1.40E-05	0.0397	C	14.2	-	-	SC	124	Light Brown Clayey SAND

Source: Site Characterization Report, 2006

Table 5.5 (Continued)
Hydraulic Conductivity Test Results – Undisturbed Samples
Geotechnical Data Report

Core Boring ID	Depth Interval		Elevation Interval		Hydraulic Conductivity		Type of Test	% Fines	L.L.	P.I.	USCS Classification	Dry Density (pcf)	Sample Description
	From (ft)	To (ft)	To (ft)	From (ft)	(cm/s)	(ft/d)							
CP05-IR44- CB-72	7	9	19.18	17.18	1.70E-05	0.0482	C	16.3	-	-	SC	113.9	Greenish Gray Clayey SAND
CP05-IR44- CB-73	8	10	18.64	16.64	1.80E-06	0.0051	C	23.8	41	25	SC	118.3	Gray Clayey SAND
CP05-IR44- CB-83	8	10	19.84	17.84	9.70E-07	0.0027	C	22.3	-	-	SC	116.6	Greenish Gray Clayey SAND
CP05-IR44- CB-198	4	6	21.74	19.74	9.60E-07	0.0027	C	25.9	47	32	SC	116.7	Brown Clayey SAND
CP05-IR44- CB-201	2	4	23.25	21.25	9.40E-08	0.0003	C	21.7	-	-	SC	98.6	Gray Clayey SAND
CP05-IR44- CB-252	4	6	20.87	18.87	4.30E-05	0.1219	C	18.5	-	-	SC	108.5	Brownish Gray Clayey SAND
CP05-IR44- CB-253	4	6	22.34	20.34	1.50E-07	0.0004	C	23.2	23	7.8	SC	108.4	Grayish Brown Clayey SAND
CP05-IR44- CB-256	2	4	22.60	20.60	2.10E-04	0.5953	C	9.6	-	-	SP-SC	104.7	Brown SAND with some Clayey Fines
CP05-IR44- CB-276	8	10	17.18	15.18	1.10E-04	0.3118	F	9.8	-	-	SP-SM	101	Brown SAND with SHELLS and some Silty Fines
CP05-IR44- CB-281	0	2	24.72	22.72	3.10E-07	0.0009	C	17.8	35.4	22.4	SC	110.2	Brownish Gray Clayey SAND
CP05-IR44- CB-283	6	8	19.02	17.02	9.70E-07	0.0027	C	92.1	-	-	CH	111.5	Light Brown Sandy CLAY
Data from Previous Work (Ardaman, 2003)													
CP05-IR44- B-104	7	9	-	-	3.00E-08	0.0001	C	94	21	10	CL	-	-
CP05-IR44- B-106	1	3	-	-	7.50E-03	21.26	F	2			SP-SM	-	-
CP05-IR44- B-107	5	7	-	-	1.00E-08	0.00003	C	22	28	11	CL	-	-

Source: Site Characterization Report, 2006
Notes: C = Constant Head Test
F = Falling Head Test

Table 5.6
Organic Content and Corrosivity Test Results – Auger Boring and Test Pit Samples
Geotechnical Data Report

Auger Boring ID	Depth Interval		Elevation Interval		pH	Resistivity (Ohm-cm)	Sulfate (mg/L)	Chloride (mg/L)	Organic Content (%)	Carbonate Content (%)	Bridge Substructure Environmental Classification* Concrete	Bridge Substructure Environmental Steel
	from (ft)	to (ft)	from (ft)	to (ft)								
CP05-IR44-AB 85	1	4	26.13	23.13	7.8	8,200	10	15	0.6	0	SA	SA
CP05-IR44- AB 89A	1	4	25.54	22.54	7.5	3,800	10	15	0.4	0.2	SA	SA
CP05-IR44- AB 92	1	4	25.96	22.96	8.2	11,000	5	15	0.5	0.1	SA	SA
CP05-IR44 - AB 97	1	4	23.89	20.89	6.6	4,300	88	15	-	-	MA	MA
CP05-IR44- AB 102	1	4	23.51	20.51	6.4	5,000	103	30	0.7	0	MA	MA
CP05-IR44- AB 106	1	4	23.91	20.91	7.6	1,700	275	30	5.1	0.1	MA	MA
CP05-IR44- AB 107	1	4	23.00	20.00	7.7	2,000	114	30	1.9	0.1	MA	MA
CP05-IR44- AB 108	1	4	27.24	24.24	6.5	7,900	< 6	15	1.2	0.1	MA	MA
CP05-IR44- AB 112	1	4	23.84	20.84	7.9	2,600	12	15	-	-	MA	MA
CP05-IR44- AB 113	1	4	23.08	20.08	7	820	495	45	2.1	0.4	MA	MA
CP05-IR44- AB 115	1	4	22.78	19.78	8	2,500	30	15	-	-	MA	MA
CP05-IR44- AB 116	1	4	23.90	20.90	6.4	1,400	47	60	3	0	MA	MA
CP05-IR44- AB 117	1	4	23.23	20.23	7.7	1,700	40	20	1.2	0.4	MA	MA
CP05-IR44- AB 118	1	4	23.92	20.92	8.2	1,500	120	30	-	-	MA	MA
CP05-IR44- AB 119	1	4	25.68	22.68	7.9	2,300	< 6	15	-	-	MA	MA
CP05-IR44- AB 122	1	4	23.13	20.13	7.8	1,000	14	15	2.1	37.3	MA	MA
CP05-IR44- AB 124	1	4	22.63	19.63	6.1	1,900	276	15	-	-	MA	MA
CP05-IR44- AB 128	1	4	23.24	20.24	6.9	3,200	< 6	60	1.5	0.1	MA	MA
CP05-IR44- AB 129	1	4	23.91	20.91	7.1	4,800	73	15	-	-	SA	SA
CP05-IR44- AB 130	1	4	23.61	20.61	8.4	2,700	< 6	15	-	-	MA	MA
CP05-IR44- AB 131	1	4	18.77	15.77	4.3	1,900	855	15	0.7	0.1	EA	EA
CP05-IR44- AB 134	1	4	21.86	18.86	7.5	2,200	60	15	0.8	1.5	MA	MA
CP05-IR44-AB 138	1	4	22.42	19.42	7.3	1,200	221	30	1.6	10.9	MA	MA

Source: Site Characterization Report, 2006

Table 5.6 (Continued)
Organic Content and Corrosivity Test Results – Auger Boring and Test Pit Samples
Geotechnical Data Report

Auger Boring ID	Depth Interval from (ft)	Depth Interval to (ft)	Elevation Interval from (ft)	Elevation Interval to (ft)	pH	Resistivity (Ohm-cm)	Sulfate (mg/L)	Chloride (mg/L)	Organic Content (%)	Carbonate Content (%)	Bridge Substructure Environmental Classification* Concrete	Bridge Substructure Environmental Steel
CP05-IR44-AB 140	1	4	22.87	19.87	5.5	2,400	93	30	2	0.1	MA	EA
CP05-IR44- AB 142	1	4	24.57	21.57	8.3	3,800	7	15	1.6	30.6	MA	MA
CP05-IR44- TP 352	-	-	-	-	7.4	3,000	34.8	30	2.3	-	MA	MA
CP05-IR44- TP 354	1	4	24.62	24.62	7.6	2,100	185.1	15	1.4	-	MA	MA
CP05-IR44- TP 355	-	-	-	-	5.5	5,000	54.6	30	1.5	-	MA	MA
CP05-IR44- TP 356	1	4	26.38	26.38	7.6	3,800	< 2.4	30	2.1	-	MA	MA
CP05-IR44- TP 357	-	-	-	-	7.4	3,000	34.8	30	2.3	-	MA	MA
CP05-IR44- TP 358	6	7	25.56	25.56	7.3	1,500	792	45	1.8	-	MA	MA
CP05-IR44- TP 359	8	9	25.76	25.76	7.7	4,000	49.5	45	1.5	-	MA	MA
CP05-IR44- TP 360	-	-	-	-	7.5	2,500	152.1	45	1.2	-	MA	MA
CP05-IR44- TP 361	8	9	23.64	23.64	7.3	3,300	79.2	45	1.0	-	MA	MA
CP05-IR44- TP 362	10	11	24.67	24.67	7.3	2,900	87.9	30	1.1	-	MA	MA
CP05-IR44- TP 363	12	13	25.48	25.48	7.3	7,100	< 2.4	30	0.7	-	MA	MA
CP05-IR44- TP 364	13	14	26.98	26.98	7.6	5,500	19.5	30	1.2	-	SA	SA
CP05-IR44- TP 366	-	-	-	-	7.5	2,500	152.1	45	1.2	-	MA	MA
CP05-IR44- TP 388	-	-	-	-	5.5	5,000	54.6	30	1.5	-	MA	EA

Source: Site Characterization Report, 2006

Table 5.7
Additional Carbonate Content Testing – Test Pits
Geotechnical Data Report

Sample Identification	Sample Interval		Elevation Interval		Percent Carbonates
	From (ft)	To (ft)	From (ft)	To (ft)	
TP-355	8	10	16.09	14.09	1.50%
TP-356	8	10	18.38	16.38	12.00%
TP-358	8	10	17.56	15.56	21.10%
TP-359	8	10	17.76	15.76	6.40%
TP-360	8	10	17.39	15.39	25.70%
TP-361	8	10	15.64	13.64	18.00%
TP-362	8	10	16.67	14.67	2.30%
TP-363	8	10	17.48	15.48	1.50%
TP-364	8	10	18.98	16.98	2.50%

Source: Site Characterization Report, 2006

Table 5.8
Triaxial Test Results – Remolded Samples
Geotechnical Data Report

Auger Boring ID (AB)	Depth Interval		Elevation Interval		Effective Friction Angle		Test Methods	Dry Density (pcf)	Maximum Proctor Density	Compaction (%)	Moisture Content (%)	(%) Fines	USCS Classification	Sample Description
	From (ft)	To (Ft)	From (ft)	To (Ft)	Ultimate (degrees)	Mohr-Coulomb (degrees)								
CP05-IR44-AB 90	4	7	22.81	19.81	35	37	Standard	**115.4**	**117.5**	**98.5**	**12.6**	**18.5**	**SC**	
CP05-IR44- AB 91	1	4	26.63	23.63	33	35	Standard	104.3	110.8	94.1	15.6	6.9	SP-SM	Dark Brown SAND with some Silt
CP05-IR44- AB 106	1	4	23.91	20.91	37	44	Modified	99.9	110.5	90.4	14.1	16	SC	Dark Brown Clayey SAND
CP05-IR44- AB 108	4	7	24.24	21.24	33	40	Modified	106.8	114.5	93.3	10.3	7.2	SP-SM	Brown SAND with some Silt
CP05-IR44- AB 112	1	4	23.84	20.84	35	37	Modified	107.9	114.5	94.2	13.3	16.6	SC	Light Brown Clayey SAND
CP05-IR44- AB 113	1	4	23.08	20.08	34	37	Modified	117.7	112.0	96.5	9.9	23.8	SC	Brown Clayey SAND
CP05-IR44- AB 118	4	7	20.92	17.92	32	37	Modified	117.1	124.7	93.9	10.8	21.6	SC	Yellowish Brown Clayey SAND
CP05-IR44- AB 119	1	4	25.68	22.68	32	36	Modified	111.4	117.5	94.8	11.3	10.3	SP-SM	Dark Brown to Black Organically Stained SAND with Silt
CP05-IR44- AB 119	4	7	22.68	19.68	33	40	Modified	114.4	122.0	93.8	14.2	21.2	SC	Brown Clayey fine SAND
CP05-IR44- AB 124	1	4	22.63	19.63	33	40	Modified	112.0	118.5	94.5	13.5	11.8	SC	Dark Brown to Black Organically Stained SAND with Silt
CP05-IR44- AB 126	4	7	20.56	17.56	36	37	Modified	123.7	130.0	95.2	10.7	35.4	SC	Brown Clayey SAND
CP05-IR44- AB 129	1	4	23.91	20.91	34	36	Modified	103.7	112.0	92.6	15.1	6.8	SP-SM	Dark Brown SAND with some Silt
CP05-IR44- AB 130	4	7	20.61	17.61	35	39	Modified	119.0	126.0	94.4	10.2	16.3	SC	Brown Clayey SAND
CP05-IR44- AB 133	1	4	24.23	21.23	33	36	Modified	107.2	114.5	93.6	11.7	9.1	SP-SM	Brown Clayey SAND with some Shells
CP05-IR44- AB 135	4	7	21.75	18.75	35	42	Modified	119.3	126.0	94.7	10.3	20.3	SC	Brown Clayey SAND with some Shells
CP05-IR44- AB 138	4	7	19.42	16.42	36	41	Modified	117.8	124.5	94.6	9.4	19.3	SC	Brown Clayey SAND

Source: Site Characterization Report, 2006

Note: This table prints full size at 11"x17".

Table 5.9
Triaxial Test Results – Undisturbed Samples
Geotechnical Data Report

Core Boring ID	Depth Interval		Elevation Interval		Effective Friction Angle		Dry Density (pcf)	Natural Moisture Content (%)	% Fines	USCS Classification	Sample Description
	From (ft)	To (ft)	From (ft)	To (ft)	Ultimate (degrees)	Mohr-Coulomb (degrees)					
CP05-IR44- CB-198	4	6	21.7	19.7	33	38	115.0	14.8	25.9	SC	Brown Clayey SAND
CP05-IR44- CB-201	2	4	23.3	21.3	34	36	110.4	16	9.8	SC	Gray Clayey SAND
CP05-IR44- CB-252	4	6	20.9	18.9	33	39	103.3	18.3	18.5	SC	Brownish Gray Clayey SAND
CP05-IR44- CB-253	4	6	22.3	20.3	35	39	110.2	17.3	21.0	SC	Grayish Brown Clayey SAND
CP05-IR44- CB-256	2	4	22.6	20.6	41	43	102.0	22.3	22.4	SP-SC	Brown SAND with some Clayey Fines
CP05-IR44- CB-276	8	10	17.2	15.2	36	40	100.8	22.4	9.2	SP-SM	Brown SAND with SHELLS and some Silty Fines
CP05-IR44- CB-281	0	2	24.7	22.7	38	42	104.8	15.6	15.5	SC	Brownish Gray Clayey SAND
CP05-IR44- CB-283	6	8	19.0	17.0	40	44	111.0	16.8	82.7	CH	Light Brown Sandy CLAY

Source: Site Characterization Report, 2006

Table 6.1
Generalized Geology and Hydrogeology of Project Area
Geotechnical Data Report

System	Series	Stratigraphic Unit		Hydrogeologic Unit	Informal Stratigrphic Unit
Quaternary	Holocene	Undifferentiated sediments		Surficial Aquifer System	Unit A
	Pleistocene	Anastasia Formation			Unit B and C
		Fort Thompson Formation			
		Caloosahatchee Formation			
Tertiary	Pliocene	Tamiami Formation			
	Miocene and Late Oligocene	Hawthorn Group	Peace River Formation	Intermediate Confining Unit	Not penetrated at site
			Arcadia Formation		
	Early Oligocene	Basal Hawthorn/SuwanneeUnit	Suwanee Limestone	Floridan Aquifer System	Not penetrated at site
	Eocene	Ocala Limestone			
		Avon Park Limestone			
		Oldsmar Formation			

Source: Site Characterization Report, 2006

Table 6.2
Hydraulic Conductivity Test Data
Geotechnical Data Report

Unit	K_h (ft/d)			K_v (ft/d)		Source
	From	To	Median	From	To	
Unit A+B (Depth 0 to ~12')	0.1	4	0.2	0.02	0.04	Field Permeability tests, Ardaman and Associates (2003)
				0.003	1.2	Laboratory Hydraulic Conductivity Tests, Ardaman and Associates (2005)
Unit C-Upper (Depth ~13 to 30' bls)	7	17	11			Field Permeability tests, (wells), Ardaman and Associates (2003)
	12	225	35			Slug tests, Ardaman and Associates (2003)
	0.4	57	5			CPTU, Baligh and Levadoux method (Ardaman and Associates, 2005)
	0.002	0.3	0.03			CPTU, Robertson method (Ardaman and Associates, 2005)
	2	27	8			Slug tests (Ardaman and Associates, 2005)
Unit C-Lower (Depth ~40 to 80' bls)	0.6	18	5			Field Permeability tests, (wells), Ardaman and Associates (2003)
	0.5	128	65			Slug tests, Ardaman and Associates (2003)
	2	30	15			Slug tests, Ardaman and Associates (2005)
Unit C-(Total thickness)	20	28	24	0.35	1.0	APTs, CDM (2004)

Source: Site Characterization Report, 2006

Notes:

1) Depths and units are as reported in 2006 site characterization report
2) This table intended only for the sumamry of available hydraulic conductivity data and not intended for subsurface stratigraphic interpretation

Table 6.3
Summary of Groundwater Elevations at Project Site
Geotechnical Data Report

Well	Screen Interval (BGS)		Coordinates		Top of Casing Elevation							
	From	To	X	Y	(NAVD 88)	30-Aug-05	23-Sep-05	21-Oct-05	22-Nov-05	20-Dec-05	4-Jan-06	13-Feb-06
MW272S	13	23	997130.32	829996.262	23.7	10.80	11.00	11.91	13.74	10.28	10.51	10.62
MW272SI	48	58	997130.32	829996.262	24.13	13.03	13.03	14.48	16.03	12.60	12.60	13.16
MW272DI	92.5	102.5	997130.32	829996.262	24	--	--	--	--	12.21	12.22	12.84
MW273S	13	23	1012350.17	830080.972	24.58	14.03	14.43	14.87	16.42	13.19	13.16	13.23
MW273SI	38	48	1012350.17	830080.972	24.95	14.68	15.05	15.53	17.11	13.89	13.86	13.93
MW273DI	84	94	1012350.17	830080.972	24.06	--	--	--	--	13.71	13.49	13.19
MW274S	21	31	1007240.24	848492.243	24.99	14.99	14.81	14.81	16.54	13.44	13.50	13.72
MW274SI	41	51	1007240.24	848492.243	25.16	16.36	16.09	16.26	17.69	14.72	14.75	15.06
MW274DI	90	100	1007240.24	848492.243	24.5	--	--	--	--	13.73	13.66	14.00
MW274D	144	154	1007240.24	848492.243	24.7	--	--	--	--	14.35	14.19	14.52
MW275S	15	25	978994.73	841503.015	27.9	15.45	15.05	16.15	19.49	20.77	20.01	19.16
MW275SI	50	60	978994.73	841503.015	27.77	14.52	14.37	14.67	17.08	18.43	18.16	17.71
MW275DI	75	85	978994.73	841503.015	27.7	--	--	--	--	18.31	17.99	17.48
MW275DI	133	143	978994.73	841503.015	27.8	--	--	--	--	22.41	17.77	17.42
MW289S	17.5	27.5	991416.762	840746.196	20.5	12.69	12.54	13.40	14.20	11.93	12.03	12.69
MW289SI	40	50	991416.762	840746.196	20.45	12.20	12.05	12.94	13.76	11.49	11.49	12.32
MW290S	20	30	1012473.27	840601.384	28.63	17.68	18.13	18.13	19.44	16.90	17.11	17.45

Source: Site Characterization Report, 2006

Table 6.3 (Continued)
Summary of Groundwater Elevations at Project Site
Geotechnical Data Report

Well	Screen Interval (BGS)		Coordinates		Top of Casing Elevation							
	From	To	X	Y	(NAVD 88)	30-Aug-05	23-Sep-05	21-Oct-05	22-Nov-05	20-Dec-05	4-Jan-06	13-Feb-06
MW290SI	40	50	1012473.27	840601.384	28.56	17.64	18.07	18.06	19.37	16.85	17.05	17.38
MW338S	20	25	1003455.84	830039.043	24.49	15.09	14.88	16.22	17.51	14.24	14.21	15.25
MW338SI	40	50	1003455.84	830039.043	24.81	16.11	16.05	17.40	18.39	15.40	15.30	16.10
MW343S	20	25	999298.853	856428.434	25.91	15.26	14.71	14.73	16.46	13.37	13.20	13.79
MW343SI	45	50	999298.853	856428.434	25.59	14.68	14.34	14.19	15.74	12.74	12.63	13.29
MW344S	15	25	990090.953	856440.458	21.19	14.44	13.44	14.38	15.30	12.02	11.97	12.69
MW344SI	45	55	990090.953	856440.458	21.37	14.72	13.72	14.66	15.52	12.29	12.24	13.00
MW344DI	90	100	990090.953	856440.458	21.57	--	--	--	--	12.66	12.46	13.23
MW345S	9.6	19.6	1008497.67	830058.458	23.45	13.81	13.93	15.17	16.38	13.18	13.24	13.84
MW346S	10	20	1012454.23	835445.272	25.16	13.44	13.76	13.57	15.01	11.63	11.10	11.05
MW347S	14	24	996681.783	840757.854	23.64	13.89	13.74	14.99	16.14	13.00	12.91	13.49
MW348S	10	20	987847.007	840703.768	23.12	14.47	14.42	15.03	15.68	13.50	13.63	14.17
MW349S	9.5	19.5	983454.563	848858.835	23.41	6.81	6.63	7.00	8.11	6.10	6.25	6.35
MW350S	9.4	19.4	1001974.26	848581.331	26.16	11.58	11.09	11.44	13.66	9.91	10.21	10.61
MW351S	7	17	985994.418	856049.399	24.66	10.81	9.68	10.22	12.15	8.78	8.64	9.11
MW352S	9.2	19.2	994072.472	856055.051	23.35	12.01	11.52	12.15	13.05	10.08	10.03	10.89
MW353S	9	19	1002000.13	853155.61	21.45	12.69	13.83	13.44	14.75	12.18	12.13	12.52

Source: Site Characterization Report, 2006

Table 6.4
Groundwater Elevation Ranges in Monitoring Wells
Geotechnical Data Report

Monitoring Well I.D.	Highest Groundwater Elevation Recorded (feet) (NAVD 88)	Lowest Groundwater Elevation Recorded (feet) (NAVD 88)	Monitoring Well I.D.	Highest Groundwater Elevation Recorded (feet) (NAVD 88)	Lowest Groundwater Elevation Recorded (feet) (NAVD 88)
MW272S	13.74	10.28	MW290SI	19.37	16.85
MW272SI	16.03	12.6	MW338S	17.51	14.21
MW272DI	12.84	12.21	MW338SI	18.39	15.3
MW273S	16.42	13.16	MW343S	16.46	13.2
MW273SI	17.11	13.86	MW343SI	15.74	12.63
MW273DI	13.71	13.19	MW344S	15.3	11.97
MW274S	16.54	13.44	MW344SI	15.52	12.24
MW274SI	17.69	14.72	MW344DI	13.23	12.46
MW274DI	14	13.66	MW345S	16.38	13.18
MW274D	14.52	14.19	MW346S	15.01	11.05
MW275S	20.77	15.05	MW347S	16.14	12.91
MW275SI	18.43	14.37	MW348S	15.68	13.5
MW275DI	18.31	17.48	MW349S	8.11	6.1
MW275DI	22.41	17.42	MW350S	13.66	9.91
MW289S	14.2	11.93	MW351S	12.15	8.64
MW289SI	13.76	11.49	MW352S	13.05	10.03
MW290S	19.44	16.9	MW353S	14.75	12.13

Notes: NE = Not Encountered

Table 6.5
Depth to Groundwater in Borings
Geotechnical Data Report

Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
AB	085	27.13	NE	3/1/05		AB	121	20.39	1.99	3/16/05
AB	086	23.58	NE	3/1/05		AB	122	24.13	7.03	3/16/05
AB	087	24.11	NE	3/7/05		AB	123	24.40	8.50	3/16/05
AB	088	26.05	NE	3/1/05		AB	124	23.63	8.03	3/16/05
AB	089	26.54	NE	3/1/05		AB	125	23.39	7.99	3/16/05
AB	090	26.81	NE	3/1/05		AB	126	24.56	2.96	3/25/05
AB	091	27.63	NE	3/7/05		AB	127	24.52	4.02	3/18/05
AB	092	26.96	NE	3/1/05		AB	128	24.24	7.54	3/18/05
AB	093	28.70	NE	3/1/05		AB	129	24.91	7.01	3/24/05
AB	094	27.56	NE	3/7/05		AB	130	24.61	NE	3/21/05
AB	095	27.24	NE	3/8/05		AB	131	19.77	NE	3/21/05
AB	096	25.70	9.00	3/8/05		AB	132	23.06	4.36	3/25/05
AB	097	24.89	NE	3/1/05		AB	133	25.23	6.03	3/21/05
AB	098	24.78	8.48	3/1/05		AB	134	22.86	4.96	3/22/05
AB	099	26.29	8.99	3/1/05		AB	135	25.75	5.95	3/25/05
AB	100	24.41	NE	3/8/05		AB	136	23.88	3.98	3/25/05
AB	101	26.92	NE	3/8/05		AB	137	24.57	3.97	3/25/05
AB	102	24.51	9.01	3/8/05		AB	138	23.42	4.02	3/25/05
AB	103	24.60	7.00	3/8/05		AB	139	25.09	3.99	3/25/05
AB	104	25.17	NE	3/8/05		AB	140	23.87	6.97	3/25/05
AB	105	25.99	8.99	3/8/05		AB	141	25.47	3.97	3/25/05
AB	106	24.91	3.01	3/22/05		AB	142	25.57	6.97	3/29/05
AB	107	24.00	8.50	3/22/05		AB	143	29.17	NE	3/22/05
AB	108	28.24	4.04	3/18/05		AB	302	23.26	4.96	7/6/05
AB	109	27.04	6.04	3/16/05		AB	303	24.62	4.52	7/6/05
AB	110	25.52	3.52	3/1/05		AB	304	23.80	4.00	7/7/05
AB	111	24.10	3.50	3/16/05		AB	305	23.14	3.54	7/7/05
AB	112	24.84	4.54	3/16/05		AB	306	23.21	4.01	7/7/05
AB	113	24.08	4.98	3/16/05		AB	307	24.32	4.52	7/6/05
AB	114	24.61	5.01	3/16/05		AB	308	23.28	4.48	7/6/05
AB	115	23.78	4.48	3/15/05		AB	309	23.80	4.50	7/6/05
AB	116	24.90	7.00	3/15/05		AB	310	23.70	4.00	7/7/05
AB	117	24.23	4.03	3/1/05		AB	311	24.42	4.02	7/7/05
AB	118	24.92	7.02	3/29/05		AB	312	23.24	NE	7/7/05
AB	119	26.68	6.98	3/29/05		AB	313	23.95	3.95	7/8/05

Table 6.5 (Continued)
Depth to Groundwater in Borings
Geotechnical Data Report

Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
AB	314	24.02	3.52	7/8/05		AB	442	26.0	NE	9/15/06
AB	315	27.07	7.97	7/8/05		AB	444	26.0	NE	9/15/06
AB	316	25.42	NE	7/8/05		AB	445	26.0	4.7	9/15/06
AB	317	25.48	3.98	7/8/05		AB	446	26.0	2.9	9/15/06
AB	318	25.80	4.00	7/8/05		AB	447	26.0	3.7	9/15/06
AB	319	25.70	4.00	7/8/05		AB	448	26.0	NR	9/15/06
AB	320	27.00	8.00	7/16/05						
AB	321	25.48	3.48	7/15/05		CB	042	27.68	6.0	2/22/05
AB	322	24.21	3.51	7/16/05		CB	043	26.92	6.0	2/22/05
AB	323	23.12	3.02	7/16/05		CB	044	26.46	6.0	2/22/05
AB	324	25.29	3.99	7/16/05		CB	045	25.27	6.0	2/22/05
AB	334	24.37	4.97	7/26/05		CB	046	23.75	4.0	2/22/05
AB	335	24.48	4.48	7/26/05		CB	047	24.22	7.0	2/23/05
AB	336	25.23	4.03	7/26/05		CB	048	24.03	5.0	2/23/05
AB	337	22.32	NE	NR		CB	049	24.18	6.0	2/22/05
AB	339	24.34	4.04	7/26/05		CB	050	23.66	6.0	3/4/05
AB	340	26.52	4.02	7/26/05		CB	051	23.35	5.0	NR
AB	341	28.15	4.45	7/26/05		CB	052	24.80	4.0	NR
AB	342	24.50	4.00	7/26/05		CB	053	24.91	7.0	2/23/05
AB	408	26.76	3.46	6/8/06		CB	054	24.11	6.0	2/24/05
AB	409	26.25	2.95	6/8/06		CB	055	23.46	4.0	NR
AB	410	26.91	5.01	6/13/06		CB	056	24.74	3.0	NR
AB	414	27.31	5.01	6/15/06		CB	057	25.23	7.0	NR
AB	415	27.75	4.95	6/13/06		CB	058	25.68	5.0	2/28/05
AB	416	25.62	5.02	6/13/06		CB	059	25.71	NR	3/3/05
AB	417	25.57	3.97	6/13/06		CB	060	25.42	5.5	2/28/05
AB	418	23.94	10.04	6/14/06		CB	061	27.41	9.7	2/28/05
AB	424	26.0	NR	9/14/06		CB	062	21.65	4.0	3/4/05
AB	425	26.0	3.30	9/14/06		CB	063	25.18	4.0	NR
AB	426	26.0	NR	9/14/06		CB	064	24.79	8.0	3/4/05
AB	427	26.0	NR	9/14/06		CB	065	26.58	5.0	2/28/05
AB	428	26.0	NE	9/15/06		CB	066	26.22	6.0	3/1/05
AB	429	26.0	NE	9/15/06		CB	067	26.96	8.0	NR
AB	430	26.0	2.80	9/15/06		CB	068	27.37	8.0	NR
AB	441	26.0	NE	9/15/06		CB	069	28.01	5.0	3/1/05

Table 6.5 (Continued)
Depth to Groundwater in Borings
Geotechnical Data Report

Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
CB	070	28.05	4.95	3/1/05		CB	196	25.1	6.0	5/24/05
CB	071	27.16	5.96	3/2/05		CB	197	25.9	6.0	5/24/05
CB	072	26.18	8.98	3/1/05		CB	198	25.7	6.0	5/25/05
CB	073	26.64	5.04	2/28/05		CB	199	26.2	6.0	5/25/05
CB	074	24.78	4.98	3/2/05		CB	200	26.6	NR	NR
CB	075	24.75	4.95	3/2/05		CB	201	25.3	NR	6/10/05
CB	076	25.63	6.03	3/2/05		CB	202	24.7	NR	NR
CB	077	26.05	4.95	3/1/05		CB	203	24.1	4.0	6/13/05
CB	078	28.82	7.02	NR		CB	204	25.8	5.0	6/13/05
CB	079	27.38	7.98	3/2/05		CB	206	24.3	5.0	5/26/05
CB	080	25.54	5.04	3/3/05		CB	207	22.9	4.5	5/26/05
CB	081	23.97	4.97	3/305		CB	208	23.6	5.0	5/26/05
CB	082	27.97	9.97	3/3/05		CB	209	23.8	5.0	5/26/05
CB	083	27.84	6.04	3/3/05		CB	210	27.2	6.0	5/27/05
CB	084	27.85	5.05	3/3/05		CB	211	28.0	5.0	5/27/05
CB	144	24.91	4.01	3/28/05		CB	212	25.1	4.0	6/2/05
CB	145	25.62	NR	3/29/05		CB	213	22.8	3.0	6/23/05
CB	146	24.64	NR	3/29/05		CB	214	24.6	3.0	6/23/05
CB	147	24.79	5.99	3/30/05		CB	215	25.5	5.0	6/23/05
CB	148	24.43	5.03	3/31/05		CB	216	22.6	4.0	6/23/05
CB	149	23.87	4.97	3/31/05		CB	217	28.3	5.0	6/2/05
CB	150	23.32	5.02	3/30/05		CB	221	26.5	5.0	6/8/05
CB	151	25.42	5.02	4/1/05		CB	222	26.6	5.0	6/3/05
CB	152	25.19	4.99	4/1/05		CB	224	27.3	5.0	6/8/05
CB	153	23.83	4.03	3/31/05		CB	227	26.9	NR	6/8/05
CB	154	24.21	5.01	3/31/05		CB	229	27.1	5.0	6/8/05
CB	155	24.36	4.96	4/1/05		CB	231	29.1	5.0	6/9/05
CB	156	23.66	2.96	4/1/05		CB	232	27.9	5.0	6/9/05
CB	157	24.40	5.20	4/5/05		CB	233	26.9	5.0	6/9/05
CB	158	24.51	NR	4/4/05		CB	234	26.5	5.0	6/10/05
CB	159	25.89	6.99	4/6/05		CB	235	27.0	5.0	6/10/05
CB	160	26.99	6.99	4/6/05		CB	236	26.6	5.5	6/9/05
CB	161	26.11	7.01	4/6/05		CB	252	24.9	5.0	6/14/05
CB	186	24.54	5.04	4/5/05		CB	253	26.3	4.0	6/14/05
CB	195	25.41	6.01	5/24/05		CB	254	27.0	4.0	6/20/05

Table 6.5 (Continued)
Depth to Groundwater in Borings
Geotechnical Data Report

Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
CB	255	24.71	3.01	6/21/05		CB	329	25.9	4.0	7/23/05
CB	256	24.60	4.00	6/21/05		CB	330	25.6	4.0	7/25/05
CB	268	25.90	4.00	6/22/05		CB	331	24.6	4.0	7/25/05
CB	269	25.00	4.00	6/22/05		CB	332	24.1	4.0	7/25/05
CB	270	27.26	3.96	6/21/05		CB	333	24.3	4.0	7/25/05
CB	271	24.48	4.98	6/23/05		CB	345	27.2	10.2	8/16/05
CB	276	25.18	3.98	6/23/05		CB	346	29.4	8.4	8/16/05
CB	277	23.90	4.00	6/23/05		CB	347	27.4	8.3	8/11/05
CB	278	23.59	3.49	6/24/05		CB	348	27.0	3.0	8/16/05
CB	279	23.96	3.46	6/24/05		CB	349	27.2	11.0	8/17/05
CB	280	24.11	NR	6/20/05		CB	350	30.0	10.0	8/17/05
CB	281	24.72	4.02	6/27/05		CB	351	28.0	9.5	8/17/05
CB	282	25.27	3.97	6/27/05		CB	352	27.2	10.2	8/17/05
CB	283	25.02	5.02	6/27/05		CB	353	25.2	5.5	8/17/05
CB	284	23.74	4.04	6/27/05		CB	365	23.7	5.0	10/20/05
CB	285	23.96	3.96	6/27/05		CB	366	24.2	4.0	10/19/05
CB	286	23.84	3.04	6/28/05		CB	367	21.9	3.5	5/3/06
CB	287	24.12	NR	NR		CB	367 B	21.9	NR	5/17/06
CB	288	23.81	3.01	7/18/05		CB	368	24.8	5.0	5/4/06
CB	289	23.53	3.03	7/18/05		CB	368 B	24.8	NR	5/18/06
CB	291	26.22				CB	369	25.8	7.0	5/5/06
CB	292	25.94	3.04	7/21/05		CB	369 B	25.8	NR	5/18/06
CB	293	24.06	2.96	7/21/05		CB	370	25.4	7.0	5/4/06
CB	294	26.07	2.97	7/19/05		CB	370 B	25.4	NR	5/22/06
CB	295	24.10	4.00	7/5/05		CB	371	26.5	8.9	5/10/06
CB	296	25.50	3.00	7/19/05		CB	372	25.8	7.0	5/10/06
CB	297	23.54	3.04	7/18/05		CB	373	25.6	7.0	5/10/06
CB	298	25.70	5.00	7/19/05		CB	374	25.9	9.0	5/10/06
CB	299	23.88	2.98	7/19/05		CB	375	26.8	7.0	5/11/06
CB	300	24.11	3.01	7/19/05		CB	376	26.4	6.9	5/11/06
CB	301	24.40	3.00	7/19/05		CB	377	26.6	7.0	5/11/06
CB	325	27.51	4.01	7/22/05		CB	378	27.1	6.9	5/11/06
CB	326	28.50	4.00	7/22/05		CB	379	25.9	6.0	5/12/06
CB	327	24.27	3.97	7/23/05		CB	380	25.4	7.0	5/12/06
CB	328	26.06	3.96	7/23/05		CB	381	25.7	7.0	5/15/06

Table 6.5 (Continued)
Depth to Groundwater in Borings
Geotechnical Data Report

Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.		Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
CB	382	27.12	7.02	5/15/06		CB	419	24.77	3.97	6/14/06
CB	383	29.62	14.02	5/22/06		CB	422	26.00	12.00	7/3/06
CB	384	28.22	14.02	5/22/06		CB	423	25.20	10.00	6/20/06
CB	385	26.93	7.03	5/15/06		CB	424	24.33	17.03	6/21/06
CB	386	24.94	7.04	5/15/06		CB	431	26.00	NR	9/14/06
CB	387	27.22	8.02	5/16/06		CB	432	26.00	7.00	9/14/06
CB	388	24.46	6.96	5/16/06		CB	433	26.00	9.30	9/14/06
CB	389	27.52	8.02	5/17/06		CB	434	26.0	6.5	9/14/06
CB	390	29.72	10.02	5/17/06		CB	435	26.0	2.4	9/14/06
CB	391	30.53	8.53	5/24/06		CB	436	26.0	7.1	9/15/06
CB	392	26.71	5.01	5/17/06		CB	437	26.0	NR	9/15/06
CB	393	27.09	4.99	5/18/06		CB	438	26.0	6.0	9/15/06
CB	394	27.42	5.02	5/18/06		CB	452	29.7	12.5	10/31/06
CB	395	29.02	5.02	5/19/06		CB	453	29.2	11.6	10/31/06
CB	396	28.62	6.02	5/22/06		CB	454	27.5	12.0	11/1/06
CB	397	28.26	5.96	5/24/06		CB	458	30.1	13.9	11/1/06
CB	398	29.50	6.00	5/25/06		CB	464	26.0	6.5	1/23/07
CB	399	27.59	5.99	5/25/06		CB	466	26.0	9.1	2/16/07
CB	400	26.81	6.01	5/25/06		CB	467	26.0	10.1	2/15/07
CB	401	27.61	5.01	5/26/05		CB	468	26.0	7.9	2/15/07
CB	402	27.21	5.01	6/8/06		CB	469	26.0	8.8	2/16/07
CB	403	26.61	4.01	5/26/05		CB	470	26.0	9.1	2/16/07
CB	404	26.00	2.50	5/26/05		CB	471	26.0	11.5	4/20/07
CB	405	27.31	NR	5/31/05		CB	471	27.4	3.5	10/23/12
CB	407	27.50	4.50	6/6/06		CB	472	24.7	1.0	10/24/12
CB	411	28.87	14.97	6/9/06		CB	473	24.8	2.0	10/24/12
CB	412	24.71	8.01	6/12/06		CB	474	25.8	1.5	10/16/12
CB	413	25.08	7.98	6/12/06						

Notes: NE = Not Encountered
NR = Not Recorded

Table 6.6
Depth to Groundwater in Test Pits
Geotechnical Data Report

Exploration I.D.	Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date		Exploration I.D.	Ground Surface Elevation (feet)	Depth to Groundwater (feet)	Date
TP 475	24.90	7.00	10/15/12		TP 488	25.3	11.0	10/20/12
TP 476	26.10	10.00	10/23/12		TP 489	25.6	14.0	10/18/12
TP 477	25.80	8.00	10/22/12		TP 490	26.5	10.0	10/18/12
TP 478	23.60	11.00	10/15/12		TP 491	23.7	14.0	10/16/12
TP 479	27.90	11.00	10/22/12		TP 492	24.7	9.0	10/17/12
TP 480	28.00	16.00	10/22/12		TP 493	25.8	10.0	10/17/12
TP 481	26.50	10.00	10/19/12		TP 494	26.8	11.0	10/18/12
TP 482	25.60	10.00	10/20/12		TP 495	26.6	8.0	10/18/12
TP 483	27.40	15.00	10/20/12		TP 496	24.5	19.0	10/17/12
TP 484	25.40	NE	10/22/12		TP 497	25.8	NE	10/23/12
TP 485	24.50	12.00	10/20/12		TP 498	26.8	11.0	10/16/12
TP 486	25.90	8.00	10/19/12		TP 499	26.3	10.0	10/23/12
TP 487	26.50	10.00	10/20/12					

Notes: NE = Not Encountered

Table 6.7
Summary of Surficial Aquifer Water Quality in the Project Area
Geotechnical Data Report

Parameter	Units	*Groundwater
pH	std. units	6.8 – 7.8
Calcium	mg/l	86-320
D.O.	mg/l	0.27-1.77
Sodium	mg/l	11-1400
Copper	mg/l	BDL-0.0084
Total Iron	mg/l	0.27-11
Aluminum	mg/l	BDL-0.54
Total Sulfate	mg/l	10
Chloride	mg/l	12-1400
Ortho-Phosphate	mg/l	0.003-0.23
Total Phosphorus	mg/l	0.022-0.17
TKN	mg/l	0.37-1.6
Nitrogen	mg/l	0.2-1.6
Fluoride	mg/l	0.14-0.36
Nitrate+Nitrite	mg/l	BDL-1.2
Total Dissolved Solids	mg/l	300-6,000
Total Organic Carbon	mg/l	5-28

Source: Site Characterization Report, 2006

*BASED ON TWO ON-SITE SAMPLING EVENTS PERFORMED IN OCTOBER AND DECMEBER 2005; ANALYSES PERFORMED BY U.S. BIOSYSTEMS INC.
BDL=BELOW DETECTION LIMITS

Table 6.8
Typical Soil Types by Resistivity for CCR surveys in Florida

Soil Type	Resistivity Range (Ohm-meters)
High Plasticity Clay	<10
Clayey Soils	10-30
Sandy Clays	30-100
Clayey, Silty, or Organic Sands	100-500
Clean Sand or Limestone (at depth)	>500

Source: Capacitively Coupled Resistivity Report, 2005, by Subsurface Evaluations Inc.

Table 8.1
Average Percent Compaction and Deviation from Optimum Moisture Content
Geotechnical Data Report

Location	Number of Tests	Average Compaction (%)	Average Deviation from Optimum Moisture Content (%)
Reservoir Test Cell 1	193	96.9	0.3
Reservoir Test Cell 2	140	97.4	0.5
STA Test Cell 1	8	95.7	0.6
STA Test Cell 2	10	97.2	0.4
Sedimentation Pond	4	96.0	-0.8
Access Ramps and Roads	13	97.4	-0.1

Source: Test Cell Report, 2007

Table 8.2
Soil-Cement Borrow Materials Test Results
Geotechnical Data Report

Sample Identification	Depth (ft)	Carbonate Content (%)	Fines Content (%)	Calcium Absorption	
				mls 0.01 M EDTA	Reacting
Type 1	-	-	5	10.4	Normal
Type 2	-	-	2.2	6.6	Normal
TP-355	10 - 11	1.5	16.3	12.9	Poorly
TP-356	1 - 4	12.0	22.8	12.8	Poorly
TP-358	6 - 7	21.1	20.5	8.7	Normal
TP-359	8 - 9	6.4	19.4	11.2	Poorly
TP-360	13 - 14	25.7	18.2	9.8	Normal
TP-361	8 - 9	18.0	18.3	11.6	Poorly
TP-362	10 - 11	2.3	16.7	8.7	Normal
TP-363	12 - 13	1.5	11.4	10.7	Normal
TP-364	13 - 14	2.5	11.6	10.8	Normal

Source: Test Cell Report, 2007

Table 8.3
Comparison of 28-Day Compressive Strength
Soil Type 1 vs. Soil Type 2 Soil-Cement
Geotechnical Data Report

Sample Type	Cement Content	28 -Day Compressive Strength		
		Soil Type 1 (psi)	Soil Type 2 (psi)	Increase (%)
Lab Mix Design	9%	385	550	43%
	11%	555	835	50%
	13%	815	1040	28%
Field Production	9%	544 631 528 562 448	1053 730 804 982	
	Average =	543	892	64%

Source: Test Cell Report, 2007

Table 8.4
Soil-Cement Field Production Compressive Strength Test Results
vs. Laboratory Mix Design Results
Geotechnical Data Report

Sample ID	Density (lb/ft^3)	Compressive Strength (lb/in^2)
Soil Type 2, 7% cement (28-day lab strength = 441 psi)		
4A	117.58	395
4B	119.94	375
7A	116.94	310
7B	120.05	360
	Average:	**360**
Soil Type 1, 11% cement (28-day lab strength = 422 psi)		
9A	123.81	455
9B	122.84	530
12A	127.13	615
12B	125.20	555
	Average:	**539**

Source: Test Cell Report, 2007

Table 8.5
Test Cell Operations and Monitoring Data Points
Geotechnical Data Report

Site	Monitoring Point	Data Type	Group	No of Data Points	Data Collection Frequency	Instrument Reading Frequency
Reservoir Test Cell 1 (RTC1)	**Recorder**	Flow meter to Reservoir (FE1-1)		1	Bi-weekly	10 mins
		Flow meter Seepage Canal to Reservoir (FE1-2)		1	Bi-weekly	10 mins
		Flow meter to Seepage Canal (FE1-3)		1	Bi-weekly	10 mins
		Reservoir Stage (FE-1-3)		1	Bi-weekly	10 mins
		Seepage Canal Stage (FE1-2)		1	Bi-weekly	10 mins
		Seepage Drain Culvert Stage (FE1-3)		1	Bi-weekly	10 mins
	Level Trolls	EPZ-10A,B,C,D; PZ-12A,B,C; PZ-14A,B,C; PZ-16A,B,C;, PZ-18A,B,C; PZ-25A,B,C;PZ-26A,B,C;	Group 1	22	Monthly	Hourly
		EPZ-11A,B,C,D; PZ-13A,B,C; PZ-15A,B,C; PZ-17A,B,C;, PZ-27A,B,C;	Group 2	16	Monthly	Hourly
		All PZs	Group 3		Monthly	Hourly
	Geokon Units	VWP-11, VWP-12, VWP13, VWP-14-VWP-15	Group 1	5	Monthly	Hourly
		VWP16, VWP-17, VWP-18, VWP-19, VWP-20	Group 2	5	Monthly	Hourly
	RTC1-SW1	RTC1 Water quality		1	Monthly	
	SCC1-SW1	Seepage Canal Water quality		1	Monthly	
	SCC1-SW2	Seepage CanalWater quality		1	Monthly	
	RTC1-Sed	Bottom Sediment		1	Quarterly	
	Geokon Settlement Gauge	Embankment Settlement			Monthly	
Reservoir Test Cell 2 (RTC2)	**Recorder**	Flow meter to Reservoir (FE2-1)		1	Bi-weekly	10 mins
		Flow meter Seepage Canal to Reservoir (FE2-2)		1	Bi-weekly	10 mins
		Flow meter to Seepage Canal (FE2-3)		1		10 mins
		Reservoir Stage (FE-2-3)		1	Bi-weekly	10 mins
		Seepage Canal Stage (FE2-2)		1	Bi-weekly	10 mins
		Seepage Drain Culvert Stage (FE2-3)		1	Bi-weekly	10 mins
	Level Trolls	EPZ-2A,B,C,D; PZ-3A,B,C; PZ-5A,B,C; PZ-7A,B,C;, PZ-9A,B,C; PZ-24A,B,C;	Group 1	19	Monthly	Hourly
		EPZ-1A,B,C,D; PZ-4A,B,C; PZ-6A,B,C; PZ-8A,B,C;	Group 2	13	Monthly	Hourly
		All PZs	Group 3		Monthly	Hourly
	Geokon Units	VWP-1, VWP-2, VWP3, VWP-4-VWP-5	Group 1	5	Monthly	Hourly
		VWP6, VWP-7, VWP-8, VWP-9, VWP-10	Group 2	5	Monthly	Hourly
	RTC2-SW1	RTC1 Water quality		1	Monthly	
	SCC2-SW1	Seepage Canal Water quality		1	Monthly	
	SCC2-SW2	Seepage CanalWater quality		1	Monthly	
	Geokon Settlement Gauge	Embankment Settlement			Monthly	

Source: Test Cell Report, 2007

Table 8.5 (Continued)
Test Cell Operations and Monitoring Data Points
Geotechnical Data Report

Site	Monitoring Point	Data Type	Group	No of Data Points	Data Collection Frequency	Instrument Reading Frequency
STA1	**Recorder**	Flow meter to STA (FE3-1)		1	Monthly	10 mins
		STA1 stage 1(LT3-1)		1	Monthly	10 mins
		STA1 stage 2 (LT3-2)		1	Monthly	10 mins
	Level Trolls	PZ-21A,B, PZ-22A,B		4	Monthly	Hourly
	STA1-SW1	STA1 Water Quality		1	Monthly	
	STA1-SW2	STA1 Water Quality		1	Monthly	
	STA1-SW3	STA1 Water Quality		1	Monthly	
STA 2	**Recorder**	Flow meter to STA (FE3-2)		1	Monthly	10 mins
		STA2 stage 1(LT3-3)		1	Monthly	10 mins
		STA2 stage 2 (LT3-4)		1	Monthly	10 mins
	Level Trolls	PZ-21A,B; PZ-22A,B		4	Monthly	hourly
	STA2-SW1	STA2 Water Quality		1	Monthly	
	STA2-SW2	STA2 Water Quality		1	Monthly	
	STA2-SW3	STA2 Water Quality		1	Monthly	
Intake Canal	**IC-SW1**	Canal Water Quality		1		Monthly
Wells	**PZ-12-B,C**	Groundwater Quality		2	Quarterly	
	PZ-16-B.C	Groundwater Quality		2	Quarterly	
	PZ-26-B,C	Groundwater Quality		2	Quarterly	
	PZ-5-B,C	Groundwater Quality		2	Quarterly	
	PZ-7-B,C	Groundwater Quality		2	Quarterly	
	PZ-24-B,C	Groundwater Quality		2	Quarterly	
	PZ-20-B	Groundwater Quality		1	Quarterly	
	PZ-21-B	Groundwater Quality		1	Quarterly	
	PZ-22-B	Groundwater Quality		1	Quarterly	
Weather	**Raingauge**	Rain		1	Monthly	Hourly

Source: Test Cell Report, 2007

Table 8.6
Test Cell Piezometer Details
Geotechnical Data Report

RTC #1				RTC #2				STA's			
PZ	TOC ELV (FT)	Total Depth (FT)	Tip Elevation (NAVD 88)	PZ	TOC ELV (FT)	Total Depth (FT)	Tip Elevation (NAVD 88)	PZ	TOC ELV (FT)	Total Depth (FT)	Tip Elevation (NAVD 88)
10A	49.01	29.5	19.51	1A	49.74	27.17	22.57	19A	27.70	7.25	20.45
10B	49.05	40.65	8.40	1B	49.53	51.32	-1.79	19B	27.73	17.77	9.96
10C	49.11	75.48	-26.37	1C	49.66	80.58	-30.92	20A	28.92	7.28	21.64
10E	49.18	15.62	33.56	1E	50.01	16.80	33.21	20B	29.22	20.01	9.21
11A	49.67	30.22	19.45	2A	49.58	26.78	22.80	21A	27.96	9.38	18.58
11B	49.46	39.18	10.28	2B	49.56	46.00	3.56	21B	27.96	17.80	10.16
11C	49.38	80.16	-30.78	2C	49.52	78.07	-28.55	22A	27.35	6.78	20.57
11E	49.47	15.75	33.72	2E	50.07	17.05	33.02	22B	27.33	17.68	9.65
12A	27.89	8.8	19.09	3A	28.36	9.03	19.33				
12B	27.63	24.55	3.08	3B	28.27	29.52	-1.25				
12C	27.55	51.0	-23.45	3C	28.25	50.20	-21.95				
13A	28.00	5.05	22.95	4A	27.36	8.09	19.27				
13B	27.72	22.75	4.97	4B	27.29	26.37	0.92				
13C	27.59	59.02	-31.43	4C	27.86	50.62	-22.76				
14A	28.29	8.14	20.15	5A	28.15	8.65	19.50				
14B	27.78	22.78	5.00	5B	28.01	27.78	0.23				
14C	27.51	54.72	-27.21	5C	27.88	51.09	-23.21				
15A	27.63	8.51	19.12	6A	28.54	9.66	18.88				
15B	27.33	22.98	4.35	6B	28.32	27.56	0.76				
15C	27.19	55.55	-28.36	6C	28.33	51.10	-22.77				
16A	27.68	8.62	19.06	7A	28.68	5.67	23.01				
16B	27.73	20.16	7.57	7B	28.89	21.80	7.09				
16C	27.74	55.99	-28.25	7C	28.67	55.04	-26.37				
17A	25.12	7.89	17.23	8A	28.02	7.02	21.00				
17B	25.08	20.2	4.88	8B	27.98	23.90	4.08				
17C	24.80	55.8	-31.00	8C	27.99	60.48	-32.49				
18A	28.30	6.78	21.52	9A	28.67	5.88	22.79				
18B	28.47	56.22	-27.75	9B	28.82	21.73	7.09				
18C	28.41	20.4	8.01	9C	28.83	58.67	-29.84				
23A		7.12		24A	28.73	8.68	20.05				
23B	28.28	22.35	5.93	24B	28.57	21.59	6.98				
23C	27.97	55.21	-27.24	24C	28.67	54.01	-25.34				
25A	28.88	9.2	19.68								
25B	28.98	21.61	7.37								
25C	29.99	55.14	-25.15								
26A	28.54	8.2	20.34								
26B	28.89	21.12	7.77								
26C	29.15	55.94	-26.79								
27A	27.58	6.95	20.63								
27B	27.58	22.03	5.55								
27C	27.34	55.05	-27.71								

Table 8.7
Test Cell Operations Summary
Geotechnical Data Report

	Units	May-06	June-06	July-06	August-06	September-06	October-06	November-06	December-06	January-07	February-07	March-07	April-07	May-07	June-07	Averages over Test Period
Reservoir Test Cell 1 (RTC 1)																
Reservoir		(Filling)														
Total Inflows	Gallons	17,029,721	6,627,657	4,578,997	5,894,186	4,728,700	No data	3,303,933	4,696,825	8,712,472	4,023,145	7,179,925	1,046,784	0.00	0.00	5,320,739
Average Daily Inflows	GPD	-	220,922	147,710	190,135	152,539	No Data	165,197	151,510	290,416	143,684	239,331	34,893	0.00	0.00	182,764
Average Stage	Feet NAVD 88	-	40.11	40.17	40.28	40.32	40.33	40.28	40.36	40.63	42.04	42.00	41.20	37.50	36.07	40.70
Seepage Collection Canal 1																
Average Stage	Feet NAVD 88	-	20.15	21.43	20.70	21.10	20.85	19.85	14.69	18.56	19.28	19.51	19.23	19.02	20.04	19.62
Sump 1																
Total Pumped Flow	Gallons	-	0.00	0.00	0.00	0.00	610.00	1,526.00	305.00	0.00	0.00	306.00	0.00	0.00	0.00	271.22
Average Daily Outflows	GPD	-	0.00	0.00	0.00	0.00	19.68	50.87	9.84	0.00	0.00	9.87	0.00	0.00	0.00	8.93
Average Stage	Feet NAVD 88	-	22.15	22.48	22.70	22.97	23.50	23.70	23.90	23.91	23.90	21.74	21.10	21.16		22.77
Reservoir Test Cell 2 (RTC 2)																
Reservoir			(Filling)													
Total Inflows	Gallons		21,350,749	18,970,304	8,117,924	7,336,650	7,788,323	6,714,073	4,333,627	4,998,938	5,352,946	2,319,406	0.00	0.00	0.00	7,951,598
Average Daily Inflows	GPD		-	611,945	261,869	244,555	251,236	223,802	139,794	166,631	191,177	74,820	0.00	0.00	0.00	261,376
Average Stage	Feet NAVD 88		-	40.10	40.24	40.25	40.31	40.31	40.73	40.31	40.40	39.76	36.63	36.55	36.92	40.33
Seepage Collection Canal 2																
Average Stage	Feet NAVD 88		-	21.65	21.03	21.52	20.53	19.70	18.71	18.97	19.23	19.45	19.01	17.03	15.83	20.17
Sump Pump 2																
Total Pumped Flow	Gallons		0.00	0.00	0.00	0.00	6,104.00	6,103.00	6,104.00	0.00	0.00	0.00	0.00	0.00	0.00	2,289
Average Daily Outflows	GPD		0.00	0.00	0.00	0.00	197	197	197	0.00	0.00	0.00	0.00	0.00	0.00	73.83
out	Feet NAVD 88		22.31	22.50	22.69	22.88	23.27	23.34	23.34	23.62	23.67	23.52	23.14	23.26		23.13
STA Cell 1 (STA 1)			(Filling)													
Total Inflows	Gallons		7,338,481	2,208,930	6,630,451	4,892,694	6,354,982	5,933,226	3,018,188	0.00	0.00	0.00	0.00	0.00	0.00	4,839,745
Average Daily Inflows	GPD		524,177	88,357	221,015	163,089	204,999	191,394	107,792	0.00	0.00	0.00	0.00	0.00	0.00	122,081
Average Stage N	Feet NAVD 88		-	23.53	24.37	24.60	24.70	24.67	24.63	22.44	22.44	22.02	22.01	22.01	22.01	23.92
Average Stage S	Feet NAVD 88		-	23.49	24.32	24.55	24.70	24.65	24.58	22.48	22.48	22.00	22.00	21.96	21.96	23.91
STA Cell 2 (STA 2)			(Filling)													
Total Inflows	Gallons		19,252,906	8,397,850	12,349,244	No data	10,359,203	16,311,329	19,050,264	0.00	0.00	0.00	0.00	0.00	0.00	9,495,413
Average Daily Inflows	GPD		-	335,914	411,641	No Data	334,168	526,172	680,367	0.00	0.00	0.00	0.00	0.00	0.00	326,895
Average Stage W	Feet NAVD 88		-	24.93	25.53	25.66	25.66	25.66	25.30	21.94	21.94	21.97	22.00	22.00	22.00	24.58
Average Stage E	Feet NAVD 88		-	24.94	25.54	25.69	25.74	25.77	25.38	22.03	22.03	22.02	22.01	22.01	22.01	24.64

Notes:
For the month of July 2006, flow and stage data for STA1and STA2 was recorded from 7/6/06 to 7/31/06.
For month of September 2006, totalizer malfunction at STA2.
For month of October 2006, totalizer malfunction at RTC2.
Pumping to STAs discontinued on December 28, 2006.
Pumping to RTC2 Discontinued on March 14, 2007
Pumping to RTC1 Discontinued on April 4, 2007

Table 8.8
Test Cell Seepage Canal Drawdown Test Volume Pumped
Geotechnical Data Report

Day	Total Volume Pumped SCC1	Estimated to Troup Canal	Total	SCC1 Stage Start	SCC1 Stage End	Cumulative Total Volume	To RTC1	To RTC2	To STA2	To STA1		
27-Nov-06	1,710,987		1,710,987	20.3	19.3	1,710,987	593,528.00	201,546.00	397,025.00			
28-Nov-06	2,354,314		2,354,314	19.38	18.48	4,065,301	407,912.00	159,835.00	1,317,679.00			
29-Nov-06	2,375,801		2,375,801	18.48	17.3	6,441,102	149,380.00	495,311.00			2031616	Total to RTC1 in Nov prior to test
30-Nov-06	869,369	1,776,000	2,645,369	17.3	16.14	9,086,471	72,795.00	151,119.00			145,115	Daily avg
1-Dec-06	927,304	330,000	1,257,304	16.14	15.42	10,343,775	177,049.00	7,423.00				
2-Dec-06	1,108,824		1,108,824	15.42	16.28	11,452,599	113,460.00	0.00				
3-Dec-06	1,525,986		1,525,986	16.28	15.64	12,978,585	0.00	501,699.00				
4-Dec-06	1,024,335		1,024,335	15.64	16.09	14,002,920	180,058.00	54,530.00				
5-Dec-06	1,711,995	660,000	2,371,995	16.09	14.82	16,374,915	230,542.00	0.00				
6-Dec-06	1,514,449.00	1,255,500	2,769,949	14.82	14.64	19,144,864	152,531.00	325,385.00				
7-Dec-06	745,577		745,577	14.64	15.39	19,890,441	59,098.00	36,251.00				
8-Dec-06	1,112,630		1,112,630		15.43	21,003,071	252,141.00	0.00				
9-Dec-06	2,619,293		2,619,293	15.43	14.76	23,622,364	201,988.00	660,281.00				
10-Dec-06	1,300,830	312,000	1,612,830	14.76	14.63	25,235,194	0.00	255,920.00				
11-Dec-06	1,415,696		1,415,696	14.63	14.86	26,650,890	339,607.00	5.00				
12-Dec-06	1,361,351	465,000	1,826,351	14.86	14.78	28,477,241	0.00	64.00	1,041,578.00	319,709.00		
13-Dec-06	1,550,339		1,550,339	14.78	14.76	30,027,580	304,894.00	375,550.00	652,985.00	216,910.00		
14-Dec-06	787,077	891,000	1,678,077	14.76	14.64	31,705,657	0.00	31.00	660,615.00	126,431.00		
15-Dec-06	1,455,186		1,455,186	14.64	14.78	33,160,843	226,553.00	2.00	846,223.00	382,408.00		
16-Dec-06	1,389,718	912,000	2,301,718	14.78	14.63	35,462,561	0.00	337,505.00	913,438.00	138,775.00		
17-Dec-06	505,845	1,152,000	1,657,845	14.63	15.35	37,120,406	0.00	57.00	369,358.00	136,430.00		
18-Dec-06	2,684,892		2,684,892	15.35	14.56	39,805,298	446,023.00	604,276.00	1,190,637.00	443,956.00		
19-Dec-06	643,032		643,032	14.56	15.4	40,448,330	0.00	1,672.00	481,545.00	159,815.00		
20-Dec-06	1,896,088	891,000	2,787,088	15.4	14.44	43,235,418	349,557.00	46.00	1,104,859.00	441,626.00		
21-Dec-06	1,297,764	787,500	2,085,264	14.44	13.95	45,320,682	258,530.00	113,429.00	637,991.00	287,814.00		
22-Dec-06	937,878	2,777,700	3,715,578	13.95	13.95	49,036,260	170,495.00	598,090.00	130,974.00	38,319.00		
23-Dec-06	1,191,344	1,614,450	2,805,794	13.95	13.93	51,842,054	143,300.00	10.00	623,701.00	424,333.00		
24-Dec-06	1,578,882	1,848,000	3,426,882	13.93	12.6	55,268,936	101,425.00	3.00	1,133,605.00	343,849.00		
25-Dec-06	505,298	1,302,000	1,807,298	12.6	13.8	57,076,234	0.00	0.00	457,599.00	47,699.00		
26-Dec-06	587,517	1,755,000	2,342,517	13.8	12.8	59,418,751	130,095.00	38,816.00	293,191.00	125,415.00		
27-Dec-06	571,926	2,199,600	2,771,526	12.8	12.4	62,190,277	241,966.00	329,922.00	5.00	33.00		
28-Dec-06		2,520,000	2,520,000	12.4	12.4	64,710,277	189,482.00	5.00		256,440.00		
29-Dec-06		936,000	936,000	12.4	12.2	65,646,277						
Total	**29,366,906**	**7,753,500**	**37,120,406**				**3,461,536.00**	**4,240,972.00**	**10,538,304.00**			
Avg	**1,398,424**	**861,500**	**1,827,210**				**173,076.80**					

Note: pumps shut down evening of 12/7

9,871,188.00

Table 8.9
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

	MCL/GW Cleanup Target Level*	MDL	Date	UNITS	PZ-5B	PZ-5C	PZ-7B	PZ-7C	PZ-12B	PZ-12C	PZ-16B	PZ-16C	PZ-24B	PZ-24C	PZ-26B	PZ-26C	PZ-20B	PZ-21B	PZ-22B	*Min*	*Max*
Temperature	N/A		Jul-06	Deg. C									24.89	24.62			25.66	25.55		*24.62*	*25.66*
			Sep-06																		
			Dec-06																		
			Apr-07																		
Conductivity	N/A		Jul-06	umhos/cm									1131	1137			1705	1525		*1131*	*1705*
			Sep-06																		
			Dec-06																		
			Apr-07																		
pH	6.5-8.5		Jul-06	std. Units									7.56	6.81			7.15	6.93		*6.81*	*7.56*
			Sep-06																		
			Dec-06																		
			Apr-07																		
Dissolved Oxygen	N/A		Jul-06	mg/l									0.32	0.24			0.26	0.41		*0.24*	*0.41*
			Sep-06																		
			Dec-06																		
			Apr-07																		
Color			Jul-06	PCU	40	50	50	50	60	50	30	30	30	20	40	50	15	60			
			Sep-06		30	50			80		30	30			150	40					
			Dec-06		20	40	40	50	40	30	30	U	40	20	50	40	30	100	50		
			Apr-07				30	40					40	20			20	60	40		
Odor			Jul-06	T.O.N.	1.0	1.000	U	8.000	1.000	2.000	U	130.000	U	U	U	4.000	U	U			
			Sep-06			2.000			1.000	32.000	1.000	32.000				8.000					
			Dec-06		U		1.000	2.000	U	4.000	U	4.000	U	U	U	8.000	U	U	U		
			Apr-07				U	4.000					U	U			U	U	U		

Table 8.9 (Continued)
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

	MCL/GW Cleanup Target Level*	MDL	Date	UNITS	PZ-5B	PZ-5C	PZ-7B	PZ-7C	PZ-12B	PZ-12C	PZ-16B	PZ-16C	PZ-24B	PZ-24C	PZ-26B	PZ-26C	PZ-20B	PZ-21B	PZ-22B	*Min*	*Max*
Turbidity			Jul-06	NTU	4.5	13.000	2.000	19.000	22.000	44.000	5.400	64.000	22.00	34.000	17.000	16.000	5.900	7.400			
			Sep-06		26.0	14.000			43.000	1.400	3.000	0.190			5.900	5.900					
			Dec-06		1.3	2.100	4.800	8.800	U	U	U	U	17.00	12.000	0.660	18.000	4.000	2.600	1.600		
			Apr-07				4.800	5.100					17.00	9.400			5.300	20.000	8.300		
Nitrite-Nitrate			Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	U		*0*	*0*
			Sep-06		U	U			U	U	U	U			U	U					
			Dec-06		0.031	0.019	U	0.015	0.025	0.014	0.026	0.014	U	U	U	U	0.011	U	U		
			Apr-07				0.048	0.0094					0.029	0.13			0.042	0.11	0.041		
Total Nitrogen			Jul-06	mg/l	0.55	0.78	1.3	1.1	0.33	0.77	0.35	0.74	0.64	0.51	0.71	0.63	0.25	1.1		*0.25*	*1.3*
			Sep-06		0.47	0.83			0.39	0.77	0.88	1.1			0.62	0.66					
			Dec-06		0.57	0.81	1.4	1.4	0.68	0.89	0.86	0.86	0.59	0.69	0.67	0.86	0.59	1.5	0.72		
			Apr-07				1.4	1.3					0.56	0.39			0.89	1.6	1.2		
Ammonia			Jul-06	mg/l	0.450	0.440	1.000	0.540	0.25	0.26	0.25	0.40	0.58	0.48	0.66	0.42	0.36	0.36		*0.25*	*1*
			Sep-06		0.370	0.510			0.21	0.32	0.25	0.46			0.64	0.41					
			Dec-06		0.290	0.460	1.000	0.450	0.27	0.42	0.29	0.53	0.46	0.63	0.46	0.46	0.39	0.66	0.37		
			Apr-07				0.830	0.370					0.41	0.22			0.30	0.45	0.27		
TKN			Jul-06	mg/l	0.550	0.780	1.300	1.100	0.330	0.770	0.350	0.740	0.64	0.510	0.710	0.630	0.250	1.1		*0.25*	*1.3*
			Sep-06		0.470	0.830			0.390	0.770	0.880	1.100			0.620	0.660					
			Dec-06		0.540	0.790	1.400	1.400	0.650	0.880	0.830	0.850	0.59	0.690	0.670	0.860	0.580	1.5	0.720		
			Apr-07				1.400	1.300					0.53	0.260			0.850	1.5	1.200		
Phosphorus			Jul-06	mg/l	0.130	0.098	0.630	0.170	0.091	0.190	0.110	0.190	0.74	0.560	0.810	0.730	0.290	0.20		*0.091*	*0.81*
			Sep-06		0.120	0.099			0.048	0.120	0.089	0.190			0.370	0.350					
			Dec-06		0.061	0.760	0.410	0.130	0.043	0.100	0.068	0.130	0.38	0.560	0.340	0.470	0.120	0.09	0.049		
			Apr-07				0.440	0.120					0.46	0.200			0.087	0.16	0.075		
Phosphorus(dissolved)			Jul-06	mg/l	0.130	0.095	0.620	0.160	0.089	0.190	0.110	0.180	0.57				0.59	0.074		*0.074*	*0.62*
			Sep-06		0.083	0.083			0.040	0.110	0.062	0.160			0.310	0.240					

Table 8.9 (Continued)
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

	MCL/GW Cleanup Target Level*	MDL	Date	UNITS	PZ-5B	PZ-5C	PZ-7B	PZ-7C	PZ-12B	PZ-12C	PZ-16B	PZ-16C	PZ-24B	PZ-24C	PZ-26B	PZ-26C	PZ-20B	PZ-21B	PZ-22B	*Min*	*Max*
			Dec-06		0.054	0.069	0.460	0.100	0.032	0.100	0.061	0.120	0.06	0.076	0.240	0.290	0.04	0.046	0.033		
			Apr-07				0.380	0.088					0.33	0.220			0.04	0.025	0.033		
Soluble Reactive P			Jul-06	mg/l	0.090	0.094	0.540	0.150	0.013	0.170	0.086	0.180	0.38	0.32			0.045	0.036		*0.013*	*0.54*
			Sep-06		0.076	0.079			0.033	0.120	0.059	0.160			0.240	0.240					
			Dec-06		0.060	0.077	0.300	0.110	0.033	0.120	0.065	0.130	0.03	0.08	0.200	0.300	0.028	0.039	0.024		
			Apr-07				0.390	0.092					0.14	0.20			0.030	0.019	0.026		
Arsenic	0.015	0.00016	Jul-06	mg/l	U	U	U	U	U	U	U	U	0.0020	0.00180	U	U	0.0021	0.0079		*0.0018*	*0.0079*
			Sep-06		0.00074	0.00064			0.00220	0.00090	0.00130	0.00230			0.00180	0.00110					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	0.00300		
			Apr-07				U	U					U	U			U	U	U		
Barium	2	0.00014	Jul-06	mg/l	0.029	0.0110	0.081	0.013	0.030	0.025	0.052	0.018	0.066	0.059	0.067	0.038	0.043	0.083		*0.011*	*0.083*
			Sep-06		0.034	0.0280			0.026	0.063	0.055	0.023			0.091	0.027					
			Dec-06		U	0.0067	0.092	0.010	0.016	0.012	0.043	0.011	0.058	0.046	0.095	0.022	0.020	0.045	0.013		
			Apr-07				0.096	0.009					0.061	0.047			0.026	0.038	0.012		
Beryllium		0.00016	Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U.	U	U	U			
			Sep-06		U	U			U	U	U	U			U.	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U.	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Cadmium	0.005	0.000091	Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	U		*0*	*0*
			Sep-06		U	U			U	U	U	U			U	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Chromium	0.1	0.000038	Jul-06	mg/l	0.003	0.00041	0.002	0.00510	0.003	0.0058	0.0052	0.009	0.0039	U	U	U	U	U		*0.00041*	*0.0086*
			Sep-06		0.001	0.00110			0.00064	0.0014	0.0020	0.004			0.008	0.00180					
			Dec-06		U	U	U	U	U	0.0024	U	0.005	U	U	U	0.00220	U	U	U		
			Apr-07				U	U					U	U			U	U	U		

Table 8.9 (Continued)
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

	MCL/GW Cleanup Target Level*	MDL	Date	UNITS	PZ-5B	PZ-5C	PZ-7B	PZ-7C	PZ-12B	PZ-12C	PZ-16B	PZ-16C	PZ-24B	PZ-24C	PZ-26B	PZ-26C	PZ-20B	PZ-21B	PZ-22B	*Min*	*Max*
Copper		0.00020	Jul-06	mg/l	U	U	U	U	U	0.000	U	U	0.001	U	U	U	U	0.00082			
			Sep-06		U	0.001			U	U	0.00053				U	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	0.004	0.00140	U		
			Apr-07				U	U					U	U			U	U	U		
Cyanide	0.2		Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	U		*0*	*0*
			Sep-06		U	U			U	U	U	U			U	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	0.009	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Calcium		0.024	Jul-06	mg/l	64.000	45.000	49.000	47.000	85.000	69.000	87.000	71.000	310	130	78.000	94.000	170	260		*45*	*310*
			Sep-06		140.000	100.000			140.000	150.000	18.000	16.000			120.000	120.000					
			Dec-06		U	90.000	110.000	95.000	120.000	130.000	160.000	140.000	120	170	95.000	100.000	83	120	75.000		
			Apr-07				120.000	84.000					130	160			130	130	78.000		
Lead	0.015	0.00012	Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	U		*0*	*0*
			Sep-06		U	U			U	U	U	U			U	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Mercury	0.002		Jul-06	mg/l	U	U	U	U	U	U	U	U	U	0.000072	U	U	U	U		*0.000072*	*0.000072*
			Sep-06		U	U			U	U	U	U			U	U					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Nickel	0.1	0.00012	Jul-06	mg/l	0.0092	0.0044	0.0070	0.0063	0.0100	0.0074	0.0100	0.0077	0.024	0.0044	0.0061	0.0076	0.0032	0.0082		*0.0032*	*0.024*
			Sep-06		0.0061	0.0031			0.0033	0.0037	0.0032	0.0020			0.0029	0.0025					
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Silver		0.00007	Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	U			
			Sep-06		U	U			U	U	U	U			U	U					

Table 8.9 (Continued)
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

	MCL/GW Cleanup Target Level*	MDL	Date	UNITS	PZ-5B	PZ-5C	PZ-7B	PZ-7C	PZ-12B	PZ-12C	PZ-16B	PZ-16C	PZ-24B	PZ-24C	PZ-26B	PZ-26C	PZ-20B	PZ-21B	PZ-22B	*Min*	*Max*
			Dec-06		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		
			Apr-07				U	U					U	U			U	U	U		
Chloride	250	5.0	Jul-06	mg/l	85.00	120.00	130.00	110.00	82.00	230.00	82.00	530.00	55.00	84.00	49.00	360.00	84.00	69.00		*49*	*530*
			Sep-06		62.00	98.00			74.00	170.00	79.00	560.00			42.00	280.00					
			Dec-06		82.00	100.00	140.00	120.00	80.00	300.00	90.00	570.00	90.00	61.00	44.00	77.00	83.00	71.00	75.00		
			Apr-07				200.00	120.00					94.00	68.00			87.00	85.00	86.00		
Iron	0.3	0.012	Jul-06	mg/l	0.38	0.096	0.590	0.160	2.200	0.940	1.000	0.170	2.0	1.8	2.700	1.200	U	0.560		*0.096*	*2.7*
			Sep-06		0.26	0.12			0.054	0.430	0.320	0.140			0.370	0.280					
			Dec-06		U	U	0.570	0.180	1.300	U	0.340	U	2.1	1.2	4.200	0.400	0.260	1.400	0.510		
			Apr-07				0.830	U					4.3	1.1			U	0.880	0.500		
Sulfate	250	10.00	Jul-06	mg/l	160	120	110	27	170.0	44.0	170	220.0	270	170	42.0	210.0	150	100		*27*	*270*
			Sep-06		150	150			110.0	71.0	160	200.0			56.0	220.0					
			Dec-06		130	140	130	25	110.0	110.0	190	240.0	200	270	50.0	240.0	67	54	56		
			Apr-07				110	26					190	200			120	53	54		
Zinc	5	0.0035	Jul-06	mg/l	U	U	U	U	U	U	U	U	U	U	U	U	U	0.0037		*0.0037*	*0.0037*
			Sep-06		U	0.009			0.0013	0.008	U	U			U	U					
			Dec-06		U	0.004	U	U	U	U	U	U	U	U	0.005	U	0.009	0.0041	0.003		
			Apr-07				U	U					U	U			U	U	U		
Total Dissolved Solids	500	7.4	Jul-06	mg/l	720	790	620	750	750	980	770	2000	970	790	490	1400	710	980		*490*	*2000*
			Sep-06		520	900			1400	730	730	1900			650	610					
			Dec-06		620	760	750	730	560	1100	750	2000	760	960	510	1400	460	560	420		
			Apr-07				780	730					750	810			590	530	490		

Table 8.9 (Continued)
Groundwater Quality Monitoring Summary – Test Cells
Geotechnical Data Report

MCL= Maximum Contaminant Level for Drinking Water per 62-550 FAC

*Groundwater and Surface Water Cleanup Target Level per 62-777 FAC

**Surface Water Quality Standards per 62-302.530 F.A.C

*** Copper surface water std based on total hardness of 120 mg/l

Data Qualifiers

Q		
I		
V		
(1)		

Q=sample held outside the required holding time

I=Result between MDL and PQL

V=Present in blank

(1)=MS and/or MSD recoveries outside control limits. LCS and/or LCSD within limits. Data reported

Table 9.1
Soil-Cement Strength Testing
Geotechnical Data Report

Test Pit ID	Depth Interval (ft)	Sample Description	Fines Content (%)	Carbonate Content (%)	pH	Organic Content (%)	Cement Content		Compressive Strength (psi)					Wet-Dry Test Loss (%)
							(%)	(lb/cy)	3 day	7 day	14 day	28 day	56 day	
TP-354	1-4	Lt. Brown to brown clayey fine SAND with shell fragments	26.8	-	7.6	1.4	7	215	380	335	370	525	625	1.5
							9	277	340	370	485	510	690	1.3
							11	339	610	495	680	725	815	1.2
TP-356	1-4	Brown clayey fine SAND	22.8	12.0	7.6	2.1	5	151	230	315	315	300		6.4
							7	211	280	365	350	350		0
							9	272	355	460	455	490		0.5
TP-357	1-4	Light tan to brown clayey fine SAND with shell fragments	19.9	-	7.4	2.3	7	210	280	260	365	415	520	10.7
							9	270	300	435	475	480	675	1.7
							11	336	465	270	420	640	885	1.7
TP-358	6-7	Gray to dark gray clayey fine SAND with shell fragments	20.5	21.1	7.3	1.8	5	146	195	235	215	250		13.0
							7	204	290	375	360	420		4.6
							9	262	360	390	440	545		3.0
TP-355	10-11	Brown to dark brown clayey fine SAND with some roots	16.3	1.5	5.5	1.5	5	151	230	260	295	330		4.1
							7	211	225	260	390	545		2.3
							9	272	335	395	555	700		0.2

Table 9.1 (Continued)
Soil-Cement Strength Testing
Geotechnical Data Report

Test Pit ID	Depth Interval (ft)	Sample Description	Fines Content (%)	Carbonate Content (%)	pH	Organic Content (%)	Cement Content		Compressive Strength (psi)					Wet-Dry Test Loss (%)
							(%)	(lb/cy)	3 day	7 day	14 day	28 day	56 day	
TP-363	12-13	Brown slightly clayey fine SAND with shell fragments and clay nodules	11.4	1.5	7.3	0.7	5	153	230	255	250	365		5.6
							7	214	315	390	365	505		1.7
							9	275	435	540	525	655		0.9
TP-364	13-14	Brown to dark brown slightly clayey fine SAND with some aggregate	11.6	2.5	7.6	1.2	5	154	250	305	360	360		4.2
							7	215	340	430	435	460		1.8
							9	277	440	555	485	620		1.1

Table 9.2
Water Analysis Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Units	Chapter 62-777 Standards GW Criteria	Fresh Surface Water	Marine Water	Result
TP-491	Lead	ug/L	15	*	*	***140***
TP-491	Potassium	ug/L	NA	NA	NA	30000
TP-491	Selenium	ug/L	50	*	*	***240***
TP-491	Sodium	ug/L	160000	NA	NA	69000
TP-491	Zinc	ug/L	5000	*	*	100
TP-491	Nitrate as N	mg/L	10	NA	NA	0.075U
TP-491	Nitrite as N	mg/L	1	NA	NA	0.075U
TP-491	Nitrate Nitrite as N	mg/L	10	NA	NA	0.075U
TP-491	Chloride	mg/L	250	NA	*	89
TP-491	Sulfate	mg/L	250	NA	NA	160
TP-491	Acidity	mg/L	NA	NA	NA	12
TP-491	Alkalinity	mg/L	NA	NA	NA	1100
TP-491	Total Organic Carbon	mg/L	NA	NA	NA	6.1
TP-491	4,4'-DDE	ug/L	0.1	0.0002	0.0002	0.0076U
TP-491	4,4'-DDT	ug/L	0.1	*	*	0.0095U
TP-491	Heptachlor	ug/L	0.4	*	*	0.0069U
TP-491	Chlordane (technical)	ug/L	2	NA	NA	0.098U
TP-491	pH	SU	NA	NA	NA	7.51H
TP-491	Density	g/mL	NA	NA	NA	1.0124
TP-498	HEM (Oil & Grease)	mg/L	NA	NA	NA	1.3U
TP-498	Copper	ug/L	1000	*	*	24
TP-498	Iron	ug/L	300	1000	*	***20000***
TP-498	Lead	ug/L	15	*	*	***43***
TP-498	Potassium	ug/L	NA	NA	NA	3700
TP-498	Selenium	ug/L	50	*	*	***140***
TP-498	Sodium	ug/L	160000	NA	NA	41000
TP-498	Zinc	ug/L	5000	*	*	17J
TP-498	Nitrate as N	mg/L	10	NA	NA	0.075U
TP-498	Nitrite as N	mg/L	1	NA	NA	0.075U
TP-498	Nitrate Nitrite as N	mg/L	10	NA	NA	0.075U
TP-498	Chloride	mg/L	250	NA	*	44
TP-498	Sulfate	mg/L	250	NA	NA	67
TP-498	Acidity	mg/L	NA	NA	NA	11
TP-498	Alkalinity	mg/L	NA	NA	NA	320
TP-498	Total Organic Carbon	mg/L	NA	NA	NA	12
TP-498	4,4'-DDE	ug/L	0.1	0.0002	0.0002	0.0073U
TP-498	4,4'-DDT	ug/L	0.1	*	*	0.0092U
TP-498	Heptachlor	ug/L	0.4	*	*	0.0066U
TP-498	Chlordane (technical)	ug/L	2	NA	NA	0.094U
TP-498	pH	SU	NA	NA	NA	7.61H
TP-498	Density	g/mL	NA	NA	NA	0.9974
TP-498-D	HEM (Oil & Grease)	mg/L	NA	NA	NA	1.3U
TP-498-D	Copper	ug/L	1000	*	*	74
TP-498-D	Iron	ug/L	300	1000	*	***53000***
TP-498-D	Lead	ug/L	15	*	*	***100***
TP-498-D	Potassium	ug/L	NA	NA	NA	6900
TP-498-D	Selenium	ug/L	50	**	**	***350***

Table 9.2 (Continued)
Water Analysis Parameters
Geotechnical Data Report

			Chapter 62-777 Standards			
Client Sample ID	Analyte	Reporting Units	GW Criteria	Fresh Surface Water	Marine Water	Result
TP-498-D	Sodium	ug/L	160000	NA	NA	44000
TP-498-D	Zinc	ug/L	5000	*	*	44
TP-498-D	Nitrate as N	mg/L	10	NA	NA	0.075U
TP-498-D	Nitrite as N	mg/L	1	NA	NA	0.075U
TP-498-D	Nitrate Nitrite as N	mg/L	10	NA	NA	0.075U
TP-498-D	Chloride	mg/L	250	NA	*	44
TP-498-D	Sulfate	mg/L	250	NA	NA	68
TP-498-D	Acidity	mg/L	NA	NA	NA	11
TP-498-D	Alkalinity	mg/L	NA	NA	NA	410
TP-498-D	Total Organic Carbon	mg/L	NA	NA	NA	14
TP-498-D	4,4'-DDE	ug/L	0.1	0.0002	0.0002	0.0073U
TP-498-D	4,4'-DDT	ug/L	0.1	*	*	0.0092U
TP-498-D	Heptachlor	ug/L	0.4	*	*	0.0066U
TP-498-D	Chlordane (technical)	ug/L	2	NA	NA	0.095U
TP-498-D	pH	SU	NA	NA	NA	7.62H
TP-498-D	Density	g/mL	NA	NA	NA	0.9994
C44-Well	HEM (Oil & Grease)	mg/L	NA	NA	NA	1.3U
C44-Well	Copper	ug/L	1000	*	*	1.9
C44-Well	Iron	ug/L	300	1000	*	50
C44-Well	Lead	ug/L	15	*	*	4
C44-Well	Potassium	ug/L	NA	NA	NA	580
C44-Well	Selenium	ug/L	50	*	*	6.4
C44-Well	Zinc	ug/L	160000	NA	NA	8.7
C44-Well	Sodium	ug/L	5000	*	*	***230000***
C44-Well	Nitrate as N	mg/L	10	NA	NA	0.075U
C44-Well	Nitrite as N	mg/L	1	NA	NA	0.075U
C44-Well	Nitrate Nitrite as N	mg/L	10	NA	NA	0.075U
C44-Well	Chloride	mg/L	250	NA	*	70
C44-Well	Sulfate	mg/L	250	NA	NA	7.9
C44-Well	Acidity	mg/L	NA	NA	NA	10U
C44-Well	Alkalinity	mg/L	NA	NA	NA	310
C44-Well	Total Organic Carbon	mg/L	NA	NA	NA	3.5
C44-Well	4,4'-DDE	ug/L	0.1	0.0002	0.0002	0.0076U
C44-Well	4,4'-DDT	ug/L	0.1	*	*	0.0096U
C44-Well	Heptachlor	ug/L	0.4	*	*	0.0069U
C44-Well	Chlordane (technical)	ug/L	2	NA	NA	0.099U
C44-Well	pH	SU	NA	NA	NA	7.54H
C44-Well	Density	g/mL	NA	NA	NA	0.9953
Indiantown	HEM (Oil & Grease)	mg/L	NA	NA	NA	1.3
Indiantown	Copper	ug/L	1000	*	*	***1200***
Indiantown	Iron	ug/L	300	1000	*	250
Indiantown	Lead	ug/L	15	*	*	5.9
Indiantown	Potassium	ug/L	NA	NA	NA	1900
Indiantown	Selenium	ug/L	50	*	*	6.4
Indiantown	Sodium	ug/L	160000	NA	NA	15000

Table 9.2 (Continued)
Water Analysis Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Units	Chapter 62-777 Standards			Result
			GW Criteria	Fresh Surface Water	Marine Water	
Indiantown	Zinc	ug/L	5000	*	*	34
Indiantown	Nitrate as N	mg/L	10	NA	NA	0.63
Indiantown	Nitrite as N	mg/L	1	NA	NA	0.075U
Indiantown	Nitrate Nitrite as N	mg/L	10	NA	NA	0.63
Indiantown	Chloride	mg/L	250	NA	*	28
Indiantown	Sulfate	mg/L	250	NA	NA	2.8J
Indiantown	Acidity	mg/L	NA	NA	NA	10U
Indiantown	Alkalinity	mg/L	NA	NA	NA	240
Indiantown	Total Organic Carbon	mg/L	NA	NA	NA	7.7
Indiantown	4,4'-DDE	ug/L	0.1	0.0002	0.0002	0.0074U
Indiantown	4,4'-DDT	ug/L	0.1	*	*	0.0093U
Indiantown	Heptachlor	ug/L	0.4	*	*	0.0067U
Indiantown	Chlordane (technical)	ug/L	2	NA	NA	0.096U
Indiantown	pH	SU	NA	NA	NA	7.87
Indiantown	Density	g/mL	NA	NA	NA	1.0025

Source: AMEC Report, 2013

Notes: g/ml – grams per milliliter
mg/l – milligrams per liter
su – standard unit
ug/l – micrograms per liter
H – sample was prepped or analyzed beyond the specified holding time
J – result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
U – indicates the analyte was analyzed for but not detected
* As Provided in Chapter 62-3032, Florida Administrative Code
Bold and italicized **–** exceeds Soil Cleanup Standards in Chapter 62-777, Florida Administrative Code

Table 9.3
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil		Result	SQAG*
			Residential	Commerical Industrial		TEC
TP-475	Chloride	mg/Kg	NA	NA	260	NA
TP-475	Nitrate Nitrite as N	mg/Kg	NA	NA	0.63U	NA
TP-475	Nitrite as N	mg/Kg	8700	220000	0.23U	NA
TP-475	Nitrate as N	mg/Kg	140000	**	0.63U	NA
TP-475	Sulfate	mg/Kg	NA	NA	36U	NA
TP-475	Copper	mg/Kg	150	89000	1.3U	32
TP-475	Iron	mg/Kg	53000	**	380	NA
TP-475	Lead	mg/Kg	400	1400	0.62J	36
TP-475	Magnesium	mg/Kg	NA	NA	130	NA
TP-475	Potassium	mg/Kg	NA	NA	38J	NA
TP-475	Selenium	mg/Kg	440	11000	1.2U	NA
TP-475	Sodium	mg/Kg	NA	NA	2100	NA
TP-475	Zinc	mg/Kg	26000	630000	1.4U	120
TP-475	Calcium	mg/Kg	NA	NA	200000	NA
TP-475	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-475	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-475	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-475	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-475	pH	SU	NA	NA	8.84	NA
TP-475	Total Organic Carbon	mg/Kg	NA	NA	15000	NA
TP-475	Percent Moisture	%			15	NA
TP-475-D	Chloride	mg/Kg	NA	NA	250	NA
TP-475-D	Nitrate Nitrite as N	mg/Kg	NA	NA	0.63U	NA
TP-475-D	Nitrite as N	mg/Kg	8700	220000	0.23U	NA
TP-475-D	Nitrate as N	mg/Kg	140000	**	0.63U	NA
TP-475-D	Sulfate	mg/Kg	NA	NA	38J	NA
TP-475-D	Copper	mg/Kg	150	89000	1.3U	32
TP-475-D	Iron	mg/Kg	53000	**	390	NA
TP-475-D	Lead	mg/Kg	400	1400	0.82J	36
TP-475-D	Magnesium	mg/Kg	NA	NA	140	NA
TP-475-D	Potassium	mg/Kg	NA	NA	40J	NA
TP-475-D	Selenium	mg/Kg	440	11000	1.1U	NA
TP-475-D	Sodium	mg/Kg	NA	NA	2500	NA
TP-475-D	Zinc	mg/Kg	26000	630000	1.4U	120
TP-475-D	Calcium	mg/Kg	26000	630000	230000	NA
TP-475-D	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-475-D	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-475-D	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-475-D	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-475-D	pH	SU	NA	NA	9.02	NA
TP-475-D	Total Organic Carbon	mg/Kg	NA	NA	12000	NA
TP-475-D	Percent Moisture	%	NA	NA	13	NA
TP-476	Chloride	mg/Kg	NA	NA	260	NA
TP-476	Nitrate Nitrite as N	mg/Kg	NA	NA	0.64U	NA
TP-476	Nitrite as N	mg/Kg	8700	220000	0.23U	NA
TP-476	Nitrate as N	mg/Kg	140000	**	0.64U	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

			62-777 Table 2 Soil			SQAG*
Client Sample ID	Analyte	Reporting Unit	Residential	Commerical Industrial	Result	TEC
TP-476	Sulfate	mg/Kg	NA	NA	130	NA
TP-476	Copper	mg/Kg	150	89000	1.2U	32
TP-476	Iron	mg/Kg	53000	*	510	NA
TP-476	Lead	mg/Kg	400	1400	0.89J	36
TP-476	Magnesium	mg/Kg	NA	NA	200	NA
TP-476	Potassium	mg/Kg	NA	NA	58J	NA
TP-476	Selenium	mg/Kg	NA	NA	1.1U	NA
TP-476	Sodium	mg/Kg	440	11000	1800	NA
TP-476	Zinc	mg/Kg	26000	630000	1.3U	120
TP-476	Calcium	mg/Kg	NA	NA	180000	NA
TP-476	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-476	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-476	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-476	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-476	pH	SU	NA	NA	8.72	NA
TP-476	Total Organic Carbon	mg/Kg	NA	NA	19000	NA
TP-476	Percent Moisture	%	NA	NA	13	NA
TP-477	Chloride	mg/Kg	NA	NA	290	NA
TP-477	Nitrate Nitrite as N	mg/Kg	NA	NA	0.71U	NA
TP-477	Nitrite as N	mg/Kg	8700	220000	0.26U	NA
TP-477	Nitrate as N	mg/Kg	140000	**	0.71U	NA
TP-477	Sulfate	mg/Kg	NA	NA	39U	NA
TP-477	Calcium	mg/Kg	NA	NA	330000	32
TP-477	Copper	mg/Kg	150	89000	1.4U	NA
TP-477	Iron	mg/Kg	53000	*	2100	36
TP-477	Lead	mg/Kg	400	1400	1.2	NA
TP-477	Magnesium	mg/Kg	NA	NA	220	NA
TP-477	Potassium	mg/Kg	NA	NA	79J	NA
TP-477	Selenium	mg/Kg	440	11000	1.2U	NA
TP-477	Sodium	mg/Kg	NA	NA	3800	120
TP-477	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-477	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-477	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-477	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-477	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-477	pH	SU	NA	NA	8.54	NA
TP-477	Total Organic Carbon	mg/Kg	NA	NA	28000	NA
TP-477	Percent Moisture	%	NA	NA	23	NA
TP-478	Chloride	mg/Kg	NA	NA	300	NA
TP-478	Nitrate Nitrite as N	mg/Kg	NA	NA	0.68U	NA
TP-478	Nitrite as N	mg/Kg	8700	220000	0.25U	NA
TP-478	Nitrate as N	mg/Kg	140000	**	0.68U	NA
TP-478	Sulfate	mg/Kg	NA	NA	110J	NA
TP-478	Calcium	mg/Kg	NA	NA	200000	32
TP-478	Copper	mg/Kg	150	89000	1.4U	NA
TP-478	Iron	mg/Kg	53000	*	570	36

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil		Result	SQAG*
			Residential	Commerical Industrial		TEC
TP-478	Lead	mg/Kg	400	1400	0.72J	NA
TP-478	Magnesium	mg/Kg	NA	NA	130	NA
TP-478	Potassium	mg/Kg	NA	NA	52J	NA
TP-478	Selenium	mg/Kg	440	11000	4.6	NA
TP-478	Sodium	mg/Kg	NA	NA	2100	120
TP-478	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-478	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-478	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-478	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-478	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-478	pH	SU	NA	NA	8.29	NA
TP-478	Total Organic Carbon	mg/Kg	NA	NA	26000	NA
TP-478	Percent Moisture	%	NA	NA	19	NA
TP-479	Chloride	mg/Kg	NA	NA	320	NA
TP-479	Nitrate Nitrite as N	mg/Kg	NA	NA	0.66	NA
TP-479	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-479	Nitrate as N	mg/Kg	140000	**	0.66U	NA
TP-479	Sulfate	mg/Kg	NA	NA	150U	NA
TP-479	Calcium	mg/Kg	NA	NA	130000	32
TP-479	Copper	mg/Kg	150	89000	1.3U	NA
TP-479	Iron	mg/Kg	53000	*	620	36
TP-479	Lead	mg/Kg	400	1400	0.95J	NA
TP-479	Magnesium	mg/Kg	NA	NA	250	NA
TP-479	Potassium	mg/Kg	NA	NA	68J	NA
TP-479	Selenium	mg/Kg	440	11000	1.3J	NA
TP-479	Sodium	mg/Kg	NA	NA	1300	120
TP-479	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-479	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-479	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-479	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-479	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-479	pH	SU	NA	NA	8.16	NA
TP-479	Total Organic Carbon	mg/Kg	NA	NA	13000	NA
TP-479	Percent Moisture	%	NA	NA	18	NA
TP-480	Chloride	mg/Kg	NA	NA	330	NA
TP-480	Nitrate Nitrite as N	mg/Kg	NA	NA	0.67U	NA
TP-480	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-480	Nitrate as N	mg/Kg	140000	**	0.67U	NA
TP-480	Sulfate	mg/Kg	NA	NA	49J	NA
TP-480	Calcium	mg/Kg	NA	NA	14000	32
TP-480	Copper	mg/Kg	150	89000	1.3U	NA
TP-480	Iron	mg/Kg	53000	*	630	36
TP-480	Lead	mg/Kg	400	1400	1.1J	NA
TP-480	Magnesium	mg/Kg	NA	NA	140	NA
TP-480	Potassium	mg/Kg	NA	NA	48J	NA
TP-480	Selenium	mg/Kg	440	11000	1.2U	NA
TP-480	Sodium	mg/Kg	NA	NA	150J	120

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-480	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-480	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-480	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-480	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-480	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-480	pH	SU	NA	NA	7.57	NA
TP-480	Total Organic Carbon	mg/Kg	NA	NA	420U	NA
TP-480	Percent Moisture	%			18	NA
TP-481	Chloride	mg/Kg	NA	NA	380	NA
TP-481	Nitrate Nitrite as N	mg/Kg	NA	NA	0.69U	NA
TP-481	Nitrite as N	mg/Kg	8700	220000	0.25U	NA
TP-481	Nitrate as N	mg/Kg	140000	**	0.69U	NA
TP-481	Sulfate	mg/Kg	NA	NA	84J	NA
TP-481	Calcium	mg/Kg	NA	NA	130000	32
TP-481	Copper	mg/Kg	150	89000	1.4U	NA
TP-481	Iron	mg/Kg	53000	*	2100	36
TP-481	Lead	mg/Kg	400	1400	1.3	NA
TP-481	Magnesium	mg/Kg	NA	NA	410	NA
TP-481	Potassium	mg/Kg	NA	NA	120	NA
TP-481	Selenium	mg/Kg	440	11000	1.8J	NA
TP-481	Sodium	mg/Kg	NA	NA	1300	120
TP-481	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-481	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-481	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-481	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-481	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-481	pH	SU	NA	NA	8.22	NA
TP-481	Total Organic Carbon	mg/Kg	NA	NA	5000	NA
TP-481	Percent Moisture	%			20	NA
TP-482	Chloride	mg/Kg	NA	NA	240	NA
TP-482	Nitrate Nitrite as N	mg/Kg	NA	NA	0.64U	NA
TP-482	Nitrite as N	mg/Kg	8700	220000	0.23U	NA
TP-482	Nitrate as N	mg/Kg	140000	**	0.64U	NA
TP-482	Sulfate	mg/Kg	NA	NA	120	NA
TP-482	Calcium	mg/Kg	NA	NA	180000	32
TP-482	Copper	mg/Kg	150	89000	1.3U	NA
TP-482	Iron	mg/Kg	53000	*	290	36
TP-482	Lead	mg/Kg	400	1400	0.67J	NA
TP-482	Magnesium	mg/Kg	NA	NA	190	NA
TP-482	Potassium	mg/Kg	NA	NA	37J	NA
TP-482	Selenium	mg/Kg	440	11000	1.1U	NA
TP-482	Sodium	mg/Kg	NA	NA	2000	120
TP-482	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-482	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-482	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-482	Heptachlor	mg/L	NA	NA	0.0025	0.0025

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-482	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-482	pH	SU	NA	NA	8.84	NA
TP-482	Total Organic Carbon	mg/Kg	NA	NA	19000	NA
TP-482	Percent Moisture	%			15	NA
TP-483	Chloride	mg/Kg	NA	NA	260	NA
TP-483	Nitrate Nitrite as N	mg/Kg	NA	NA	0.71U	NA
TP-483	Nitrite as N	mg/Kg	8700	220000	0.26U	NA
TP-483	Nitrate as N	mg/Kg	140000	**	0.71U	NA
TP-483	Sulfate	mg/Kg	NA	NA	120	NA
TP-483	Calcium	mg/Kg	NA	NA	170000	32
TP-483	Copper	mg/Kg	150	89000	1.4U	NA
TP-483	Iron	mg/Kg	53000	*	360	36
TP-483	Lead	mg/Kg	400	1400	0.69J	NA
TP-483	Magnesium	mg/Kg	NA	NA	140	NA
TP-483	Potassium	mg/Kg	NA	NA	44J	NA
TP-483	Selenium	mg/Kg	440	11000	1.3J	NA
TP-483	Sodium	mg/Kg	NA	NA	1900	120
TP-483	Zinc	mg/Kg	26000	630000	1.5J	NA
TP-483	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-483	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-483	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-483	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-483	pH	SU	NA	NA	8.84	NA
TP-483	Total Organic Carbon	mg/Kg	NA	NA	33000	NA
TP-483	Percent Moisture	%	NA	NA	22	NA
TP-484A	Chloride	mg/Kg	NA	NA	290	NA
TP-484A	Nitrate Nitrite as N	mg/Kg	NA	NA	0.67U	NA
TP-484A	Nitrite as N	mg/Kg	8700	220000	2.6	NA
TP-484A	Nitrate as N	mg/Kg	140000	**	0.67U	NA
TP-484A	Sulfate	mg/Kg	NA	NA	190	NA
TP-484A	Calcium	mg/Kg	NA	NA	1100	32
TP-484A	Copper	mg/Kg	150	89000	1.3U	NA
TP-484A	Iron	mg/Kg	53000	*	740	36
TP-484A	Lead	mg/Kg	400	1400	2.3	NA
TP-484A	Magnesium	mg/Kg	NA	NA	120J	NA
TP-484A	Potassium	mg/Kg	NA	NA	58J	NA
TP-484A	Selenium	mg/Kg	440	11000	2.4J	NA
TP-484A	Sodium	mg/Kg	NA	NA	98	120
TP-484A	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-484A	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-484A	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-484A	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-484A	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-484A	pH	SU	NA	NA	7.79	NA
TP-484A	Total Organic Carbon	mg/Kg	NA	NA	610	NA
TP-484A	Percent Moisture	%	NA	NA	18	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-485A	Chloride	mg/Kg	NA	NA	320	NA
TP-485A	Nitrate Nitrite as N	mg/Kg	NA	NA	0.69U	NA
TP-485A	Nitrite as N	mg/Kg	8700	220000	0.25U	NA
TP-485A	Nitrate as N	mg/Kg	140000	**	0.69U	NA
TP-485A	Sulfate	mg/Kg	NA	NA	330U	NA
TP-485A	Calcium	mg/Kg	NA	NA	170000	32
TP-485A	Copper	mg/Kg	150	89000	1.3	NA
TP-485A	Iron	mg/Kg	53000	*	700	36
TP-485A	Lead	mg/Kg	400	1400	0.95J	NA
TP-485A	Magnesium	mg/Kg	NA	NA	300	NA
TP-485A	Potassium	mg/Kg	NA	NA	69J	NA
TP-485A	Selenium	mg/Kg	440	11000	1.6	NA
TP-485A	Sodium	mg/Kg	NA	NA	1800	120
TP-485A	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-485A	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-485A	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-485A	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-485A	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-485A	pH	SU	NA	NA	8.31	NA
TP-485A	Total Organic Carbon	mg/Kg	NA	NA	27000	NA
TP-485A	Percent Moisture	%	NA	NA	22	NA
TP-486	Chloride	mg/Kg	NA	NA	290	NA
TP-486	Nitrate Nitrite as N	mg/Kg	NA	NA	0.67U	NA
TP-486	Nitrite as N	mg/Kg	8700	220000	0.26U	NA
TP-486	Nitrate as N	mg/Kg	140000	**	0.67U	NA
TP-486	Sulfate	mg/Kg	NA	NA	38U	NA
TP-486	Calcium	mg/Kg	NA	NA	160000	32
TP-486	Copper	mg/Kg	150	89000	1.3U	NA
TP-486	Iron	mg/Kg	53000	*	450	36
TP-486	Lead	mg/Kg	400	1400	0.91J	NA
TP-486	Magnesium	mg/Kg	NA	NA	210	NA
TP-486	Potassium	mg/Kg	NA	NA	52J	NA
TP-486	Selenium	mg/Kg	440	11000	1.2U	NA
TP-486	Sodium	mg/Kg	NA	NA	1600	120
TP-486	Zinc	mg/Kg	26000	630000	1.4	NA
TP-486	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-486	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-486	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-486	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-486	pH	SU	NA	NA	8.66	NA
TP-486	Total Organic Carbon	mg/Kg	NA	NA	25000	NA
TP-486	Percent Moisture	%	NA	NA	18	NA
TP-487	Chloride	mg/Kg	NA	NA	310	NA
TP-487	Nitrate Nitrite as N	mg/Kg	NA	NA	0.74	NA
TP-487	Nitrite as N	mg/Kg	8700	220000	0.27	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-487	Nitrate as N	mg/Kg	140000	**	0.74	NA
TP-487	Sulfate	mg/Kg	NA	NA	48	NA
TP-487	Calcium	mg/Kg	NA	NA	230000	32
TP-487	Copper	mg/Kg	150	89000	1.4	NA
TP-487	Iron	mg/Kg	53000	*	360	36
TP-487	Lead	mg/Kg	400	1400	0.82	NA
TP-487	Magnesium	mg/Kg	NA	NA	130	NA
TP-487	Potassium	mg/Kg	NA	NA	60	NA
TP-487	Selenium	mg/Kg	440	11000	1.3	NA
TP-487	Sodium	mg/Kg	NA	NA	2600	120
TP-487	Zinc	mg/Kg	26000	630000	1.6	NA
TP-487	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-487	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-487	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-487	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-487	pH	SU	NA	NA	8.55	NA
TP-487	Total Organic Carbon	mg/Kg	NA	NA	21000	NA
TP-487	Percent Moisture	%	NA	NA	25	NA
TP-488	Chloride	mg/Kg	NA	NA	290	NA
TP-488	Nitrate Nitrite as N	mg/Kg	NA	NA	0.67U	NA
TP-488	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-488	Nitrate as N	mg/Kg	140000	**	0.67U	NA
TP-488	Sulfate	mg/Kg	NA	NA	130	NA
TP-488	Calcium	mg/Kg	NA	NA	140000	32
TP-488	Copper	mg/Kg	150	89000	1.3U	NA
TP-488	Iron	mg/Kg	53000	*	540	36
TP-488	Lead	mg/Kg	400	1400	0.91J	NA
TP-488	Magnesium	mg/Kg	NA	NA	190	NA
TP-488	Potassium	mg/Kg	NA	NA	58J	NA
TP-488	Selenium	mg/Kg	440	11000	1.2U	NA
TP-488	Sodium	mg/Kg	NA	NA	1500	120
TP-488	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-488	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-488	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-488	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-488	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-488	pH	SU	NA	NA	8.56	NA
TP-488	Total Organic Carbon	mg/Kg	NA	NA	17000	NA
TP-488	Percent Moisture	%	NA	NA	18	NA
TP-489	Chloride	mg/Kg	NA	NA	380	NA
TP-489	Nitrate Nitrite as N	mg/Kg	NA	NA	0.65U	NA
TP-489	Nitrite as N	mg/Kg	8700	220000	1J	NA
TP-489	Nitrate as N	mg/Kg	140000	**	0.65U	NA
TP-489	Sulfate	mg/Kg	NA	NA	140	NA
TP-489	Calcium	mg/Kg	NA	NA	73000	32
TP-489	Copper	mg/Kg	150	89000	1.3U	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-489	Iron	mg/Kg	53000	**	2100	36
TP-489	Lead	mg/Kg	400	1400	1.3	NA
TP-489	Magnesium	mg/Kg	NA	NA	230	NA
TP-489	Potassium	mg/Kg	NA	NA	98J	NA
TP-489	Selenium	mg/Kg	440	11000	1.2J	NA
TP-489	Sodium	mg/Kg	NA	NA	720	120
TP-489	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-489	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-489	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-489	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-489	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-489	pH	SU	NA	NA	7.95	NA
TP-489	Total Organic Carbon	mg/Kg	NA	NA	13000	NA
TP-489	Percent Moisture	%	NA	NA	16	NA
TP-490	Chloride	mg/Kg	NA	NA	28	NA
TP-490	Nitrate Nitrite as N	mg/Kg	NA	NA	0.63U	NA
TP-490	Nitrite as N	mg/Kg	8700	220000	0.29J	NA
TP-490	Nitrate as N	mg/Kg	140000	**	0.63U	NA
TP-490	Sulfate	mg/Kg	NA	NA	35U	NA
TP-490	Calcium	mg/Kg	NA	NA	93000	32
TP-490	Copper	mg/Kg	150	89000	1.3U	NA
TP-490	Iron	mg/Kg	53000	**	610	36
TP-490	Lead	mg/Kg	400	1400	0.8J	NA
TP-490	Magnesium	mg/Kg	NA	NA	250	NA
TP-490	Potassium	mg/Kg	NA	NA	49J	NA
TP-490	Selenium	mg/Kg	440	11000	1.1U	NA
TP-490	Sodium	mg/Kg	NA	NA	820	120
TP-490	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-490	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-490	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-490	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-490	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-490	pH	SU	NA	NA	8.97	NA
TP-490	Total Organic Carbon	mg/Kg	NA	NA	12000	NA
TP-490	Percent Moisture	%	NA	NA	12	NA
TP-490	Percent Solids	%	NA	NA	88	NA
TP-491	Chloride	mg/Kg	NA	NA	270	NA
TP-491	Nitrate Nitrite as N	mg/Kg	NA	NA	0.66U	NA
TP-491	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-491	Nitrate as N	mg/Kg	140000	**	0.66U	NA
TP-491	Sulfate	mg/Kg	NA	NA	36U	NA
TP-491	Calcium	mg/Kg	NA	NA	56000	32
TP-491	Copper	mg/Kg	150	89000	1.3U	NA
TP-491	Iron	mg/Kg	53000	*	1500	36
TP-491	Lead	mg/Kg	400	1400	1.7	NA
TP-491	Magnesium	mg/Kg	NA	NA	610	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-491	Potassium	mg/Kg	NA	NA	230	NA
TP-491	Selenium	mg/Kg	440	11000	4.3	NA
TP-491	Sodium	mg/Kg	NA	NA	380	120
TP-491	Zinc	mg/Kg	26000	630000	1.9U	NA
TP-491	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-491	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-491	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-491	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-491	pH	SU	NA	NA	8.67	NA
TP-491	Total Organic Carbon	mg/Kg	NA	NA	1800	NA
TP-491	Percent Moisture	%	NA	NA	17	NA
TP-492	Chloride	mg/Kg	NA	NA	430	NA
TP-492	Nitrate Nitrite as N	mg/Kg	NA	NA	0.67U	NA
TP-492	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-492	Nitrate as N	mg/Kg	140000	**	0.67U	NA
TP-492	Sulfate	mg/Kg	NA	NA	290	NA
TP-492	Calcium	mg/Kg	NA	NA	24000	32
TP-492	Copper	mg/Kg	150	89000	1.4U	NA
TP-492	Iron	mg/Kg	53000	**	2500	36
TP-492	Lead	mg/Kg	400	1400	1.7	NA
TP-492	Magnesium	mg/Kg	NA	NA	440	NA
TP-492	Potassium	mg/Kg	NA	NA	230	NA
TP-492	Selenium	mg/Kg	440	11000	1.2U	NA
TP-492	Sodium	mg/Kg	NA	NA	200J	120
TP-492	Zinc	mg/Kg	26000	630000	2.3J	NA
TP-492	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-492	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-492	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-492	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-492	pH	SU	NA	NA	8.21	NA
TP-492	Total Organic Carbon	mg/Kg	NA	NA	540	NA
TP-492	Percent Moisture	%	NA	NA	19	NA
TP-494	Chloride	mg/Kg	NA	NA	35	NA
TP-494	Nitrate Nitrite as N	mg/Kg	NA	NA	0.65U	NA
TP-494	Nitrite as N	mg/Kg	8700	220000	0.4J	NA
TP-494	Nitrate as N	mg/Kg	140000	**	0.65U	NA
TP-494	Sulfate	mg/Kg	NA	NA	36U	NA
TP-494	Calcium	mg/Kg	NA	NA	250000	32
TP-494	Copper	mg/Kg	150	89000	1.2U	NA
TP-494	Iron	mg/Kg	53000	*	450	36
TP-494	Lead	mg/Kg	400	1400	0.71J	NA
TP-494	Magnesium	mg/Kg	NA	NA	200	NA
TP-494	Potassium	mg/Kg	NA	NA	74J	NA
TP-494	Selenium	mg/Kg	440	11000	1.1U	NA
TP-494	Sodium	mg/Kg	NA	NA	2600	120
TP-494	Zinc	mg/Kg	26000	630000	1.3U	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-494	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-494	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-494	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-494	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-494	pH	SU	NA	NA	8.61	NA
TP-494	Total Organic Carbon	mg/Kg	NA	NA	26000	NA
TP-494	Percent Moisture	%	NA	NA	15	NA
TP-494D	Chloride	mg/Kg	NA	NA	38	NA
TP-494D	Nitrate Nitrite as N	mg/Kg	NA	NA	0.65U	NA
TP-494D	Nitrite as N	mg/Kg	8700	220000	0.4J	NA
TP-494D	Nitrate as N	mg/Kg	140000	**	0.65U	NA
TP-494D	Sulfate	mg/Kg	NA	NA	34U	NA
TP-494D	Calcium	mg/Kg	NA	NA	190000	32
TP-494D	Copper	mg/Kg	150	89000	1.3U	NA
TP-494D	Iron	mg/Kg	53000	*	530	36
TP-494D	Lead	mg/Kg	400	1400	0.89J	NA
TP-494D	Magnesium	mg/Kg	NA	NA	320	NA
TP-494D	Potassium	mg/Kg	NA	NA	83J	NA
TP-494D	Selenium	mg/Kg	440	11000	1.2J	NA
TP-494D	Sodium	mg/Kg	NA	NA	1900	120
TP-494D	Zinc	mg/Kg	26000	630000	1.4U	NA
TP-494D	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-494D	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-494D	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-494D	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-494D	pH	SU	NA	NA	8.60	NA
TP-494D	Total Organic Carbon	mg/Kg	NA	NA	39000	NA
TP-494D	Percent Moisture	%	NA	NA	15	NA
TP-495	Chloride	mg/Kg	NA	NA	24	NA
TP-495	Nitrate Nitrite as N	mg/Kg	NA	NA	0.62	NA
TP-495	Nitrite as N	mg/Kg	8700	220000	0.23U	NA
TP-495	Nitrate as N	mg/Kg	140000	**	0.62U	NA
TP-495	Sulfate	mg/Kg	NA	NA	35U	NA
TP-495	Calcium	mg/Kg	NA	NA	180000	32
TP-495	Copper	mg/Kg	150	89000	1.2U	NA
TP-495	Iron	mg/Kg	53000	*	560	36
TP-495	Lead	mg/Kg	400	1400	0.89J	NA
TP-495	Magnesium	mg/Kg	NA	NA	420	NA
TP-495	Potassium	mg/Kg	NA	NA	71J	NA
TP-495	Selenium	mg/Kg	440	11000	1.1U	NA
TP-495	Sodium	mg/Kg	NA	NA	1600	120
TP-495	Zinc	mg/Kg	26000	630000	1.3U	NA
TP-495	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-495	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-495	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-495	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-495	pH	SU	NA	NA	9.05	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-495	Total Organic Carbon	mg/Kg	NA	NA	34000	NA
TP-495	Percent Moisture	%	NA	NA	13	NA
TP-497	Chloride	mg/Kg	NA	NA	280	NA
TP-497	Nitrate Nitrite as N	mg/Kg	NA	NA	0.88J	NA
TP-497	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-497	Nitrate as N	mg/Kg	140000	**	0.69J ^	NA
TP-497	Sulfate	mg/Kg	NA	NA	150	NA
TP-497	Copper	mg/Kg	NA	NA	1.3U	32
TP-497	Iron	mg/Kg	150	89000	1500	NA
TP-497	Lead	mg/Kg	53000	**	2.9	36
TP-497	Magnesium	mg/Kg	400	1400	520	NA
TP-497	Potassium	mg/Kg	NA	NA	210	NA
TP-497	Selenium	mg/Kg	NA	NA	1.1U	NA
TP-497	Sodium	mg/Kg	440	11000	93U	NA
TP-497	Zinc	mg/Kg	NA	NA	1.4J	120
TP-497	Calcium	mg/Kg	26000	630000	2300	NA
TP-497	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-497	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-497	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-497	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-497	pH	SU	NA	NA	8.32	NA
TP-497	Total Organic Carbon	mg/Kg	NA	NA	420U	NA
TP-497	Percent Moisture	%	NA	NA	17	NA
TP-498	Chloride	mg/Kg	NA	NA	34	NA
TP-498	Nitrate Nitrite as N	mg/Kg	NA	NA	0.7U	NA
TP-498	Nitrite as N	mg/Kg	8700	220000	0.25U	NA
TP-498	Nitrate as N	mg/Kg	140000	**	0.7U	NA
TP-498	Sulfate	mg/Kg	NA	NA	40U	NA
TP-498	Calcium	mg/Kg	NA	NA	130000	32
TP-498	Copper	mg/Kg	150	89000	1.4U	NA
TP-498	Iron	mg/Kg	53000	**	390	36
TP-498	Lead	mg/Kg	400	1400	0.66U	NA
TP-498	Magnesium	mg/Kg	NA	NA	120	NA
TP-498	Potassium	mg/Kg	NA	NA	47J	NA
TP-498	Selenium	mg/Kg	440	11000	2.4J	NA
TP-498	Sodium	mg/Kg	NA	NA	1300	120
TP-498	Zinc	mg/Kg	26000	630000	1.5U	NA
TP-498	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-498	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-498	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-498	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-498	pH	SU	NA	NA	8.77	NA
TP-498	Total Organic Carbon	mg/Kg	NA	NA	11000	NA
TP-498	Percent Moisture	%	NA	NA	22	NA

Table 9.3 (Continued)
Soil Aggregate Parameters
Geotechnical Data Report

Client Sample ID	Analyte	Reporting Unit	62-777 Table 2 Soil Residential	62-777 Table 2 Soil Commerical Industrial	Result	SQAG* TEC
TP-499	Chloride	mg/Kg	NA	NA	250	NA
TP-499	Nitrate Nitrite as N	mg/Kg	NA	NA	0.66U	NA
TP-499	Nitrite as N	mg/Kg	8700	220000	0.24U	NA
TP-499	Nitrate as N	mg/Kg	140000	**	0.66U	NA
TP-499	Sulfate	mg/Kg	NA	NA	120	NA
TP-499	Copper	mg/Kg	NA	NA	1.3U	32
TP-499	Iron	mg/Kg	150	89000	510	NA
TP-499	Lead	mg/Kg	53000	**	1.1J	36
TP-499	Magnesium	mg/Kg	400	1400	340	NA
TP-499	Potassium	mg/Kg	NA	NA	110J	NA
TP-499	Selenium	mg/Kg	NA	NA	1.2U	NA
TP-499	Sodium	mg/Kg	440	11000	2500	NA
TP-499	Zinc	mg/Kg	NA	NA	1.4U	120
TP-499	Calcium	mg/Kg	26000	630000	240000	NA
TP-499	4,4'-DDE	mg/L	NA	NA	0.0025	0.0032
TP-499	4,4'-DDT	mg/L	NA	NA	0.0025	0.0042
TP-499	Heptachlor	mg/L	NA	NA	0.0025	0.0025
TP-499	***Chlordane (technical)***	***mg/L***	***NA***	***NA***	***0.025***	***0.0032***
TP-499	pH	SU	NA	NA	8.8	NA
TP-499	Total Organic Carbon	mg/Kg	NA	NA	26000	NA
TP-499	Percent Moisture	%	NA	NA	18	NA

Source: AMEC Report, 2013

Notes: mg/kg – milligrams per kilogram
su – standard unit
J- result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U – indicates the analyte was analyzed but not detected
*Sediment Quality Assessment Guideline
**Contaminant is not a health concern for this exposure scenario
Bold and italicized – exceeds SQAG TEC

Table 9.4
Summary of Water Source Testing
Geotechnical Data Report

TEST PIT WATER SOURCE

Test Pit	Cement Content	Sample	Max Density (pcf)	Optimum Moisture Content	Test Sample Density (pcf)	Test Sample Moisture Content	7-Day Unconfined Compressive Strength (psi)
475	8%	1	106.4	17.1	101.4	17.2	130
		2	106.4	17.1	101.3	17.2	140
	10%	1	109.6	15.8	104.2	15.8	230
		2	109.6	15.8	104.1	15.8	230
	12%	1	111.2	16.3	106.4	16.3	295
		2	111.2	16.3	106.4	16.3	300
478	8%	1	116.2	12	110.9	12.0	390
		2	116.2	12	110.6	12.0	420
	10%	1	116.3	14	110.5	14.0	430
		2	116.3	14	111.0	14.0	415
	12%	1	117.9	13.9	111.7	13.9	555
		2	117.9	13.9	112.3	13.9	565
491	8%	1	116.9	11	110.7	11.0	305
		2	116.9	11	111.1	11.0	285
	10%	1	117.8	11	111.7	11.0	360
		2	117.8	11	112.2	11.0	380
	12%	1	118.8	11	113.1	11.0	495
		2	118.8	11	112.6	11.0	475
498	8%	1	110.7	13.5	105.7	13.1	280
		2	110.7	13.5	105.2	13.1	295
	10%	1	111.2	13.5	106.3	13.5	360
		2	111.2	13.5	106.4	13.5	350
	12%	1	112.7	13.2	107.8	13.0	500
		2	112.7	13.2	107.2	13.0	475

Table 9.4 (Continued)
Summary of Water Source Testing
Geotechnical Data Report

SITE WELL WATER SOURCE

Test Pit	Cement Content	Sample	Max Density (pcf)	Optimum Moisture Content	Test Sample Density (pcf)	Test Sample Moisture Content	7-Day Unconfined Compressive Strength (psi)
475	8%	1	107.5	17.1	102.8	16.8	155
		2	107.5	17.1	103.1	16.8	160
	10%	1	110	16.9	104.7	16.9	250
		2	110	16.9	105.0	16.9	255
	12%	1	111.1	16.7	105.3	16.7	335
		2	111.1	16.7	105.8	16.7	335
478	8%	1	115.2	15	109.3	15.0	235
		2	115.2	15	110.0	15.0	250
	10%	1	117.3	14.4	111.2	14.4	270
		2	117.3	14.4	111.8	14.4	405
	12%	1	117.5	14.5	111.6	14.5	540
		2	117.5	14.5	112.0	14.5	500
491	8%	1	116.9	11.4	111.1	11.4	380
		2	116.9	11.4	111.2	11.4	435
	10%	1	117.6	11	111.9	11.0	665
		2	117.6	11	112.1	11.0	635
	12%	1	118.5	11.2	112.5	11.2	730
		2	118.5	11.2	112.6	11.2	745
498	8%	1	111.4	14.7	105.5	14.4	270
		2	111.4	14.7	105.4	14.4	260
	10%	1	111.9	14.5	105.9	14.5	360
		2	111.9	14.5	106.5	14.5	345
	12%	1	113.1	14.6	107.4	14.6	380
		2	113.1	14.6	107.7	14.6	400

Table 9.4 (Continued)
Summary of Water Source Testing
Geotechnical Data Report

INDIANTOWN PUBLIC WATER SOURCE

Test Pit	Cement Content	Sample	Max Density (pcf)	Optimum Moisture Content	Test Sample Density (pcf)	Test Sample Moisture Content	7-Day Unconfined Compressive Strength (psi)
475	8%	1	108	17.3	102.3	17.2	130
		2	108	17.3	102.7	17.2	145
	10%	1	109.7	17.1	103.7	17.1	205
		2	109.7	17.1	104.4	17.1	215
	12%	1	110.1	16.2	104.9	16.2	275
		2	110.1	16.2	105.2	16.2	300
478	8%	1	115.6	15.1	110.0	15.1	220
		2	115.6	15.1	110.6	15.1	240
	10%	1	117.2	15	112.1	15.0	440
		2	117.2	15	112.5	15.0	455
	12%	1	118.2	12.8	112.7	12.8	695
		2	118.2	12.8	112.8	12.8	680
491	8%	1	117.1	11.1	110.8	11.1	420
		2	117.1	11.1	110.9	11.1	375
	10%	1	118	11.3	111.7	11.3	575
		2	118	11.3	112.3	11.3	595
	12%	1	119.3	10.2	113.5	11.4	710
		2	119.3	10.2	113.8	11.4	665
498	8%	1	110.6	14.8	105.3	14.7	215
		2	110.6	14.8	105.4	14.7	175
	10%	1	111.5	14.9	106.4	14.9	280
		2	111.5	14.9	106.6	14.9	285
	12%	1	115.7	12.6	109.8	15.2	405
		2	115.7	12.6	110.3	15.2	400

Source: AMEC Report, 2013

Note: Compressive strength test samples molded using standard 4 in. diameter split proctor mold with 4.57 in. height yielding an approximate 1:15 h/d ratio, no correction factor was applied

Table 9.5
Summary of Soil-Cement Mix Design Testing
Geotechnical Data Report

Cement Content	Proctor Testing: Max Density (pcf)	Proctor Testing: Optimum Moiture (%)	7 - Day Compressive Strength (3 Samples): Sample Dry Density (pcf)	7 - Day: % of Maximum	7 - Day: Molding Moisture Content (%)	7 - Day: Compressive Strength (psi)	Wetting / Drying Samples: Specimen	Wetting / Drying: Sample Dry Density (pcf)	Wetting / Drying: % of Maximum	Wetting / Drying: Molding Moisture Content (%)	Cycle Testing	Cycle Testing Value
Test Pit CP12-IRC44-TP-476												
10%	111.9	15.0	106.2	94.9	14.9	230	Specimen 1	106.8	95.5	14.9	Specimen 1 Max Volume Change (%)	1.13
			106.8	95.5	14.9	270					Max Moisture Content	15.7
			106.8	95.4	14.9	250	Specimen 2	106.6	95.2	14.9	Specimen 2 Soil Cement Loss (g)	99
											Soil Cement Loss (%)	6.1
12%	112.7	14.9	107.9	95.7	14.7	440	Specimen 1	107.6	95.5	14.7	Specimen 1 Max Volume Change (%)	1.41
			107.7	95.6	14.7	390					Max Moisture Content	14.9
			107.7	95.6	14.7	380	Specimen 2	107.5	95.4	14.7	Specimen 2 Soil Cement Loss (g)	41
											Soil Cement Loss (%)	2.5
Test Pit CP12-IRC44-TP-479												
10%	113.5	14.8	107.6	94.8	14.5	280	Specimen 1	108.0	95.2	14.5	Specimen 1 Max Volume Change (%)	1.04
			108.3	95.4	14.5	270					Max Moisture Content	15.7
			108.5	95.6	14.5	275	Specimen 2	108.5	95.6	14.5	Specimen 2 Soil Cement Loss (g)	57
											Soil Cement Loss (%)	3.5
12%	114.3	15.4	109.9	96.1	15.4	325	Specimen 1	109.6	95.9	15.4	Specimen 1 Max Volume Change (%)	2.18
			109.2	95.5	15.4	375					Max Moisture Content	15.0
			109.9	96.1	15.4	385	Specimen 2	109.9	96.1	15.4	Specimen 2 Soil Cement Loss (g)	74
											Soil Cement Loss (%)	4.4
Test Pit CP12-IRC44-TP-480												
10%	115.1	11.6	110.2	95.7	11.5	355	Specimen 1	109.5	95.1	11.5	Specimen 1 Max Volume Change (%)	0.61
			110.0	95.6	11.5	370					Max Moisture Content	11.1
			109.2	94.9	11.5	350	Specimen 2	109.4	95.0	11.5	Specimen 2 Soil Cement Loss (g)	13
											Soil Cement Loss (%)	0.8
12%	117.6	11.4	111.4	94.8	11.2	515	Specimen 1	111.0	94.4	11.2	Specimen 1 Max Volume Change (%)	0.90
			111.8	95.1	11.2	515					Max Moisture Content	12.5
			111.8	95.1	11.2	380	Specimen 2	112.4	95.6	11.2	Specimen 2 Soil Cement Loss (g)	47
											Soil Cement Loss (%)	2.8
Test Pit CP12-IRC44-TP-481												
10%	114.4	13.2	107.8	94.3	13.7	330	Specimen 1	108.0	94.4	13.7	Specimen 1 Max Volume Change (%)	0.60
			108.8	95.1	13.7	375					Max Moisture Content	15.2
			108.7	95.0	13.7	365	Specimen 2	108.4	94.7	13.7	Specimen 2 Soil Cement Loss (g)	31
											Soil Cement Loss (%)	1.9
12%	116.2	13.4	109.8	94.5	13.4	435	Specimen 1	110.7	95.3	13.4	Specimen 1 Max Volume Change (%)	0.95
			110.9	95.4	13.4	455					Max Moisture Content	14.5
			110.6	95.2	13.4	405	Specimen 2	110.8	95.4	13.4	Specimen 2 Soil Cement Loss (g)	6
											Soil Cement Loss (%)	0.4
Test Pit CP12-IRC44-TP-482												
10%	111.3	16.1	105.0	94.3	16.4	245	Specimen 1	106.2	95.4	16.4	Specimen 1 Max Volume Change (%)	0.58
			105.8	95.1	16.4	260					Max Moisture Content	15.2
			105.1	94.4	16.4	230	Specimen 2	106.1	95.3	16.4	Specimen 2 Soil Cement Loss (g)	53
											Soil Cement Loss (%)	3.3
12%	112.5	15.7	108.2	96.2	15.4	365	Specimen 1	106.3	94.5	15.4	Specimen 1 Max Volume Change (%)	0.41
			107.7	95.7	15.4	350					Max Moisture Content	15.9
			107.6	95.6	15.4	345	Specimen 2	106.3	94.5	15.4	Specimen 2 Soil Cement Loss (g)	119
											Soil Cement Loss (%)	7.4

Table 9.5 (Continued)
Summary of Soil-Cement Mix Design Testing
Geotechnical Data Report

Cement Content	Proctor Testing: Max Density (pcf)	Proctor Testing: Optimum Moiture (%)	7 - Day Compressive Strength (3 Samples): Sample Dry Density (pcf)	7 - Day: % of Maximum	7 - Day: Molding Moisture Content (%)	7 - Day: Compressive Strength (psi)	Wetting / Drying Samples: Specimen	Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Cycle Testing	
Test Pit CP12-IRC44-TP-476												
10%	111.9	15.0	106.2	94.9	14.9	230	Specimen 1	106.8	95.5	14.9	Specimen 1 Max Volume Change (%) Max Moisture Content	 1.13 15.7
			106.8	95.5	14.9	270	Specimen 2					
			106.8	95.4	14.9	250		106.6	95.2	14.9	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 99 6.1
12%	112.7	14.9	107.9	95.7	14.7	440	Specimen 1	107.6	95.5	14.7	Specimen 1 Max Volume Change (%) Max Moisture Content	 1.41 14.9
			107.7	95.6	14.7	390	Specimen 2					
			107.7	95.6	14.7	380		107.5	95.4	14.7	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 41 2.5
Test Pit CP12-IRC44-TP-479												
10%	113.5	14.8	107.6	94.8	14.5	280	Specimen 1	108.0	95.2	14.5	Specimen 1 Max Volume Change (%) Max Moisture Content	 1.04 15.7
			108.3	95.4	14.5	270	Specimen 2					
			108.5	95.6	14.5	275		108.5	95.6	14.5	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 57 3.5
12%	114.3	15.4	109.9	96.1	15.4	325	Specimen 1	109.6	95.9	15.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 2.18 15.0
			109.2	95.5	15.4	375	Specimen 2					
			109.9	96.1	15.4	385		109.9	96.1	15.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 74 4.4
Test Pit CP12-IRC44-TP-480												
10%	115.1	11.6	110.2	95.7	11.5	355	Specimen 1	109.5	95.1	11.5	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.61 11.1
			110.0	95.6	11.5	370	Specimen 2					
			109.2	94.9	11.5	350		109.4	95.0	11.5	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 13 0.8
12%	117.6	11.4	111.4	94.8	11.2	515	Specimen 1	111.0	94.4	11.2	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.90 12.5
			111.8	95.1	11.2	515	Specimen 2					
			111.8	95.1	11.2	380		112.4	95.6	11.2	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 47 2.8
Test Pit CP12-IRC44-TP-481												
10%	114.4	13.2	107.8	94.3	13.7	330	Specimen 1	108.0	94.4	13.7	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.60 15.2
			108.8	95.1	13.7	375	Specimen 2					
			108.7	95.0	13.7	365		108.4	94.7	13.7	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 31 1.9
12%	116.2	13.4	109.8	94.5	13.4	435	Specimen 1	110.7	95.3	13.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.95 14.5
			110.9	95.4	13.4	455	Specimen 2					
			110.6	95.2	13.4	405		110.8	95.4	13.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 6 0.4
Test Pit CP12-IRC44-TP-482												
10%	111.3	16.1	105.0	94.3	16.4	245	Specimen 1	106.2	95.4	16.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.58 15.2
			105.8	95.1	16.4	260	Specimen 2					
			105.1	94.4	16.4	230		106.1	95.3	16.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 53 3.3
12%	112.5	15.7	108.2	96.2	15.4	365	Specimen 1	106.3	94.5	15.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.41 15.9
			107.7	95.7	15.4	350	Specimen 2					
			107.6	95.6	15.4	345		106.3	94.5	15.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 119 7.4

Table 9.5 (Continued)
Summary of Soil-Cement Mix Design Testing
Geotechnical Data Report

Cement Content	Proctor Testing		7 - Day Compressive Strength (3 Samples)				Wetting / Drying Samples				
	Max Density (pcf)	Optimum Moiture (%)	Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Compressive Strength (psi)	Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Cycle Testing	
Test Pit CP12-IRC44-TP-483											
10%	115.3	14.7	109.7	95.2	14.4	420	Specimen 1 109.6	95.1	14.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.41 15.1
			109.7	95.2	14.4	415					
			110.2	95.5	14.4	420	Specimen 2 109.9	95.3	14.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 73 4.4
12%	118.0	14.2	111.6	94.6	14.0	615	Specimen 1 112.5	95.3	14.0	Specimen 1 Max Volume Change (%) Max Moisture Content	 1.08 13.3
			111.6	94.6	14.0	575					
			112.7	95.5	14.0	650	Specimen 2 112.2	95.1	14.0	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 24 1.4
Test Pit CP12-IRC44-TP-484											
10%	112.8	12.8	108.1	95.9	12.7	250	Specimen 1 108.3	96.0	12.7	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.65 14.1
			108.3	96.0	12.7	210					
			107.9	95.6	12.7	240	Specimen 2 108.3	96.0	12.7	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 53 3.2
12%	113.7	13.5	108.9	95.8	13.3	270	Specimen 1 108.9	95.8	13.3	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.04 14.3
			108.6	95.6	13.3	225					
			109.0	95.9	13.3	280	Specimen 2 108.9	95.8	13.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 31 1.9
Test Pit CP12-IRC44-TP-484 (D)											
10%	113.4	13.4	108.3	95.5	13.3	230	Specimen 1 108.4	95.6	13.3	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.72 14.8
			108.8	96.0	13.3	240					
			108.6	95.8	13.3	220	Specimen 2 109.0	96.1	13.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 57 3.5
12%	114.3	13.5	109.8	96.1	13.3	210	Specimen 1 109.9	96.1	13.3	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.52 14.0
			109.6	95.9	13.3	185					
			109.9	96.1	13.3	240	Specimen 2 109.8	96.1	13.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 16 1.0
Test Pit CP12-IRC44-TP-485											
10%	113.6	14.5	108.2	95.3	14.4	385	Specimen 1 108.3	95.3	14.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.54 15.8
			107.8	94.9	14.4	405					
			107.8	94.9	14.4	405	Specimen 2 108.2	95.2	14.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 42 2.6
12%	113.7	14.2	108.5	94.5	14.3	560	Specimen 1 109.0	95.8	14.3	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.27 15.2
			108.9	95.8	14.3	540					
			108.9	95.8	14.3	520	Specimen 2 109.0	95.9	14.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 23 1.4
Test Pit CP12-IRC44-TP-486											
10%	114.6	14.7	109.2	95.3	14.6	480	Specimen 1 108.3	94.5	14.6	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.83 15.4
			109.0	95.2	14.6	500					
			109.2	95.3	14.6	510	Specimen 2 109.0	95.1	14.6	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 47 2.8
12%	115.7	14.5	110.3	95.4	14.4	665	Specimen 1 110.9	95.9	14.4	Specimen 1 Max Volume Change (%) Max Moisture Content	 0.98 14.1
			110.6	95.6	14.4	665					
			110.5	95.5	14.4	660	Specimen 2 110.8	95.8	14.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 17 1.0

Table 9.5 (Continued)
Summary of Soil-Cement Mix Design Testing
Geotechnical Data Report

Cement Content	Proctor Testing: Max Density (pcf)	Proctor Testing: Optimum Moiture (%)	7 - Day Compressive Strength (3 Samples): Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Compressive Strength (psi)	Wetting / Drying Samples: Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Cycle Testing	
Test Pit CP12-IRC44-TP-488											
10%	114.8	15.5	109.6	95.4	15.3	405	109.9	Specimen 1 95.7	15.3	Specimen 1 Max Volume Change (%) Max Moisture Content	0.41 15.0
			109.6	95.4	15.3	370					
			109.5	95.4	15.3	400	110.0	Specimen 2 95.8	15.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	56 3.3
12%	116.7	14.7	111.9	95.9	14.7	645	110.9	Specimen 1 95.0	14.7	Specimen 1 Max Volume Change (%) Max Moisture Content	0.75 14.1
			111.6	95.7	14.7	610					
			110.8	95.0	14.7	555	111.4	Specimen 2 95.5	14.7	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	22 1.3
Test Pit CP12-IRC44-TP-489											
10%	117.9	12.3	111.0	94.2	12.3	450	113.1	Specimen 1 95.9	12.3	Specimen 1 Max Volume Change (%) Max Moisture Content	0.51 14.0
			112.3	95.2	12.3	480					
			112.4	95.3	12.3	485	113.1	Specimen 2 96.0	12.3	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	32 1.9
12%	118.7	12.1	113.2	95.4	11.9	640	114.1	Specimen 1 96.1	11.9	Specimen 1 Max Volume Change (%) Max Moisture Content	0.43 13.3
			113.3	95.5	11.9	655					
			114.1	96.1	11.9	695	113.3	Specimen 2 95.5	11.9	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	23 1.3
Test Pit CP12-IRC44-TP-489 (D)											
10%	117.7	12.2	111.9	95.0	12.1	385	112.5	Specimen 1 95.6	12.1	Specimen 1 Max Volume Change (%) Max Moisture Content	0.76 14.4
			112.9	95.9	12.1	420					
			112.9	95.9	12.1	535	111.9	Specimen 2 95.1	12.1	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	61 3.6
12%	119.0	12.2	113.9	95.7	12.2	635	114.1	Specimen 1 95.8	12.2	Specimen 1 Max Volume Change (%) Max Moisture Content	1.03 13.1
			114.1	95.8	12.2	650					
			114.1	95.8	12.2	660	113.4	Specimen 2 95.3	12.2	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	21 1.2
Test Pit CP12-IRC44-TP-490											
10%	111.1	15.9	105.8	95.2	15.9	270	105.6	Specimen 1 95.0	15.9	Specimen 1 Max Volume Change (%) Max Moisture Content	0.44 15.5
			105.8	95.2	15.9	250					
			105.5	95.0	15.9	260	105.5	Specimen 2 95.0	15.9	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	107 6.7
12%	112.0	13.9	106.4	95.0	13.6	410	106.6	Specimen 1 95.2	13.6	Specimen 1 Max Volume Change (%) Max Moisture Content	0.65 14.6
			107.2	95.7	13.6	420					
			107.2	95.7	13.6	440	106.8	Specimen 2 95.3	13.6	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	49 3.0
Test Pit CP12-IRC44-TP-492											
10%	119.1	11.3	114.0	95.7	11.2	510	113.2	Specimen 1 95.0	11.2	Specimen 1 Max Volume Change (%) Max Moisture Content	0.48 14.3
			113.7	95.5	11.2	535					
			112.9	94.8	11.2	470	113.5	Specimen 2 95.3	11.2	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	10 0.6
12%	120.5	11.4	114.6	95.1	11.2	675	114.1	Specimen 1 94.7	11.2	Specimen 1 Max Volume Change (%) Max Moisture Content	0.48 13.6
			115.0	95.4	11.2	670					
			114.2	94.7	11.2	675	114.4	Specimen 2 94.9	11.2	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	4 0.3

Table 9.5 (Continued)
Summary of Soil-Cement Mix Design Testing
Geotechnical Data Report

Cement Content	Proctor Testing: Max Density (pcf)	Proctor Testing: Optimum Moiture (%)	7 - Day Compressive Strength (3 Samples): Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Compressive Strength (psi)	Wetting / Drying Samples: Sample Dry Density (pcf)	% of Maximum	Molding Moisture Content (%)	Cycle Testing	
Test Pit CP12-IRC44-TP-494											
10%	118.3	12.9	111.9	94.6	12.9	425	Specimen 1 112.1	94.7	12.9	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.84 13.9
			112.9	95.4	12.9	485					
			112.6	95.2	12.9	435	Specimen 2 112.5	95.1	12.9	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 29 1.7
12%	121.3	12.9	114.8	94.6	12.9	615	Specimen 1 114.5	94.4	12.9	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.68 12.6
			115.6	95.3	12.9	670					
			116.4	96.0	12.9	750	Specimen 2 114.4	94.3	12.9	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 24 1.4
Test Pit CP12-IRC44-TP-495											
10%	114.2	14.9	109.4	95.8	15.0	390	Specimen 1 109.4	95.8	15.0	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.62 13.5
			108.6	95.1	15.0	365					
			108.5	95.0	15.0	335	Specimen 2 109.4	95.8	15.0	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 80 4.8
12%	116.3	14.0	111.1	95.5	14.0	510	Specimen 1 110.8	95.2	14.0	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.90 13.1
			110.3	94.8	14.0	485					
			111.4	95.8	14.0	525	Specimen 2 111.3	95.7	14.0	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 38 2.3
Test Pit CP12-IRC44-TP-497											
10%	121.2	11.7	116.0	95.7	11.4	465	Specimen 1 115.3	95.1	11.4	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.82 13.1
			116.0	95.7	11.4	470					
			115.2	95.1	11.4	450	Specimen 2 115.4	95.2	11.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 20 1.1
12%	121.4	11.7	116.4	95.9	11.4	600	Specimen 1 116.8	96.2	11.4	Specimen 1 Max Volume Change (%) Max. Moisture Content	 0.23 12.1
			116.6	96.0	11.4	620					
			116.8	96.2	11.4	620	Specimen 2 115.8	95.4	11.4	Specimen 2 Soil Cement Loss (g) Soil Cement Loss (%)	 17 0.9

Source: AMEC Report, 2013