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November 5, 2009

Mr. Kenneth Clough
Project Manager
Bechtel Power Corporation
5275 Westview Drive
Frederick, MD 21703-8306

Subject: **Final Data Report Transmittal, Revision 1**
Geotechnical Exploration and Testing
Exelon Texas COL Project
Power Block
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Dear Mr. Clough:

MACTEC Engineering and Consulting, Inc., is submitting with this transmittal the Final Data Report, Revision 1, for geotechnical exploration and laboratory testing associated with the Power Block of the Exelon Texas COL Project located in Victoria County, Texas. This revision is intended to address correction of survey data for Observation Wells OW-2253 U and OW-2253 L, and specifically applies to the affected pages of the report indicated as follows:

- Volume 1, Transmittal Letter (page 1 of 588)
- Volume 1, COVER SHEET (page 2 of 588)
- Volume 1, Table 5.1, Testing Summary - Observation Wells (page 50 of 588)
- Volume 1, Table 5.4, In-Situ Slug Test Results Summary (page 53 of 588)
- Volume 4, Appendix G, Well Data Sheet for OW-2253 U (page 434 of 561)
- Volume 4, Appendix G, Well Data Sheet for OW-2253 L (page 435 of 561)

To complete this revision, the pages noted should be removed and replaced for the current revision (Revision 0) in the Final Data Report document. It should be noted that all other pages of the report will continue to be designated as Revision 0.

Please do not hesitate to contact us if you have any questions or if we may be of further service.

Sincerely,

MACTEC Engineering and Consulting, Inc.

Richard S. Auger
Project Manager

Kathryn A. White, PE
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MACTEC

COVER SHEET

FINAL DATA REPORT
Revision 1

This revision of the Final Data Report is intended to cover the affected pages of the document as follows:

- Volume 1, Transmittal Letter (page 1 of 588)
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GEOTECHNICAL EXPLORATION AND TESTING
EXELON TEXAS COL PROJECT
VICTORIA COUNTY, TEXAS
POWER BLOCK

November 5, 2009

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

MACTEC PROJECT No. 6468-07-1777

Prepared For:
Bechtel Power Corporation
Subcontract No. 25352-102-HC4-CY00-00001

FINAL DATA REPORT
GEOTECHNICAL EXPLORATION AND TESTING
EXELON TEXAS COL PROJECT – VICTORIA COUNTY
POWER BLOCK

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SECTION 1
OVERVIEW

1.1 Introduction

MACTEC Engineering and Consulting, Inc. (MACTEC) was retained by Bechtel Power Corporation (Bechtel) to conduct the subsurface investigation and laboratory testing program to obtain information on subsurface materials and conditions for use in the preparation of the Combined Operating License (COL) Application for the Exelon Victoria County Site. The COL application, to be prepared by others, will be submitted to the U.S. Nuclear Regulatory Commission (NRC) for approval to locate a future nuclear electric power generation facility at the existing Victoria County Site. A site location map is included as Figure 1.

MACTEC executed its services in accordance with Bechtel Subcontract No. 25352-102-HC4-CY00-00001. The field work commenced on November 5, 2007 and was completed on February 21, 2008.

The Scope of Work was defined in Exhibit "D" of the Bechtel Subcontract and the technical requirements were defined in Bechtel Specification 25352-102-3PS-CY00-00001, Revision 003, dated 10/31/07. The scope of work is briefly described below:

- Preparing and submitting a Quality Assurance Project Document, Work Plan and Health and Safety Plan.
- Obtain permits necessary for performing the work.
- Furnishing all the supervision, labor, equipment, tools, supplies, and materials necessary to perform the specified work at the locations specified by Bechtel.
- Providing geotechnical engineers and/or geologists in the field under the direction of qualified geotechnical engineers and/or geologists with the experience in geotechnical investigations to oversee and log the investigation work.
- Providing a site superintendent responsible for oversight of all required field activities.
- Providing Quality Assurance (QA) observation of the field and laboratory work activities and submitting QA records.
- Locating work items by survey methods.
- Performing utility location survey prior to starting work
- Providing water to work areas for drilling and testing
- Performing Standard Penetration Tests (SPT) and obtaining samples using a split spoon sampler.
- Performing SPT energy measurements..
- Obtaining undisturbed samples using thin walled sampler or Pitcher Barrel sampler.
- Collecting, labeling and transporting soil samples to a designated sample storage area.
- Transporting designated samples to appropriate laboratories for testing purposes.
- Backfilling drilled holes with cement/bentonite grout using the tremie method.
- Excavating and backfilling test pits and obtaining bulk samples.
- Installing ground water observation wells, performing field permeability tests, and obtaining water samples.
- Performing electrical Cone Penetrometer Tests (CPT) with down-hole seismic tests and porewater dissipation tests at selected locations.
- Down-hole geophysical logging.

- Performing down-hole acoustic televiewer logging.
- Performing suspension P-S logging
- Performing field electrical resistivity testing.
- Restoring the work areas.
- Performing laboratory testing on soil samples.
- Preparing a Data Report containing the data generated by the subsurface investigation and laboratory testing activities.
- Performing all work under MACTEC's approved Safety Program.

Sampling and testing related to the geotechnical exploration are considered to be tasks that could affect design, construction or operation of safety-related systems, structures and components. This work in performed under a Quality Assurance program that meets the requirements of 10 CRF Part 50 Appendix B and 10 CFR 21 (Reporting of Defects and Noncompliance)

This Data Report generally describes the field and laboratory testing methods and presents the laboratory testing results in the Power Block area. A data report for the Cooling Basin area will be issued under a separate cover at a later date.

1.2 Personnel

MACTEC completed field work for this project under the direction of Bechtel's Site Coordinator, Mr. Allen Shaw. Site technical support was provided by Mr. Lawrence (Larry) Young (Bechtel) and Mr. Garrett Day (Bechtel). Bechtel was contracted by Exelon to provide technical and general oversight support to Exelon.

Primary MACTEC personnel and their responsibilities were as follows:

Stephen J. Criscenzo	Chief Engineer
Kathryn A.White, P.E.	Project Principal Engineer
Scott Auger	Project Manager
John Martin	Quality Assurance Representative
Chris Bruce	Site Superintendent, Report Preparation
Shawn Lehman	Site Coordinator
Daniel Haug	Lead Geologist
Daniel Atkinson	Project Scientist
Lise Bisson	Rig Geologist
Chris Gandy	Rig Geologist
Mandel Harvey	Rig Geologist
Jason Jarvis	Rig Geologist
Harry Lyatuu	Rig Geologist
Johnny Liles	Rig Geologist
Jeff Moore	Rig Geologist
Ammi Osori	Rig Geologist
Kyla Rudd	Project Scientist
Kimberly Charles Smith	Project Scientist
Alex Taylor	Rig Geologist
Bryan Taylor	Rig Geologist
Jason Fox	Site Utility Survey
Lee Brian Johnson	Laboratory Services Manager - Raleigh
Jianren Wang	Laboratory Services Manager - Atlanta

Chris Pruneau	Report Preparation
Walker Jones	Report Preparation
William Grimes	Report Preparation
Steven Copley	Report Preparation
Bill Deobald	Report Preparation
Zeynep Ulker	Report Preparation

The organizations that conducted on-site work or laboratory testing of samples as part of this effort are listed in Table 1.1.

1.3 Organization of Report

The organization of this report consists of a transmittal letter, table of contents, narrative text, tables, figures and appendices. The appendix documents containing project data submittals are further organized as follows:

Appendix A – Survey Data

Appendix B – Geotechnical Field Data
- Boring Logs
- Test Pit Logs
- SPT Energy Measurement Reports

Appendix C – Cone Penetrometer Test Results
- CPT Report
- CPT Calibration Report

Appendix D – Geophysical Test Data
- Field Electrical Resistivity Data
- Geophysical Data

Appendix E – Laboratory Test Data
- Index Test Data (Split Spoon, Test Pit, Undisturbed)
- Strength Test Data (Triaxial UU, Triaxial CU, Direct Shear)
- Consolidation Test Data
- Soil Chemical Test Data

Appendix F – RCTS Data

Appendix G – Groundwater Data
- Observation Well Records
- Well Record Sampling Sheets
- Laboratory Test Report
- Slug Test Data

1.4 Quality Assurance

Quality-related activities conducted by MACTEC and its subcontractors during the work presented in this report were in accordance with the MACTEC Quality Assurance Manual and the

MACTEC Quality Assurance Project Document. The MACTEC QA program complies with NQA-1 Subpart 2.2 and the requirements of 10 CFR 50 Appendix B.

SECTION 2
TEST METHODS

2.1 Surveying

The surveying in the power block area was conducted in two phases by MACTEC's contract surveyor, SURVCON INC. (SURVCON) of Houston, Texas. The first phase was to stake preliminary test locations based on initial coordinates provided by Bechtel, listed on Drawing No. 000-CY-0010-00003 issued for use on October 31, 2007. Test locations were located in the field using Real Time Kinematic-Global Positioning Satellite (RTK-GPS) techniques. Wooden stakes tied with flagging and marked with the test-location designator were used to mark the surveyed locations. Prior to the start of testing, some test locations were relocated due to site conditions (utilities, trees, topography) with concurrence of Bechtel personnel. Other borings were located at offsets from the staked location to accommodate additional testing/sampling at a given location, for example undisturbed sampling and/or geophysical testing. The second phase of surveying was conducted after completion of testing. The surveyor returned to the site and determined as-built locations and ground surface elevations of the actual test locations using RTK-GPS survey techniques.

The cooling basin test locations were similarly located, marked and captured in two phases. MACTEC completed the first phase, marking test locations by referencing initial coordinates provided by Bechtel, listed on Drawing No. 000-CY-0010-00002 Rev. 2 issued for use on November 19, 2007. MACTEC located test locations in the field using mapping-grade Trimble GEOXT GPS equipment. SURVCON conducted the second phase of surveying, capturing as-built locations and ground surface elevations of actual test locations after completion of testing using RTK-GPS survey techniques.

SURVCON used a Leica GPS System 1200 to locate test locations and collect field data and observations. At project start, SURVCON established two control points at the site to serve as reference for the surveys. To achieve project accuracy requirements, two observations were made on each preliminary test location for the first-phase survey for the power block, and three observations were made on each of the actual test locations for the second-phase as-built surveys in both the power block and cooling basin areas. The independent observations captured at each test location were subsequently processed through Leica Geomatics Office software to determine final coordinate and elevation values. The survey data was complied by Adam Salazar, Land Surveyor, Texas License No. 5965.

It should be noted that the survey reports included in previous draft report submittals for this project may list independent, unprocessed observations for any given test location. SURVCON has been made aware of the issue to insure the integrity of the data included in this report.

The as-built survey locations provided by the surveyor will be provided to Bechtel for their use in creating an as-built drawing of the exploration. The as-built survey locations were also used as input to final boring logs and other tables reporting locations. A complete copy of the surveyor's report can be found in Appendix A. This report includes as-built survey data for the power block and cooling basin test locations.

2.2 Utility Location

Jason Fox of MACTEC used preliminary survey locations and physical features to mark the locations planned for borings, wells, CPT probes and test pits. These preliminary locations were provided to Bechtel for utility clearance.

MACTEC personnel conducted an inductive sweep using a Metrotech 810 and conducted a 60 kilohertz passive search using a Subsite Pipe and Cable Locator within a 10-ft radius surrounding each boring location and or boring offset. The intent was to locate any metallic underground utilities or energized lines that would pose a risk to drilling personnel. In addition to the electromagnetic (EM) survey, Texas One Call was also notified at least one week in advance of drilling activities. No metallic underground utilities or energized lines were detected in the area of the Power Block.

2.3 Drilling Equipment/Methods

MACTEC mobilized the following drilling equipment to the site:

Hammer Serial Number	Driller	Drill Rig	Carrier Type	Owner	Auto Hammer	Rig Use
MAC-02	D. White	CME 55 LC	ATV	MACTEC	Yes	SPT
MAC-09	T. Warren	CME 75	Truck	MACTEC	Yes	SPT, UD
NA	A. Polacios	Failing 1500	Truck	Best	No	Wells, UD
MAC-12	J. Warren	CME 45	Track	MACTEC	Yes	STP
263048*	G. Bray	CME 750	ATV	EEI	Yes	SPT, UD
MAC-03	L. Carter	CME 550	ATV	MACTEC	Yes	SPT
MAC-13	D. Rhodes	CME 45	Track	MACTEC	Yes	SPT
NA	A. Fonseca	Fugro CPT	Track	MACTEC	No	CPT
MAC-05	R. Banks	CME 550-X	ATV	MACTEC	Yes	SPT, UD
MAC-11	D. Nalls	CME 75	Truck	EEI	Yes	SPT, UD
MAC-10	R. White	CME 85	Truck	Miller	Yes	SPT, UD

* Drill rig serial number was used as hammer serial number.

Each rig also had at least one support truck used to haul materials. In addition, one rubber-tired highway-type water tanker trucks and ATV water buggy were utilized to haul water from a two water storage tanks feed by a water production well located adjacent to the command and support trailers.

A Caterpillar D-8 bulldozer was used to smooth the ground at several boring locations and to construct mud pit (for drill fluid circulation) adjacent to B-2174 A Offset and B-2274 A Offset prior to drilling activities at these locations.

Borings were advanced in soil using mud rotary wash drilling techniques to a predetermined termination depth. Due to the use of rotary wash drilling techniques using bentonite drilling mud, groundwater levels during drilling could not be determined. All rigs utilized on this project for the collection of standard penetration testing (SPT) soil samples used automatic hammers. SPT soil samples from the geotechnical borings were obtained at 2.5-foot and 5-foot, 10-foot and 20-

foot intervals as described in Section 2.5. A summary of boring log information is presented in Table 2.1. Geotechnical Field Data including boring logs are included in Appendix B.

In borings where SPT measurements were collected, only side discharge type bits were used. Bit size varied depending on rod diameter, sampling type and depth. Flush jointed A-rods (AW, and AWJ) were used for any SPT boring that was advanced to less than 200 feet below ground surface (bgs). Flush jointed N-rods (NW, NWJ and Mayhew Junior), were used (from ground surface to the total depth of the boring) for any SPT boring that was advanced deeper than 200 feet bgs.

At selected locations and following review of the adjacent geotechnical boring by MACTEC and Bechtel, two observation wells were installed by rotary wash drilling methods. The borings were performed in accordance with the Bechtel Specification as described Section 5.1. Each well in the Power Block consisted of PVC screen and riser pipe, sand filter pack, bentonite chips or pellets and cement bentonite grout. Protective steel well covers and concrete pads were placed at the surface.

Cone penetration testing (CPT) was conducted by Fugro Consultants, Inc., a subcontractor to MACTEC. Fugro used a purpose-built 25-ton capacity truck-mounted unit and a 15-ton capacity ATV track-mounted cone penetration unit to complete the work. Each probe was advanced to the assigned termination depth or to cone refusal, which was the limit of the pushing capacity of the rig. At some locations testing was terminated prior to intended depth due to technical difficulties (such as excessive cone deflection or equipment malfunction) and retests were performed as necessary in adjacent soundings. Seismic and pore pressure dissipation testing were completed in selected CPT's and intervals determined by Bechtel.

The borings and the CPT probe locations were filled using a cement-bentonite grout prior to demobilizing from the site. The borings were grouted from the bottom of the boring by pumping the grout through a tremie pipe. A grout mixture was used to backfill the borings per the Specification Section 5.12. A stake or other marker was placed at each completed boring location for later survey use.

2.4 SPT Energy Measurements

SPT energy measurements were conducted for each of the drill rigs performing SPT soil sampling. Energy measurements were recorded during SPT sampling at the depth intervals shown in Attachment B. The length of the drill rod string, including the instrumented drill rod insert for each sample was generally 4 feet longer than the depth of the sample being collected.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAK and calibrated accelerometers and strain gages. A section of drill rod two feet long and the same size as the drill rod used to advance the boring and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT automatic hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod.

The work was conducted in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The EFV method of energy calculation is recommended in ASTM Standard D 4633-05. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t
dt = time differential (integral taken with respect to time)

The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow were tabulated and averaged to obtain the average measured energy at each depth tested. The ratio of the average measured energy to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the energy transfer ratio (ETR).

The average ETR measured for each rig used at the site ranged from 72.5% to 90.7% of the theoretical potential energy. These ETR values are within the range of typical values for automatic hammers. The ETR values (as percent of the theoretical value) are shown in Attachment B.

2.5 Sampling in Geotechnical Borings

2.5.1 Standard Penetration Test Sampling

SPT sampling in the geotechnical borings was generally conducted on 2.5-foot centers from the ground surface to a depth of 15 feet. The SPT sampling interval below 15 feet was five feet to a depth of 100 feet. The SPT sampling interval from 100 feet to 200 feet was 10 feet. From 200 feet to 600 feet, the sampling interval was 20 feet. The equipment and methods are described in ASTM D 1586-99. Two of the borings, B-2177 and B-2277 were continuously sampled (samples collected on 2.5 foot centers) to 200 feet within the reactor unit boundaries. The split barrel sampler was typically driven 18 inches in soil with blows recorded for each six-inch interval of penetration. The weight of the hammers used at the site ranged from 138.3 to 140.2 pounds, meeting the ASTM requirements. In very hard soils, driving was terminated after 50 blows were recorded for a six-inch, or less, interval and the actual penetration recorded, (e.g., 50 blows / 0.3 feet). At selected locations where low penetration was encountered the sampler was over-driven to collect additional sample.

The split barrel sampler was opened at the drill site and the recovered materials were visually described, classified, and photographed by MACTEC's rig geologist or engineer. A selected portion of the sample (typically the lower portion of the sample) was placed in a glass sample jar with a moisture proof lid. Sample jars were labeled, placed in cardboard boxes, and transported to the on-site secure storage trailer at the end of each work day.

2.5.3 Undisturbed Soil Sampling

Undisturbed soil samples were obtained as directed by Bechtel, using a 3-inch thin-walled Shelby tube sampler in accordance with ASTM D 1587-00 or pitcher barrel sampler (USACE EM 1110-1-1804). Undisturbed soil samples were collected in the Power Block area from borings B-2174 UD, B-2174 UDR, B-2182 UD, B-2269 UD and B-2274 UD.

A Pitcher tube sampler was used for collection of undisturbed soil samples at depth intervals selected by Bechtel or when subsurface material was anticipated to be too dense or hard to allow satisfactory samples to be recovered by pushing the Shelby tube sampler. The Pitcher tube sampler is a rotary sampler that drills the 3-inch tube into the subsurface material.

Some of the Shelby tube samplers were deformed during the sampling process. These samples were retained, capped and were noted as possibly disturbed samples. The undisturbed samples were sealed at the top and bottom against moisture loss, labeled, and kept in an upright condition.

Disturbed and undisturbed soil samples were transported to the climate-controlled on-site storage trailer following ASTM D 4220-95(2000).

2.6 Boring Logs

The soil descriptions on the boring logs in Appendix B.1 are based on the field descriptions (ASTM D 2488-00) by the rig geologist or engineer, modified according to ASTM D 2487-00 where lab test results are available. Note that the strata may have been modified on logs for test locations where more than one boring was performed. For example, field observations and laboratory test results for a geotechnical boring and an adjacent undisturbed sample boring may have been shared for the purpose of utilizing all available information and to make the strata similar on both logs. The boring logs in Appendix B.1 were prepared using Version 8 of the computer program "gINT".

2.7 Sampling in Geotechnical Test Pits

A rubber-tired backhoe was used to excavate and then to backfill the shallow test pits used for soil sampling purposes. The backfilled soil was loosely compacted and the surface smoothed to surrounding ground level.

Test pits were excavated at eight locations identified by Bechtel. A rubber-tired backhoe was used to excavate the pits. The Bechtel field representative selected the materials to be sampled. A MACTEC rig geologist collected the bulk samples. As approved by Bechtel, the bulk samples were placed in new 5-gallon plastic buckets with handles for carrying. Two buckets of each sampled material were obtained. Small portions of the samples were placed in glass jars and sealed for moisture retention. The backhoe was used to backfill the test pits using the excavated materials. The backfilled materials were tamped in-place using the backhoe. The rig geologist placed a stake at the test pit location for later survey location.

The buckets and jar samples were labeled and transported to the on-site storage area. The rig geologist prepared a Geotechnical Test Pit Log based on visual description of the excavated materials according to ASTM D 2488-06. The surveyed locations of the test pits are included in Appendix A. The Geotechnical Test Pit Logs are included in Appendix B.

2.8 Cone Penetrometer Testing

Locations for 29 Cone Penetrometer Tests (CPT) were included in the original scope of work for this project. The locations were designated as C-2101 through C-2113 in the proximity of Unit 1, and C-2201 through C-2216 in the proximity of Unit 2. Specified probe depths ranged from 100 feet to 300 feet below ground surface, or to refusal. MACTEC personnel staked the probes at the specified locations; however, due to presence of roads or underground utilities, some of the probes were relocated. The test locations were designated/approved by Bechtel and cleared by

MACTEC utility clearance personnel prior to pushing. Results for all CPT testing are included in Appendix C.

Seismic testing was completed at intervals of approximately five feet at locations C-2102S, C-2104S, C-2106S, C-2109S for Unit 1 and at locations C-2202S, C-2204S, C-2206S, C-2209S for Unit 2. Pore pressure dissipation tests were completed in C-2104S and C-2106 at the location of Unit 1, and in C2203, C2204SA, C-2206, C-2207, C-2213 at the location of Unit 2. All testing was done in accordance with the Technical Scope of Work and ASTM D 5778-95 (reapproved 2005).

The CPT tests were conducted using 15 cm^2 peizocones or seismic cones with the piezo transducer mounted in the U2 position (between the tip and sleeve). At locations C-2106 and C-2206, the soil was investigated to depths of 300 feet by using multiple stage soundings with intervals of drilling where cone refusal was encountered. The seismic tests at these locations were conducted in adjacent soundings. Details of the procedures and methods used are contained in Appendix C. At locations C-2111, C-2204 and C-2210 multiple soundings were conducted due to difficult local soil conditions or technical issues. Repeat soundings have been denoted using name suffixes (i.e. "A") and the reasons for termination of testing have been noted in Appendix C. The profiles from short or unreliable soundings have been included in Appendix C and are denoted by the profile header "CPT Data-Disregard". All recorded soundings have been included.

2.9 Field Electrical Resistivity Testing

Field electrical resistivity testing was performed along 4 arrays in the proposed Power Block area of the site. As-built survey locations and ground surface elevations for resistivity testing can be found in Appendix A. The survey includes data captured at the centerpoint, or intersection of each array-pair, and two arbitrary points located inline with each array. The arbitrary points document the orientation of each array and are identified in the survey report with an "A" or "D" in the point designator, for example R-2101A. The Wenner four electrode method was used to perform the tests in accordance with ASTM G 57-06. Electrode spacing ranging from 3 feet up to 300 feet was used in order to determine the soil resistivity at increasing depths. The resistivity data interpreted from the tests are contained in Attachment D.

2.10 Geophysical Down-hole Testing

Down-hole geophysical testing and logging was performed in ten borings in the power block area, including B-11, B-12, B-2162A Offset, B-2174A Offset, B-2176A Offset, B-2182A Offset, B-2262A Offset, B-2274A Offset, B-2276A Offset and B-2282A Offset. With the exception of borings B-11, B-12 and B-2274A Offset where acoustic televiewer logging was not performed, the complete suite of tests listed below were performed in each boring. GEOVision, a MACTEC subcontractor, conducted the down-hole geophysical testing in accordance with ASTM D 5753. The test results are found in the report from GEOVision contained in Appendix D. The GEOVision report consists of a text and graphical volume and an electronic set of data and charts presented on CD. The down-hole geophysical logs performed in the selected borings are described below.

2.10.1 Natural Gamma

Gamma logs record the amount of natural gamma radiation emitted by the soil and rocks surrounding the boring.

2.10.2 Long and Short Normal Resistivity/Spontaneous Potential

Normal-resistivity logs record the electrical resistivity of the borehole environment and surrounding soil and water as measured by variably spaced potential electrodes on the logging probe. Typical spacing for potential electrodes is 16 inches for short-normal resistivity and 64 inches for long normal resistivity. Normal resistivity logs are affected by bed thickness, borehole diameter and borehole fluid, and can only be collected in water or mud filled open holes.

2.10.3 Three Arm Caliper

Caliper logs record borehole diameter. Changes in borehole diameter are related to boring construction, such as casing or drilling bit size, and to fracturing or caving along the borehole wall. Because borehole diameter commonly affects log response, the caliper log may be useful in the analysis of other geophysical logs.

2.10.4 Borehole Acoustic Televiewer Logging

Televiewer logging was conducted in accordance with GEOVison procedures as included in the MACTEC Work Plan. The acoustic televiewer determines bore-hole inclination and deviation from vertical by measuring amplitude and travel time of the reflected acoustic signal and produces a magnetically oriented photographic image of the acoustic reflectivity of the boring wall. The acoustic televiewer is limited to open boreholes filled with water or drilling mud.

2.10.5 Suspension P-S Velocity Logging

Suspension P-S velocity logging was conducted in accordance with GEOVision procedures as contained in the MACTEC Work Plan. Measurements of compression (P) and shear (S) wave velocity were made at 1.6-foot intervals.

SECTION 3
SAMPLE STORAGE

Consistent with MACTEC's QAPD Requirements, an on-site sample storage facility was established. The sample storage facility was a lockable climate controlled sample storage trailer. The trailer was a ground mounted 40-long by 8-foot wide Mobile-Mini Open Bay Security Office with high security door system and exterior security bars over each window. Racks were assembled to provide secure storage of undisturbed samples.

Samples were transported daily from the field to the sample storage warehouse by the rig geologists/engineers. The samples were transported in accordance with ASTM D 4220-95(2000). SPT samples were transported in their compartmentalized cardboard boxes, each labeled to show the contents therein. The bulk test pit samples were sealed in 5-gallon plastic buckets. The UD samples were sealed and placed upright in the UD sample racks.

A chain-of-custody form was completed for samples removed from the facility.

SECTION 4
LABORATORY TESTING – GEOTECHNICAL

Soil laboratory testing was conducted on approximately 291 disturbed (split-spoon), 73 undisturbed (tube), 8 bulk samples (test pits) and 5 borrow soils obtained during the site investigation. The testing was performed in accordance with the current ASTM standards or other standards where applicable. The samples to be tested and the tests to be performed were selected by Bechtel engineers. Bechtel provided the following Geotechnical Laboratory Test Assignment Sheets for Power Block related testing:

- Assignment 1 – November 16, 2007
- Assignment 2 – December 6, 2007
- Assignment 3 – December 14, 2007
- Assignment 4 – December 19, 2007
- Assignment 5 – December 20, 2007
- Assignment 6 – December 28, 2007
- Assignment 8 (Revised) – January 11, 2008
- Assignment 9 – January 15, 2008
- Assignment 11 – January 23, 2008
- Assignment 14 (Revised) – February 20, 2008
- Assignment 16 (Revised) – April 23, 2008

Each subsequent assignment sheet supplemented the previous sheets with new assignments. Testing of soil specimens was contingent upon the receipt of soil samples, Laboratory Assignment sheets and authorization for testing. In some cases commencement of testing was deferred until all three of these items were received by the laboratory performing the test.

Occasionally, an assigned soil sample was damaged during collection, or the quantity of material was insufficient to perform the assigned testing. These occurrences were brought to the attention of Bechtel, and either a replacement sample was assigned, or the testing was cancelled altogether.

The soil testing was conducted in MACTEC's laboratories in Raleigh, North Carolina and Atlanta, Georgia. Chemical testing for pH, sulfates and chlorides on selected soil samples was done by Severn Trent Laboratory (STL) now TestAmerica in Saint Louis, Missouri, a subcontractor to MACTEC.

A total of 59 soil samples were identified by Bechtel engineers for soil chemical testing and a portion of each jar sample was divided and submitted to TestAmerica for moisture content, pH, sulfate and chloride testing. The results of the soil chemical tests are summarized in Table 4.8 and analytical test results are in Appendix E. Twenty of the soil samples tested for Chloride content indicated method blank contamination that was at the targeted analyte reportable levels. These samples were obtained from borings B-2151, B-2160 and B-2265 and are noted in Table 4.8.

Resonant Column Torsional Shear (RCTS) testing of selected soil samples is being conducted by the Fugro Consultants' laboratory (subcontractors to MACTEC) under the technical direction of Dr. K. H. Stokoe of the University of Texas. In addition, one RCTS test was performed by the Department of Civil Engineering, University of Texas at Austin.

The tests that were assigned and performed, identified by their ASTM standard, are shown in the following sections.

4.1 Identification Tests

- Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass - ASTM D 2216-05
- Specific Gravity of Soil Solids by Water Pycnometer - ASTM D 854-06
- Specific Gravity and Absorption of Fine Aggregate – ASTM C 128-07
- Particle-Size Analysis of Soils - ASTM D 422-63(2002)e1 (for analysis including hydrometer)
- Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis - ASTM D 6913-(2004)e1 (for analysis not including hydrometer)
- Liquid Limit, Plastic Limit, and Plasticity Index of Soils - ASTM D 4318-05
- Moisture, Ash, and Organic Matter of Peat and Other Organic Soils - ASTM D 2974-07a
- Unit Weight (sections 5.7-5.9, 8.1 and 11.3.2 of ASTM D 5084-03)
- Classification of Soils for Engineering Purposes (Unified Soil Classification System) – ASTM D 2487-06
- Description and Identification of Soils (Visual-Manual Procedure) – ASTM D 2488-06
- Laboratory Compaction Characteristics of Soil Using Modified Effort – ASTM D 1557-02e1
- CBR (California Bearing Ratio) of Laboratory-Compacted Soils – ASTM D 1883-05

4.2 Shear Strength Tests

- Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils - ASTM D 2850-03a
- Consolidated-Undrained Triaxial Compression Test on Cohesive Soils – ASTM D 4767-04
- Direct Shear Tests of Soils Under Consolidated Drained Conditions – ASTM D3080-04
- Consolidated-Undrained Direct Simple Shear Testing of Cohesive Soils – ASTM D 6528-07

4.3 Consolidation Tests

- One-Dimensional Consolidation Properties of Soils using Incremental Loading - ASTM D 2435-04

4.4 Modulus and Damping Tests

- Test Procedures and Calibration Documentation Associated with the RCTS and URC Tests at the University of Texas at Austin, DCN: UTSD RCTS GR06-4, April 25, 2006, Geotechnical Engineering Center, University of Texas, Austin, Texas.

4.5 Chemical Testing of Soil

- pH – EPA Standard SW 846 9045D

- Chloride- EPA Standard SW 846 9056 / EPA Method 300.0 (EPA-600/4-79-020)
- Sulfate- EPA Standard SW 846 8056 / EPA Method 300.0 (EPA-600/4-79-020)

4.5 Reporting

The geotechnical laboratory test reports consisting of individual test data and results sheets as required by the testing standard, are contained in Appendix E. Summaries of the test results are shown in Tables 4.1 through 4.9.

The RCTS test reports supervised or approved by Dr. K. H. Stokoe, are presented in Appendix F. The classification tests on the RCTS samples have been included in Table 4.3 and in Appendix E.

SECTION 5
WATER SAMPLING, FIELD AND LABORATORY TESTING

5.1 Well Installation

BEST Drilling, MACTEC's contractor, installed seven observation well pairs within the power block portion of the site as part of this project. Each well pair consisted of an observation well screened in an upper sand unit (well identification contains the prefix "U") and an observation well screened in a lower sand unit (well identification contains the prefix "L"). The wells were installed per the Technical Scope of Work. The well-construction details are shown in Observation Well Installation Records in Appendix G. Pertinent information for the observation wells installed in the power block portion of the site is shown in Table 5.1.

The observation well depths and screen intervals were specified by Bechtel's hydrogeologist after review of adjacent borehole records, and geophysical logs where appropriate. Borings for the observation wells were advanced using mud rotary drilling techniques with a nominal 6-inch outside diameter. The drilling contractor used water (without the use of bentonite or other drilling fluid additive) during borehole advancement. MACTEC did not collect soil samples from the boreholes for the wells because these boreholes were adjacent to geotechnical borings, from which samples were collected.

Borehole depths shown on the borehole logs indicate the total depth drilled and sampled. Due to small amounts of drill spoil at the base of the drill bit, or due to the sampler advancing beyond the augered depth, the total depth shown on the borehole log may be slightly greater than the well depth reported on the companion well installation record.

Upon reaching the designated depth for a well, slotted PVC casing connected to solid PVC riser was set, and a sand pack and bentonite seal were placed in the wells. A cement/bentonite grout mixture was emplaced from the top of the bentonite seal to the ground surface in each borehole by the tremie method. The drilling contractor used the grout mix specified in Section 4.12 of the Technical Scope of Work.

After well installation activities were completed, Survon, MACTEC's survey contractor, determined the location, marked top of well casing elevation, and the elevation of the concrete pad installed around the well. These data are included on the well installation records. The water-depth measurements are referenced to the marked point on top of the PVC casing. The elevation of the top of casing was also used along with measurements of the well sections to calculate elevations for the well monitoring interval.

The wells were capped with a lockable steel well cover extending approximately two feet above grade. A concrete pad, two feet square and six inches thick, was also placed around each well cover as per the Technical Scope of Work.

5.2 Water-Level Measurements

MACTEC representatives measured the depth to the water table in each well at various times related to development, slug testing and water quality sampling using an electric water-level meter and referenced to the mark on the top of the PVC casing. These water levels are shown on the various field forms in Appendix G.

5.3 Well Development

After well installation was completed, wells were developed by the well installation contractor using air-lifting techniques, in accordance with Section 5.3.6 of the Technical Scope of Work. A minimum of five, saturated borehole volumes were removed from each well during the development process. Water was removed from each well until it was relatively clear and sediment free, in accordance with the Technical Scope of Work. During the development process, the well contractor cycled the air on and off to create a surging effect. The wells were considered developed when the pumped water was relatively clear and free of suspended sediment.

5.4 Well Purging and Sampling

Each well was purged and sampled using a submersible pump that was set approximately one foot above the bottom of the well. Each well was purged until field-measured indicator parameters of water quality "stabilized" and until at least three well volumes were purged. Using a YSI 650 equipped with a flow-through cell and a HACH turbidity meter, MACTEC measured the following field-indicator parameters in accordance with ASTM D 6452-99 (2005):

- Temperature
- pH
- Electrical conductivity (specific conductance)
- Turbidity
- Oxidation-reduction potential (redox)
- Dissolved oxygen

Stabilization of field parameters was based on three consecutive measurements showing values with the following criteria, made at intervals not less than one-half well volume or five minutes, whichever is greater, unless directed otherwise by Bechtel:

- pH: ±0.1 pH units
- Dissolved oxygen: ±0.3 mg/liter
- Electrical conductivity: ±3 percent
- Oxidation-reduction potential: ±10 mv
- Turbidity ±1 nephelometric turbidity unit (NTU), or ±10 percent if greater than 10 NTUs

The pumping rate during field-indicator parameter measurement collection and sample collection was kept low enough to minimize sample turbidity, sample aeration, bubble formation, and turbulent filling of the sample containers. The purging method used was consistent with "purging based on fixed volume combined with indicator parameter stabilization" as described in ASTM D 6452-99. In accordance with Section 5.5.4 of the Technical Scope of Work, the final field-indicator parameter readings are summarized in Table 5.2. Well sampling record sheets are included in Appendix G.

5.5 Laboratory Testing

MACTEC filled the laboratory-provided sample containers with groundwater directly from the tubing attached to the pump. The containers were placed in a cooler with ice, and the cooler was delivered by overnight courier to the STL Laboratories, Inc. (TestAmerica) in Earth City, Missouri under chain-of-custody. STL tested the groundwater samples for the following parameters according to the current methods cited in "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020 using the methods cited:

- Total dissolved solids -- EPA Method 160.1
- Inorganic ions (bromide, chloride, fluoride, sulfate) -- EPA Method 300.0
- Cations (calcium, iron, magnesium, manganese, potassium, silica, silicon, and sodium) -- EPA 6020C
- Alkalinity (bicarbonate/carbonate) -- EPA Method 310.1.
- Nitrogen as Ammonia -- EPA Method 350.1.
- Nitrate/nitrite -- EPA Method 300.0
- Cation/anion balance -- Laboratory standard procedure

The Technical Scope of Work indicated testing for cations by EPA Method 200 and nitrate and nitrite by EPA Method 353.1. The laboratory used Method 6020C to test for cations. This method is a more current version of Method 200 and yields lower detection limits. Therefore, this deviation should not have an adverse impact on the groundwater quality data. The use of Method 300 for nitrate and nitrite testing is a different methodology than the requested Method 353.1. MACTEC is currently investigating what impact the different test method may have on data quality and thus, the nitrate and nitrite data should be considered suspect at this point in time. As indicated in correspondence from STL that was forwarded to Bechtel by MACTEC, silica is not a cation. Therefore, STL used Method 6020 to test for silicon, and calculated the resulting silica content based on the assumption that all of the silicon was silica. STL detected ammonia in the method blank associated with samples OW-2169U, OW-2169L, and OW-2269-U. The reported detections of ammonia in these samples were below the reporting limit. Therefore, MACTEC recommends that these results should be considered non-detect values at the reporting limit of 50μg/L.

Also, the Technical Scope of Work listed cation/anion balance as a laboratory report item. STL reported the ion balance difference as a %, using Standard Method 18 1030F & API.

The laboratory test results for groundwater chemistry are summarized on Table 5.3 and copies of the laboratory test reports are included in Appendix G. MACTEC's review of the laboratory results identified possible quality issues as detailed above. MACTEC prepared a Supplier Deviation Disposition Request (SDDR No. 47) and recommends the use of the data "as-is", with the exception of the ammonia results as discussed above.

5.6 In-Situ Hydraulic Conductivity Testing

In-situ hydraulic conductivity testing was conducted in observation wells OW-2150 U and L, OW-2169 U and L, OW-2181 U and L, OW-218 U and L, OW-2253 U and L, OW-2269 U and L, and OW-2284 U and L. The testing used procedures described in Section 8 of ASTM D 4044-96 (2002). The test procedure is commonly termed the slug test method. Slug testing involves establishing a static water level, lowering a solid cylinder into the well to cause an increase of water level in the well and monitoring the time rate for the well water level to return to the pre-test static level. This method is commonly called the "falling head" method. After stabilization of the water level due to the falling head test, the slug is rapidly removed to create a lowering of the water level in the well, and the time rate for water to recover to the pre-test static level is recorded. This method is commonly called the "rising head" method. Electronic transducers and data loggers are used for measuring the water levels and times during the test.

Water-level measurements were collected on a logarithmic cycle throughout the slug tests using In-situ Level Troll 900 data loggers. At the completion of each slug test, water-level measurements were downloaded from the data loggers. These data were imported into AQTESOLV™ for Windows version 4.5 and evaluated using both the Bouwer-Rice and Butler methods. The Bouwer-Rice method is based on the following assumptions:

- Aquifer has infinite areal extent
- Test well is fully or partially penetrating
- Aquifer is confined
- Aquifer is homogeneous and of uniform thickness
- Flow to the well is quasi-steady-state (storage is negligible)
- Volume of water, V, is injected into or discharged from the well instantaneously

The Butler method, which accounts for oscillatory water-level response sometimes observed in aquifers of high hydraulic conductivity, is based on the following assumptions:

- Aquifer has infinite areal extent
- Test well is partially penetrating
- Aquifer is confined
- Aquifer is homogeneous and of uniform thickness
- Flow is quasi-steady state
- Volume of water, V, is injected into or discharged from the well instantaneously

Based on these two methods, values of hydraulic conductivity were calculated for each slug test conducted.

A summary of the slug test results is provided in Table 5.4. The software output plots used to analyze the slug test data are included in Appendix G.

FINAL DATA REPORT Rev 0
GEOTECHNICAL EXPLORATION AND TESTING

EXELON TEXAS COL PROJECT
VICTORIA COUNTY, TEXAS
POWER BLOCK

July 10, 2008

VOLUME 1

Prepared By:

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

MACTEC Project No. 6468-07-1777

Prepared For:

Bechtel Power Corporation
Subcontract No. 25352-102-HC4-CY00-00001

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TABLE 1.1
ORGANIZATIONS PERFORMING WORK AT THE SITE OR IN THE LABORATORY

Organization	Function
MACTEC Engineering and Consulting, Inc.	• Underground Utility Clearance • Geotechnical soil borings with SPT tests • Undisturbed Sampling • Boring Abandonment • Bulk Sampling • Geotechnical Laboratory Testing for Soil samples • SPT Energy Measurement on Drill Rig • Well Installation • Water Sampling • Slug Testing • Aquifer Pumping Test • Logging of Soil Borings • Site Coordination • Field Electrical Resistivity • Borehole Permeameter
Fugro Consultants, Inc.	• CPT Tests • RCTS Testing • Soil Sample Strength Testing
Lewis Environmental Services, Inc	• Observation Well Installation
Best Drilling, Inc.	• Observation Well Installation • Drilling for Geophysical Tests
STL Laboratories (Test America)	• Laboratory Chemical Testing for Soil & Water Samples
Miller Drilling, Inc. Environmental Exploration Inc. (EEI)	• Geotechnical soil borings with SPT tests • Undisturbed Sampling
GEOVision	• Downhole geophysical logging • Resistivity testing • P-S suspension logging
Survcon, Inc.	• Surveying of borings, observation wells, CPT locations, test pits and geophysical test locations
University of Texas Austin/Dr. Stokoe	• RCTS Testing

TESTING SUMMARY - SOIL BORINGS
Exelon COL Project (Victoria Site)
MACTEC Project No. 6468-07-1777
POWER BLOCK

Boring Number	Boring Type		Depth (ft)		As-Built Coordinates/Elevations			In-Situ Testing					
	SPT	UD Tubes	Proposed	Actual	Northing (US ft)	Easting (US ft)	Ground Surface Elevation (ft)	P-S Suspension	Deviation	Natural Gamma	Resistivity	Caliper	Spontaneous Potential
B-01	X		150.0	150.0	13,404,257.08	2,606,680.96	71.46						
B-02	X		150.0	150.0	13,411,511.00	2,607,865.77	74.68						
B-03	X		150.0	150.0	13,414,926.74	2,609,291.47	74.89						
B-04	X		150.0	150.2	13,414,277.17	2,607,437.06	78.97						
B-05	X		150.0	150.2	13,414,770.02	2,605,821.89	77.56						
B-06	X		150.0	150.2	13,415,884.18	2,604,971.12	78.98						
B-07	X		150.0	150.2	13,418,366.17	2,606,567.82	77.39						
B-08	X		150.0	150.0	13,415,809.85	2,598,937.51	81.71						
B-09	X		150.0	150.2	13,414,943.90	2,604,897.77	77.36						
B-10	X		150.0	150.2	13,418,474.15	2,604,736.80	77.69						
B-11			NA	310.0	13,411,479.49	2,607,866.27	74.47	X		X	X	X	X
B-12			NA	310.0	13,418,446.37	3,606,546.46	76.70	X		X	X	X	X
B-2150	X		150.0	150.0	13,412,560.45	2,599,590.93	80.44						
B-2151	X		200.0	200.0	13,412,636.54	2,599,654.12	80.41						
B-2152	X		150.0	150.0	13,412,705.76	2,599,720.24	80.26						
B-2153	X		150.0	150.1	13,412,821.99	2,599,842.54	80.23						
B-2154	X		150.0	150.0	13,412,450.91	2,599,619.84	80.56						
B-2155	X		150.0	150.0	13,412,471.13	2,599,698.69	80.36						
B-2156	X		200.0	201.5	13,412,548.01	2,599,760.77	80.25						
B-2157	X		150.0	150.0	13,412,623.72	2,599,823.06	80.06						
B-2158	X		100.0	100.0	13,412,749.59	2,599,928.77	80.45						
B-2159	X		200.0	211.5	13,412,476.54	2,599,788.95	80.40						
B-2160	X		200.0	200.0	13,412,180.67	2,599,627.24	80.43						
B-2161	X		150.0	150.0	13,412,263.42	2,599,698.14	80.54						
B-2162A	X		200.0	202.8	13,412,385.92	2,599,799.34	80.16						
B-2162A Offset			200.0	210.0	13,412,378.65	2,599,792.16	80.05	X	X	X	X	X	X
B-2163	X		150.0	150.0	13,412,463.50	2,599,862.07	79.85						
B-2164	X		150.0	151.4	13,412,537.94	2,599,925.58	80.38						
B-2165	X		150.0	150.0	13,412,661.24	2,600,035.28	80.13						
B-2166	X		150.0	150.0	13,412,109.03	2,599,713.14	80.50						
B-2167	X		150.0	150.0	13,412,192.20	2,599,781.27	80.19						
B-2168	X		200.0	201.5	13,412,294.30	2,599,891.10	80.12						
B-2169	X		400.0	400.0	13,412,350.22	2,599,938.43	79.46						
B-2170	X		300.0	300.0	13,412,413.87	2,599,989.73	79.72						
B-2170R	X		300.0	300.0	13,412,396.18	2,599,989.34	79.17						
B-2171	X		300.0	81.5	13,412,488.43	2,600,092.96	80.03						
B-2171R	X		300.0	300.0	13,412,479.95	2,600,074.23	79.97						
B-2172	X		100.0	100.0	13,412,096.23	2,599,829.90	80.10						
B-2173	X		300.0	300.0	13,412,224.52	2,599,944.53	79.60						
B-2174A	X		600.0	601.0	13,412,299.46	2,600,000.66	80.10						
B-2174A Offset			600.0	617.0	13,412,316.51	2,599,991.79	79.28	X	X	X	X	X	X
B-2174UD		X	600.0	305.0	13,412,276.56	2,600,005.51	79.58						
B-2174UDR		X	600.0	593.0	13,412,303.29	2,600,012.41	78.98						
B-2175	X		200.0	200.0	13,412,370.50	2,600,062.84	80.14						
B-2176A	X		200.0	200.0	13,412,511.69	2,600,175.17	79.81						
B-2176A Offset			200.0	210.0	13,412,522.55	2,600,178.10	79.99	X	X	X	X	X	X
B-2177	X		150.0	150.0	13,412,196.92	2,600,000.49	79.61						
B-2178	X		150.0	151.1	13,412,315.44	2,600,107.24	79.53						
B-2179	X		200.0	200.0	13,412,424.95	2,600,168.69	79.69						
B-2180	X		200.0	200.0	13,412,247.38	2,600,062.59	78.84						
B-2181	X		150.0	151.3	13,412,143.28	2,600,062.56	79.24						

NA = Not Assigned

Note: This Sheet was corrected on 8-22-08 to remove SPT From B-11, B-12 and B-2162A Offset (SJC 8-22-08)

TABLE 2.1 A
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MACTEC ENGINEERING AND CONSULTING, INC
RALEIGH, NC